



Rail Accident Investigation Branch

Rail Accident Report



**Child nearly falling through a missing toilet floor, South Devon Railway
22 June 2017**

Report 02/2018
January 2018

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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This report is published by the Rail Accident Investigation Branch, Department for Transport.

Preface

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. 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.

The RAIB's findings are based on its own evaluation of the evidence that was available at the time of the investigation and are intended to explain what happened, and why, in a fair and unbiased manner.

Where the RAIB has described a factor as being linked to cause and the term is unqualified, this means that the RAIB has satisfied itself that the evidence supports both the presence of the factor and its direct relevance to the causation of the accident. However, where the RAIB is less confident about the existence of a factor, or its role in the causation of the accident, the RAIB will qualify its findings by use of the words 'probable' or 'possible', as appropriate. Where there is more than one potential explanation the RAIB may describe one factor as being 'more' or 'less' likely than the other.

In some cases factors are described as 'underlying'. Such factors are also relevant to the causation of the accident but are associated with the underlying management arrangements or organisational issues (such as working culture). Where necessary, the words 'probable' or 'possible' can also be used to qualify 'underlying factor'.

Use of the word 'probable' means that, although it is considered highly likely that the factor applied, some small element of uncertainty remains. Use of the word 'possible' means that, although there is some evidence that supports this factor, there remains a more significant degree of uncertainty.

An 'observation' is a safety issue discovered as part of the investigation that is not considered to be causal or underlying to the event being investigated, but does deserve scrutiny because of a perceived potential for safety learning.

The above terms are intended to assist readers' interpretation of the report, and to provide suitable explanations where uncertainty remains. The report should therefore be interpreted as the view of the RAIB, expressed with the sole purpose of improving railway safety.

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

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Child nearly falling through a missing toilet floor, South Devon Railway, 22 June 2017

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Summary

At around 13:15 hrs on Thursday 22 June 2017, a mother and her three-year-old child were travelling on a South Devon Railway train from Totnes (Riverside) to Buckfastleigh. Shortly after leaving Staverton station, while the train was travelling at about 20 mph (32 km/h), the child left his seat and went towards a toilet on the train, followed by his mother walking a short distance behind.

The child entered the toilet, and as the door opened and the child stepped through it, he fell forward because the floor was missing in the compartment he had entered. A more serious accident was only prevented by the quick reaction of the mother who grabbed the child's arm and prevented him falling through the opening and onto the track below. The child suffered minor bruising, and both mother and child were shocked. The accident was reported immediately to the railway company, but the RAIB was not advised of what had happened until 25 June 2017.

In April 2017 the South Devon Railway had carried out a repair to this carriage. The location of the repair was difficult to gain access to and required the floor of the toilet cubicle to be removed. The railway's management decided that the door would be secured and notices placed on the door, allowing the carriage to enter service with the toilet floor missing. The RAIB found that the method of securing the door was inadequate, so that over time the door became less secure to the extent it was possible for the child to open it. The risk associated with the absence of the toilet floor was not sufficiently appreciated nor adequately managed after the carriage was allowed to enter service. The RAIB also found that the South Devon Railway had no formal competence management assessment for staff involved in carriage maintenance. Both of these factors led to no-one detecting that the door had become unsecure.

The RAIB observed during the investigation that the South Devon Railway's maintenance regime did not identify the extent of the deteriorating condition of the carriage structure, and the railway's fitness to run process was not being correctly applied.

The RAIB has made one recommendation to the South Devon Railway to commission an independent review of the actions it has taken since the accident to address the deficiencies in its processes.

The RAIB believes that the investigation has also identified an important lesson likely to be applicable to other heritage railways, about applying appropriate standards for vehicle maintenance, to ensure that the examination regime which they have in place will identify the foreseeable deterioration of vehicles, before it reaches a stage that may affect safety.

Introduction

Key definitions

- 1 Metric units are used in this report, except when it is normal railway practice to give speeds and locations in imperial units. Where appropriate the equivalent metric value is also given.
- 2 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. Sources of evidence used in the investigation are listed in Appendix C.

The accident

Summary of the accident

- 3 At around 13:15 hrs on Thursday 22 June 2017, a mother and her three-year-old child were travelling on a South Devon Railway (SDR) steam train service from Totnes (Riverside) to Buckfastleigh (figures 1 and 2). Shortly after leaving Staverton station, while the train was travelling at about 20 mph (32 km/h), the child left his seat in the fourth carriage (of five) and went towards a toilet on the train, followed by his mother walking a short distance behind.
- 4 The child went to enter one of the toilet compartments, and as the door opened and the child stepped through it, he fell forward because the floor of the toilet compartment was missing. A more serious accident was only prevented by the quick reaction of the mother who grabbed the child's arm and prevented him falling further through the opening and onto the track below. The child suffered minor bruising, and both mother and child were shocked.

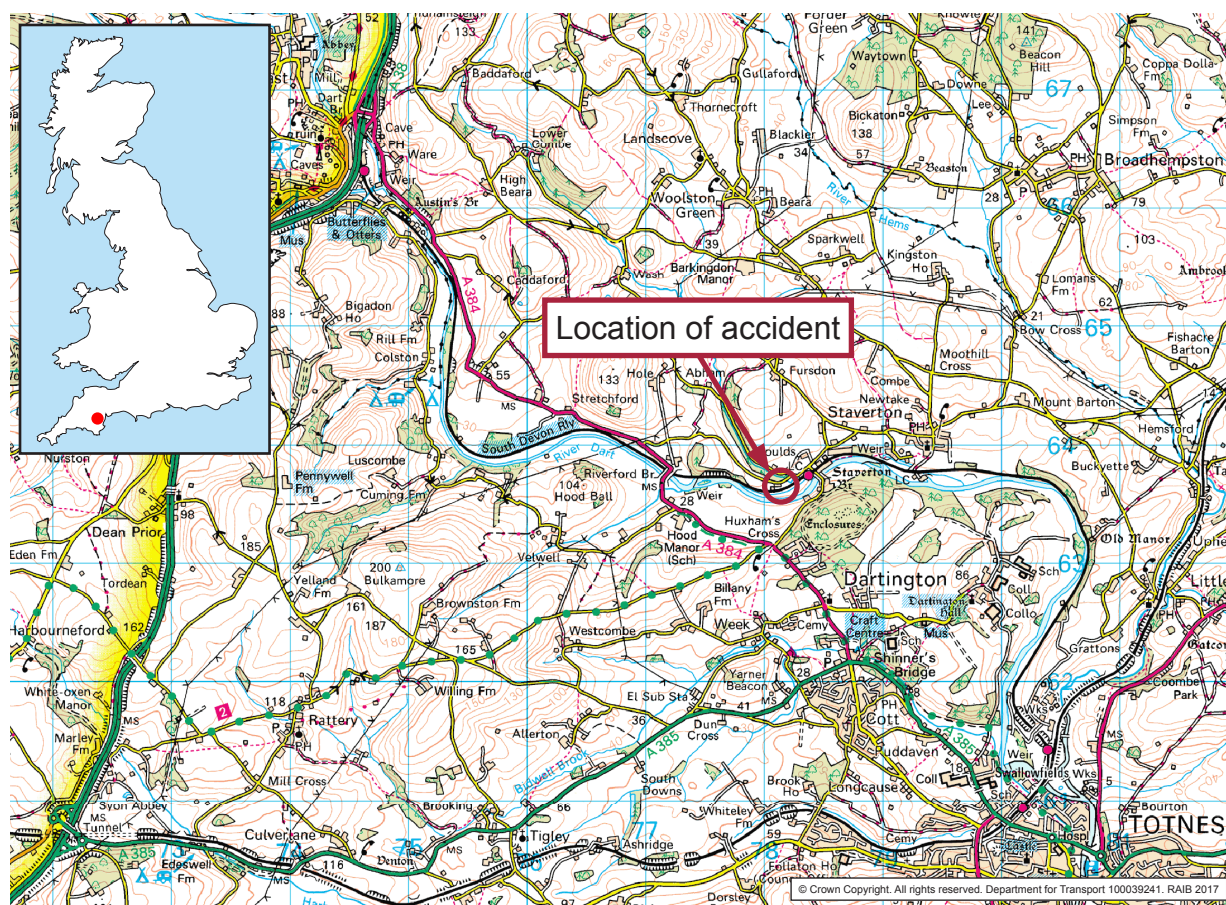


Figure 1: Extract from Ordnance Survey map showing location of accident

Context

Location

- 5 The branch line from Totnes to Ashburton in south Devon was opened in 1872. Since 1969 the section from Totnes (Riverside) to Buckfastleigh has been operated as a tourist railway, currently by the South Devon Railway Trust. The single line is 6 miles and 51 chains (10.7 km) long, with an intermediate station at Staverton (figure 2).

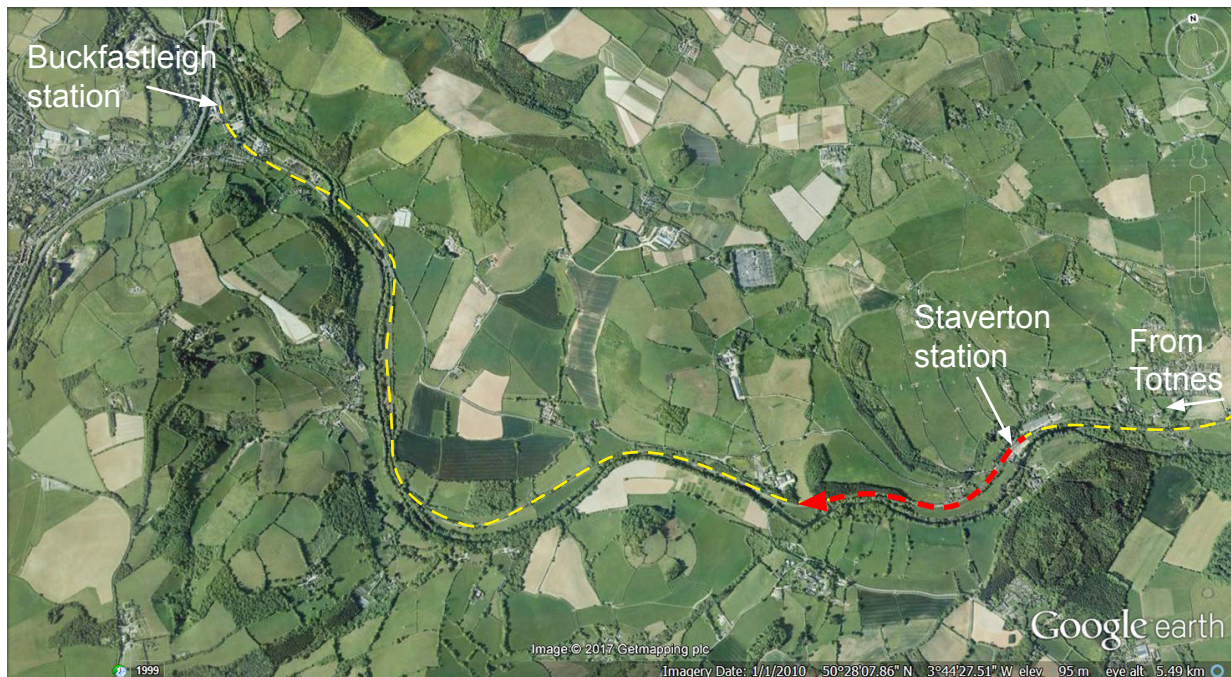


Figure 2: Route between Totnes (Riverside) and Buckfastleigh

Organisations involved

- 6 The railway is owned and operated by the South Devon Railway Trust, trading as South Devon Railway. The Trust, previously known as Dumbleton Hall Locomotive Limited, changed its name when it took over the lease of the railway in January 1991. It then acquired the freehold in 2010.
- 7 The Trust owns and runs the operational railway and employs staff to run the railway and associated businesses (café and shops). The Trust has engineering workshops (locomotive and carriage and wagon) which carry out repairs and overhauls on SDR locomotives and rolling stock. The workshops also undertake work for external customers (mainly steam locomotive overhaul and restoration), trading through South Devon Railway Engineering (SDRE). SDRE is a limited company owned by the Trust, which brings in additional revenue for the SDR. Staff in the Trust's engineering and operations sectors are a mixture of paid employees (full and part time), and volunteers.
- 8 The SDR operates a daily train service from March to October. On most days, this comprises a steam locomotive with five carriages (SDR has a fleet of 26 carriages) operating four journeys in each direction. On busier days, the railway operates a two train service. There are occasional special evening and weekend 'gala' events.

Train involved

- 9 The train was formed of former Great Western Railway steam locomotive 5526 and a combination of ex-British Railways (BR) Mark One Second Open (SO) carriages (figure 3) and ex-Great Western Railway coaches. Carriage 4805 was the fourth of the five coaches. On the day of the accident, only three of the six toilets on the five carriages of the train were operational.

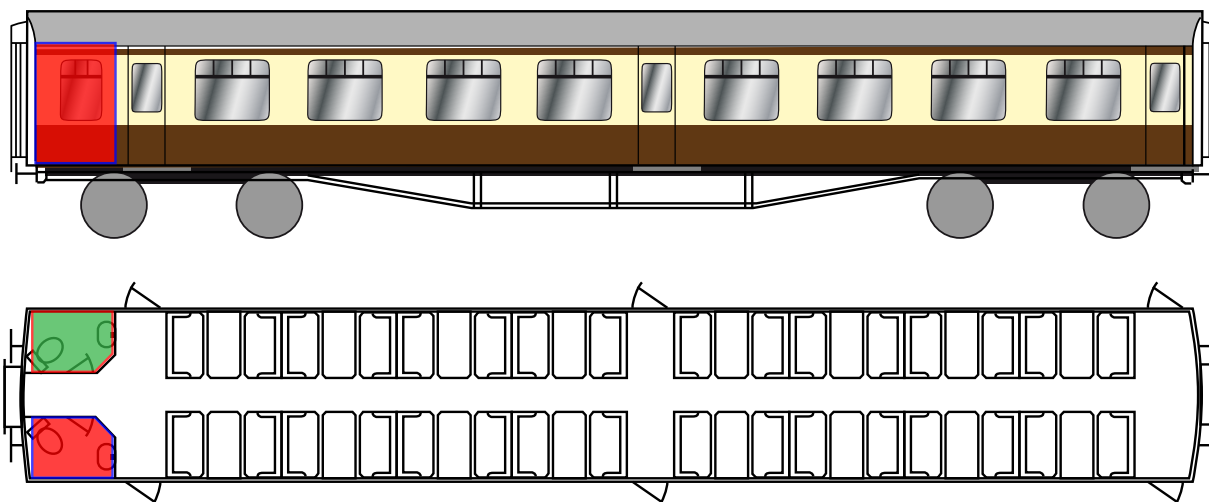


Figure 3: Side elevation and plan of the carriage showing the location of the toilet cubicle with the floor missing (green box). The toilet opposite (red box) was also out of use.

Staff involved

- 10 The SDR railway manager was acting as the duty officer¹ on the day of the accident. The railway manager has over 30 years' experience working in the transport industry, which included voluntary work on various heritage railways, and had been employed by the SDR since 2014. The railway manager is responsible for all employees and volunteers involved in operating the railway, as well as signalling operations and maintenance activities on SDR infrastructure. The railway manager is responsible for ensuring that all operating staff of the railway are complying with the SDR rule book and regulations regarding health and safety.
- 11 The operations coordinator has 13 years' experience working for Network Rail and joined SDR as a full time employee in April 2017. The operations coordinator is responsible for timetables, gala planning, competence management, the administration of the Safety Management System² and control of SDR documents including Periodical and Weekly Operating Notices.

¹ An SDR manager or suitably qualified volunteer may act as duty officer, with responsibility for operations and incident management, whenever the railway is operating trains.

² A Safety Management System is a system designed to allow the operator to manage the risks associated with the operational aspects and engineering and maintenance activities to achieve a high level of safety performance. It should be documented in a suite of documents, policies and procedures that are linked to deliver a safely maintained and operated railway.

- 12 The engineering manager started work as an apprentice fitter in 1986 with the Dart Valley Railway (which operated the railway before the SDR Trust). The engineering manager is employed by the Trust, and has management responsibility for full and part time staff and volunteers working in both the locomotive and the carriage and wagon workshops.
- 13 The carriage and wagon superintendent, who reports to the engineering manager, has been employed (part time, working one week in every two) since 2014. The carriage and wagon superintendent is responsible for the employees and volunteers who maintain the railway's passenger rolling stock and undertake fitness to run (FTR) examinations of the carriages.
- 14 The carriage and wagon fitter has been employed since 2013. He had originally worked in the locomotive workshop before moving to the carriage and wagon workshop in 2014, undertaking a variety of tasks including welding and fabrication in addition to fitting and carpentry work.

The sequence of events

Events preceding the accident

- 15 The mother and child boarded the train at Buckfastleigh station (for the 12:17 hrs departure) and travelled to Totnes. Soon after arriving at Totnes, they decided to return on the same train, which departed from Totnes at 13:00 hrs, and from Staverton at 13:15 hrs.
- 16 A few minutes after leaving Staverton station, the child, who had travelled on the train before and was aware that the toilets were located at the end of each carriage, decided to go to look at a toilet. The mother, who was aware that some of the toilets were out of use ('out of use' signs were on several toilet cubicle doors) followed a short distance behind the child (figure 4).



Figure 4: The outside of the toilet cubicle involved in the accident

Events during the accident

- 17 Both of the toilet cubicles at the end of the carriage that the mother and child were travelling in had previously been put out of use by the railway company, because the toilet floor in one and the sink in the other had been removed. Both toilet doors had 'out of use' notices fixed to them, and had been secured with screws through the frame and the door. Before the mother, who had seen the warning signs, could warn her child that the toilet he was about to enter was out of use, the child went into the toilet cubicle.

- 18 Although the toilet cubicle door was supposed to have been secured closed (see paragraphs 30 to 37), the child was able to enter the cubicle (it is not known whether he used the door knob or simply pushed the door). The door of the toilet cubicle opened inwards. The mother stated that the child fell forward towards the track, breaking his fall on the brake pipe. The mother reacted quickly and grabbed the child's arm, preventing him from falling onto the track (figure 8).



Figure 5: The 'out of use' sign and orange tape placed on the toilet cubicle door



Figures 6 and 7: Typical layout of a door locking arrangements on a toilet cubicle on a British Rail Mark I carriage



Figure 8: The interior of the toilet cubicle on carriage 4805



Figures 9 to 13: Details of the condition of the toilet cubicle on carriage 4805

Events following the accident

- 19 The mother reported the accident to the guard and travelling ticket inspector (TTI), both of whom had been unaware that the toilet floor was missing. The guard then instructed the TTI to stop any further access to the toilet cubicle until the train reached Buckfastleigh.
- 20 Upon arrival of the train at Buckfastleigh at 13:30 hrs, the guard reported the accident to the duty officer, who met and spoke to the mother and child. The duty officer contacted the carriage and wagon workshop and asked them to come to the station and repair the door. Two fitters attended.
- 21 One of the fitters stated that when he arrived at the carriage to carry out repairs, he found the toilet door was open, part of the wooden door frame had broken off and the screws that were supposed to be holding the door closed were missing. The screws holding the vacant / engaged sign to the door frame and door were also loose (figures 6 and 7). The 'out of use' sign on the door was still present, but the orange tape which was said to have been stuck all round the door frame was only present on the top part of the frame above the door (figure 5).
- 22 The fitters re-secured the door and notified the guard and the duty officer, who inspected the repair, and were not prepared to allow the train to return to service. The fitters were called back and removed the handle and the 'engaged' disc on the outside of the door, leaving no means of opening it. The re-secured door was further inspected by the duty officer and the engineering manager. Both managers and the guard were satisfied that the door was secure and that the carriage was safe, and allowed the train to re-enter service.
- 23 The duty officer obtained details of the accident from the mother and entered the details into the SDR's accident book. He later booked off duty without reporting the accident to either the RAIB or the Office of Rail and Road (ORR). The mother, who was unhappy with the railway's initial response, emailed the SDR the following day (Friday 23 June) requesting a copy of the accident form. The email was not read until Sunday 25 June, when it was brought to the attention of a different duty officer who was unaware of the occurrence, and after making some enquiries the potential seriousness of the accident was realised. The train was then taken out of service to allow coach 4805 to be quarantined, and the SDR contacted the RAIB the same day (paragraphs 77 to 80).

Key facts and analysis

Background information

- 24 Carriage 4805 was built by BR in 1957. It was sold for preservation in 1990, and has been on the SDR since 1993. It is of the BR standard design now known as Mark 1, and has a steel body on a steel underframe. The interior, including the flooring and partitions, is made of a mixture of wood and plastic laminates.
- 25 The toilet compartments are wood framed, with wood panelling on the outside and a laminated interior surface. The base of the toilet compartment is secured to the carriage floor, and the top is fixed to the vehicle roof members.
- 26 The carriage is equipped with *vacuum brakes*, and the piping associated with this system is fixed to the *underframe*. Towards the ends of the vehicle the brake pipe passes over the *bogies* and under one of the toilet compartments. Access to this section of the vacuum pipe from below is hindered by the bogies.
- 27 The area of the vehicle around the ends and the toilet compartments is prone to damage and deterioration caused by ingress of water through joints in the roof, via door and window openings, and spillage from the lavatory equipment, and from substances used to clean the toilet areas. These penetrate the floor and, if not dealt with effectively, may result in wet rot affecting the toilet floor and the partition wall bases, and corrosion of the underframe cross-members and bracing (figure 14).

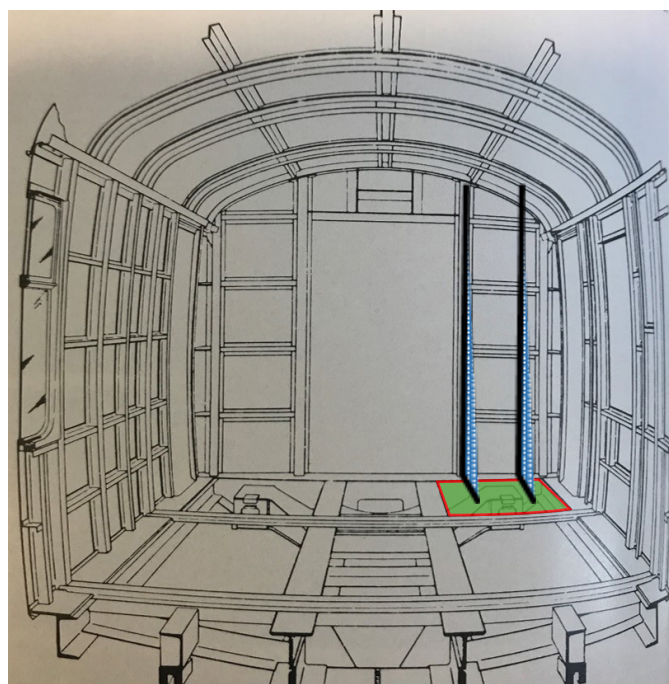


Figure 14: Diagram showing the structure of the Mark 1 carriage. Probable areas where water may enter the carriage panelling are shown in blue. The green shaded area shows the location of the toilet floor (see figure 7). (Image courtesy of the Institute of Locomotive Engineers).

Identification of the immediate cause

28 The child was able to open the door of a toilet cubicle that had no floor.

- 29 This occurred as a result of the following causal factors:
- a. Carriage 4805 was in service with no toilet floor (paragraphs 30 to 34);
 - b. The toilet door was not secure (paragraphs 35 to 37); and
 - c. No-one detected that the door had become unsecure before the accident (paragraphs 38 to 46).

Identification of causal factors

30 Carriage 4805 had been in service since April 2017 with no toilet floor.

- 31 During June 2016 a fault was reported with the braking system on carriage 4805, which was suspected to be caused by a leak in the brake pipe. In December 2016 several train drivers reported that the fault had worsened, and the leak was now severe enough to make it difficult to keep the brakes released in normal running. On 31 March 2017 the problem with carriage 4805 became worse and the vehicle was removed from service for the brake pipe to be repaired.
- 32 The position of the fault in the brake pipe (between the toilet floor and structural member) meant the maintenance staff could not see the fault nor could they gain access to repair it. As, at the time, the SDR had no resources available to lift the carriage, the engineering manager and carriage and wagon superintendent decided the most effective method of gaining access to undertake the repair, was to remove the toilet cubicle floor. This was done on 2 April. Removal of the floor revealed a previously unsuspected level of corrosion of the underframe and wood rot in the toilet floor and partition walls (figures 9 to 13).
- 33 Witness evidence indicates that the staff working in the carriage and wagon workshop did not want to reinstate carriage 4805 for service until the full repairs had been completed, both to the brake pipe fault and to the corrosion and other decay. However, the carriage was wanted for the passenger train service, so the carriage and wagon superintendent escalated the matter to the engineering manager, who subsequently inspected the carriage. Due to the amount of work that would be required to carry out a full repair, and the possibility that it might involve the removal of asbestos insulation within the panelling of the carriage, discussions took place between the engineering manager, the carriage and wagon superintendent and the railway manager to resolve the issue. The discussions were around the various options available and the potential impact on both the workload within the workshops, and the financial impact of the reducing the number of operational carriages available to run a train service.

34 The result of these discussions was a decision that the repair to the brake pipe leak would be completed, but that any further repair or refurbishment work to rectify the corrosion and wood rot would not be undertaken until early June (paragraph 36). This was because another carriage, then under repair, was expected to re-enter service by June, and the removal of carriage 4805 from service would leave only 9 out of the 10 operational carriages available, and this would affect the SDR's capacity during the 'Gala' events over the forthcoming bank holiday weekend (31 May 2017). On 13 April the fitter secured the door using screws inserted through the door into the frame and the carriage was put back into service. The engineering manager checked the repair, and materials for the rest of the work were ordered, with the intention of completing the repairs to 4805 in early June 2017, when the SDR would be operating a reduced timetable. However, this work was further delayed (see paragraph 42). The repairs on carriage 4805 had not started by the time the accident occurred on 22 June.

35 The toilet door was not secure, allowing the child to enter the toilet cubicle.

36 The method of securing the toilet door, with screws through the door into the frame (figure 15), had been previously used on another vehicle without incident in 2016. As a result, the engineering manager and carriage and wagon superintendent believed that this method was adequate as a temporary measure. An 'out of use' sign was placed on the door and orange tape was attached to the door frame surround. The toilet cubicle door was inspected by the carriage and wagon superintendent and the engineering manager, and the railway manager was advised that the carriage could be put back into service.



Figure 15: The method of securing a toilet cubicle door using screws through the door and frame

- 37 The RAIB's examination of the toilet cubicle and the damage to the door and the frame, after the accident and the subsequent repairs, found that the screws were inserted through the door frame and door at an angle (figures 16 to 19). Although the physical evidence is not conclusive, the RAIB considers that the screws could have become ineffective as a result of one or a combination of the following factors:
- The door was accidentally or intentionally forced open, resulting in damage to the door frame, allowing the screws to become loose or fall out.
 - The removal of the toilet floor and the decay at the base of the partitions resulted in a loss of integrity of the structure of the toilet cubicle, because the floor was no longer tying the partition walls together. This meant the structure was no longer rigid, and the movement of the train may have resulted in the door frame and the door moving relative to each other. This movement caused the screws securing the door to become loose, fracture or fall out.

38 No-one detected that the door had become unsecured before the accident, because train crew were unaware of the situation.

- 39 The SDR's safety management system was first produced in 2008. Section 16 of the 2008 document required the general manager to maintain the safety management system to ensure changes were clearly identified and revisions were communicated to all copy holders. Several reviews of the safety management system had been completed as a result of new Heritage Railway Association (HRA) guidance issued in 2012 and 2014 but no subsequent versions of the safety management system had been published. The investigation found that SDR's engineering workshop was working to a draft version of the safety management system (dated 2012), while the SDR operations department was still working to the original 2008 version. The post of general manager was abolished in 2014, and responsibility for maintenance of the safety management system was undefined until after the operations coordinator was appointed in 2017, when he was initially asked to review the system and later to take full responsibility for rewriting it (paragraph 11).
- 40 Although the engineering manager, the carriage and wagon superintendent and the railway manager had applied their experience and judgement to come to a mutually agreed decision to put carriage 4805 into service without a toilet floor, they were not required to undertake or document any formal 'handover' between the engineering and operations departments before carriage 4805 was put back into service on 14 April 2017.
- 41 If he had been made aware of the situation, the operations coordinator, in line with document 3 of the safety management system, would have been required to arrange for staff briefings to take place and to publish notices highlighting the hazard. One way of doing this would have been to include them in the railway's weekly operating notice. However, as the information about the removal of the toilet floor was not shared and disseminated, this was not done and the guards and TTIs were unaware of the hazard³ (paragraph 46).

³ There were no reported accidents relating to carriage 4805 between April 14 and June 21.



Figures 16 to 19: The damage to the toilet cubicle frame and door of carriage 4805

- 42 In June 2017, the carriage and wagon superintendent advised the railway manager that an opportunity to repair the toilet floor of carriage 4805 was now available, between mid-June and mid-July. There was an alternative option to work on another carriage, and postpone work on carriage 4805 until November, which would allow a full restoration of 4805 to be done. Witness evidence indicates that the railway manager was concerned that carriage 4805 was still required in service, because of delays in refurbishing a similar carriage (4785)⁴ that was to be used as a replacement. The managers agreed that carriage 4805 would continue in service until carriage 4785 was available. The operations coordinator, who was still unaware of the hazard on carriage 4805, was not advised of this decision.
- 43 The SDR fitness to run process required carriage and wagon staff (the fitter or the carriage and wagon superintendent) to inspect each vehicle and endorse (sign and date) a form (safety management system document 19) to confirm that the carriage was fit to run in passenger service (see paragraphs 69 to 76). The scope of the required inspection included the toilet facilities. The fitness to run examination of carriage 4805 on 21 June, the day before the accident, noted 'toilets out of use' and 'floor missing in toilet' (table 1).
- 44 Although the fitter was aware of the situation (having undertaken the original repair work), and recorded the issues on the fitness to run form, the RAIB is unable to confirm if the physical check on the security of the door was actually undertaken by the fitter. This is because the fitter stated that he would normally check the signage, but he would not always be vigorous in confirming that the doors on toilet cubicles that had been signed 'out of use' were actually secured.
- 45 The SDR Rule book requires train guards to prepare and check the train prior to the train entering service. The check includes inspecting toilets that are in use to check that they are well stocked and that the doors of toilets in use are operational. The rules state that if internal or external doors have to be locked out of use, staff must ensure the doors are clearly labelled with an 'out of use' notice and are locked securely. If a fault is identified the guard should enter the details in the fault book (safety management system document 18). Depending on the type of fault (underframe, bogie or carriage structure), a copy of the fault book is passed to the respective workshop (locomotive or carriage and wagon) to take action. The last fault book entry for the train incorporating carriage 4805 was completed on 18 June 2017 and was not related to the toilet doors.
- 46 As the guards and TTI staff were unaware of the missing toilet floor on carriage 4805 and it was a common occurrence to see 'out of use' notices on the toilet cubicle doors, many of the guards and TTIs, although they were required to do so, did not physically check all toilet doors which appeared to be closed. The RAIB carried out a confidential survey of SDR train crews. The results of this suggest that the last confirmed physical check on the toilet cubicle door involved in the accident probably took place on 14 June, a week before the accident. The guard and the TTI travelling on the train on 22 June were unable to confirm if a physical check on the doors displaying an 'out of use' sign was undertaken before the train entered service⁵. The RAIB is therefore unable to establish if a physical check on the security of the door was undertaken by anyone between 14 June and the accident being reported.

⁴ The originally scheduled date for completion of repairs and refurbishment to carriage 4785 was 22 May 2017.

⁵ The RAIB was able to establish that it is unlikely that any members of the public (including an excursion / school trip) tried to use the toilet cubicle on the morning of June 22 and prior to the accident being reported.

Identification of underlying factors

47 The risk associated with the absence of the floor was not sufficiently appreciated or adequately managed.

- 48 Section 12.14 of the SDR safety management system states that all risk assessments (safety management system document 25) are carried out using available data and expert judgement, and should include the frequency and severity of the potential risk. In addition, section 12.16 provides guidance that any risk assessments should be based upon common sense, good practice and published guidance produced by the rail industry.
- 49 Witness evidence shows that both the engineering manager and the carriage and wagon superintendent believed there was no apparent risk with the method of securing a toilet door using screws through the frame and door, as it had been previously used without incident in 2016. Other types of security (such as applying another type of lock) were considered but discounted, as the fix was considered to be a temporary one. Although the managers were aware of the SDR risk assessment process, they did not consider it was necessary to carry out a formal assessment of the risk associated with allowing the carriage to enter service with no toilet floor.
- 50 Had the managers carried out a risk assessment which fully considered the risks associated with securing the door with screws, they might have identified and considered the potential effect of the removal of the floor on the rigidity of the toilet cubicle. Such a consideration would have included the possible effects on the security of the screws of train movement and people pushing the door frame.
- 51 Witness evidence also shows that there was ambiguity within the management structure of SDR about who had responsibility for managing the risk. The railway manager believed the engineering manager and the carriage and wagon superintendent had the ultimate safety responsibility for deciding that carriage 4805 was fit to run, while the other two managers believed it was the railway manager's decision to reinstate the carriage, based upon his operational requirements.
- 52 In the past, the SDR had employed a general manager who was senior to both the engineering manager and the railway manager. This post was abolished following the resignation of its holder in 2014, and since then staff, including the carriage and wagon superintendent (who was employed by the Trust, but worked to the engineering manager) were unsure as to which of the senior managers had ultimate responsibility to make the decision. Witness and documentary evidence indicates that the SDR had not clearly communicated a new management structure since the end of the role of the general manager in 2014, and that there was some friction between the operations and engineering functions as a result of this, and also relating to the balance between the use of engineering resources for work on the SDR's vehicles, and for external work obtained through SDRE.
- 53 The confusion over who had management responsibility for the carriage entering service in this condition may be the reason why no handover occurred between the engineering and operating functions of the SDR, and why information about the state of the carriage was not shared with the operations coordinator in April after the initial repair, or when the work was further delayed in June.

Competence management

54 **The SDR competence management process for staff involved in the carriage maintenance and train preparation was inadequate.**

- 55 The Railways and Other Guided Transport Systems (Safety) Regulations 2006 (ROGS)⁶ require those in control of safety critical work in the rail industry to ensure, so far as is reasonably practicable, that any person under their supervision, management or control, only carries out safety critical work where they have been assessed as being competent and fit to do so by an assessor, and there is a record of the criteria used to carry out that assessment.
- 56 At the time of the accident the SDR safety management system was out of date, with Section 13.1 of the document still referring to the (by then abolished role of) general manager having responsibility for ensuring the competence management process was monitored when assessing staff prior to and after their appointment.
- 57 Section 13.3 of the safety management system stated that all new staff would always be allocated tasks requiring only basic competence and responsibility. Training in the specific working practices of the SDR would be provided until their capability was proven, or if they could provide written evidence of competence from similar organisations (such as other heritage railways or public operators).
- 58 Witness evidence shows that some aspects of the process were being complied with. Many of the employed staff and volunteers working for the SDR (civil engineering and signalling) had started work with the necessary technical skills and competence (many working for Network Rail and other train operators) and training was done 'on the job' with knowledge and experience being passed on through the practical application of skills. In addition to this, the SDR initial track safety and refresher training, and the initial training of guards in train preparation duties was completed and documented.
- 59 However, the process to assess the competence of staff working in the carriage and wagon workshop was not being followed or monitored. Staff competence in this area was not routinely assessed, and refresher training was not being undertaken or recorded.
- 60 Carriage and wagon staff competence was therefore inferred by management rather than being explicitly assessed and audited on a regular basis in line with the safety management system. This may be a probable factor in why the following omissions occurred:
- the general deterioration of the toilet compartment end of carriage 4805 was not identified prior to the brake pipe repair (see paragraph 62);
 - inadequate steps were taken to repair the toilet cubicle door (see paragraphs 42 and 50);
 - the fitness to run process was not being correctly applied before the accident (see paragraph 69); and
 - the accident was not reported or evidence preserved (see paragraph 77).

⁶ SI 2006 No. 599, as amended.

Factors affecting the severity of consequences

- 61 Had the mother not grabbed her child as he fell, he is likely to have been seriously injured and possibly killed.

Observations

Carriage inspection and maintenance

- 62 **Although the SDR's safety management system specified a carriage examination regime, the poor condition of the internal carriage structure was not previously identified, nor adequately monitored after its partial repair.**
- 63 The SDR safety management system section 12.6 required '*All locomotives, rolling stock and plant in operational use are regularly maintained and serviced by SDR experienced staff under the direction of the Workshop Manager to either the manufacturers specifications or the design concepts and safety standards employed by the previous owners (e.g. British Rail, Great Western Railway or similar)*'.
- 64 The document used by many heritage railways as a reference source for maintenance standards for Mark 1 carriages is the British Rail document MT 250 'British Railways Board - Examination and Repair of Privately Owned Coaching Stock'⁷, and is applied by the various railways with modifications to relate to the changing duty cycles on their lines. This standard was produced to define the standards required for vehicles operating on special charter services on the national network at speeds of up to 90 mph (144 km/h). Some railways make use of other British Rail maintenance standards and regulations, dating from the 1970s and before.
- 65 Passenger services on heritage railways operate at a maximum speed of 25 mph (40 km/h), and evidence gathered by the RAIB indicates that most operators have modified the inspection intervals defined in the standard to suit the conditions in which their vehicles are used. In the past it was common for Mark 1 carriages to be repainted and put into service following purchase, and then withdrawn from service when heavy repairs became necessary. It has since become necessary for heritage railways to confront the need to keep these vehicles serviceable for a long-term future.
- 66 The document MT 250 specifies that a major overhaul should be undertaken every six years or 100,000 miles, whichever comes first. Being able to comply with this requirement is dependent on the private owner of the vehicle having the facilities and the finance to resource a major overhaul. Section 6 of the document provides guidance on bodywork and the requirement to inspect for rot and corrosion and includes the phrase 'if necessary remove any floors and coverings to identify any issues'.

⁷ Available through the Heritage Railway Association at <https://www.hra.uk.com/br-maintenance-specs>.

- 67 The investigation identified that water from the exterior of the carriage is likely to have leaked into the body causing the corrosion to the cross members of the chassis, and that the normal usage and cleaning of the toilet facilities would have contributed to the wood rot within the timber floor and panelling on the carriage (paragraph 27). At the time of the accident the SDR was in the process of building undercover storage facilities (see paragraph 90 (vii)) for its carriages, which were still being kept outside. When stored outdoors, normal weather conditions would have exacerbated the decay of carriage 4805.
- 68 Witness evidence also suggests that there was a disparity between the SDR's focus on and attention to the maintenance and repair of its steam locomotives, compared to the deteriorating condition of its Mark 1 carriages. Although regular fitness to run examinations were carried out, the RAIB found no evidence that carriage 4805 had been sufficiently thoroughly inspected (since 2006) to identify the decay and deterioration around the toilet compartments, until the toilet floor was removed to enable the brake pipe to be repaired. The RAIB has no evidence that, when the vehicle was examined after the accident, the extent of decay found represented a safety risk to passengers. However, if left uncorrected, continuing decay would eventually result in a loss of structural strength which could impair the safety of the vehicle.
- 69 The fitness to run process was not correctly applied.**
- 70 Section 12.11 of the SDR safety management system requires all passenger rolling stock in operational use to have a thorough annual inspection before the commencement of the operating season in March each year, followed by weekly fitness to run inspections during the operating period.
- 71 The safety management system section relating to the maintenance regime for carriages (section 12.8) requires the following checks to be undertaken:
- **Weekly check:** including door mechanisms, running gear and communication cords, toilets and seats etc; and
 - **Annual check:** including couplings, axle box bearings, vacuum brake gear, running gear, tyres, and door mechanisms.
- 72 Both checks require the fitness to run form (safety management system document 19) to be used, completed, signed and dated.
- 73 Additionally, all locomotives and rolling stock must be subjected to a thorough fitness to run examination before entry into traffic after maintenance, emergency repairs or on arrival if hired from another operator.
- 74 SDR fitness to run records for routine maintenance on carriage 4805 (fault reporting and carriage maintenance) show the faults and observations that were recorded on the weekly fitness to run forms since the brake pipe repair had been completed in April 2017 (table 1).

75 However, witness evidence shows that the fitness to run process had never been subjected to a review or audit. Had SDR done this, it would have identified that the engineering staff within the carriage and wagon workshop had not been signing the fitness to run forms for some years. Although SDR staff conducting the fitness to run examinations were confident in their own ability and competence to identify if a fault required a carriage to be removed from service⁸, they did not feel comfortable in signing and dating the forms to show that they had examined the condition of the carriages and were authorising that they were fit to run. They stated that this was due to the number of faults being identified, the 'fix and patch' culture, and the perceived possible personal implications for them of signing the form and an incident or accident occurring subsequently.

FTR	Notes / comments
19 April 2017	No toilet floor
25 April	Toilet floor gone/ toilets locked out of use/
3 May 2017	No comments made on toilet cubicle
4 May 2017	No comments made on toilet cubicle
9 May 2017	Under gangway vestibule A and B ends needs rebuilding and holes visible/ toilets at both ends bad
15 May 2017	Body work holes and floor of toilet missing- door secured
31 May 2017	Floor of toilet missing- out of use -door secured
7 June	Various body work faults and holes – all aware of / no toilets / various water leaks and panel damage.
13 June 2017	Various body work issues / lots of issues re Toilets, bodywork, tables, damp, comms cord / doors not working due to stress on flanges.
21 June	Various body work issues and holes / Toilets out of use and floor missing

Table 1: Fitness to run entries for carriage 4805 from April to June 2017. All these entries were unsigned

76 Although compliance with SDR's fitness to run process was inadequate, in that it had become a listing of existing faults rather than a confirmation that the vehicle was fit to be in service, the investigation found that while the condition of the carriages was deteriorating, there was no evidence that other carriages in the SDR fleet were unfit to be in service.

⁸ The investigation found no evidence that historical fitness to run documents had resulted in carriages being removed from the SDR train service.

77 The SDR did not immediately notify the RAIB of the accident.

- 78 The Railways (Accident Investigation and Reporting) Regulations 2005 placed an obligation on SDR to immediately report the accident to the RAIB (as this was an accident which under slightly different conditions might have led to a death or serious injury) and to preserve any evidence.
- 79 Section 16 of the SDR safety management system required the duty officer on 22 June 2017 to follow the railway's procedures to ensure that accidents, incidents, near misses and other dangerous occurrences are reported, investigated and analysed and that necessary preventative measures are taken. The duty officer was aware that the accident needed to be documented, so he obtained and recorded the necessary details, but he did not realise that the accident came into the category of those that need to be reported immediately to the RAIB. He did not consider the severity of the accident was sufficient to require him to remove the carriage from service and preserve any evidence.
- 80 SDR management did not identify this omission or realise the potential seriousness of the accident until an email that had been sent by the child's mother following the accident (23 June) was brought to the attention of another duty officer on 25 June. This duty officer, who was unhappy with the state of the toilet door, then took action to remove carriage 4805 from service and notify the RAIB and ORR (under RIDDOR⁹).

The role of the Office of Rail and Road (ORR)

- 81 The Railways and Other Guided Transport Systems (Safety) Regulations (ROGS) came into force from 2006, providing the current regulatory regime for rail safety, including heritage railways. Under ROGS main line operators are not permitted to operate vehicles unless they have obtained safety certification from the national safety authority, which is the ORR for most railways in the United Kingdom. Applicants need to show how their safety management system allows them to run their transport system safely.
- 82 Lower-risk sectors such as tramways and heritage railways that do not run at speeds above 25 mph (40 km/h) do not need a safety certificate, but must still have a written safety management system in place, which sets out the method by which the railway operator manages risks. There is no requirement on the ORR to review an operator's safety management system. Witness evidence indicates that ORR generally does this as part of an inspection in response to accidents or serious complaints against the railway, or if there is a statutory requirement (eg level crossings and steam locomotive / boiler maintenance). ORR's strategy for the regulation of safety management systems on heritage railways is available on its website¹⁰. Since 2007, and up to the time of this accident, ORR has issued improvement notices to 14 heritage railways in respect of deficient safety management systems. Until this accident it had not reviewed the SDR's safety management system.

⁹ The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (SI 2013 no. 1471).

¹⁰ http://orr.gov.uk/__data/assets/pdf_file/0003/6429/safety-strategy-chapter-1.pdf.

83 The ORR, in conjunction with the Heritage Railway Association, invited the heritage sector to attend a series of workshops on safety management issues, which were held in 2009. Following the workshops a series of guidance notes were produced or updated by HRA that included Safety Management Systems and Competence Management. In 2012 the ORR wrote to all minor railways to provide an update on a range of current issues that the ORR had identified from a number of its own investigations that it believed were relevant to the minor railways of the UK. These issues related to the following areas:

- Suitable management structures were not in place, resulting in a lack of control over changes to infrastructure and procedures.
- There was evidence of poor planning and a lack of competence management within the heritage sector.

The actions that the ORR considered should be taken in respect of these issues were:

- Minor railways should identify safety critical roles and the competence required for those roles. Operators should ensure that they have appropriate training and initial competence assessment criteria in place, and a process of regular re-assessment supported by appropriate records to show that staff have been assessed as fit for their roles¹¹.
 - A safety management system must be put in place that is fit for purpose.
 - Operators should ensure that the requirements of their safety management system are being adhered to.
- 84 The ORR reported that two managers from the SDR had attended the workshops. However, the RAIB found that although some work was started, the SDR had not taken any effective action to review its SMS until shortly before the accident occurred.

Previous occurrences of a similar character

85 Although there have been no previous occurrences involving a toilet cubicle floor being removed and a carriage being returned to service, the RAIB has undertaken 26 investigations relating to heritage railways since 2006. Seven of these investigations have found causal factors, and subsequently made recommendations, relating to the operator's safety management system. These were:

- Ropley, Mid-Hants Railway, 25 July 2006 ([RAIB report 20/2007](#)).
- Bronwydd Arms, Gwili Railway, 19 July 2006 ([RAIB report 22/2007](#)).
- Fisherground, Ravenglass & Eskdale Railway, 12 May 2007 ([RAIB report 32/2007](#)).
- Hampton Loade, Severn Valley Railway, 28 September 2009 ([RAIB report 07/2010](#)).
- Kirklees Light Railway, 3 July 2011 ([RAIB report 04/2012](#)).

¹¹ There is no evidence that SDR acted upon the advice provided by the ORR in reviewing its competence management system to ensure safety critical roles were identified, trained and monitored.

- Grosmont, North York Moors Railway, 21 May 2012 ([RAIB report 23/2012](#)).
- Loughborough, Great Central Railway, 12 May 2014 ([RAIB report 04/2015](#)).

Observations and recommendations arising from three investigations related to the non-reporting of accidents. One of these was the accident at Bronwydd Arms listed above. The other two were:

- Pickering, North York Moors Railway, 5 May 2007 ([RAIB report 29/2007](#)).
- Lydney, Dean Forest Railway, 15 August 2007 ([RAIB report 14/2008](#)).

Summary of conclusions

Immediate cause

86 The child was able to open the toilet cubicle door, which was not secure (paragraph 28).

Identification of causal factors

- 87 The accident occurred due to a combination of the following causal factors:
- a. Carriage 4805 was in service with no toilet floor (paragraphs 30 to 34, **Recommendation 1**).
 - b. The toilet door was not secure (paragraphs 35 to 37 and 90 (i), (iii) and (iv), 91 and 92, **Recommendation 1**).
 - c. No-one detected that the door had become unsecured before the accident (paragraphs 38 to 46 and 90 (i), (ii) and (iii), 91 and 92, **Recommendation 1**).

Underlying factors

- 88 The underlying factors were:
- a. The risk associated with the absence of the floor was not sufficiently appreciated or adequately managed (paragraphs 47 to 53 and 90 (iii), **Recommendation 1**).
 - b. SDR had no formal competence management assessment for staff involved in carriage maintenance and train preparation (paragraphs 54 to 62 and 90 (i), **Recommendation 1 and Learning point 1**).

Additional observations

- 89 Although not linked to the accident on 22 June 2017, the RAIB observes that:
- a. The SDR maintenance regime did not identify the degrading condition of the carriage structure nor was it adequately monitored after its partial repair (paragraphs 62 to 68 and 90 (i), **Recommendation 1**).
 - b. The SDR fitness to run process was not being correctly applied (paragraphs 69 to 76, 90 (i) and 91 to 92).
 - c. The SDR did not immediately notify the accident to the RAIB (paragraphs 77 to 79, no recommendation, see paragraph 90 (vi)).

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

- 90 South Devon Railway has taken the following actions as a result of the accident:
- i. The railway has developed a new safety management system (published November 2017) and in accordance with this, it has introduced a competence assessment process. All staff within the engineering and carriage and wagon workshops have had a competence assessment to ensure general engineering competency skills;
 - ii. Leadership and management reporting lines for carriage and workshop staff have been clarified by way of a circular to the relevant staff. A policy for resolution of differences of opinion between the engineering and operational workshops has been agreed with all matters now being referred to the Trust chairman until such time as a new Chief Executive Officer is appointed;
 - iii. The risk assessment policy for defects and decision-making has been recirculated to all managers, heads of department reminding all managers to undertake a risk assessment as and when required;
 - iv. A fault reporting and defect recording system has been implemented. The database ensures both engineering (including carriage and wagon) and operations departments are fully aware of the status and nature of the fault and any outstanding repairs. The system provides a fault log for the guard showing all issues on a particular rake to assist in train preparation duties;
 - v. The carriage maintenance section (dated Sept 2017) of the new safety management system has proposed a major overhaul of SDR carriages every 20 years or 100,000 miles (whichever comes first);
 - vi. The operations coordinator has re-briefed the requirements of the SDR accident and accident reporting process to all duty officers to remind them of SDR's legal obligations to report such events in a timely manner and ensure evidence is preserved; and
 - vii. A new carriage shed has been built to protect the rolling stock.

Actions reported that address factors which otherwise would have resulted in a RAIB recommendation

- 91 In addition to the above actions, the SDR has implemented a two-stage fitness to run process that requires the examiner to sign the form to confirm that the examination has been carried out. The examination form is then reviewed by the C&W manager who decides whether the carriage is fit to run, and countersigns the form.

Other reported actions

Office of Rail and Road

- 92 The Office of Rail and Road issued the SDR with an improvement notice in July 2017 as it considered sections of the SDR safety management system relating to carriage maintenance and inspection were inadequate. A further inspection in November 2017 concluded that the SDR had complied with the notice. The ORR also noted that the new fitness to run inspection procedures were being followed.

RSSB

- 93 RSSB¹² is currently working with the rail industry standards committees and heritage rail operators (operating on the main line railway) to publish three new rail industry standards (December 2017) intended to cover all engineering and operational aspects needed to support the safe operation of heritage vehicles and heritage trains operating on the main line railway.
- 94 The standards will cover the technical requirements, certification and operation of the heritage trains. The technical standard will include sections on monitoring the overall vehicle condition and the effects of long term fatigue and corrosion on vehicles that are approaching or have gone beyond their expected design life (eg Mark I carriages). Requirements for maintenance arrangements and competency management are also intended to be included within the standard.
- 95 The operations standard is intended to set out the operators' requirements for managing the planning and operation of heritage train services and includes the examination and documentation about the fitness to run examinations, train preparation, fitness for duty and competence management of staff. Although the new standards are designed for operators of heritage vehicles that operate on the main line railway, the technical detail and requirements provided may also assist owners and operators of vehicles on heritage railways (paragraph 97).

¹² 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'.

Recommendations and learning points

Recommendation

96 The following recommendation is made¹³:

- 1 *The intent of this recommendation is that the South Devon Railway's safety management system should be independently reviewed and any changes identified as necessary should be implemented.*

The South Devon Railway should engage an external party (to be agreed with the ORR) to review South Devon Railway's safety management system and the way it is being implemented in practice. The review should examine all aspects of and if necessary any revisions to the system that should be implemented including:

- i. governance, policy and leadership;
- ii. management control and communication;
- iii. risk assessment and the identification of additional control measures;
- iv. how the competence of employees is developed, assured and maintained;
- v. monitoring, review and auditing of compliance to the safety management system (paragraphs 87 and 88).

Any changes identified as necessary by this review should be implemented and reported to the ORR.

This recommendation may also apply to other heritage railways.

¹³ Those identified in the recommendation 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, this recommendation are addressed to the Office of Rail and Road 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.govuk/raib.

Learning point

97 The RAIB has identified the following key learning point¹⁴ during the investigation:

- 1 The importance, for heritage railways, of adhering to appropriate standards for vehicle maintenance, and ensuring that the railway's examination regime will identify the foreseeable deterioration of vehicles before it reaches a stage that may affect safety.

¹⁴ '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.

Appendices

Appendix A - Glossary of abbreviations and acronyms

BR	British Rail
ORR	Office of Rail and Road
ROGS	Railways and Other Guided Transport Systems (Safety) Regulations 2006
SDR	South Devon Railway
SDRE	South Devon Railway Engineering
SO	Second Open
TTI	Travelling Ticket inspector

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.

Bogie	A metal frame equipped with two or three wheelsets and able to rotate freely in plan, used in pairs under rail vehicles to improve ride quality and better distribute forces to the track.*
Underframe	The structural assembly underneath the floor of a rail vehicle which supports the weight of the vehicle and its load and resists longitudinal forces.*
Vacuum brakes	An automatic braking system in which the train's brakes are maintained in the 'off' position by a vacuum in the brake pipe. Allowing air into the pipe will cause the brakes to be applied throughout the train.

Appendix C - Investigation details

The RAIB used the following sources of evidence in this investigation:

- information provided by witnesses;
- documents provided by SDR;
- site photographs and measurements; and
- a review of previous RAIB investigations that had relevance to this accident.

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Department for Transport.

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