RAIB

Rail Accident Investigation Branch

Rail Accident Report

Signal passed at danger at Stafford
26 April 2012

Report 16/2013
September 2013

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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(Cover photo courtesy Andrew Edkins)

Signal passed at danger at Stafford, 26 April 2012

Contents

Summary

At about 13:35 hrs on 26 April 2012, a locomotive operated by Devon & Cornwall Railways passed signal SD4-81 at Stafford, which was displaying a red aspect, by about 94 metres.

The investigation found that the locomotive had been travelling at excessive speed as it approached the Stafford area. The driver was probably aware that he had been exceeding the maximum permitted speed for a locomotive running on its own, but he did not make a full brake application as soon as he saw the signal displaying a double yellow aspect, which was his preliminary warning of the red signal ahead. The driver probably did not have sufficient experience or competence for the task he was performing and Devon & Cornwall Railways had not followed its own process for managing the competence of drivers. The company also had insufficient management controls to ensure compliance with its safety management system.

The Office of Rail Regulation had not examined the implementation of Devon & Cornwall Railways' safety management system following the issue of the company's safety certificate nearly two years before this incident.

The RAIB has made two recommendations to Devon & Cornwall Railways, covering the competence of safety-critical staff and locomotive maintenance. Two recommendations have been addressed to the Office of Rail Regulation, covering its supervision of a new operator's safety management system and the effectiveness of Devon & Cornwall Railways' safety management system. One recommendation has been made to RSSB for the relevant rail industry standard to address the assessment of the training needs of train drivers and other staff transferring between employers. A key learning point has been identified relating to the examination and maintenance of vehicles that are used infrequently on the main line.

Introduction

Preface

1 The purpose of a Rail Accident Investigation Branch (RAIB) investigation is to improve railway safety by preventing future railway accidents or by mitigating their consequences. It is not the purpose of such an investigation to establish blame or liability.

2 Accordingly, it is inappropriate that RAIB reports should be used to assign fault or blame, or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

3 The RAIB's investigation (including its scope, methods, conclusions and recommendations) is independent of all other investigations, including those carried out by the safety authority, police or railway industry.

Key definitions

4 All dimensions in this report are given in metric units, except speed and locations, which are given in imperial units in accordance with normal railway practice. Where appropriate the equivalent metric value is also given.

5 The report contains abbreviations and technical terms (shown in *italics* the first time they appear in the report). These are explained in appendices A and B.

The incident

Summary of the incident

6 At about 13:35 hrs on 26 April 2012, train 0Z47, a *light locomotive* operated by Devon & Cornwall Railways (DCR), en route from Washwood Heath, Birmingham, to Crewe, passed signal SD4-81 at Stafford, which was displaying a red aspect, by about 94 metres.

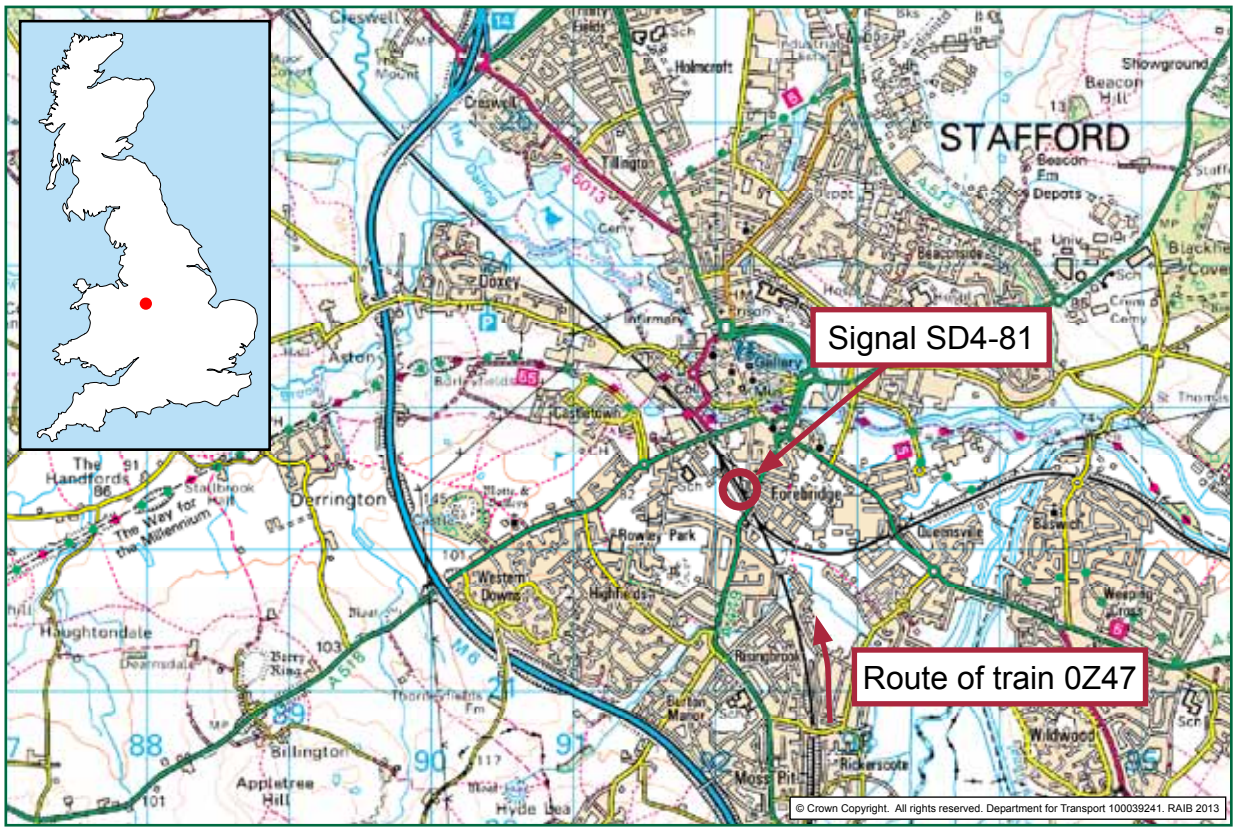

Figure 1: Extract from Ordnance Survey map showing location of incident

Context

Location

7 Signal SD4-81 is classified as a *multi-SPAD signal*, situated on the approach to Stafford station on the *Down* Slow line of the West Coast Main Line, figure 2. The *permissible speed* at this location is 60 mph (97 km/h). Signalling in the area is controlled from Stafford No. 4 signal box.

8 The locomotive approached Stafford on the Bushbury to Stafford (Grand Junction) line[1], before joining the West Coast Main Line at Trent Valley Junction No. 1, figure 3. The permissible speed on the Down Birmingham line[2] reduces from 90 to 60 mph (145 to 97 km/h) shortly before the junction.

[1] Its route from Washwood Heath had been via Castle Bromwich Junction, Walsall North Junction, Darlaston Junction, Portobello Junction and Bushbury Junction.

[2] The Down Main line becomes the Down Birmingham line approximately one mile before the junction.

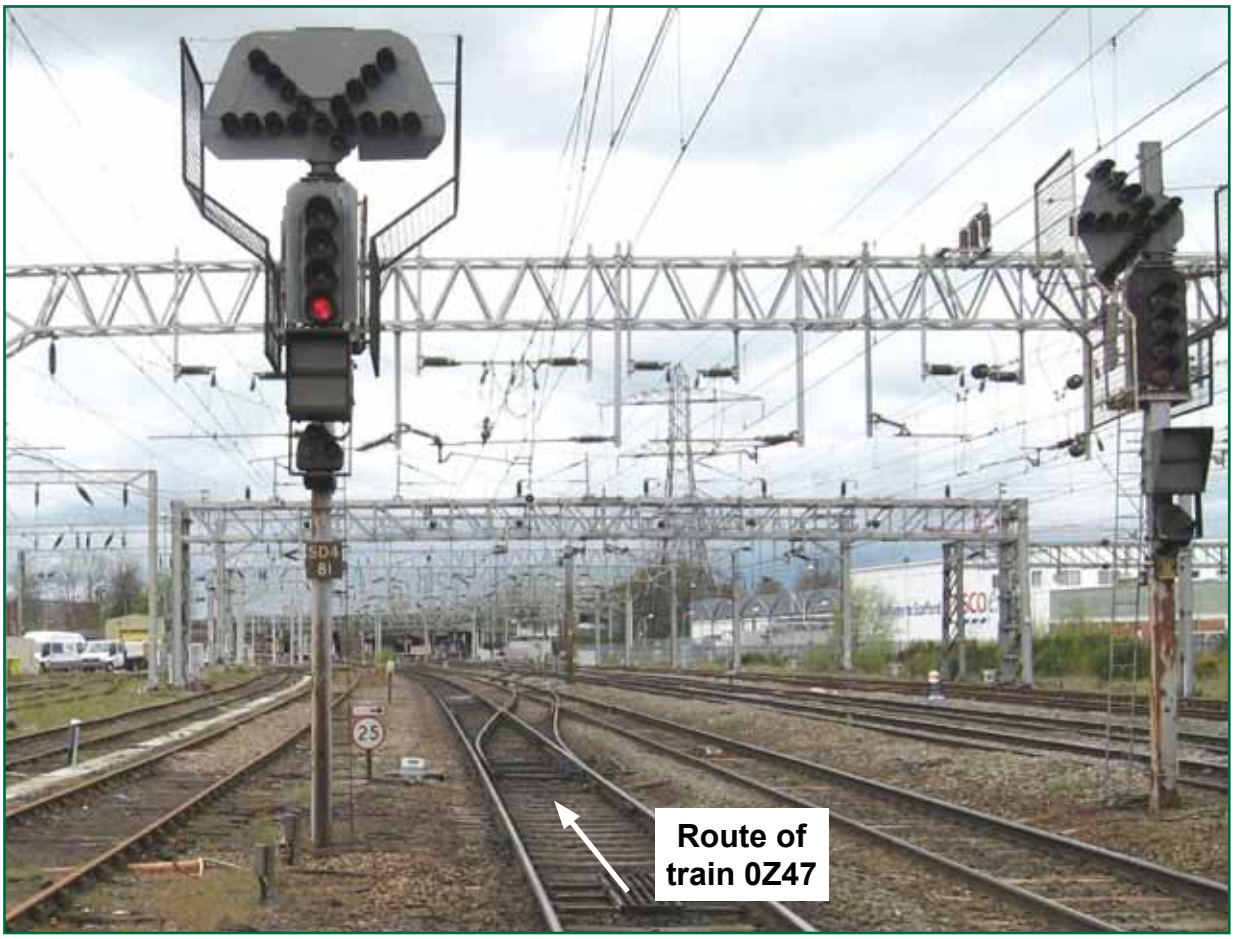

Figure 2: Signal SD4-81

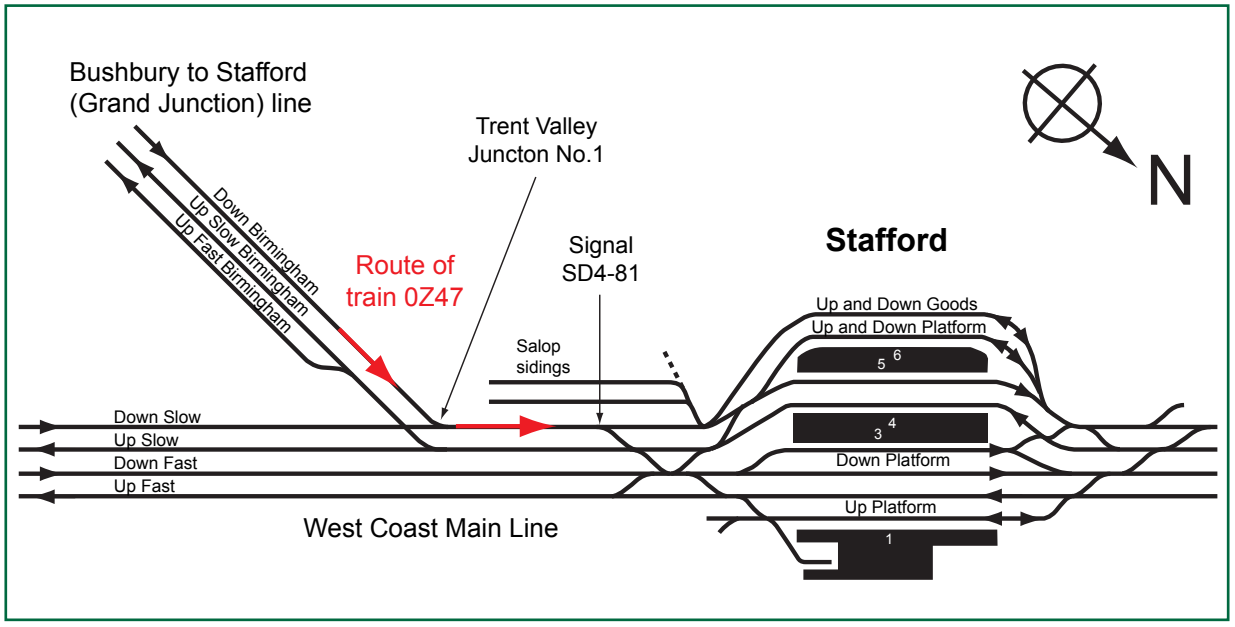

Figure 3: Track layout

Organisations involved

9 Devon & Cornwall Railways was the operator of the locomotive. DCR is part of the British American Rail Services (BARS) group. Another BARS company is RMS Locotec, which owns and maintains most of the locomotives operated by DCR. It did not own the locomotive involved in the incident on 26 April 2012 although it was maintaining it on DCR's behalf.

10 Amtrain provided part-time consultancy support to the BARS group. In particular, the BARS group's safety director who was in post until shortly before the incident was engaged through Amtrain, with additional support from a senior manager of the same company. Both of the consultants also drove trains for DCR on a 'zero hours' contract basis (this is a call-off arrangement in which an employer and an individual agree the hours to be worked, with no minimum). Amtrain offers training and assessment for safety-critical competencies held by track workers; it does not normally hire drivers to train operators.

11 The owner of the locomotive is Riviera Trains (RTL), which provides locomotives and rolling stock for use by others. RTL's vehicles are typically used for charter trains.

12 Network Rail is the owner and manager of the infrastructure, including signal SD4-81.

13 The Office of Rail Regulation (ORR) is the safety authority, and had issued DCR's *safety certificate* in May 2010 in accordance with the Railways and Other Guided Transport Systems (Safety) Regulations 2006 (ROGS). It is also responsible for validating a railway undertaking's *safety management system* and carrying out inspections under the Health and Safety at Work, etc. Act 1974[3]. The roles of the safety certificate and safety management system are described at appendix E.

14 All of the organisations involved freely co-operated with the investigation.

Locomotive involved

15 The locomotive involved in the incident was a class 47 diesel-electric locomotive, No. 47843, which had been built in 1965 and owned by Riviera Trains (RTL) since 2005. It had been hired to DCR with another locomotive, No. 47812, and hauled to RMS Locotec's depot at Washwood Heath on 24 March 2012. The basis of the hire of the two locomotives was that they both needed maintenance as neither of them had been used on the main line for some time (refer to paragraph 59). Maintenance was to be carried out by RMS Locotec on behalf of DCR.

16 RMS Locotec started a routine examination of 47843 (including an *A exam*) when it arrived. The depot manager concluded that the extent of the work that was necessary to bring the locomotive into a serviceable condition precluded a quick return to main line operation; this related principally to matters affecting reliability such as the rectification of oil leaks. He therefore abandoned the A exam on 29 March 2012 and focused his attention on bringing 47812 into use. Locomotive 47843 was being returned to RTL at Crewe (figure 4), when the incident occurred on 26 April 2012. DCR had not used the locomotive on the main line between 24 March and 26 April.

[3] Since June 2013, such inspections are being carried out in accordance with the common safety method for supervision, defined in European Regulation No. 1077/2012.

Figure 4: Locomotive 47843 leaving Washwood Heath before the incident on 26 April 2012 (courtesy Andrew Edkins)

Staff involved

17 The driver was a senior manager of Amtrain (paragraph 10), and had originally been engaged to provide consultancy support to BARS. He was a 'zero hours' driver for DCR. He had been a volunteer driver with the North Yorkshire Moors Railway for about 25 years, and a *traction inspector* for that railway for about 5 years. In addition, he had worked as a *fireman* on steam locomotives operating on the main line. The driver had a medical certificate to Level 1 of 'Competence Specific Medical Fitness Requirements', Ref. NR/L2/OHS/00124, and 'Train Movement – Staff Suitability and Fitness Requirements', Ref. GO/RT3451 Issue 2.

18 The second person in the cab of the locomotive was a technician employed by RMS Locotec, part of the BARS group. He had been a locomotive technician for about 11 years, carrying out fault finding and examination work. He often accompanied drivers, to assist them in the event of technical problems occurring with the locomotives used by DCR. He had been the general manager of traction and rolling stock (T&RS) for BARS, from the inception of DCR until October 2011.

19 BARS' head of T&RS and safety director at the time of the incident had 26 years' experience of locomotive maintenance and repair. He had started as an apprentice with British Railways, and had worked his way up through technician, project engineer, project manager, technical riding inspector, area engineer and area manager for a variety of employers in the industry, before carrying out an interim management role with a train maintenance company. At the time of the incident, he was working for BARS on a part-time consultancy basis.

20 The manager of RMS Locotec's depot at Washwood Heath had worked in the railway industry since 1999, and had worked his way up to become a senior technician. He was working for Hanson Traction when it became part of the BARS group in October 2010. Witness evidence indicates that he had been deemed competent by his previous employers to maintain locomotives of classes 31, 47 and 56.

21 The former safety director for the BARS group was a part-time consultant engaged through Amtrain. He was also another of DCR's 'zero hours' drivers. His experience included train driving as well as managing and training drivers. He had subsequently been an operations specialist with RSSB.

External circumstances

22 The RAIB has concluded that the weather and other external circumstances did not influence the occurrence.

Events preceding the incident

23 The RAIB has analysed data from the *on-train data recorder* (OTDR) installed on the locomotive[4] and from Network Rail's train operations monitoring system known as the *Control Centre of the Future* (CCF). The sequence of events set out in paragraphs 26 to 29 is partly based on this analysis.

24 One week before the incident, senior managers within BARS agreed to return locomotive 47843 to Crewe, following a request from the owners, RTL. Witness evidence indicates that, on the day before the incident (25 April 2012), DCR's *controller* and its operations manager had decided to return the locomotive under its own power. RMS Locotec's depot manager and BARS' head of T&RS then worked together to repair a fault with the *driver's safety device* (DSD) unit on the locomotive. When the driver and the technician who was to accompany him arrived at Washwood Heath depot on the morning of 26 April, the depot manager and head of T&RS were still repairing the DSD.

25 The depot manager subsequently signed a 'service check exam' sheet and a 'loco repair sheet', which included the statement "loco fit to run". There are conflicting accounts of a conversation between him and the driver. However, witnesses agree that the depot manager eventually confirmed to the driver that the locomotive was 'OK' to be driven. The driver and technician subsequently inspected the locomotive themselves[5] and identified a piece of loose trim on the side of the locomotive, which the depot staff then removed.

[4] The validity of the data recorded by the OTDR is considered at appendix I. After the incident, the speeds in the OTDR output file were found to have been low by approximately 7.4%. The speeds and distances referred to in this report have been corrected to reflect the speed calibration carried out in May 2012.

[5] Drivers' normal duties include carrying out pre-departure checks.

Figure 5: Approximate location where the DSD was isolated, prior to entering Network Rail infrastructure

26 Although the depot manager had repaired the DSD, it failed again and was isolated by the technician on board the locomotive, in the vicinity of the gates just before the locomotive crossed the boundary between Washwood Heath depot and Network Rail's main line infrastructure, figure 5. Module TW5 of the *Rule Book* does not permit a train to enter service if the DSD is defective. The locomotive's *national radio network* (NRN) radio also failed at Duddeston Junction, after the driver and technician changed ends to reverse the locomotive immediately following departure from the depot. The driver did not stop and report the failure of either of these safety systems to the signaller as required by Module TW5 of the Rule Book.

Events during the incident

27 Around 55 minutes after leaving Washwood Heath, the locomotive joined the Bushbury to Stafford line at Bushbury Junction. The driver then accelerated continuously, although he reduced power as the locomotive reached approximately 90 mph (145 km/h), and the locomotive reached 100 mph (161 km/h) about 3 minutes before the brakes were applied. He and the technician subsequently both stated that the speedometer had been stuck, and that it had indicated a maximum speed of 55 mph (89 km/h). The driver did not stop to report the defective speedometer to the signaller, as required by the Rule Book.

28 The driver made a partial brake application as the locomotive approached signal SD4-213, which was displaying a double yellow (‘*preliminary caution*’) aspect, (figure 6); the brake application was increased 16 seconds later. The locomotive subsequently passed signal SD4-95, which was displaying a single yellow (‘*caution*’) aspect, at approximately 70 mph (113 km/h) and signal SD4-81, which was displaying a red (‘danger’) aspect at approximately 24 mph (38 km/h).

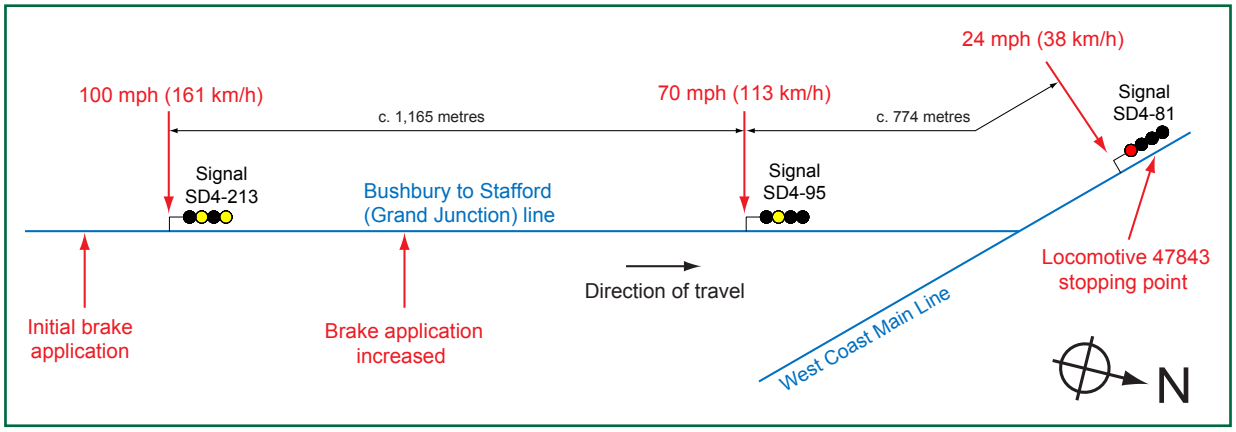

Figure 6: Diagram showing the approach of locomotive 47843 to Stafford

Events following the incident

29 The locomotive stopped approximately 94 metres beyond signal SD4-81. Another train was approximately 500 metres ahead of the locomotive when it came to a stand, and was about to depart from platform 5 at Stafford station. This was train 1F44, the 13:01 hrs London Midland passenger service from Birmingham New Street to Liverpool Lime Street.

30 The driver and technician state that DCR management initially instructed them to continue their journey to Crewe. However, they alleged that the brakes on the locomotive were defective, and the technician contacted an independent engineer from URS[6]; arrangements were then made for him to come to Stafford to examine the locomotive. Locomotive 47843 was then moved into platform 6 at Stafford station, and was later stabled nearby in the Salop sidings (figure 3).

31 The driver and technician were tested for the effects of drugs and alcohol in accordance with RSSB’s ‘Guidance on the Management of Drugs and Alcohol following an incident’, Ref. GE/GN8570, issue 1, which was current at the time. The results from the testing showed no sign of drugs or alcohol for either the driver or the technician.

[6] A company which is listed on the New York stock exchange as URS.

The investigation

32 A third party contacted the RAIB on 10 May 2012 to express concern about the incident and the way in which it was being investigated by DCR. Based on the information provided, which indicated that it had been a low-risk event, the RAIB advised the individual that it would be more appropriate for this concern to be addressed to the ORR, to inform its inspections of DCR[7]. On 24 September 2012, a member of railway staff employed by another train operating company sent an email to the ORR, the RAIB and RSSB, in which he outlined further details of the incident and requested that action be taken to prevent a recurrence. The email detailed that the locomotive's DSD had been isolated and that it had apparently reached a maximum speed of 97 mph (156 km/h) before passing the signal at danger; it also stated that the driver had subsequently been unable to provide documentary evidence of his *route knowledge*. The RAIB subsequently reviewed the available information, including DCR's internal report, and decided to conduct an investigation into the incident.

33 Given the length of time that had elapsed since the incident occurred, the RAIB did not have the opportunity to examine the locomotive itself and has relied on evidence provided by others.

Sources of evidence

34 The following sources of evidence were used:

- witness interviews;
- DCR's internal investigation report and its report on the locomotive;
- an independent locomotive examination report prepared by URS for DCR;
- vehicle maintenance records;
- data from the locomotive's OTDR;
- photographs of the locomotive's brake blocks taken at Riviera Trains, Crewe, on 14/05/12;
- CCF data;
- signal box voice recordings;
- DCR procedures and staff competence records;
- ORR guidance documents in the public domain, which may be found at www.rail-reg.gov.uk;
- ORR internal reports and emails; and
- a review of previous RAIB investigations that had relevance to this incident.

DCR was unable to provide the RAIB with a copy of its control log for the day of the incident.

[7] The ORR subsequently advised the RAIB that, although the incident did not meet its normal criteria for investigation of a signal passed at danger (SPAD), it nonetheless decided to carry one out when it became aware of further circumstances relating to the incident in May 2012.

Acknowledgements

35 The RAIB would like to thank:

- Interfleet Technology and Railway Brake Services, who provided advice on class 47 braking characteristics; and
- Colas Rail and DB Schenker, who provided advice on *route learning norms*.

Key facts and analysis

Identification of the immediate cause[8]

36 **The locomotive was travelling at excessive speed on the approach to signal SD4-81.**

37 The locomotive approached signal SD4-81, which was displaying a red aspect, with the brakes fully applied, but was travelling too quickly to enable it to stop before passing the signal.

Identification of causal factors[9]

The driver's handling of the locomotive

The braking of the locomotive at signal SD4-213

38 **The driver did not make a full brake application as soon as he saw the signal displaying a double yellow aspect. This was a causal factor.**

39 The permissible speed on the Down Main line is 90 mph (145 km/h)[10], and the light locomotive should have been driven at no more than 75 mph (121 km/h), as required by Module TW3 of the Rule Book. The locomotive's speed was above 75 mph for nearly seven minutes and above 90 mph for five and a half minutes before the SPAD incident occurred. It reached a maximum speed of 103 mph (166 km/h) before approaching signal SD4-213, which was 1.2 miles (1.9 km) from signal SD4-81 and displaying a double yellow 'preliminary caution' aspect. The OTDR shows that the driver made a partial brake application[11] at the AWS (*automatic warning system*) inductor for signal SD4-213. The driver stated he was not aware of being distracted by the second person in the cab.

40 The braking profile of the locomotive on the approach to signal SD4-81 is shown at figure 7. The retardation rate was approximately 5.8 %g (0.57 m/s^2) once the brakes were fully applied, but approximately 4.2 %g (0.41 m/s^2) during the first 16 seconds. The reduction in speed during the first 16 seconds of braking was approximately 12%, in comparison with an estimated 17% if the brakes had been applied fully. The locomotive probably would not have passed signal SD4-81 at danger if the driver had fully applied the brakes straight away.

41 Guidance on the braking of light locomotives, which is commonly issued by train operators to their drivers, is to make an initial speed reduction as quickly as possible; the brake application may be reduced subsequently if appropriate. The OTDR data demonstrates that the braking of the locomotive in this instance was inconsistent with such guidance. The RAIB has not seen any evidence that DCR had issued such guidance to its drivers.

42 The braking performance of the locomotive is considered further at paragraph 66.

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[8] The condition, event or behaviour that directly resulted in the occurrence.

[9] Any condition, event or behaviour that was necessary for the occurrence. Avoiding or eliminating any one of these factors would have prevented it happening.

[10] There is a differential speed restriction of 125 mph (201 km/h) for certain types of train.

[11] Approximately 70% of a full application.

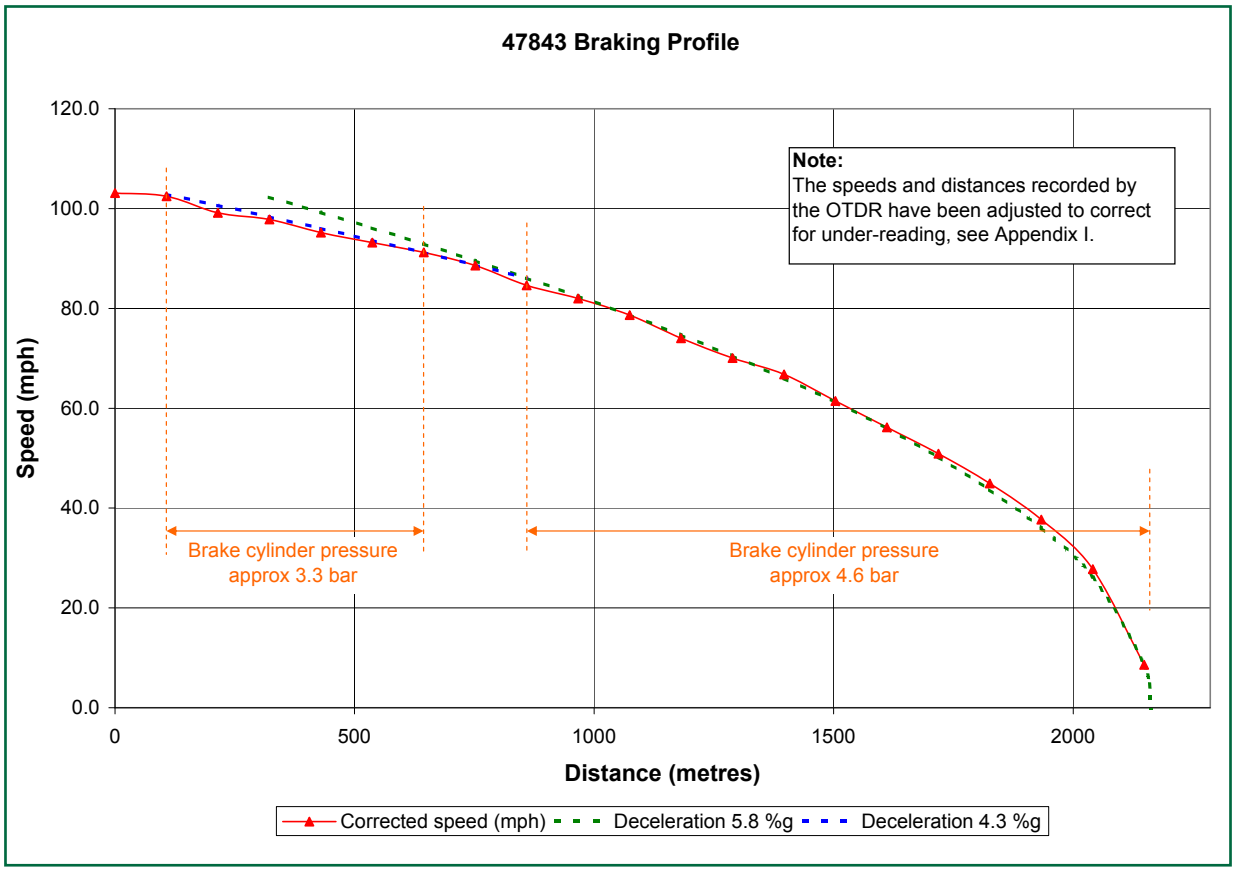

Figure 7: 47843 braking profile

Exceeding the permitted speed

43 The driver may have deliberately exceeded the speed permitted for light locomotives. This was a probable causal factor.

44 After the incident, the driver and technician advised DCR's investigation panel that the speedometer had been stuck showing a maximum of 55 mph; the OTDR shows that the locomotive was travelling faster than 55 mph (89 km/h) for eight minutes before passing signal SD4-81 at danger. The accuracy of the speedometer is discussed at paragraph 57. Irrespective of the speed displayed, the driver stated that he was aware that the locomotive was travelling faster than 55 mph and also that the Rule Book restricted light locomotives to 75 mph (121 km/h).

45 The RAIB has concluded that the driver probably knew the locomotive was travelling faster than 75 mph (121 km/h). His earlier actions demonstrated that he had disregarded provisions of the Rule Book, despite being aware of them (refer to paragraph 83c).

The driver's competence

The driver's experience of high-speed operation

46 **The driver had limited experience of high-speed operation, in particular of its effect on the braking performance of a light locomotive. This was a probable causal factor.**

47 On Britain's main line railway, the principal elements of competence on which train drivers are assessed are:

- relevant parts of the Rule Book ('rules knowledge');
- the types of train that the driver will operate ('traction knowledge'); and
- the routes over which the driver will drive ('route knowledge').

Documents defining the arrangements for managing driver competence are listed at appendix F.

48 The driver's rules knowledge and traction knowledge for class 47 locomotives had been assessed by DCR, although the RAIB has seen no evidence that this included experience of practical handling on the main line. Furthermore, a significant part of the assessment of his route knowledge was based on his previous claimed experience (refer to paragraph 54). DCR has not been able to provide any evidence that it sought to verify the driver's experience that was 'transferred in' from previous employers, or that DCR had carried out a training needs analysis for the driver (this is discussed further at paragraph 62).

49 Before joining DCR, the driver's experience of driving trains was mainly acquired with the North Yorkshire Moors Railway, which principally operates trains hauled by steam locomotives; he did not drive class 47 locomotives on this railway. Speeds on the North Yorkshire Moors Railway's own line are limited to 25 mph (40 km/h); its trains also use the Esk Valley line between Battersby and Whitby at certain times of year, on which speeds are limited to 45 mph (72 km/h). He had limited experience of driving trains under instruction on the main line at speeds of up to 75 mph (121 km/h), when he had been working as a fireman on steam locomotives in the period up to October 2005 (refer to paragraph 54).

50 With DCR, which had started operating during the second half of 2011, the driver had mainly driven class 31 and 56 locomotives for freight and route learning purposes, at speeds of up to 75 mph (121 km/h). On two or three occasions, he had also driven High Speed Trains (HSTs)[12], which DCR was moving between Crewe and Newcastle on behalf of train operator Grand Central, at speeds of up to 100 mph (161 km/h).

51 The reason that the Rule Book restricts the speed of light locomotives (paragraph 39) is that they have relatively poor braking performance in comparison with longer passenger and freight trains, for which most of the braking effort is provided by the trailing coaches or wagons. The RAIB considers that the driver's limited experience of driving trains at speeds above 75 mph (121 km/h) probably contributed to a lack of awareness of the distance that would be required to stop the locomotive.

[12] Also known as InterCity 125.

The driver's route knowledge

52 **The driver probably had insufficient route knowledge. This was a probable causal factor.**

53 Main line signalling in the UK is based on the principle of route signalling, in which the signalling system provides the train driver with an indication of the route that a train is to take, and drivers use their knowledge of the route to drive trains at the appropriate speed. Rail industry standard RIS-3702-TOM, 'Management of route knowledge for drivers, train managers, guards and driver managers' (appendix F, paragraph F4), describes route knowledge as 'knowledge of route factors and route risks and appropriate practical operating experience to enable staff to work safely over each route and to give them the necessary skills and confidence to predict and react to environmental changes and conditions'.

54 An extract from the driver's *route card* is attached at appendix J; this includes a number of routes for which the driver had signed to indicate his competence on 1 June 2011. The 'Supervisor Verification' on the driver's route card was signed by the BARS group safety director at the time (a consultant working through Amtrain, see paragraphs 17 and 21). Witness evidence indicates that the safety director believed the driver to have gained route knowledge from his experience as a locomotive fireman, and there was no formal assessment of his training needs as a driver. Colas Rail, which has a broadly similar type of freight operation to DCR, has advised the RAIB that its route learning norms would have required in excess of 148 days' route learning for all the routes signed by the driver on 1 June 2011. The driver's experience of these routes had been obtained prior to his involvement as a driver in the operation of DCR's first train in July 2011 (it had previously run a one-off special to retain its safety certificate, see appendix D). The documents that RAIB has seen in support of the driver's driving experience identify only seven occasions on which he had driven under supervision on the main line (other than on the Esk Valley line, paragraph 49); none of these had been since October 2005.

55 The driver signed his route card to confirm his competence on additional routes on 1 October 2011, including the route from Washwood Heath to Crewe; further routes were added on 4 January 2012. Colas Rail's route learning norm for the route from Washwood Heath to Crewe requires a driver to experience a total of sixty trips over the route (thirty days); DB Schenker has assessed the equivalent route learning requirement as fifteen days. These norms are based on the operators' *route risk assessments* for the route. Witness evidence suggests that the driver may have driven over the route on only six to eight occasions before the incident on 26 April 2012. The RAIB has seen no record of a formal assessment of his competence for the route.

56 The *signalling braking distance* from signal SD4-213 to signal SD4-81 is 18% shorter than the average signalling braking distance on the Bushbury to Stafford line. There is also restricted sighting on the approach to signal SD4-213, which displays a cautionary aspect when there is a train ahead in the platform at Stafford. In this case, signal SD4-81 would be at danger; this is a multi-SPAD signal (see appendix B). A driver with sufficient route knowledge would anticipate the possible need to brake at certain locations before a signal came into view. The partial brake application made by the driver at signal SD4-213 (paragraph 39) indicates that his understanding of the route ahead as he approached Stafford was deficient.

The speedometer

57 The driver may have been partially misled by the defective speedometer. This was a possible causal factor.

58 The RAIB has been unable to substantiate the claim, made by the driver and technician, that the speedometer had been stuck showing a maximum of 55 mph (paragraph 44). However, when the locomotive was hauled back to RTL at Crewe on 7 May 2012, DCR staff observed a discrepancy between the speedometer on the hauling locomotive, 47812, and that on locomotive 47843. Witnesses have also reported that the speedometer on locomotive 47843 was inoperative (not reading at all), when the locomotive was taken from Crewe to collect coaches belonging to RTL from Rail Vehicle Engineering at Derby on 18 July 2011. Locomotive 47843 was not used on the main line again until its hire to DCR on 24 March 2012.

59 RTL subsequently tested the speedometer at Crewe on 14 May 2012 and found that it was under-reading by 13%. It had previously been calibrated on 17 September 2009, as part of the locomotive's last scheduled B exam (see appendix B), at which time no adjustment had been necessary[13]. Since that date, the locomotive had spent the majority of its time carrying out shunting and train heating[14] duties at Crewe: records provided by RTL indicate that, until its hire by DCR on 24 March 2012, its main line duties had consisted of two return trips from Crewe to Warrington and one from Crewe to Derby.

60 Representatives of RTL and DCR reported that when they examined the locomotive at Crewe, they found that the locknut on one of the adjustment screws on the speedometer equipment box was loose and that the screw itself showed signs of recent adjustment (figure 8). This screw provides a coarse adjustment of the speed displayed by the speedometer; its condition apparently explains the discrepancy of 13% in the speed displayed, although it would not have caused the alleged sticking of the speedometer (paragraph 27). The RAIB has been unable to establish why or when the locknut on the adjustment screw had been undone.

61 The possible scenarios associated with the driver's actions and the defective speedometer are:

a. The speedometer was stuck showing 55 mph immediately before the incident and the driver and technician were aware that it was defective. In this case, Module TW5 of the Rule Book required the driver to have stopped the locomotive immediately to tell the signaller, and not to have moved it until instructed to do so. He did not do so.

b. The speedometer was stuck showing 55 mph but the driver and technician were not aware that it was defective. For this to have happened, they would have to have been unable to tell the difference between 55 mph (89 km/h) and the maximum speed of the locomotive, 103 mph (166 km/h). The RAIB does not consider this to be credible.

[13] A speedometer is required by railway group standard 'Rail Vehicle Maintenance', Ref. GM/RT2004 to be accurate to within ± 2%.

[14] ie running the engine while stationary to provide electric power for the heaters on coaching stock.

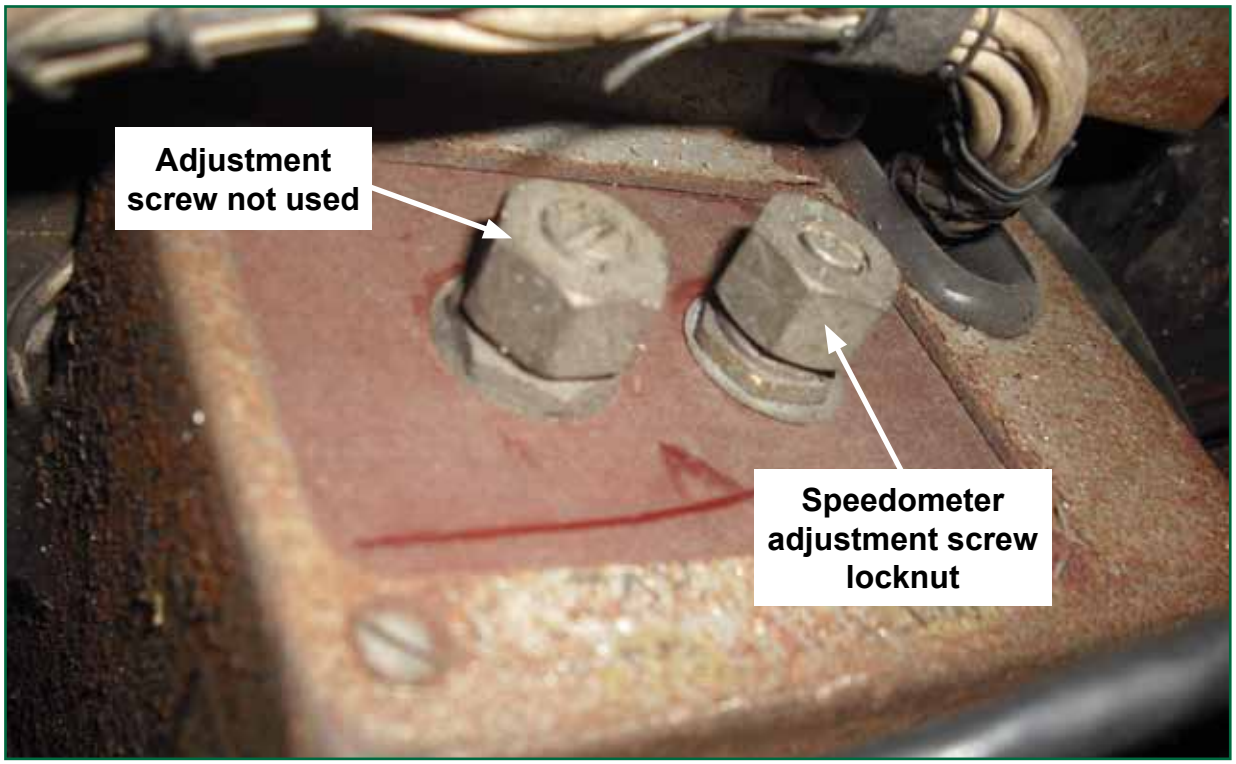

Figure 8: Close up of the coarse adjustment screw for the speedometer on 47843 (courtesy RTL)

c. The speedometer was not stuck showing 55 mph and the driver believed the locomotive was travelling at the indicated speed of 90 mph when it was actually at its maximum speed of 103 mph (166 km/h). The RAIB concludes that this is the most likely scenario.

Identification of underlying factor[15]

DCR's non-compliance with its safety management system

62 **DCR did not follow its own process for managing the competence of drivers, and it had insufficient management controls to ensure compliance with its safety management system.**

63 DCR's safety management system was based on that of an established passenger operator (appendix D, paragraph D2), and included two documents containing its requirements for managing the competence of its operating staff (appendix F, paragraph F2). The RAIB has seen no evidence that it had complied with the following requirements of its procedure 'Route and traction requirements for drivers and guard / shunters', Ref. OS 009:

- *Conduct route risk assessments to establish related hazards and identify the minimum frequency to operate over that route and retain competence.*
- *Assess the route competence of drivers. The routes over which staff are competent will be initially certified following a practical assessment on the route.*

[15] Any factors associated with the overall management systems, organisational arrangements or the regulatory structure.

- *Design individual route learning programmes for drivers [based on agreed norms], and monitor driver progress against such. The detail of this learning programme along with copies of related assessments will be retained in the individual's personal file at the depot.*
- *Prevent traincrew from operating over routes where competence has lapsed. Route knowledge is deemed to have lapsed after 6 months if not applied.*

64 DCR's company procedure OS 009 assigns the substantive responsibilities for managing driver competence to two posts described as the 'Operations Managers (North and South)'. These posts remained unfilled until February 2012, when DCR recruited one operations manager. Witness evidence indicates that, until this time, the competence of DCR's drivers had been assessed by the two consultants from Amtrain, who were also both acting as drivers for DCR (appendix D, paragraph D6), with some support from the general manager of the Dartmoor and Weardale railways[16]. One of these consultants was the driver involved in the incident on 26 April 2012. The consultants from Amtrain stated that they felt under pressure to drive trains at the same time as they were trying to put adequate processes in place for managing driver competence. By the time of the incident, Amtrain had been relieved of its safety direction responsibilities. The RAIB considers that DCR's arrangements for managing its drivers during this period lacked independence, were non-compliant with its own procedures and were inadequate to ensure the competence of its drivers.

65 DCR's safety management system included a number of posts with safety responsibilities. As a start-up operator, it was unlikely that these would all have been filled by the time DCR began operating trains. In such cases, the responsibilities defined in the safety management system could have been formally reassigned on an interim basis, although the RAIB has seen no evidence that such a reassignment had been carried out (paragraph 48).

Discounted factor

The locomotive's brakes were alleged to have been defective

66 After the incident, the driver and the technician on board locomotive 47843 alleged that its brakes were defective (although the driver later told the RAIB that he had not been aware of any problem with the brakes when he performed a *running brake test* after leaving Washwood Heath). Arrangements were made for an independent engineer from URS to examine the brakes on the locomotive. His report concluded that it had reduced braking performance due to the brake blocks failing to make complete contact with the wheels.

[16] This individual assessed the rules knowledge of the driver involved in the incident on 15 April 2012, eleven days before the incident occurred.

67 The RAIB has compared the braking performance of locomotive 47843 on its approach to signal SD4-81 with curve A1 in railway group standard 'Braking system requirements and performance for traction units' (GM/RT2042), and with tests of braking on a class 47 light locomotive that were carried out by British Rail in 1983 (see figure 9)[17]. A direct comparison is not possible for the following reasons:

a. The results of the 1983 tests and the relevant stopping distances mandated in GM/RT2042 are for speeds equal to or below 75 mph (121 km/h), whereas the locomotive involved in the incident was braking from 103 mph (166 km/h). The comparison is made between the relative stopping distances from 75 mph (121 km/h).

b. The reference stopping distances (from the 1983 tests and GM/RT2042) include the period taken for the brake pressure to build up, whereas the stopping distance representing the actual braking performance of the locomotive does not. This is because the brakes of locomotive 47843 were already fully applied by the time its speed had fallen to 75 mph (121 km/h).

c. The requirement in GM/RT2042 and the tests carried out in 1983 relate to level track, whereas the gradient on the approach to signal SD4-81, from the point at which the speed of locomotive 47843 had fallen to 75 mph (121 km/h), falls at an average of 1 in 594. This would have extended the stopping distance by approximately 30 metres.

d. Cast iron brake blocks exhibit different coefficients of friction depending on the starting speed of a brake application: the higher the initial speed, the lower the coefficient of friction throughout that particular brake application. This means that the stopping distance of the locomotive, if it had started braking at 75 mph (121 km/h), would have been less than the distance required to stop from 75 mph while braking from 103 mph (166 km/h).

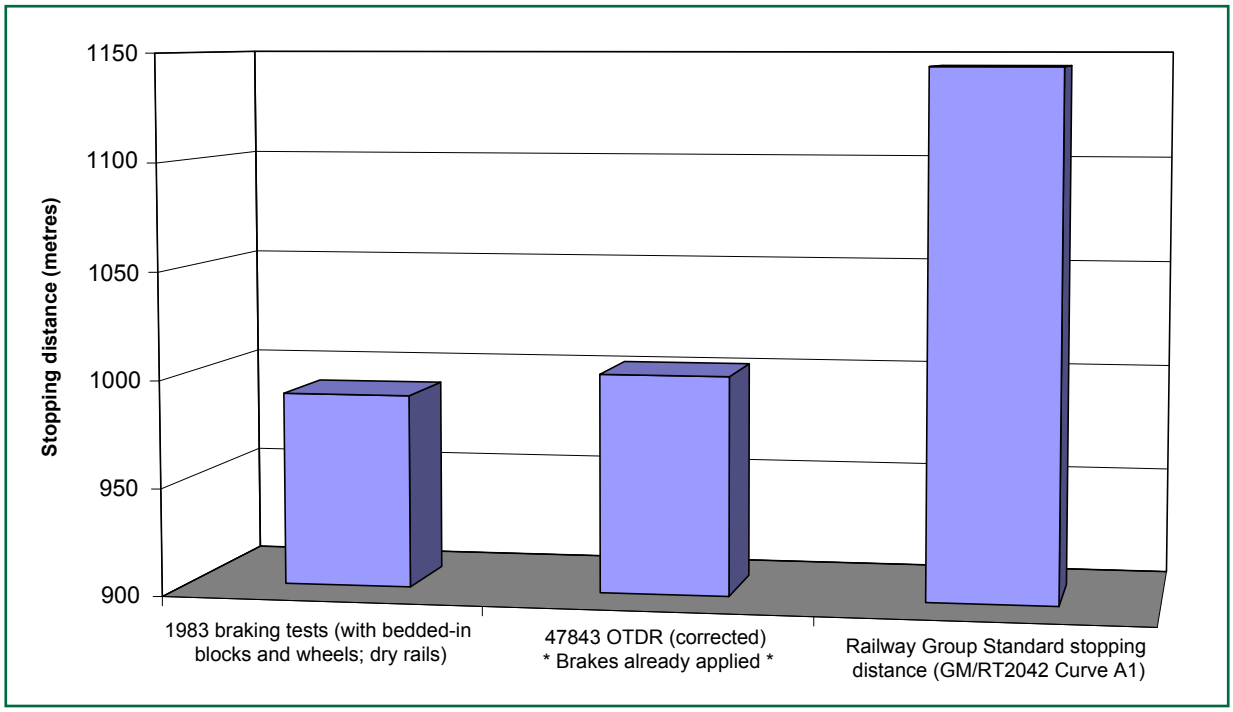

Figure 9: Comparison of stopping distances from 75 mph (121 km/h)

[17] The results shown for the 1983 tests are for a locomotive with bedded-in brake blocks on level, dry rail.

68 The RAIB has concluded that the braking performance of the locomotive was broadly as effective as that of the class 47 locomotive tested by British Rail in 1983, and that it would have complied with the relevant standard (curve A1 in GM/RT2042). It was therefore not causal to signal SD4-81 being passed at danger on 26 April 2012. The condition of the brake blocks is discussed at appendix H.

The role of the Office of Rail Regulation

The absence of a detailed examination of DCR's safety management system by the ORR

69 **The ORR had not examined the implementation of DCR's safety management system.**

70 As explained at appendix E, ROGS defines the process of assessing an operator's application for a safety certificate; the objective of the assessment is to determine whether the safety management system is capable of delivering a safe operation. The issue of a safety certificate does not indicate that an operator has implemented the safety management system[18]. When the ORR issued DCR's safety certificate, there was therefore a period of risk before the ORR commenced its inspection of the safety management system in accordance with the Health and Safety at Work, etc. Act 1974.

71 During the assessment of DCR's application for its safety certificate, the ORR identified the following priority areas to be examined through inspection:

a. Staff selection / training / competence management / route and traction knowledge (high priority).

b. Rolling stock maintenance (medium priority).

72 The ORR held an internal meeting to discuss DCR's application on 20 May 2010, one week before it issued the safety certificate, which was four months after the submission had been received. This was chaired by an 'assuror', who was independent from the team that had carried out the assessment. The assuror recommended that the two priority areas identified during the assessment (paragraph 71) should be subject to inspection by the ORR: the arrangements for ensuring staff competence were to be inspected before DCR's operation went 'live' and those for rolling stock maintenance within one year of DCR starting to run trains. DCR was not aware of these recommendations and the ORR had not carried out an inspection of DCR by the time of the incident on 26 April 2012, which was nearly two years after it issued the safety certificate (refer to appendix D, paragraphs D4 to D7. Had the ORR carried out the inspections, it would probably have identified DCR's non-compliance with its process for managing driver competence (paragraph 62).

[18] European Regulation No 1077/2012, which has applied since 7 June 2013, now explicitly links the assessment of a safety management system with supervision of its 'continued application' after the safety certificate has been issued.

73 The responsibility for validation of these aspects of DCR's safety management system was not clearly assigned within the ORR during the period that DCR started to run trains. The same individual would normally have acted as the lead assessor for safety certification and as the account holder for inspection purposes (appendix E, paragraph E1). In the case of DCR, the application for a safety certificate was assessed by the team within the ORR that dealt with *heritage railways*; the responsibility for inspection was subsequently transferred from the heritage team to the freight team. Witness evidence and correspondence reveal a lack of clarity about which team was responsible in the period between February and July 2011; this lack of clarity existed until DCR ran its first loaded freight train on 12 July 2011 (see appendix D, paragraph D6).

74 The freight team had not participated in the assessment of DCR's application for a safety certificate, and the heritage team had not previously assessed safety certificate applications for freight operators (including the complexities of managing drivers' route knowledge for a spot-hire freight operation). The allocation of the review of DCR's application to the heritage team came about because the ORR had understood that DCR was intending principally to operate a limited passenger service from its two heritage lines onto the main line network, notwithstanding the inclusion of national freight operations in its submission (appendix D, paragraph D1).

75 Following the issue of DCR's safety certificate on 26 May 2010, correspondence shows that the heritage team sought to pass the responsibility for inspection of DCR's safety management system to the freight team. This was because they had obtained a better understanding of the likely scope of DCR's proposed main-line operation through the assessment process. The freight team understood the transfer of 'account holder' responsibility would be effective from the start of DCR's main line operations. The RAIB has seen no evidence that the freight team was made specifically aware of the assuror's recommendation that staff competence should be inspected before DCR started to operate trains (paragraph 72). Witness evidence indicates that the ORR did not have an effective process for managing or tracking any actions arising from the safety certification process.

76 Witnesses have also stated that ORR inspectors from both teams believed that there was no point in carrying out an inspection of DCR until the company had started operations, despite the assuror's recommendation. Although the ORR was aware that DCR was carrying out empty stock and light engine movements during the second half of 2011, inspectors did not believe DCR was carrying out substantive freight operations (appendix D, paragraph D7). This was because they were relying on an informal arrangement for DCR to advise them of the scale of its operations, and the ORR had not established a process for inspectors to monitor such movements.

Other safety issues

The maintenance of the locomotive

77 **The locomotive had not been maintained in accordance with RTL's vehicle maintenance instructions.**

78 RTL's vehicle maintenance instructions required locomotive 47843 to have had a B exam at least every twelve calendar months (an extract outlining the various types of exam is included at appendix G). Its last B exam had been nineteen months before the incident, and it had not had an intervening A+ exam, which was required every six calendar months. Its last 'fitness for service' exam had been carried out nine months before the incident. The RAIB has seen no evidence that the checks of safety systems defined in the A+ exam, including AWS and TPWS (the train protection and warning system), had been carried out since the last B exam.

79 Although the agreement for hire of locomotives 47843 and 47812 by DCR was informal, witnesses agree that this was on the understanding that DCR would maintain the locomotives (in practice this was to be carried out by RMS Locotec at Washwood Heath). RTL had emailed its vehicle maintenance instructions to BARS' head of T&RS on 24 March 2012.

80 Witness evidence indicates that the depot manager at Washwood Heath wrongly understood that locomotive 47843 required an A exam before operating on the main line under its own power; he was not aware that the vehicle maintenance instructions required it to have received a B exam. The RAIB has seen no evidence that anyone in the BARS group consciously decided to carry out a less stringent examination than was required by the vehicle maintenance instructions. The depot manager had intended to complete the A exam that had been abandoned on 29 March 2012 due to the general condition of the locomotive (paragraph 16) before authorising it to leave the depot on 26 April 2012. However, he had been diverted into repairing the DSD fault with BARS' head of T&RS and had run out of time before the driver and technician arrived to drive the locomotive to Crewe. As a result, he had not completed the A exam.

81 The under-reading of locomotive 47843's speedometer is discussed at paragraphs 57 to 61. With this possible exception, the condition of the locomotive was not causal to signal SD4-81 being passed at danger on 26 April 2012, even though it had not been maintained in accordance with RTL's vehicle maintenance instructions.

Devon and Cornwall Railways' safety management system

82 **Devon & Cornwall Railways' non-compliance with its own safety management system and other practices may indicate that there was an underlying deficiency in its safety culture.**

83 The nature of a start-up operation such as DCR is that some posts will be unfilled initially, and that one person may have to cover more than one post to discharge the responsibilities defined in the safety management system (paragraph 65). However, the practice at DCR was not compliant with its safety management system and fell short of best practice in the industry. The following examples have been identified in this report:

a. The DCR operations manager and the duty controller decided to return locomotive 47843 under its own power (paragraph 24), despite its known poor condition.

b. Staff at Washwood Heath depot released locomotive 47843 for operation on the main line without completion of an A exam (paragraph 25).

c. The technician travelling on locomotive 47843 isolated the DSD just before it entered Network Rail controlled infrastructure (paragraph 26 and figure 5). Module TW5 of the Rule Book states that a driver should not allow a locomotive to enter service with a failed DSD. The Rule Book also requires a driver to stop a train immediately and advise the signaller on becoming aware of a defect on the fixed radio equipment or a speedometer[19]. The radio on locomotive 47843 had failed shortly after leaving the depot; neither this nor the alleged defect with the speedometer (paragraph 27) was reported to the signaller.

d. The control log was either not completed or not archived correctly (paragraph 34)[20].

e. There was a blurring of responsibilities and potential for a conflict of interest which enabled the consultants from Amtrain, who had been taken on to provide safety direction to the BARS group, also to act as drivers for DCR (paragraphs 17, 21 and 64).

f. There was a lack of independence in the arrangements for managing driver competence (paragraph 64).

Previous occurrences of a similar character

84 The RAIB has previously investigated two events in which train drivers mismanaged the speed of their trains while approaching signals displaying restrictive aspects. These were a signal passed at danger and subsequent near miss at Didcot North Junction on 22 August 2007 (report 23/2008) and a derailment at Bletchley Junction on 3 February 2012 (report 24/2012). Details of one recommendation and one learning point relevant to the incident at Stafford are included in paragraphs 93 to 95 of this report.

[19] The signaller would then contact the controller for advice on what arrangements the operator concerned had in place to mitigate the risk.

[20] DCR's control office was initially based at the North Yorkshire Moors Railway at Grosmont, with limited access to computing and communications facilities.

Summary of conclusions

Immediate cause

85 The locomotive was travelling at excessive speed on the approach to signal SD4-81 (**paragraph 36**).

Causal factors

86 The driver did not make a full brake application as soon as he saw the signal displaying a double yellow aspect (**paragraphs 38 and 100, Recommendation 1**).

87 It is probable that the following factors were causal:

a. The driver may have deliberately exceeded the speed permitted for light locomotives (**paragraphs 43 and 99, Recommendation 4**).

b. The driver had limited experience of high-speed operation, in particular of its effect on the braking performance of a light locomotive (**paragraphs 46 and 100, Recommendations 1 and 4**).

c. The driver probably had insufficient route knowledge (**paragraphs 52 and 100, Recommendations 1, 4 and 5**).

88 A possible causal factor was that the driver may have been partially misled by the defective speedometer (**paragraphs 57 and 97, Learning point 1, Recommendations 1, 2 and 4**).

Underlying factor

89 An underlying factor was that Devon & Cornwall Railways did not follow its own process for managing the competence of drivers, and it had insufficient management controls to ensure compliance with its safety management system (**paragraphs 62 and 100, Recommendations 1 and 4**).

Other safety issues

90 Although not causal to the incident on 26 April 2012, the RAIB observes that:

a. the locomotive had not been maintained in accordance with Riviera Train's vehicle maintenance instructions (**paragraph 77, Learning point 1, Recommendations 2 and 4**).

b. Devon & Cornwall Railways' non-compliance with its own safety management system and other practices may indicate that there was an underlying deficiency in its safety culture (**paragraphs 82, 98, 100 and 101, Recommendation 4**).

The role of the Office of Rail Regulation

91 The Office of Rail Regulation had not examined the implementation of Devon & Cornwall Railways' safety management system (**paragraphs 69, 96 and 97, Recommendation 3**).

Previous RAIB recommendations relevant to this investigation

92 The following recommendations, which were made by the RAIB as a result of its previous investigations, have relevance to this investigation.

Recommendations that could have affected the factors

93 The following recommendation was made by the RAIB as a result of a previous investigation. It was addressed to a different operator.

Signal passed at danger and subsequent near miss at Didcot North junction on 22 August 2007, RAIB report 23/2008 published 20 November 2008

Recommendation 7

First Great Western should review its systems for the management of route knowledge with the following objectives:

- *To assess whether the extent of current route knowledge required by its drivers is compatible with the need for drivers to retain adequate situational awareness.*
- *To assess whether the currently mandated minimum frequency of exposure to each route is sufficient.*
- *To put in place systems for monitoring the actual exposure of drivers to each route they have signed for.*
- *To assess the adequacy of driver training and competency management systems related to route learning and the retention of route knowledge.*

94 In response to the RAIB's recommendation, the ORR has reported that First Great Western has implemented the recommendation by redesigning its system of route risk assessment, route knowledge training and the assessment of route knowledge competence. First Great Western has formalised the arrangements in a new company standard within its safety management system.

Learning points previously identified by the RAIB

95 The following learning point was identified by the RAIB as a result of a previous investigation and addresses factors identified in this investigation. It is therefore not remade so as to avoid duplication:

Derailment at Bletchley Junction, Bletchley, on 3 February 2012, RAIB report 24/2012 published 21 November 2012

Key learning point

Train operators, whose drivers drive light locomotives, should be aware that inappropriate driving behaviour may develop unless such driving is monitored as part of the competence management system to enable inappropriate methods of driving to be detected and suitable remedial action taken. This could be achieved by taking downloads from locomotive on-train data recorders, or track side speed checks, at suitable intervals.

Actions reported as already taken or in progress relevant to this report

Action reported that addresses factors which otherwise would have resulted in a RAIB recommendation

96 The ORR has held a number of meetings with DCR management to discuss the implementation of its safety management system. In addition, the ORR has carried out four site inspections of DCR's operation (paragraph 91).

97 The RAIB has been informed that ORR has established a framework which is intended to deliver effective safety regulation in the period between the issue of a new operator's safety certificate and commencement of its operations (paragraph 91). The new process has been designed to meet the requirements of the common safety method for supervision, defined in European Regulation No. 1077/2012. It includes the provision for an ORR inspection of a new operator before issue of a safety certificate, the capture of follow-up inspection activities into the ORR's 'five year inspection plan' or the possible refusal by ORR to issue a safety certificate.

98 RTL has clarified its maintenance requirements for locomotives which are used infrequently on the main line. These include the requirement to confirm that safety systems have been examined before locomotives are released for operational use (paragraph 90a).

Other reported actions

99 BARS terminated the contract with Amtrain for the safety director and the driver (paragraph 87a), and has brought in a new management team (appendix D, paragraph D8).

100 BARS reports that it has audited DCR's compliance with its safety management system and taken steps to ensure the competence of DCR's own and hired-in drivers (paragraphs 86, 87b, 87c and 89).

101 DCR submitted a new application for a safety certificate to the ORR on 10 July 2013, based on a revised safety management system. It has reported to the RAIB that it has also made changes to its organisation and some of its practices; these are summarised at appendix K.

102 RTL temporarily withdrew its locomotives from main line operation while it made changes to its policy and procedures. These include the introduction of a new hire procedure and establishing annual reviews of vehicle maintenance issues. An annual speedometer test has been included in the maintenance requirements for RTL's locomotives.

103 The ORR has brought its teams of inspectors that are responsible for heritage and freight operators together under one Principal Inspector.

Learning point

104 The RAIB has identified the following key learning point[21]:

1 This investigation has identified that vehicle examination and maintenance regimes based on operating hours may not be appropriate for vehicles that spend extended periods in sidings and depots. Railway industry *duty holders* and the Office of Rail Regulation may therefore wish to give particular attention to the risk arising from the operation of vehicles that are used infrequently on the main line. This risk could be addressed by the inclusion of regular calendar-based examinations or additional pre-use inspections.

[21] 'Learning points' are intended to disseminate safety learning that is not covered by a recommendation. They are included in a report when the RAIB wishes to reinforce the importance of compliance with existing safety arrangements (where the RAIB has not identified management issues that justify a recommendation) and the consequences of failing to do so. They also record good practice and actions already taken by industry bodies that may have a wider application.

Recommendations

105 The following recommendations are made[22]:

1 *The intent of this recommendation is to ensure the competence of Devon & Cornwall Railway's staff undertaking safety-critical work.*

Devon & Cornwall Railways should implement formal competence management processes for all safety-critical staff, taking account of best practice in the industry. This should include operational, maintenance and managerial staff, whether permanent or contracted-in (paragraphs 86, 87b to 88 and 89). Particular attention should be given to the management of train drivers on 'zero hours' contracts and those who drive for more than one company. Devon & Cornwall Railways should subsequently commission an independent review of the arrangements, and audit, to confirm effective implementation.

Note: The RAIB has written to Devon & Cornwall Railways to draw its attention to:

- Potential conflicts of interest which could compromise effective operation of its safety management system(s) (paragraph 83e).
- Issues relating to the competence of drivers who operate light locomotives, including the learning point the RAIB identified during its investigation of the derailment at Bletchley Junction (paragraph 95).

2 *The intent of this recommendation is to clarify the procedures for making sure that vehicles have been examined by competent persons in accordance with vehicle maintenance instructions.*

Devon & Cornwall Railways should implement processes to confirm that locomotives, whether owned or hired-in, have been examined by competent persons and assessed as fit to run before they are released for operational use (paragraphs 88 and 90a).

continued

[22] Those identified in the recommendations, have a general and ongoing obligation to comply with health and safety legislation and need to take these recommendations into account in ensuring the safety of their employees and others.

Additionally, for the purposes of regulation 12(1) of the Railways (Accident Investigation and Reporting) Regulations 2005, these recommendations are addressed to the Office of Rail Regulation to enable it to carry out its duties under regulation 12(2) to:

(a) ensure that recommendations are duly considered and where appropriate acted upon; and

(b) report back to RAIB details of any implementation measures, or the reasons why no implementation measures are being taken.

Copies of both the regulations and the accompanying guidance notes (paragraphs 200 to 203) can be found on RAIB's website www.raib.gov.uk.

3 *The intent of this recommendation is to confirm that the Office of Rail Regulation's revised assessment and supervision process is effective in verifying that the risk from the commencement of operations by new train operators has been appropriately limited.*

The Office of Rail Regulation should establish a process for the periodic management review of its assessment of safety certificate applications and the resolution of outstanding issues through supervision (paragraph 91). This process should include an evaluation of the extent to which the assessments of applications from new operators are correctly identifying matters for urgent inspection or for refusal of certification. It should also evaluate the effectiveness of post-certification supervision in limiting the risk to the railway in cases requiring urgent inspection.

4 *The intent of this recommendation is to ensure that the changes made to Devon & Cornwall Railways' safety management system have enabled its effective implementation.*

The Office of Rail Regulation should satisfy itself as soon as possible, through supervision, that Devon & Cornwall Railways' revised safety management system (paragraph 101) has established adequate controls regarding the competence of safety-critical staff, traction & rolling stock maintenance and safety culture (paragraphs 88, 89 and 90).

5 *The intent of this recommendation is to minimise the risk that an individual's route knowledge will be inadequately assessed.*

RSSB should amend rail industry standard 'Management of route knowledge for drivers, train managers, guards and driver managers', Ref. RIS-3702-TOM, to require an assessment of the training needs of new staff. This should clarify how 'transferred-in' route and traction knowledge should be assessed by the new employer (paragraph 87c). Particular attention should be given to the management of train drivers on 'zero hours' contracts and those who drive for more than one company.

Appendices

Appendix A - Glossary of abbreviations and acronyms

AWS	Automatic warning system
BARS	British American Rail Services
CCF	Control Centre of the Future
DCR	Devon & Cornwall Railways
DSD	Driver's Safety Device
g	Acceleration due to gravity (9.81 m/s^2)
HST	High Speed Train, also known as InterCity 125
ORR	Office of Rail Regulation
OTDR	On-train data recorder
ROGS	Railways and Other Guided Transport Systems (Safety) Regulations 2006
RTL	Riviera Trains Ltd
SPAD	Signal passed at danger
TOPS	Total Operations Processing System
T&RS	Traction and rolling stock

Appendix B - Glossary of terms

All definitions marked with an asterisk, thus (*), have been taken from Ellis's British Railway Engineering Encyclopaedia © Iain Ellis. www.iainellis.com.

A exam (also B exam)	An examination of a locomotive in accordance with the vehicle maintenance instructions. This is normally scheduled on the basis of the number of hours' operation recorded by the Total Operations Processing System (TOPS).
Automatic warning system (AWS)	A safety system for alerting drivers about the signal aspect or speed restriction ahead, sounding a horn in the cab for a red, single or double yellow aspect, or a bell to indicate a green signal.
Blued (also bluing)	Damage to the surface of an iron or steel component, typically caused by local overheating, with a characteristic blue patina.
Caution	The meaning of a single yellow aspect is defined by Module S1 of the Rule Book as 'Proceed: be prepared to stop at the next signal'.
Control Centre of the Future (CCF)	A system used by control centre staff and others which provides a visual schematic display of train position, both real-time and historic, and presents information on train running.
Controller	The central point of contact for information and decisions relating to the day-to-day operation of a railway.*
Down	The name generally given to lines used by trains travelling in the direction away from London. In this case it is towards Stafford and Crewe.
Driver's safety device (DSD)	A system that halts the locomotive or train if the driver ceases to respond. Previously commonly known as a dead man's handle, most examples are buttons or pedals that must be released and pressed in response to an audible reminder.*
Duty holder	An organisation, or person which has a duty imposed on them by the law intended to protect the health and safety of employees and/or other persons.
Fireman	The person responsible for keeping a steam locomotive supplied with coal during a journey, and assisting in the observation of signals when required to do so.*
Heritage Railway	A railway operated as a tourist attraction or museum exhibit, and equipped and operated in a manner dating from a previous era.*
Light locomotive	Any self-contained locomotive not coupled to, drawing or propelling another vehicle.*

Multi-SPAD Signal	A signal that has been passed at danger under Category A SPAD conditions more than once during the preceding five years. Note: The definition of Category A SPAD in railway group standard 'Accident and Incident Investigation' (GO/RT3119) includes situations when 'a stop aspect, indication or end of in-cab signalled movement authority was displayed or given correctly and in sufficient time for the train to be stopped safely at it', whether or not 'the train driver was unable to stop his train owing to circumstances beyond his control'.
National Radio Network (NRN)	A dedicated national radio network operated and maintained by Network Rail that allows direct communication between driver and network controller.* NRN has been superseded by a more modern system since the incident.
On-train data recorder (OTDR)	A data recorder collecting information about the performance of the train, including speed, brake control positions, etc.
Permissible speed	The maximum speed at which conventional trains [without tilting capabilities] may safely negotiate a section of track, as published in the Sectional Appendix.*
Preliminary caution	In four aspect signalling, the meaning of the double yellow aspect is defined by Module S1 of the Rule Book as 'Proceed: be prepared to find the next signal displaying one yellow aspect'.
Route card	The card which records the routes a driver is considered competent to drive unaccompanied. It is signed by the driver and counter-signed by their driver manager.*
Route knowledge	Before any driver can drive a train along a particular route, they must first learn the locations of junctions, stations, signals, permissible speeds and gradients, etc. This also includes any route risks, such as multi-SPAD signals. RIS-3702-TOM describes route knowledge as 'knowledge of route factors and route risks and appropriate practical operating experience to enable staff to work safely over each route and to give them the necessary skills and confidence to predict and react to environmental changes and conditions'.
Route learning norm	An indication of the number of days that an average driver would need to spend to acquire route knowledge, taking account of the route risk assessment.

Route risk assessment	An operator's assessment of the features of a particular route, reflecting factors such as locations which are prone to signals being passed at danger, overruns, low adhesion or abnormal placing of signals. This informs the route learning norm for that route.
Rule Book	Railway Group Standard GE/RT8000, which describes the duties and responsibilities of staff and the regulations in force to ensure the safe operation of the railway (see appendix C).
Running brake test	A test where the brakes are applied on a train, shortly after starting out, to check that they retard the train as expected.
Safety certificate	A certificate issued by the ORR with a five-year validity. It specifies the type and extent of the railway operation and confirms the ORR's acceptance that the applicant has demonstrated that (i) its safety management system meets the requirements of ROGS and (ii) it has adopted suitable provisions to ensure safe operation.
Safety management system	The organisation and arrangements established by a railway operator to ensure the safe management of its operation, as required by ROGS.
Signal passed at danger (SPAD)	A train failing to stop correctly at a signal displaying a stop aspect. Thus a failure of signalling system and driver to adequately maintain a safe distance between trains.*
Signalling braking distance (from GK/RT0075)	The distance between the signal exhibiting the first caution aspect and the signal at which the train is required to stop.
Slack adjuster	A component of a brake system that automatically takes up any slack in the brake rigging caused by the wearing of the brake blocks or pads and therefore maintains constant braking effort as such wear occurs.
Total Operations Processing System (usually referred to as TOPS)	A mainframe based computer system used to track rail vehicles. It deals with destination, load, location and maintenance information for all vehicles on the network. Vehicle data is entered for every movement, allowing virtually real time updates.*
Traction inspector	A person whose job it is to examine, train and supervise drivers of trains.*

Appendix C - Key legislation and standards current at the time

DIRECTIVE 2004/49/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 29 April 2004 on safety on the Community's railways and amending Council Directive 95/18/EC on the licensing of railway undertakings and Directive 2001/14/EC on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure and safety certification	European Railway Safety Directive
Health and Safety at Work, etc. Act 1974	UK legislation
The Railways and Other Guided Transport Systems (Safety) Regulations 2006 (ROGS)	
Signals and indicators controlling train movements, GE/RT8000 Rule Book Module S1, June 2003	The Rule Book – RSSB Railway Group Standard, available at: www.rgsonline.co.uk
Preparation and movement of locomotive-hauled trains, GE/RT8000 Rule Book Module TW3, November 2004	
Preparation and movement of trains – Defective or isolated vehicles and on-train equipment, GE/RT8000 Rule Book Module TW5, April 2008	
Lineside Signal Spacing and Speed Signage, GK/RT0075 Issue Two, March 2011	Railway Group Standard, available at: www.rgsonline.co.uk
Train driver selection, Ref. RIS-3751-TOM	Rail industry standard, published by RSSB and available at: www.rgsonline.co.uk
Route and traction requirements for drivers and guard / shunters, Ref. OS 009, version 1, July 2009	Devon & Cornwall Railways company standards
Assessment of performance against safety critical standards for train driving and train working, Ref. OP 004, Draft 1, Aug 2009	

Appendix D - Devon & Cornwall Railways – a brief history

D1 Devon & Cornwall Railways was originally established to enable the two heritage railways within the BARS group, the Dartmoor Railway and the Weardale Railway, to run limited freight and passenger operations on the main line. DCR had held discussions about its safety certificate application with the ORR during 2009, and formally submitted the application on 27 January 2010. The proposed scope of operation which was included in the application is set out at the table below.

2.1 **Type and Extent of Operation**

2.1.1 **Devon and Cornwall Railway (DCR)** is a train company which operates both passenger and freight trains. The company is a wholly owned subsidiary of British American Railway Services Ltd, a new company which has been established in the United Kingdom by Iowa Pacific Holdings.

Iowa Pacific is a privately-owned company that owns and operates six shortline railways in the United States with over 700 miles of track, 180 employees, and a current annual turnover rate in excess of $40 million (US). Iowa Pacific handles over 35,000 annual freight carloads and over 75,000 annual passenger trips in six states, with additional subsidiaries that repair freight and passenger cars, and operate first-class mainline passenger tours.

2.1.2 **Associated companies within the BARS Group:**

Dartmoor Railway (DR) which operates a 17-mile freight and passenger line in the south-west of England, serving Okehampton and Meldon Quarry.

Weardale Railway (WR) which owns an 18-mile line in County Durham between Bishop Auckland and Eastgate with heritage passenger services presently operating between Wolsingham and Stanhope.

2.1.3 **Freight operations:**

- Hauling of train load freight services (single commodity trains eg. Aggregates and timber) throughout the UK network on both Network Rail and private railways.
- Haulage of inter depot freight on a “hook and haul” basis
- Haulage of empty coaching stock
- Haulage of aggregate trains
- Haulage of timber trains
- Haulage of engineering trains
- Haulage of “one off dead in traffic” locomotives for 3rd party customers who do not possess the required Safety Certification
- Haulage of mixed freight

DCR does not knowingly or intentionally accept for transport any substances or products classified by international regulations as ‘dangerous goods’

2.1.4 **Passenger operations:**

- Rural commuter services to major towns between Okehampton and Exeter in the south west of England, and Stanhope and Shildon in the north east of England
- Excursion specials

Table D1: Extract from DCR’s ‘Railway Safety Certification Application Document’

D2 BARS engaged a consultant to assist with writing the documents that formed DCR's safety management system before the safety certificate application was submitted. This documentation was based on that of an existing passenger operator and many of the documents were still at draft status at the time of the incident in April 2012.

D3 When the application was received by the ORR, the impression was that any freight operation by DCR was speculative, and the freight aspects of the submission were given relatively little scrutiny. The ORR believed that DCR's principal freight objective was to run coal trains from Wolsingham onto the main line, where they would be taken forward by one of the existing freight operators; at that stage DCR had not obtained planning permission for the associated coal-loading facility. DCR also did not have traction and rolling stock suitable for a significant freight operation.

D4 The ORR issued a safety certificate to DCR on 26 May 2010. However, the company also needed an operating licence from the ORR to be able to run trains on the main line, as well as a track access agreement with Network Rail. The process for DCR to obtain a licence was protracted. The company applied separately for a passenger and a freight licence; the ORR issued a freight licence on 24 December 2010, although it did not issue DCR with a passenger licence. In the meantime, Hanson Traction was acquired by the BARS group in October 2010 and was merged into its subsidiary RMS Locotec. The assets of Hanson Traction included class 31 and 56 freight locomotives, and the direction of the company subsequently developed towards becoming a spot-hire freight operator rather than a predominantly passenger-focused heritage operator.

D5 One of the provisions of ROGS is that the ORR must revoke a safety certificate if the operator has not operated a vehicle on the network within a twelve month period. When DCR eventually obtained its licence, it had no operations staff (eg drivers) or organisation in place. BARS engaged a safety director on a consultancy basis in April 2011 and the ORR quickly made him aware of the need for DCR to operate a train before the anniversary of the certificate. Accordingly DCR developed a plan to operate a single train, and subsequently hauled some heritage locomotives from Washwood Heath to Ruddington on the Great Central Railway (North) on 13 May 2011.

D6 Following the operation of DCR's first train, the company operated its first freight train, carrying scrap metal from Grimsby to Cardiff, on 12 July 2011. As part of this operation, a class 56 locomotive ran light from Washwood Heath to Hither Green on 7 July, to collect some wagons and take them via Derby to Grimsby, where they arrived on 8 July. The drivers for these movements included the part-time consultants from Amtrain (paragraph 10).

D7 DCR started to secure freight business over the following months, mainly hauling locomotives and empty wagons to and from maintenance depots on behalf of other companies. The company had a number of 'zero hours' contract drivers, and was also operating light locomotives for route learning purposes. An internal ORR email on 23 February 2012 reveals that the ORR was 'not aware of any main line operations by this company since their scrap train from Grimsby to Cardiff several months ago'. Information obtained by the RAIB indicates that DCR had in fact operated at least 23 trains in this period, excluding route learning and light engine movements.

D8 DCR appointed a full-time operations manager in February 2012. Another part-time consultant was appointed as head of T&RS in February 2012; he subsequently took over the safety director's responsibilities in March 2012 (paragraph 19). The contract with Amtrain was cancelled on 10 May 2012.

Appendix E - Overview of the regulatory framework in the railway industry

E1 The safety regulation of railway operators is in two parts, certification and inspection, both of which are carried out by the ORR. In most cases, the same ORR Inspector will act as 'lead assessor' of the application for a safety certificate and as the 'account holder' who will carry out post-certification inspections.

E2 Certification is intended to establish that a railway operator has a suitable and documented safety management system. The rules for certification of operators are contained in the European 'Railway Safety Directive' and have been incorporated into the UK's 'Railways and Other Guided Transport Systems (Safety) Regulations 2006', commonly referred to as ROGS. The context of safety certification is provided in the following extract from 'Assessment Criteria for Safety Certificate and Authorisation applications for mainline railways', issued by the ORR in April 2011:

> *'[ROGS] requires evidence of the management capability of an applicant to operate safely. The duty is a high-level one, and consequently it is not necessary to provide very detailed evidence when submitting an application. A satisfactory application will provide clear and coherent evidence that there is a safety management system (SMS) in place capable of delivering safety and will provide "signposts", to where more detailed information can be found with specific references to named company procedures and standards.*
>
> *'Rather than a detailed scrutiny of supporting documents at the application stage, inspectors will spend more time verifying through inspection, after the certificate or authorisation has been issued. This will test the evidence submitted in applications, and provide confidence in the applicant's capability. The overall regime will therefore be rigorous and well-balanced between a paper-based assessment of systems, and checking and testing on the ground.'*

E3 Assessment of a submission for a safety certificate is carried out to a timescale which is prescribed in ROGS. The ORR is obliged either to grant or to refuse a certificate within four months, and to give reasons for its decision.

E4 A safety certificate is valid for five years, during which time the ORR carries out inspection activities in accordance with the common safety method for supervision, defined in European Regulation No. 1077/2012[23], with the aim of validating a company's safety management system. The ORR has outlined the process of validation in a manual for its inspectors[24]. There are three categories of validation, depending on the level of risk being managed by the operator. The elements of the safety management system that are subject to validation may be prioritised according to the perceived risks, and will include any specific areas which have been identified during the assessment process.

[23] At the time of the incident, inspection activities were undertaken under section 20 of the 'Health and Safety at Work, etc. Act 1974'.

[24] 'Inspection Manual – Validation of ROGS Safety Management Systems – ORR Guidance for HMRI Inspectors', February 2008.

Appendix F - Arrangements for managing driver competence

F1 The requirements for managing driver competence were formerly contained in railway group standard 'Train Driving' GO/RT3251, which was supported by 'Approved Code of Practice – Train Driving' GO/RC3551. In August 2008, the group standard was partly replaced by 'Train Movement – Staff Suitability and Fitness Requirements', Ref. GO/RT3451, and the code of practice by a suite of guidance documents[25] and a voluntary rail industry standard (all of which were issued by RSSB[26]):

- 'Good practice guide to train driver training', Ref. RS/221;
- 'Good practice guide for driver assessment', Ref. RS/702;
- 'Good practice guide on competence review and assessment', Ref. RS/701;
- 'Good practice guide on cognitive and individual risk factors', Ref. RS/232;
- 'Recommendations for train movement – staff suitability and fitness requirements', Ref. GO/RC3561; and
- 'Train driver selection', Ref. RIS-3751-TOM.

F2 DCR's safety management system was developed during 2009 and contained two (incomplete) documents that outlined its driver competence arrangements and made reference to the RSSB documents which had been issued in 2008:

- 'Route and traction requirements for drivers and guard / shunters', Ref. OS 009, version 1, July 2009; and
- 'Assessment of performance against safety critical standards for train driving and train working', Ref. OP 004, Draft 1, Aug 2009.

F3 The withdrawn railway group standard GO/RT3251 contained a requirement for driver selection systems to include arrangements for obtaining, and confirming the accuracy of, information relevant to controlling risks related to train driving. This was supported by a high-level process in code of practice GO/RC3551, which covered the documentation of experience that was being transferred in from a previous employer. This requirement was carried forward in rail industry standard RIS-3751-TOM, which included requirements for the transfer of information relevant to the selection of drivers. These documents did not specifically cover assessment of 'transferred in' competence by the new employer, although good practice guide RS/702 identified the need for drivers transferring from another railway undertaking to be subject to a 'training needs analysis'.

F4 RSSB issued a further voluntary rail industry standard, 'Management of route knowledge for drivers, train managers, guards and driver managers', Ref. RIS-3702-TOM, in September 2011; this post-dated the documents in DCR's safety management system. The rail industry standard does not address the possibility that a railway undertaking might accept previous route knowledge without carrying out its own assessment of a driver's competence.

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[25] Some of these documents have since been superseded by 'Good practice guide on competence development', Ref. RS/100.

[26] A not-for-profit company owned and funded by major stakeholders in the railway industry, and which provides support and facilitation for a wide range of cross-industry activities. The company is registered as 'Rail Safety and Standards Board', but trades as 'RSSB'.

Appendix G - Extracts from RTL's class 47 vehicle maintenance instructions

Introduction

1) This document supersedes ALL other class 47 documents such as STANDARD EXAMINATION SCHEDULES DIESEL TRACTION sections BR12014/11 (Star chart & exam summary & BR 12013/2 (Job descriptions).

2) Pages shown in the form of a star chart which jobs are to be carried out at a particular examination.

3) Service check is basic exam which is to carried out every 4 days whilst in use.

4) Exam Schedule is A Exams / Fitness For Service Exam to be carried at 60 hour periods (TOPS hours) or as dictated by Train Operating Company hiring / operating Locomotive. When A / FFS exams are carried out these must be inputted into TOPS as A exams.

5) A+ to be carried out 6 Monthly or every 170 days, unless B exam at 300 TOPS hours comes first. The reason for this exam is that maximum periods between B exams must not exceed 12 months, this exam functions as an interim 6 Monthly check of safety systems i.e.: - AWS, TPWS and full brake system check.

6) B exams to be carried out at 12 Monthly periods or 300 TOPS hours (which ever comes first). Every 5 years or B18 exam the Locomotive should be removed from its bogies and under frame cleaning should be carried out in accordance with Job No. 617A.

7) This V.M.O.I is subject to alteration at any time in agreement of Riviera Trains Ltd and Vehicle Acceptance Body.

* * *

Locomotives stored or out of service

Should it become necessary for a Locomotive to placed into store or out of service for medium to long term repair for periods exceeding 18 weeks the vehicle must receive an A+ examination before being returned to use. If the total store period exceeds 36 weeks then the Locomotive must received the next B exam which is called for.

Appendix H - The condition of the locomotive's brake blocks

H1 In the immediate aftermath of the incident of the SPAD incident at Stafford on 26 April 2012, arrangements were made for an independent engineer from URS to examine the brakes on the locomotive. The URS report concluded that second hand brake blocks had been fitted to the locomotive, with the result that only 57% of the friction surface was in contact with the wheels (paragraph 66). The principal evidence cited in support of this hypothesis was that the internal diameter of the blocks' friction surfaces appeared to be smaller than the external diameter of the wheels. Figure H1a shows the gap between the centre of one of the brake blocks and the wheel tread, which was observed before locomotive 47843 was moved from Stafford. Figure H1b is typical of photographs taken by RTL at Crewe on 14 May 2012, and shows a brake block after removal from the locomotive; the centre of the block is '*blued*' (defined at Appendix B) due to overheating. This is the part of the block that was not in contact with the wheel in Figure H1a. The URS hypothesis does not account for the recent bluing, scoring and burring which is evident in the centre part of the brake block.

H2 Advice given to the RAIB by Interfleet Technology, Railway Brake Services and a train operator with relevant experience suggests that the condition of the blocks is probably attributable to a sustained high-speed application of the locomotive's brakes; this is consistent with the opinion of the locomotive's owners, RTL. A possible mechanism for the damage to the inside face (the friction surface) of the brake block is that, during such a brake application, the friction surface experiences an extreme temperature, whereas the mounting point on the outside of the block acts as a heat sink. The temperature gradient through the brake block causes the inside face to expand more than the outside, and therefore tends to flatten its curved shape; on cooling, the block contracts again. The energy needed to stop a vehicle from 103 mph (166 km/h) is 189% of that needed to stop it from 75 mph (121 km/h); this energy must be dissipated by the brakes. The light wear at the ends of the block is likely to have been caused by the subsequent use of the locomotive's brakes when it was moved from Stafford to Crewe after the incident.

Figure H1a and H1b: Brake blocks from locomotive 47843, when examined after the incident (courtesy URS and RTL)

H3 The URS report on the locomotive's braking system found that one of the *slack adjusters* had seized, and consequently that there was an excessive amount of movement of the brake blocks. The report identified that the brake blocks linked to this slack adjuster were in complete contact with the wheel tread and did not exhibit the deformation described above. The driver stated that immediately after the incident he had found that these wheels were cooler than the others, indicating that the brakes had done less work than those on other wheels. However, the URS report stated that the seized slack adjuster 'was not an issue in braking in this case', and an internal BARS report on the condition of the locomotive also stated that the effect of the seized slack adjuster would have been 'minimal, as there was more than adequate stroke left' for the brake piston.

Appendix I - The accuracy of the on-train data recorder

I1 When the OTDR was downloaded, the maximum speed was indicated to have been 97 mph (156 km/h). The driver and BARS' former safety director subsequently challenged the integrity of the OTDR data and disputed the maximum speed recorded, as they asserted that the locomotive had been travelling at a lower speed (paragraph 44). This supported their view that the braking had been sub-standard and brought the sequence of events into doubt.

I2 The OTDR had not been maintained in accordance with the vehicle maintenance instructions. These stipulated that a full system test, including speed calibration, should have been carried out 'on a calendar cycle of 6 months periodicity'. RTL has advised the RAIB that it believed the OTDR had been maintained at the locomotive's B exam in September 2009, but it was unable to provide any documents to confirm this. The OTDR was recording an incorrect time due to a flat internal battery; this caused it to lose its time reference when the locomotive was not being used. The manufacturer of the OTDR, Arrowvale, reviewed the downloaded OTDR file and confirmed that the input signals had nevertheless been correctly recorded[27].

I3 The speed recorded by the OTDR was tested at Crewe on 14 May 2012 and was found to have been under-reading by 7.4%. OTDR data is stored in a compressed format to maximise the capacity of the recorder's memory; consequently it is necessary for the data to be decompressed for analysis. Each OTDR of the type fitted to locomotive 47843 has an associated configuration file containing many of the parameters necessary to decompress the data correctly. An incorrect configuration file was used to decompress the OTDR data for the incident on 26 April 2012; the same configuration file was also used for the speed test at Crewe on 14 May 2012. The parameters used in the incorrect configuration file contributed to the 7.4% error in the OTDR output file. The speeds and distances quoted in this report have been adjusted for consistency with the post-incident calibration and the parameters used in the correct configuration file.

I4 The RAIB has compared the calibrated (ie corrected by 7.4%) OTDR data for the whole journey of train 0Z47 on 26 April 2012 with data recorded by CCF: the recordings of AWS activations have been correlated with the times of occupation of signal berths. For the two signal sections through which the locomotive was travelling at its maximum speed, the difference between the average calibrated OTDR speed of 103.4 mph (166.4 km/h) and the average speed of 103.9 mph (167.2 km/h), calculated from the distance between signals[28] and the occupation of signal berths recorded by CCF, is 0.5%.

I5 In summary, although the OTDR had not been maintained and an incorrect configuration file was used to decompress the data, the data recorded on 26 April 2012 was reliable once speeds and distances had been corrected for consistency with the calibration test carried out on 14 May 2012.

[27] This confirmation related to the operation of the data recorder itself, rather than to the accuracy of the signals it was receiving.

[28] Taken from infrastructure plans.

Appendix J - Extract from the driver's route card

DCR amtrain

DRIVERS ROUTE CARD

Driver: [redacted] Depot: [redacted] ID No: [redacted]

Route From / To	Certification		Cancellation		Route Risk Rating
Washwood Heath to Willesden west London Junction Via Solihull, Leamington Spa and Didcot.	[redacted]	1st June 2011			
Willesden West London junction to Hither green and Hoo Junction Via Latchmere, Factory Junction, Nunhead and Lewisham.		1st June 2011			
Washwood Heath to York via Derby Clay Cross, Tapton junction, Masborough, Swinton, Knottingley		1st June 2011			
York to Bishop Auckland via Darlington.		1st June 2011			
Northallerton to Middlesbrough.		1st June 2011			
Darlington to Eaglescliffe and Middlesborough		1st June 2011			
Washwood Heath to Cardiff via Camp Hill, Gloucester,parkway or Lydney, Newport.		1st June 2011			
Cardiff to Willesden West London junction via Severn Tunnel, Swindon.		1st June 2011			
Middlesbrough to Whitby.		1st June 2011			
Cardiff to Cardiff Tidal.		1st June 2011			
Washwood Heath to Crewe via Sutton park		1st October 2011			
Derby to Chesterfield via Erewash valley		1st October 2011			
Sheet stores to Stenson junction		1st October 2011			
Trowell Junction to Nottingham		1st October 2011			
Nottingham to Peterborough via Grantham		1st October 2011			
Washwood Heath to Willesden via Northampton		1st October 2011			
Willesden to old oak common		4th January 2012			

DRIVERS ROUTE CARD [redacted]

Washwood Heath to Carlisle via Walsall stafford	[redacted]	4th January 2012			
Carlisle to Newcastle, Heaton depot		4th January 2012			

DRIVERS ROUTE CARD [redacted]

Appendix K - Changes reported as made by Devon & Cornwall Railways

DCR has advised the RAIB that it has made the changes identified below since the incident on 26 April 2012.

Organisational structure

The management team has been restructured and now consists of:

- a new engineering & safety director;
- a new operations director;
- a new head of operations; and
- two new operations standards managers.

There is a new control structure and a team of experienced and professional drivers has been appointed.

The company now participates in industry bodies and systems, including RSSB, SMIS (Safety Management Information System), FTC (Freight Technical Committee), RFOG (Rail Freight Operations Group) and NFSG (National Freight Safety Group).

New / revised systems and safety arrangements

The following changes have been introduced to DCR's safety management system:

- a completely re-engineered and rewritten safety certificate application document;
- a new register of generic and DCR specific risks;
- a new general operating appendix;
- a new DCR tailored competence management system;
- a new route risk assessment process;
- a new procurement process;
- a new traffic acceptance process; and
- a new approvals process for new freight flows.

Engineering

The following changes have been made to DCR's engineering department:

- a new supplier qualification procedure has been put in place;
- a revised draft maintenance policy and interim procedures have been issued;
- additional technical staff have been recruited by RMS Locotec (the traction maintenance organisation);
- a field based maintenance and response team has been set up for minor exams and repairs; and
- TOPS has been established to track vehicle maintenance history.

Control office

The following changes have been made to DCR's control office:

- the control office has been moved to the East Midlands Control Centre at Derby;
- a control room manager and two maintenance controllers have been recruited;
- maintenance planning is now in place for all T&RS;
- a daily conference call is held;
- a faults and failures database has been established, including prioritisation and control of safety critical faults; and
- performance is managed using TRUST [the industry's Train Running System on TOPS], with all incidents investigated.

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