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Mr Andrew Hall
Deputy Chief Inspector of Rail Accidents
Cullen House
Berkshire Copse Rd
Aldershot
Hampshire GU11 2HP

Dear Andrew,

RAIB Report: Derailment at Godmersham, Kent on 26 July 2015

I write to provide an update¹ on the action taken in respect of recommendations 3 & 5 addressed to ORR in the above report, published on 6 April 2016.

The annex to this letter provides details of actions taken in response to the recommendations and the status decided by ORR. The status of recommendations 3 & 5 is **'Implemented'**.

We do not propose to take any further action in respect of the recommendations, unless we become aware that any of the information provided has become inaccurate, in which case I will write to you again.

We will publish this response on the ORR website on 17 March 2021.

Yours sincerely,



Oliver Stewart

¹ In accordance with Regulation 12(2)(b) of the Railways (Accident Investigation and Reporting) Regulations 2005

Recommendation 3

The intent of this recommendation is to reduce the risk of derailment arising from collisions with obstacles for electric multiple units operating exclusively on third rail lines.

London & South Eastern Railway Limited, in conjunction with Govia Thameslink Railway, Porterbrook Leasing Company Limited and Eversholt Rail Group should develop, and then implement, a programme for retrofitting obstacle deflectors to Electrostar units that are not currently fitted, but are equipped with mountings for such deflectors

ORR decision – LSER

1. London & South Eastern Railway Ltd (LSER) have completed the programme of work to fit obstacle deflectors to Electrostar units that already have appropriate mountings.
2. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, LSER has:
 - taken the recommendation into consideration; and
 - has taken action to implement it.

Status: Implemented.

ORR decision – GTR

3. Govia Thameslink Railway Ltd (GTR) have developed and implemented a programme of work to fit obstacle deflectors to Electrostar units that already have appropriate mountings. The work is carried out as part of the A5 overhaul, which is expected to be completed by the end of July 2021. Units will have obstacle deflectors fitted sooner if they are stopped for out of course repairs that require lifting and coupler removal.
4. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, GTR has:
 - taken the recommendation into consideration; and
 - has taken action to implement it.

Status: Implemented

Previously reported to RAIB

5. On 29 March 2017 ORR reported the following:

Southeastern

Southeastern are working with Eversholt Rail to investigate the fitment of obstacle deflectors to units with appropriate fittings. They are planning to complete this work by 'early 2017', but have not yet provided ORR with a time-bound plan.

Govia Thameslink Railway

GTR have made arrangements with the ROSCO that owns the relevant units to fit obstacle deflectors as part of major overhaul work starting in February 2017. GTR have not yet provided ORR with a time-bound plan indicating when the work is expected to be completed.

Update

6. On 1 May 2020 Southeastern provided the following update:

I can confirm that fitment of obstacle deflectors to all Southeastern Electrostar units not previously so equipped has been completed. In the last 12 months we have had a couple of further instances of trains striking cattle but have not suffered a derailment as a consequence.

7. On 3 June 2020 GTR provided the following update:

GTR have 119 units fitted with obstacle deflectors on 377/1-3-4 fleet (48 remaining), the 377/2 were fitted at build.

We undertake this work on the A5 overhaul, but as the A5 programme is stretching to 2022, fleet control plan to release the units just to fit deflectors on their own.

There is no definitive plan to catch back units but the Repair Shop is fitting more deflectors than they are undertaking A5 overhauls, at the current beat rate the work will be completed on the fleet by end of this year.

8. GTR provided a further update on 7 January 2021, stating that 84% of Electrostar units (142 out of 169) had obstacle deflectors fitted, with the rest expected to be completed by the end of July 2021.

Recommendation 5

The intent of this recommendation is to ensure that drivers have continuous access to a railway emergency call facility in the event of an accident that affects the on-board train radio.

London & South Eastern Railway Limited, in conjunction with Siemens Rail Automation Ltd and Network Rail, should complete their work to understand the nature of the problem with the GSM-R train radio system in this accident, and then implement reasonably practicable measures to ensure that its drivers have the facility to make an emergency call in similar situations in future (paragraph 93b). Examples of such measures may include:

a) improving the resilience of the GSM-R radio system following an accident such as a derailment;

- b) providing drivers with GSM-R handheld units;
- c) ensuring that all relevant signalbox telephone numbers are stored in drivers' company mobile phones; and/or
- d) providing guidance to drivers on the actions to take if the GSM-R radio becomes inoperative.

On completion of its work, LSER should update the National Incident Report it raised on this matter.

Note: This recommendation may be applicable to other train operators.

ORR decision

9. Southeastern, in conjunction with Siemens and Network Rail carried out research to understand why the GSM-R radio did not operating properly during the Godmersham incident. The issue was fixed by the upgrade of GSM-R to version 4, which was subsequently rolled out across the Southeastern fleets.

10. Before the upgrade programme was completed, LSER introduced an interim measure of providing drivers with the phone numbers of Network Rail signal boxes on mobile phones.

11. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, LSER has:

- taken the recommendation into consideration; and
- has taken action to implement it.

Status: Implemented.

Previously reported to RAIB

12. On 29 March 2017 ORR reported the following:

Southeastern, together with Siemens and Network Rail have carried out research to understand the nature of the problem which prevented the GSM-R radio operating properly at Godmersham. An appropriate modification has been identified and options for implementing it are being explored.

Update

13. On 1 May 2020 Southeastern provided the following update:

The issues raised here are resolved by the GSM-R version 4 upgrade. This has been applied to all class 395 units (29 x 6-car) and a further 14 version 4 sets have been implemented across the remainder of the Southeastern fleet. At present implementation on these fleets is paused awaiting Network Rail developing a new tri-

band antenna and is currently expected to restart in August this year. Once the version 4 upgrade is completed this recommendation will be closed.

14. On 4 May 2020 Southeastern provided the following further update:

I can also confirm (in relation to Recommendation 5) that Southeastern has completed a process to load the telephone numbers of all Network Rail signal boxes into driver mobile phones to facilitate contact in the even that GSM-R is unavailable for any reason. This work was completed during 2018.

15. On 6 January 2021 Southeastern provided the following further update

I'm pleased to be able to report that we have been able to expedite the GSM-R version 4 campaign and that this is now complete across all Southeastern fleets.

Previously reported to RAIB

Recommendation 3

The intent of this recommendation is to reduce the risk of derailment arising from collisions with obstacles for electric multiple units operating exclusively on third rail lines.

London & South Eastern Railway Limited, in conjunction with Govia Thameslink Railway, Porterbrook Leasing Company Limited and Eversholt Rail Group should develop, and then implement, a programme for retrofitting obstacle deflectors to Electrostar units that are not currently fitted, but are equipped with mountings for such deflectors

ORR decision

Southeastern

1. Southeastern are working with Eversholt Rail to investigate the fitment of obstacle deflectors to units with appropriate fittings. They are planning to complete this work by 'early 2017', but have not yet provided ORR with a time-bound plan.
2. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Southeastern has:
 - taken the recommendation into consideration; and
 - is taking action to implement it by early 2017, but has not provided a finalised completion date

Status: *Progressing*. ORR will advise RAIB when further information is available regarding actions being taken to address this recommendation.

Information in support of ORR decision

3. On 5 July 2016 Southeastern provided the following initial response: *London and South Eastern Railway (Southeastern) has reviewed the Electrostar units which it operates; these are classes 375/3, 6-9 and class 376. Class 375/3 and 6 units are already fitted with obstacle deflectors. Class 376 units are not equipped either with obstacle deflectors or the mountings for such deflectors. Class 375/7-9 units do not have obstacle deflectors but are equipped with the mountings for such deflectors.*

Southeastern therefore commissioned SNC Lavalin to complete a technical investigation into the potential for fitting obstacle deflectors to class 375/7-9 units. This concluded that retro-fitting was feasible and Southeastern has therefore entered into commercial negotiations with the trains' owners, Eversholt Rail, for this work to be carried out. The final project plan for this work has yet to be agreed, but both parties are working towards implementation in early 2017.

Govia Thameslink Railway

4. GTR have made arrangements with the ROSCO that owns the relevant units to fit obstacle deflectors as part of major overhaul work starting in February 2017. GTR have not yet provided ORR with a time-bound plan indicating when the work is expected to be completed.

5. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, GTR has:

- taken the recommendation into consideration; and
- is taking action to implement it, with a programme beginning in February 2017, but has not yet indicated when the work is likely to be completed

Status: Progressing. ORR will advise RAIB when further information is available regarding actions being taken to address this recommendation.

Information in support of ORR decision

6. On 18 July 2016 Govia Thameslink Railway provided the following initial response:

I can confirm that this was discussed and updated at our period Safety & Environment Executive meeting of Thursday, 14 July and that we have now agreed a quote for this work with the ROSCO, have agreed that this can be rentalised, and that the work to fit obstacle deflectors to the 377/1, 377/3 and 377/4 units will commence as part of their next major overhaul A5 Exam from February 2017. This involves the fitment of 334 deflectors across 167 units, the Class 377/2 units were already so fitted as they worked under AC overhead wires.

Recommendation 5

The intent of this recommendation is to ensure that drivers have continuous access to a railway emergency call facility in the event of an accident that affects the on-board train radio.

London & South Eastern Railway Limited, in conjunction with Siemens Rail Automation Ltd and Network Rail, should complete their work to understand the nature of the problem with the GSM-R train radio system in this accident, and then implement reasonably practicable measures to ensure that its drivers have the facility to make an emergency call in similar situations in future (paragraph 93b). Examples of such measures may include:

- a) improving the resilience of the GSM-R radio system following an accident such as a derailment;
- b) providing drivers with GSM-R handheld units;
- c) ensuring that all relevant signalbox telephone numbers are stored in drivers' company mobile phones; and/or
- d) providing guidance to drivers on the actions to take if the GSM-R radio becomes inoperative.

On completion of its work, LSER should update the National Incident Report it raised on this matter.

Note: This recommendation may be applicable to other train operators.

ORR decision

7. Southeastern, together with Siemens and Network Rail have carried out research to understand the nature of the problem which prevented the GSM-R radio operating properly at Godmersham. An appropriate modification has been identified and options for implementing it are being explored.

8. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Southeastern has:

- taken the recommendation into consideration; and
- is taking action to implement it, but ORR has yet to be provided with a timebound plan.

Status: Progressing. ORR will advise RAIB when further information is available regarding actions being taken to address this recommendation.

Information in support of ORR decision

9. On 5 July 2016 Southeastern provided the following initial response:

Southeastern is supporting Network Rail, who are leading the investigation into the GSM-R system behaviour experienced in this incident. Network Rail, Siemens and Southeastern have completed high voltage simulation tests at Siemens' test facility in Chippenham, which confirmed the hypothesis proposed by Southeastern and detailed in the National Incident Report (NIR 3195). This testing is currently being documented by Siemens, and the results being used to develop proposed solutions to the issue. Southeastern will continue to work closely with Network Rail on this issue to identify and implement a solution in a timely manner.

Until recently Southeastern provided all drivers with direct access to Network Rail signalling centre telephone numbers via an application on their BlackBerry devices, but this was lost in the replacement of BlackBerries by Windows Phones. Work is now under way to provide apps for both the driver's Windows Phone and their iPads with similar functionality. This work is expected to complete later in 2016.

10. ORR requested further information from Southeastern about their work on GSM-R radios and when they were planning to provide apps for driver's phones/tablets; and any action being taken in the meantime to provide signallers telephone numbers to drivers. On 29 September 2016, Southeastern provided the following update:

GSM-R

Investigation has identified that the GSM-R radio did not work as the MCB had tripped. The radio at the other end of the four car unit (375703) had also tripped its MCB, although both radios on the attached four car unit (375612) had not tripped.

Monitoring data from Stoke TEC indicated the radios MCBs tripped when the train became derailed.

When the radio was inspected by Siemens and Southeastern, it was identified that the voltage dependent resistors (VDR) were damaged. This suggests that the radio tripped due to an over-voltage which operated the VDR device. It is believed that the GSM-R system design is a contributory factor. The radio case is connected to earth (running rail), and the case is also connected to the VDR in order to protect the internal GSM-R components against over-voltage. When the train became derailed, the lead vehicle lost its earth return, as all wheels were off the rails. When the vehicle de-rails and is electrically isolated, the chassis return will be raised to line voltage (750V) due to no negative return path, which will cause a potential difference of the line voltage minus control supply (e.g. $750V - 110V = 640V$) across the VDR. The VDR operated at 200V DC, pulling the 110V supply to a direct short to earth allowing greater than 5 amp to flow through VDR, until the MCBs tripped.

In the event of a derailment, the radio is unavailable to make the REC, which is a key safety function to prevent further collisions. It is also noted that this issue is likely to cause reliability issues with the GSM-R radios. If the train earth return is high resistance (due to leaves, sand, high impedance bonds etc), then there are likely to be transients which could reduce the operating life of the component. This damage has been seen on other defective radios returned by Southeastern.

A tri-party working group (Southeastern, Network Rail and Siemens) has undertaken controlled environment testing, and successfully replicated the fault. However, to date, a solution to this issue has not been identified. This has been escalated to Network Rail's Route Director for the South East as we are concerned at its slow progress.

Signal box numbers

The driver's iPad already has access to the Periodical Operating Notice, which contains the relevant signal box numbers. We do not plan to produce an iPad app. The current Windows phones are not data-enabled and therefore it is not possible at present to place apps on them or even to "push" a list of numbers into their contacts directories. We are still looking at options to provide this information to the phones, which is likely to require them to be data enabled. If this proves to be excessively difficult we will consider other options such as aide-memoirs.

11. An NIR was circulated to industry by Southeastern highlighting the problem. Southeastern, Siemens and Network Rail have subsequently researched different options of addressing the issue and reached the following conclusion:
A number of potential options to address the problem were discussed and developed at a workshop hosted by Southeastern on 17th November 2016. This workshop was attended by Engineering representatives from Southeastern, MerseyRail, Govia Thameslink Railway, South West Trains and FreightLiner. These options are as follows:

Option 1

Add a thermal fuse (or similar device) in line with each varistor. These fuses will operate when the reported fault occurs, disconnecting the radio from the source of high voltage whilst retaining the power supply and so keeping the radio operative. The effect of the fuse operating is to remove the varistor over-voltage protection on the radio; therefore the radio will also need to monitor the condition of these fuses. This addresses safety and potential reliability issues, however in order to monitor the fuses potentially complex GSM-R hardware modifications would be required.

Option 2

Remove varistor over-voltage protection from the GSM-R radio. This removes the high voltage path experienced during the incident. However, the radio would no longer be protected against high voltage transients on the power supply. This will potentially affect the GSM-R reliability, which Siemens and Network Rail are unlikely to accept.

Option 3

Add a polyswitch on the 110V input to the radio, limiting current flow and so preventing the MCB from tripping. This addresses the safety issue; however the workshop attendees were unsure of the likely effectiveness of this proposal.

Option 4

Add a galvanically isolated DC-DC power supply between the input (TC18) and return (RW16), and add simple isolation devices (e.g.fuses) to each train wire input / output (external to the GSM-R radio). This breaks the available fault path on all circuits through the train radio, so fully addressing the safety issue.

Preferred Option

Option 4 is the preferred option to resolve this issue. This is due to its high likelihood of success, and it being a modification to the rolling stock, rather than the GSM-R radio. This means that only applicable fleets need to be modified, rather than changing all GSM-R radios which are a common component on all fleets. A further advantage is that such a modification need not delay the development of Version 4 of the cab mobile software which is currently under development.

When compared to the RAIB recommendation cited on page 4, the author feels that this option is reasonably practicable, and will improve the resilience of the GSM-R radio system following an accident such as a derailment. This option therefore satisfies the demands of RAIB.