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

Dear Andrew,

RAIB Report: Uncontrolled evacuation of a London Underground train at Holland Park station

I write to provide an update[1] on the action taken in respect of the 6 recommendations addressed to ORR in the above report, published on 28 July 2014.

Annex A to this letter provides details of the consideration given/action taken in respect of these recommendations. The status of all recommendations is now '**Implemented**'. We do not propose to take any further action in respect of these recommendations unless we become aware that any of the information provided becomes inaccurate, in which case I will write to you again.

We will publish this response on the ORR website on 16 October 2015.

Yours sincerely,

Andrew Eyles

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

Initial consideration by ORR

1. All 6 recommendations were addressed to ORR when the report was published on 28 July 2014

2. After considering the recommendations ORR passed all 6 recommendations to London Underground Ltd (LU) asking it to consider and where appropriate act upon them and advise ORR of its conclusions.

Brief Summary on what was previously reported to RAIB

3. On 24 July 2015 ORR reported to RAIB that, whilst LU had demonstrated that progress has been made in addressing these recommendations, the report submitted by LU on 2 July 2015 did not provide a sufficient response. LU had undertaken to provide an updated document which ORR would review and provide an updated to RAIB by 31 October 2015.

Recommendation 1

The purpose of this recommendation is to promote a design review of the passenger emergency alarm system on Central line and Waterloo & City line 92 tube stock and the adoption of ergonomics best practice in an improved design.

London Underground Limited should carry out an ergonomics assessment of the driver interface with the passenger emergency alarm system on Central line and Waterloo & City line 92 tube stock. This assessment should include the functioning of the talkback system and the compatibility between the controls and the display. Taking account of guidelines on alarm handling and prioritisation (such as the, 'Good Practice Guide for the design of alarms and alerts' (T326), RSSB, 2008), LU should then take appropriate action to present critical information to the Train Operator in a way that supports decisions and actions so that they can deal appropriately with the emergency situation.

Relevant outcomes of this ergonomic assessment should also be applied to other stock as appropriate.

Update

4. On 29 July 2015 LU provided the following information as part of its updated report:

London Underground
ORR RAIB response 1[illegible]

A Transport for London (TfL) human factors specialist carried out an ergonomics assessment of the driver interface with the passenger emergency alarm system on Central line and Waterloo & City line '92 tube stock. The TfL human factors specialist worked together with TfL rolling stock engineers using

EMMUA 191. EMMUA 191 is the standard on alarm management and informs the Good Practice Guide for the design of alarms and alerts (T326), RSSB 2008.

This assessment included:

- *the functioning of the talkback system, and;*
- *the compatibility between the controls and the display*

The assessment made the following recommendations;

1. Provide the Train Operator with a briefing on how to deal with multiple PEA activations and to make the Train Operators aware that the 'acknowledge' button sequences the talk back facility along the train length and not in PEA activation sequence.

2. Investigate the possibility of providing visual feedback to the Train Operator by providing an indication as to which car they are talking to or synchronise the talkback facility with the alarm display i.e. when the acknowledge button is pressed the communications goes to the next passenger alarm not the next car where the PEA has been activated.

3. Investigate the ability to record activities (e.g. communications, button presses) when the PEAs have been activated.

4. Review documentation (e.g. functional description communications systems documentation ref 8) which references the activation of one or two PEAs and include the process for multiple PEA activations.

5. Investigate the possibility of placing an alarm repeater display on the left hand side of the cab, in close proximity of the OPO CCTV display and communications devices or if the information can be displayed on the OPO CCTV monitor.

6. Investigate method of muting the alarms when the handsets or other communication devices are in use.

7. Investigate if the system can provide better communication/display to customer if driver is talking to another car or moves on to the next PEA e.g. Driver talking to car 4.

8. Review PEA display wording to determine whether a more accurate phrase or phrases could be shown at the alarm point to inform the passenger that the driver is aware that the alarm has been activated and the driver is either responding to the alarm or responding to another alarm from another car. (The alarm currently indicates 'driver aware').

9. Additionally, clarify the appropriateness of the recommendations for 92 stock, and then investigate the application of the recommendations to the other stocks on the underground network as appropriate in line with the RAIB recommendations.

Assessment Recommendations 1 and 4 relate to training or training documentation requirements.

Actions taken

Training for LU Train Operators has been updated to include the scenarios of the activation of one or two PEAs and for multiple PEA activations and is explored in more detail in response to RAIB Recommendation 2.

Refer to Appendix 2: Skills Development bulletin

Assessment recommendations 2, 3, 5, 6, and 7 relate to technical functionality of train borne systems.

Actions taken

The current data systems on the Central line and Waterloo & City line 92 tube stock are at capacity, and further system capability is possible only with new hardware. Therefore, the recommended additional functionality to the public address, passenger emergency alarm and in-cab controls and displays can only be achieved by renewing the system.

To satisfy recommendation 9, the review group also considered other train fleets across the LU network which is in line with RAIB recommendation 1.

Refer to Appendix 3 for a table of rolling stock findings

The current estimate for system renewal, provided by LU rolling stock engineers, that would be required in recommendations 2, 7 and 8 is a capital expenditure cost in excess of £70 million for all LU trains.

This figure does not take into account any additional operational costs, such as a reduction in rolling stock availability for passenger service to facilitate the works and the training costs for all affected train operating staff to gain the correct level of competence to operate a new system. Additionally, the figure does not take into account any cost of potential modifications to cab and control layout and providing alarm feedback to train operator and passengers as described in recommendations 3, 5, and 6.

To assess whether £70m is a proportionate sum to achieve enhanced capability, a TfL risk specialist considered the risk of an occurrence similar to the Holland Park scenario. The risk, while present, was assessed as being within the tolerable range.

Refer to Appendix 4: Modelling Risk

In conclusion, it is considered that the cost of the system renewal is grossly disproportionate against such an unusual event, and that the actions and mitigations detailed below, including improvements to rules, processes and training provide a proportionate and reasonably practicable course of action.

Other actions and risk mitigations

There is a risk of passenger injury during self-detrainment between cars. The fitting of inner inter-car barriers and canopy barriers on the Central line and Waterloo & City line 92 tube stock, Bakerloo Line 72 tube stock, Piccadilly Line 73 tube stock, Jubilee line 96 tube stocks and the open wide gangway (OWG)

of S Stock significantly reduces the ability of passengers to self-detrain from between cars.

Sub-surface S-stock and Victoria line 09 tube stock offer CCTV images in the cab showing the vicinity around the PEA once an alarm has been activated. This information supports the Train Operator in their decision making processes by providing better situational awareness in the form of live images.

The Human Factors study, together with Good Practice Guide for the design of alarms and alerts' (T326), RSSB, 2008 and EEMUA Publication 191 Alarm systems - a guide to design, management and procurement have been submitted to the team managing the design specification for New Tube for London, to ensure that the New Tube For London has a Train Operator interface and PEA system that is designed considering the guidance.

Although not called for in the RAIB Report, the recommendations from the ergonomic assessment developed for LU stock will be extended to review London Rail vehicles; namely DLR, London Overground and Trams rolling stock, and TfL will report back in September 2015.

ORR decision

5. LU undertook a design review of the passenger emergency alarm system on the 92 tube stock that identified the need to change documentation and therefore training for LU Train Operators, so it includes multiple PEA activations. Possible design changes were also identified however they have not been adopted as they are not considered to be reasonably practicable.

6. LU has also ensured that the good practice guidance has been submitted to the team managing the design specification for New Tube for London so it can be considered at the design stage.

7. After reviewing the information received ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, LU has:

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

***Status: Implemented**.*

Recommendation 2

The purpose of this recommendation is to improve the ability of Train Operators to handle multiple passenger emergency alarms and other 'out of course' events on Central line and Waterloo & City line 92 tube stock.

London Underground Limited should review the rules, procedures and training applying to the handling of emergency situations on Central line and Waterloo & City line 92 tube stock, where multiple passenger emergency alarms have been activated and/or where only part of the train is stopped in a station. This review

should include an assessment of the ways in which Train Operators can best manage a situation and adequacy of existing training arrangements. Particular attention should be paid to helping operators make appropriate and timely announcements and the safe management of doors in such circumstances. Any necessary changes to existing arrangements should then be implemented and staff briefed and trained as appropriate (paragraph 126b).

Relevant outcomes of this review should also be applied to other stock as appropriate.

Update

8. On 29 July 2015 LU provided the following information:

The [LU] review group looked at the handling of emergency situations and in particular, situations where a passenger emergency alarm is operated when only part of a train is in a station.

LU has a comprehensive suite of Rule Books to cover all aspects of its railway operation. Rule books tell staff the 'do's and don'ts' and also prescribe particular courses of action to take in particular circumstances. Rule Book 7 (Train Incidents and Safety Equipment) was reviewed, as it is the rule book that covers Passenger emergency alarm operation.

The rules require the Train Operator to tell the customers what has happened, before investigating the incident.

The RAIB report states "passengers became increasingly alarmed when there was little or no perceived response from the train operator to the activation of passenger emergency alarms and no passenger information announcements were made"

Had the Train Operator followed these rules, the event at Holland Park would probably not have developed in the way that it did, in that, passengers would have been kept informed, the incident investigated, and the train detrained in a controlled way.

Having examined the existing rules for handling passenger emergency alarms, the group concluded that the current Rule Book entries, if followed, are fit for purpose.

The Competence and Compliance Manager then looked at existing training arrangements for dealing with emergency situations, and concluded that the issue is adequately covered within new entrant training and the Continuous Development Programme (CDP) training.

Refer to Appendix 5: Excerpt from Rule Book 7 - Train Incidents and Safety Equipment, section 17

Refer to Appendix 2: Skills Development bulletin

However, when reviewing the existing training arrangements for Passenger Emergency Alarms (PEAs) the group identified a training shortfall for Multiple Passenger Emergency Alarms (MPEAs).

The possibility of multiple alarm activation was not covered in the existing training material. The review group felt that although the actions required by all staff – as covered in rule book 7 – is the same for single and multiple alarms, training could be further enhanced by the inclusion of examples where multiple passenger emergency alarms occur, and what Train Operators should expect in such circumstances.

A review of training material for all other rolling stock identified similar omissions in multiple passenger emergency alarms, so it was decided to update the training for all stocks.

The updated multiple passenger emergency alarms training material for new entrants and CDP training will address the identified gaps by including a theory and practical module.

A communication will be distributed to all Train Operators from their managers to ensure they are made aware of how to deal with incidents of multiple passenger emergency alarm activation.

Refer to Appendix 6: Page 14 - Competence Management guidance excerpt for Train Operators provides information for Public Address (PA) announcements and the safe management for opening and closing doors whilst the train is on the platform.

Refer to Appendix 7: Email PEA procedures bulletin v1.0

The proposed changes for multiple passenger emergency alarms in the Continuous Development Programme (CDP) and new entrant training are planned as follows:

- *Updated Training material was produced for Central line and Waterloo & City line new entrant and CDP training.*
- *Communication to be issued to train operators via their managers by: July 2015*
- *Trainers will be up-skilled to deliver the revised training by July 2015*
- *Central Line and Waterloo & City Line commence training by July 2015*
- *Sub-surface and Victoria lines Line commence training by August 2015*
- *Northern Line commence training by September 2015*
- *Piccadilly/Bakerloo lines Line commence training by October 2015*
- *Jubilee Line commence training by November 2015*

Refer to Appendix 2: Skills Development bulletin

It is estimated that all train operators will have been trained, as part of their normal CDP training, by December 2016.

ORR decision

9. LU has identified that the existing rules were fit for purpose, as were training arrangements for dealing with emergency situations. However a shortfall was

identified for training in Multiple Passenger Emergency Alarm activation. This shortfall was identified for all rolling stock.

10. Training material has been updated and delivery of that training commenced in July 2015 for the Central Line and Waterloo & City Line. That for the other rolling stock has commenced / is due to commence by November 2015. It is estimated that all train operators will have been trained by December 2016.

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

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

***Status: Implemented**.*

Recommendation 3

The purpose of this recommendation is to ensure that Train Operators remain in communication with line controllers when they are required to leave the cab to go back into the train.

London Underground Limited should put procedures in place to require Train Operators to carry their hand-held radio when going back into the train, for example, to investigate the activation of a passenger emergency alarm, so that they can communicate with the line controller in a timely manner (paragraph 126c).

Update

12. On 29 July 2015 LU provided the following information:

For this recommendation, the group reviewed rules and procedures relating to General Train Operations – Rule Book 6. The rule book covers the use of train radios by Train Operators.

The existing rules required Train Operators to make sure they had a hand held radio with them when on duty; however, there was no specific requirement for them to take the radio with them when they left the cab.

The group also identified that while the recommendation was for a Train Operator to carry their hand-held radio when going back into the train, this could possibly mean that a Train Operator would not take the radio if leaving the cab and walking down the platform, or accessing the track. Whilst this was not a requirement of the recommendation, the rules were changed to capture that when a Train Operator would need to leave the cab to investigate incidents they must take their handheld radio with them at all times:

Excerpt Rule Book 6 (as amended) "… associate their hand held radio with the train radio. When leaving the cab, if dealing with an incident, tell the controller and take their handheld radio with them…"

The updated rules came into effect on 9th November 2014 by way of an Operational Standards Notice (OSN 114), was published as updated Rule Book 6 (General train operations - Section 2) in May 2015 and has been added to relevant training regimes.

Refer to Appendix 8 for OSN 114

Refer to Appendix 9 for Updated Rule Book 6 Section 12 and excerpts from radio training

ORR decision

13. LU has updated its Rule Book to capture that when a Train Operator would need to leave the cab to investigate incidents they must take their handheld radio with them at all times. This requirement has also been added to relevant training regimes.

14. After reviewing the information received ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, LU has:

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

***Status: Implemented**.*

Recommendation 4

The purpose of this recommendation is to make sure that line controllers are enabled to take appropriate and timely action when dealing with potential safety critical faults and conditions on trains.

London Underground Limited should:

a. review the procedure applying to line controllers for dealing with reports of faults on trains, particularly reports relating to smoke or burning, and improve as necessary, in order that line controllers are provided with a clear process to assist timely decision- making and response; and

b. establish a protocol to manage the shift changeover between controllers, so that there is no loss of time or continuity in dealing with an incident (paragraph 128).

Update

15. On 29 July 2015 LU provided the following information:

The review group reviewed Rule Book 7 Train Incidents and Safety Equipment, Section 5 which covers the rules for fire, arcing and fusing as these are the sources of smoke.

The rule book states that when a controller has been told that there is a fire, arcing and fusing on a train they must tell the LU Control Centre to arrange for the emergency services to attend and arrange for the Emergency Response

Unit (ERU) to attend if necessary. The controller must also tell the Station Supervisor at the station ahead of the train. This must be acted upon immediately the controller has been told of any reports of fire, arcing and fusing.

The review group compared the Rule Book requirements against the actions taken during the Holland Park incident and concluded that the existing rules were fit for purpose but staff involved did not apply the rules immediately as specified. The immediate application of the rules would have dealt with the Holland Park scenario appropriately and would have assisted in timely decision making.

The group also reviewed the training provision for fire, arcing and fusing. It was noted that promotional training courses for Service Controllers contained various scenarios and that the subject is also covered as part of new entrant training for Service Controllers and is covered as part of CDP training

Refer to Appendix 10a – Rule Book 7 Section 5 and Fire, Arcing and Fusing

Refer to Appendix 10b – Fire, Arcing and Fusing training provision

LU Traffic Circulars are used as a method of communicating to operational staff on a weekly basis with important notices and updates to operational service. Signing for receipt and reading of weekly Traffic Circulars is a standard activity for operational staff. To ensure all operational staff remain aware of their responsibilities during incidents of fire, arcing and fusing, a rule book reminder was published in Traffic Circular 20 (week commencing 15/9/14), and again repeated for Traffic Circular 9 (week commencing 27/4/15). This will be repeated again in September 2015.

Refer to Appendix 11Traffic Circular 20

The group reviewed the protocol for shift handover. The subject is documented within current training courses. It is also covered in Rule Book 1 Section 5 Communication and this makes reference to protocol for ensuring correct shift handover. The group determined that the rules were fit for purpose but were not followed during the Holland Park incident.

Refer to Appendix 13 Rule Book 1 Section 5 Communication

To determine if there is a systemic reason for failure to follow the rules, LU plans to carry out an audit by September 2015 on Service Control managers with particular emphasis on:

1. *Shift changeover rosters*
2. *Log book entries*
3. *Handover of duty*
4. *Administrative responsibilities that must be carried out prior to leaving duty.*

Any audit non-conformances and identified areas for improvement will be reviewed by LU management to determine and agree the actions required.

ORR decision

16. LU undertook a review of the relevant Rule Book and concluded that the existing rules were fit for purpose but staff involved did not apply the rules immediately as specified. Training was also reviewed. A Rule Book reminder was published and twice repeated.

17. LU already had a protocol for shift handover. It was reviewed and concluded that the rules already in place were fit for purpose but simply not followed. However, as this was considered to be a compliance issue, an audit was carried out on Service Control Managers to determine if there was a systematic failure to follow the rules.

18. After reviewing the information received ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, LU has:

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

***Status: Implemented**.*

Recommendation 5

The purpose of this recommendation is to ensure that LU's staff are able to respond appropriately to incidents on trains in platforms.

London Underground Limited should review the required competencies and training for dealing with out-of- course events on trains in platforms. This should include consideration of how best to prepare station staff, Train Operators and Service Controllers to respond to such events in a rapid, coordinated and coherent manner, to protect the safety of passengers and station users (paragraphs 126b, 126c, 126d and 128).

Update

19. On 29 July 2015 LU provided the following information:

> *The review group examined the regime for training and competence and concluded that the current training provision could be further enhanced for Train Operators, Service Controllers and station staff by the inclusion of scenario based training that uses the event at Holland Park as a table-Train Operator exercise.*
>
> *The concept is that training delegates will 'role-play' their way through the course of events of the Holland Park incident. The delegates have the opportunity to pause to reflect on actions and decision making. Through discussion and input from trainers, the training delegates will navigate their way through the incident, making the correct decisions and reaching a successful outcome. 'Role-play' is a 'safe' method for increasing skills, knowledge and experience in group based scenario training.*

The reasons for LU using scenario-based training are;

- *It provides a safe place to fail and to fix mistakes as you might in real life*
- *It enables the acceleration of time allowing attendees to make a decision, implement it and experience its consequences all in one exercise*
- *promoting critical thinking providing a context to implement attendees best judgement*
- *providing shared context, bonding between people and improving morale*
- *engaging attendees emotions triggering short and long term memory*
- *story-telling which improves retention*
- *triggering memories creating powerful linkages in the brain.*

Source: Immersive Learning, Allan Carrington & Ken Spero, University of Adelaide

The Holland Park scenario training joins a wider suite of modules on 'out of course events' that contains approximately 40 other scenarios such as a person ill on a train, a person under a train and dealing with trespassers on track. These 'out of course event' scenarios are captured in all CDP and promotional training for Stations/Trains/Service Control staff.

The timescales for implementation of the 'Holland Park' scenario based training packages will be:

- *The scenario will be developed and ready to deliver by July 2015.*
- *'Train the trainer' will be delivered to trainers by August 2015*
- *Implementation in CDP training to all affected groups of staff by September 2015*

All affected staff will have undergone this scenario based training by January 2017.

ORR decision

20. LU reviewed its training and competence for dealing with out-of-course events on trains in platforms and concluded it could be enhanced. Implementation to affected groups in CPD training commenced by September 2015 and all affected staff will have received the training by January 2017.

21. After reviewing the information received ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, LU has:

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

***Status: Implemented**.*

Recommendation 6

The purpose of this recommendation is to draw attention to the need for the prompt and accurate reporting of incidents.

London Underground Limited should devise a time bound programme to reinforce, by briefing and further training if necessary, its procedures on the reporting and investigation of incidents in which there are no reported injuries but which could have led to more serious consequences. This should include the need for the early debriefing of staff involved and, where appropriate, the withdrawal of any trains from service for inspection and testing, to permit such incidents to be properly investigated (paragraph 130).

Update

22. On 29 July 2015 LU provided the following information:

In reviewing this recommendation the group looked at the most effective way of reaching the affected groups of staff, and the best briefing and/or training intervention point in order to reinforce the procedures for reporting and investigation of incidents.

Competency management is a process used by LU for the development of its people and reaches all staff affected by this recommendation. It is used to manage skills, knowledge and experience and is recommended as part of the ORR's Railway Management Maturity Model (RM^3) Ref: Criterion OP (Sub-criterion OP2).

Refer to Appendix 12 ORR's Railway Management Maturity Model (RM^3)

In reviewing this recommendation the group looked at the most effective way of reaching the service management staff, and the best briefing and/or training intervention point in order to reinforce the procedures for reporting and investigation of incidents.

Competency management is a process used by LU for the development of its people and reaches all service management staff. It is used to manage skills, knowledge and experience and is recommended as part of the ORR's Railway Management Maturity Model (RM^3) Ref: Criterion OP (Sub-criterion OP2).

Refer to Appendix 12 ORR's Railway Management Maturity Model (RM^3).

The group decided that a competency management based training module would be a suitable intervention to address the recommendation requirements. LU will deliver the module to all Service Management staff. The module will address key points from the recommendations, namely:

- *Incident reporting*
- *Carrying out investigations*
- *Recording events and findings*
- *Emergencies*
- *Event control*
- *Congestion control*

- *Withdrawal of trains from passenger service*
- *Inspection and testing*

The intervention module will be delivered as part of regular competency management training. Training for all Service Management staff will commence in November 2015, and all Service Management staff will have completed the module by January 2017.

ORR decision

23. LU will introduce in November 2015 a new competency management training module for Service Management staff to address key points of the recommendation. Relevant staff will have completed the module by January 2017.

24. After reviewing the information received ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, LU has:

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

***Status: Implemented**.*