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Dear Carolyn

RAIB report: Person trapped in doors and pulled along platform at Kings Cross station

I write to report¹ on the consideration given and action taken in respect of the recommendation addressed to ORR in the above report, published on 30 May 2012.

The annex to this letter provides details of the consideration given/action taken in respect of the recommendation where recommendation 1 is in progress.

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

Introduction

The recommendation from the report was addressed to ORR when the report was published on 30 May 2012. After considering the report and the recommendation ORR passed the recommendation to Eversholt Rail asking it to consider and where appropriate act upon it and advise ORR of its conclusions. ORR also considered that the recommendation may apply to the other main ROSCOs, so also directed the recommendation to Angel Trains and Porterbrook. The consideration given to the recommendation is outlined below

Recommendation 1

The intent of this recommendation is that the practicability of providing a modified door seal arrangement on Class 365 trains, when the existing seals are replaced during the major overhaul due between 2013 and 2015, should be assessed. If such modifications are practicable for Class 365 trains, consideration should be given to:

- *modifying any similar doors on other classes of trains; and*
- *using modified seals if these are available when seal replacement is undertaken before the next major overhaul (e.g. following damage).*

As some trains with similar doors are owned by other organisations, the owner of Class 365 trains should make available to these organisations the information needed for them to determine whether they should consider modifying doors on any of their trains.

Eversholt Rail UK (Ltd) should determine whether the next planned replacement of Class 365 door seals provides an opportunity to modify the seal arrangements to reduce the risk associated with trapping of objects and people to be as low as reasonably practicable. If such modification is found to be reasonably practicable, Eversholt Rail UK (Ltd) should:

- determine whether a similar modification is appropriate for other classes of train owned by the Eversholt Rail Group;
- determine whether such modifications should be applied if seals require replacement before the scheduled date; and
- make available to other train owners suitable and sufficient information for these owners to establish whether a similar approach should be considered for any of their train doors.

Actions taken or being taken to address the recommendation

1. In its initial response dated 27 July 2012 Eversholt Rail stated:

Eversholt Rail is investigating two options to determine whether it is possible to reduce the Class 365 door system risk so far as is reasonably practicable. The door system is scheduled for overhaul at a planned C6X repair which starts in March 2013 and completes in 2015.

The door system is compliant with the requirements of current standards, which do not require retrospective action on existing door system designs. However,

Eversholt Rail is considering whether it is possible to move towards or achieve compliance with current standards for the withdrawal of a small object without an adverse effect on obstacle detection. The two options that are being considered are:

Change to door seal design

Eversholt Rail is working with Rail Door Solutions, an independent company that specialises in refurbishment and modification of train door systems. Their proposal is to review the existing door system design to determine whether risks can be reduced by optimisation of the system settings and also to consider whether an alternative door seal design could optimise the safety, reliability and functionality of the door system.

The work is being developed in stages to minimise the risk. The first stage is a feasibility study to review the performance of the existing door system, including seal design, and to propose options for improvements. This stage is due for delivery by the end of September 2012. Subject to the output from this study, further work will be undertaken to design, develop and test a solution for implementation during the C6X overhaul.

Drag detection

Eversholt Rail has also approached Knorr Bremse – IFE, who are the successors to the original equipment manufacturer for elements of the existing door system.

They do not wish to offer an alternative door seal and have proposed a more complex solution involving the use of a pressure sensitive control strip on the door seal combined with a new door control unit to provide drag detection. The development of this solution presents new risks and KB-IFE has not yet been able to provide costs or lead times for any feasibility study and subsequent design, development and testing of a proposed solution before installation.

Because of this, it is not expected that this solution would be available within the timescales for the Class 365 C6X overhaul. However, Eversholt Rail is considering this option with KB-IFE to determine whether there is a benefit in the longer term. At this stage, no commitment has been made for any development work and further information is awaited to determine whether this option is reasonably practicable.

Next steps

Eversholt rail has committed to the RDS feasibility study and is continuing discussions with Knorr Bremse – IFE. The output for this work is being used to support a risk assessment to determine how each of the options will contribute to the reduction of risk so far as is reasonably practicable.

The current focus is Class 365 in preparation for the C6X overhaul starting next year. The risk modelling will also be used to determine the options for the Class 4654 fleet, which has just completed a door system overhaul.

Eversholt Rail is sharing information with Angel Trains to inform decisions on their own fleets.

2. Eversholt Rail provided the following update on 28 March 2013:

As you are aware Class 365 complies with the current requirements of the Railway Group Standards. This letter sets out the actions that we have taken in response to the RAIB recommendation.

Eversholt Rail (UK) Limited (ERUK) (acting in its capacity as asset manager of the fleet on behalf of ER365) commissioned Rail Door Solutions (RDS) to investigate the feasibility of changes to the Class 365 door system following the Kings Cross incident that occurred on 10 October 2011 (RAIB report 09/2012); also taking into account the factors that contributed to the Huntingdon incident that occurred on 15 February 2006 (RAIB report 11/2007). RDS was selected to carry out this work due to its significant experience of the door system gained through working on the Class 465 Half Life Repair Project.

The remit for this review was to consider all aspects of the door system design, operation and maintenance, labelling utilised in the door area, and any other system enhancements that might be possible, e.g. changes to the door seal design or modifications that might reduce the risk of entrapment and any resultant dragging incident. The objective was to identify opportunities to reduce risk so far as is reasonably practicable. (Appendix 1 refers)

The review has been carried out with the full involvement and support of the train operator, FCC. Eversholt Rail provided ORR with a copy of the review document.

It should be noted that the Class 365 C6X commenced in February 2013 and is planned to complete by the end of 2015. This is viewed as an opportunity to implement any changes or modifications that ERUK and FCC have identified as being reasonably practicable once the identified trials have been completed.

Following this review it is ERUK's opinion that it is not possible to reduce the withdrawal forces associated with the current Class 365 door system without an adverse effect on obstacle detection and door reliability. However based on the recommendations from RDS, ERUK has set out its intention to address the factors that can reduce the risk of entrapment. ERUK is also progressing with a trial of the sensitive edge system

Eversholt Rail Group's Class 465 units have a similar system to the Class 365. The Class 465 has recently completed a half-life overhaul but the results of this review will be considered with the train operator to determine whether there are any benefits from implementation of the solutions on the Class 465.

The RAIB recommended that ERUK make available to other train operators, suitable and sufficient information for those train owners to establish whether they should consider modifying doors on any of their trains in order to avoid the occurrence in the future of accidents similar to the incident. In complying with that RAIB recommendation, ERUK has investigated the feasibility of changes to the Class 365 door system and wishes to share the results of that investigation by copying this letter to Angel Trains and Porterbrook.

ORR decision

ORR is not satisfied with the response from Eversholt Rail. In particular, Eversholt Rail have stated modifications can be undertaken as part of the C6X which commenced in February 2013 in the absence of a firm decision we wish to know how Eversholt Rail will deal with those vehicles that will have undergone the C6X repair before the decision to include the modification is made.

Additionally we wish to see more detailed timescales on the actions that are contained in appendix 1 and more detail on the time and costings which informed the decision of *Altering the existing obstacle detection parameters to achieve a smaller cut off detection zone, this will increase the probability of passengers being detected in case that a door closure has been initiated when a passenger is located in a doorway not being achievable in the short term.*

ORR is intending to meet with Eversholt Rail to discuss the above issues and will update RAIB in October 2013.

Status: In progress, ORR will update RAIB in October 2013.

Angel Trains

3. In its initial response on 25 July 2012 Angel Trains explained:

Our Class 165 and 166 fleets have a similar door seal to that found on Class 365. The seals are subject to examination at periodic C6 overhauls and changed on condition.

A lead engineer has been appointed and will liaise with Eversholt Rail to obtain information from them regarding the outcome of their investigations that might assist consideration of modifications to our fleets. An assessment of the reasonable practicability of modifications to door seals on the Class 165 and 166 fleets will then be undertaken.

The following update was provided by Angel Trains on 28 March 2013.

Angel Trains has recently reviewed the information from Eversholt Rail relating to their investigation and conclusions to date. Eversholt Rail have commissioned a report and concluded that the existing seal design is already optimised and that any change to make it easier to withdraw small objects resulted in reduced sensitivity of larger options and do not intend to pursue this option, they are however considering a further door seals options relating to fitment of a sensitive edge obstacle deflection system. The report commissioned by Eversholt Rail also recommends other modifications that can be considered e.g. signage and audible warnings. We understand that Eversholt Rail has liaised closely with ORR and have assumed that they have provided or will be providing ORR with the background to these decisions.

The reasonable practicability of fitting sensitive edge door seal arrangement needs to be assessed for Angel Trains' Class 165 and 166 fleets. As noted in a previous

email of 25 July 2012 these fleets have a similar door seal to that found on Class 365 and these seals are subject to examination at periodic C6 overhauls and changed on condition.

We have received indicative cost information for the sensitive edge modification from Eversholt Rail and now intend to liaise with the train operators to establish the likely benefits that would accrue from the modification; this will need to consider overall platform train interface, train despatch risk and other controls that can be applied to T&RS, infrastructure and operational procedures.

Porterbrook

4. On 14 August 2012 Porterbrook confirmed the following:

Porterbrook has reviewed its vehicles for similarity to the door seal design involved in the above incident. We can advise that none of our vehicles have similar door seals.

Eversholt Rail response to Class 365 Passenger Bodyside Doors Feasibility Study Issue 2 Revision A November 2012 Recommendations

Following review of the feasibility study with the train operator First Capital Connect, the following conclusions to the recommendations have been drawn.

Recommendations to be implemented 'immediately'

10.1.1 Change in detection to reduce the obstacle detection cut off zone

Altering the existing obstacle detection parameters to achieve a smaller cut off detection zone, this will increase the probability of passengers being detected in case that a door closure has been initiated when a passenger is located in a doorway

Eversholt Rail/FCC response: This was not considered to be achievable in the short term due to the down time required and level of interference with the door system. Eversholt Rail and FCC will be setting the door system up to an improved obstacle detection setting on the C6X PROGRAMME.

10.1.2 Introduction of non-synchronous plugging would be beneficial i.e. one door panel closes prior to the other. This will reduce the risk of simultaneously detecting and causing a stalling effect. This will also improve door operational reliability and limit the likelihood of a larger object being trapped.

Eversholt Rail/FCC response: As per the response for 10.1.1 above

10.1.3 Introduction of driver announcement at crowded platforms

At predetermined stations or time of day the driver is to make announcements which cite the dangers and risks of entering a door which is due to close. This aim is to improve passenger awareness

Eversholt Rail/FCC response: FCC states that train crew are already required to make announcements prior to door close. FCC will reinforce this requirement through internal communication channels. To be completed as soon as possible

10.1.4 Improvements to VMI/VMP

RDS recommend that improvements detailed in the body of the report are carried out to help improvement maintenance practices (i.e. defined method for setting obstacle detection) to improve safety and reliability.

Eversholt Rail/FCC response: The vehicle overhaul instruction is being updated by RDS as part of the C6X. These improvements will be carried across to the relevant Vehicle Maintenance Instruction/Procedure after that are made available to FCC. This action is planned to be completed within three months of this letter.

10.1.5 Greasing of nosing and Bodyside Rubbers

The application of silicone grease to the nosing rubbers through testing has shown to provide a significant decrease in withdrawal forces. Improvements to the VMI are required to include the bodyside seals as well as the nosing rubbers. Careful

consideration is required on the periodicity of application to ensure the rubbers are maintained and don't become dry leaving the process ineffective. A trial would need to be conducted to determine the duration to which this solution is effective whilst out of passenger service.

Eversholt Rail/FCC response: FCC is to run a trial on one unit to understand the degradation of the grease and practicality of including the task in the maintenance regime. This trial is to be carried out as soon as possible.

10.1.6 Removal of emergency device covers.

Undertake the removal of the cardboard covers which deter passengers from operating the handles. This will reduce the response time for activation when required under an emergency situation.

Eversholt Rail/FCC response: FCC will trial removal of the covers on the same unit as greasing of nosing rubbers. There is some concern regarding the impact of this measure operationally as previous experience has seen an increase in the malicious use of the emergency devices. This trial is to be carried out as soon as possible.

Recommendations to be implemented in the medium term:

10.2.1 Improved signage inside and outside

Additional markings should be considered to provide enhanced passenger awareness of the moving door panels. These would comprise of a high visibility 'sharks tooth' marking or similar applied as a vertical strip running the full height of the door panel leading edge.

The design and rewording of the internal sign on the door presell located above the push buttons to be clearer using RSSB Graphic Design Guidance for Safety Signs document. Further work would be required to develop the most effective marking scheme to deter passengers attempting to enter a closing doorway.

Eversholt Rail/FCC response: FCC will be reviewing the signage as part of the trial in 10.1.6, as removal of the cover requires removal of the sign giving operating instructions to the user. Additionally, Eversholt Rail will incorporate this requirement into the C6X works as part of the changes to interior and exterior livery.

10.2.2 Improved audible warnings

The current audible warnings only provides an indication immediately prior to door closure when the driver initiates a door close, with no sounding during the door close movement. It is believed that any changes to the audible warnings should be included within TSI PRM compliance activity.

Eversholt Rail/FCC response: Under the requirements of the TSI PRM the Class 365 fleet will be modified to incorporate external door sounders. Eversholt Rail is currently reviewing opportunities to complete this work as part of the current C6X. In any case this will be required in advance of December 2019.

10.2.3 Implementation of Body Indicator Light Flashing

RDS recommend the implementation of the circa modification applied to the Class 463/0 and 463/1 fleet in 2004 to help improve response times in case of a genuine emergency and to aid quicker response times when malicious use has occurred.

Eversholt Rail/FCC response: This recommendation will be reviewed in light of the outcome of the trial from 10.1.6. This modification is of operational benefit following activation of the emergency device and does not, in itself, reduce the risk of entrapment.

Recommendations to be implemented in the longer term

10.3.1 Relocation of emergency devices to line of sight

The safety devices as fitted to the Class 365 are fitted to locations which are not directly within the sight line of passengers and as such may not be immediately apparent in an emergency. Further work should be considered to assess if these devices could be repositioned to locations which are more readily visible to passengers.

Eversholt Rail/FCC response: A high level review of the technical feasibility of relocating the emergency devices has been undertaken. The conclusion being that, should the fleet be the subject of a major refurbishment in the future, this recommendation should be considered at this stage. However it involves significant alteration to the arrangement of the structure around the door. In the medium term the C6X provides opportunity to review the signage associated with the emergency devices to emphasise their location and function in line with 10.2.1.

Recommendations for further investigation

10.4.1 Door closure inhibit and vigilance indicator

The use of a detection system mounted internally within the vehicle at each passenger doorway location should be further investigated. This device would pre-empt the possibility of trapping passengers, but further work would be required to investigate suitable products and how these might be integrated into the doorway and with the existing door control system.

An externally mounted device mounted to the vehicle body above the doorway could be utilised to provide an indication to train crew that an object may be trapped at a doorway. This concept would require additional work to investigate suitable product and determine vehicle body and control interfaces.

Eversholt Rail/FCC response: The RDS proposal to install an opto-electrical device on the exterior of the vehicle is not thought to be an optimal solution. Such a device would be subject to a harsh and dirty environment, would not be capable of 'seeing' round the curvature of the body shell to provide coverage over the entire range of the door seal and is unlikely to prevent an incident such as the two experienced on Class 365.

However, Eversholt Rail has been in discussion with IFE, the Original Equipment Manufacturer of the door system, regarding the door system. Following review and discussion of the incident IFE concluded that there was little that could be done to reduce the risk of the current system without significantly impacting on its function and reliability. As a result IFE has proposed a modification to the door seal that installs a sensitive edge detection system. When the sensitive edge is activated the unit is prevented from moving through interruption of the track interlock circuit.

The IFE system has been retro-fitted to a high number of doors across Europe and is also fitted on new fleets such as the Class 380. Following a recent technical review with IFE AND VISIT TO Wiener Linien in Vienna (whose fleet has a similar door system and had similar drag incidents prior to installing the IFE solution) Eversholt Rail and FCC intend to trial the system on Class 365. The trial will consider the functionality and reliability of the system alongside any change in withdrawal forces as part of a redesign of the nosing seal.

Subject to successful trial and assessment of reasonable practicability there is opportunity to implement this solution on the current C6X. Eversholt Rail and IFE are planning to get to the stage of trialling the solution by June 2013. This is linked to the engineering and procurement lead times.

10.4.2 Experiments of new nosing rubber design, utilising existing profile with a variety of new materials and existing nosing rubber profile with a bonded slip coating.

There have been no instances of passenger entrapment in doors on Class 465/0, 465/1, 165 AND 166 all of which have an identical system design. Further design work and development testing would be required, including the physical test of a range of samples to demonstrate the suitability of the alternative seal material.

RSD recommend further investigating into the process of coating material that will provide a lower coefficient of friction in the hope to significantly reduce withdrawal forces with the intention of utilising the current IFE nosing rubbers.

Eversholt Rail/FCC response: In discussion with the OEM, IFE, they do not believe there is an alternative seal arrangement that will reduce the risk of entrapment and deliver the sealing and reliability performance.

Eversholt Rail and FCC carried out trials of slip coatings following the Huntingdon incident and came to the conclusion that such a solution would not be capable of withstanding the day to day trials of service operation without impacting on reliability of the door system and increasing maintenance workload. This recommendation will not be progressed.