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OFFICE OF RAIL AND ROAD

10 June 2020

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

Dear Andrew,

RAIB Report: Train travelling with doors open on the Jubilee line on 1 September 2018

I write to report[1] on the consideration given and action taken in respect of the recommendations addressed to ORR in the above report, published on 10 July 2019.

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 1, 2 & 4 is **'Progressing'** and the status of recommendation 3 is **'Implemented'.**

ORR will advise RAIB when further information is available regarding actions being taken to address these recommendations.

We will publish this response on the ORR website on 11 June 2020.

Yours sincerely,

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

Oliver Stewart

Initial consideration by ORR

1. All 4 recommendations were addressed to ORR when the report was published on 10 July 2019.

2. After considering the recommendations ORR passed all 4 recommendations to London Underground Ltd asking them to consider and where appropriate act upon them and advise ORR of its conclusions. The consideration given to each recommendation is included below.

3. This annex identifies the correspondence with end implementers on which ORR's decision has been based.

Recommendation 1

The intent of this recommendation is to mitigate the risk of train operators driving a train out of a platform with one or more doors open. It is anticipated that consideration will be given to additional safeguards when the train door interlock cut-out switch is operated.

London Underground should review the safety systems associated with control of passenger door opening and closing, including train door interlock cut-out switch operation, on its 1995 and 1996 stock trains. Where such features are inconsistent with current good practice, appropriate remedial action should be undertaken. The review should include gaining a sufficient understanding of train control systems so that potential impacts on door safety can be established.

ORR decision

4. LUL have carried out a review of the safety systems associated with control of passenger door opening and closing. LUL have made the seal on the interlock more robust and improved warning signs, but we have challenged them to find a more effective risk control. As a result, LUL will undertake a quantified risk assessment and cost benefit analysis with a view to identify an appropriate technical solution.

5. We have asked LUL to keep us informed with progress and to provide a time-bound plan when they have identified a technical solution.

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

- taken the recommendation into consideration; and
- is taking action to implement it, but ORR has yet to identify if there is an appropriate technical solution.

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

7. On 15 October 2019 London Underground Ltd provided the following initial response:

As a result of the incident, a technical assessment was undertaken during April 2019 by TfL's Engineering Department. The assessment involved a review of how safety standards can be improved into the use of the Train Door Interlock Cut-Out ("TDIC") switch. Several options for improvement were identified as a result of this study and consideration was given to each option.

When feasibility of the proposed work was taken into account, it was decided that large visible warning labels would be fitted to the TDIC switch. The full details of this work are set out on page 6 of report "AOS-E-RS-Int-MU-TR_12-N0-843-A1". A copy of this report will be included with this letter.

The incorrect use of the TDIC switch by the train operator was a major factor in this incident and we feel that the introduction of this visible warning label will be effective in raising awareness about the use of this switch. Next steps on this modification will involve mapping out its introduction with our Head of Fleet.

8. On 13 March 2020 London Underground Ltd provided the following update:

As a result of this incident, a technical assessment was undertaken in April 2019 by TfL's Engineering Department. This involved a review of how the risk of incorrect use of the Train Door Interlock Cut -Out switch (TDICOS) may be better mitigated. The assessment also considered several options for clearer identification of the TDICO to avoid an operation in error. It concluded that the signage on the switch should be updated with large visible warning labels in addition to making the associated seal more robust.

The ORR highlighted that these solutions are the lowest of all the options on the hierarchy of controls and the other, more technical, options should be considered further.

As a result, we are now undertaking a quantified risk assessment and cost benefit analysis. This will allow us to determine what is appropriate in terms of implementing a technical solution. A draft of this has been completed and is with the relevant subject matter experts for review. We will update the ORR in the next month of the outcome of this.

In the short term we will improve the warning label and seal robustness. We have sourced a new indicator seal/tag for the cut-out switch and this has undergone initial testing. The tag is coloured bright red to highlight the significance of operating the cut-out switch and it fits with the current design of the latch/cover with no modification required. The force required to break this tag is approximately the same as the previous version. This will be complemented by a security label which highlights the significance of operating the cut-out switch. The wording of the message on this is still being determined as we are consulting with Trains Health & Safety Representatives on this.

A site visit with the Trade Union Health and Safety Representatives was undertaken. These Representatives were on LU's Formal Investigation Panel into this incident. This proposal is being presented to the Trains Health and Safety Council on the 17th March 2020

Once agreement has been reached with all stakeholders the assurance and maintenance documents for the new seals and labels will then be developed. The production and approval process for these will be 12 weeks for all LU fleets.

The additional change to comply with the updated Category 1 Standard (to disable automatic train operation once the TDICO has been operated) will be included within the next major modification on Northern and Jubilee Lines.

Recommendation 2

The intent of this recommendation is for London Underground to support train operator decision-making when they are dealing with unusual faults under stressful conditions. The review could form an extension of the work London Underground is undertaking in response to Notting Hill Gate recommendation 2 (paragraph 123) but should not delay that work.

London Underground should review and, where necessary, take action to equip its train operators with the skills, knowledge and information needed to identify and respond appropriately to faults affecting their trains. This should include consideration of the:

- use of train simulators to practise fault finding; and
- provision of documentation, such as quick reference guides, to help train operators transition effectively from a low workload scenario to an unexpected high workload scenario when there is an unusual occurrence during automatic train operation.

ORR decision

9. LUL are making changes to their Competence Management System (CMS) to identify ways to improve the ability of train controllers to respond to train faults. We have asked LUL to keep us informed with progress of the project and to provide a time-bound plan when they have finalised the changes to the CMS.

10. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, London Underground Ltd 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

11. On 15 October 2019 London Underground Ltd provided the following initial response:

A. Train Simulators

We are actively reviewing all elements of our Competency Management System ("CMS") and the detail of this was discussed during a recent meeting with the ORR in July 2019 at Palestra House. This includes use of simulators to train staff in handling unusual faults and attempts to recreate 'stressful conditions'. However, we recognise this is not the same as working on the live railway, nor is a training environment likely to be experienced similarly to operating an automated train prior to a fault occurring.

A review of our fleet simulators indicates that they are not available on every line, some require updates and others need maintenance. However, we are exploring new technologies which represent industry best practice which offer a realistic simulated environment. TfL recognises the need to make further improvements in this area. We are currently in the process of developing a plan for this work and we will share this with the ORR once this is complete. Whilst this is underway, we would be happy to arrange a demonstration of these and how we can use in our context.

B. Quick Reference Material

It is well recognised that prompt rectification of faults improves the safety and reliability of our fleet. This is why the ability of our staff in this area is an ongoing priority for TfL. Personal issue defect cards are already given to every train operator and staff are being reminded about their use in their annual refresher training as well as a specific reminder that took place on Friday 13 September 2019.

Recent analysis of how our rules our communicated, including use of prompt cards, has triggered a recommendation that has been accepted by the LU Directors Review and Change Control Team ("DRACCT").

Work in this area will allow staff to have better access to a single point of information and will include notices, bulletins and prompt cards. This may require significant changes to our information portals which may include the LU Rule Book. We are still in the process of examining how this will be best done to ensure that it is most effective for all our staff. Work on this will commence in 2020 and will be completed by no later than 2021. This action will also be tracked by the TfL Formal Investigation Action Tracker so that progress on this project is closely monitored.

12. On 13 March 2020 London Underground Ltd provided the following update:

A. Competence Management System (CMS)

In July 2019 and February 2020, we explained our project to overhaul much of our Competence Management System (CMS) for train operators to the ORR. The scope of this work includes their initial and annual refresher training, on-

going live assessments, the supporting documentation and information systems plus how we train and monitor our instructor operators.

The CMS addresses support for decision making when responding to unusual faults under all conditions at various stages in live, simulated and classroom environments.

We have followed a robust method to re-base what and how we train starting with a 'risk-based training needs analysis' of all rolling stock faults, conducted by subject matter experts, using historic data. We then evaluated the best blend of experiential and theoretic training for each fault.

The result will be a CMS which is driven by risk, more capable of being quickly updated and better aligned with what our train operators need to know and how we want them to respond to faults when under pressure.

We began consultation with our Trade Unions on this last Autumn. We've concluded discussions about the risk-based training needs analysis and approach to redesigning training content and are currently working through the detail. We aim to

implement changes, starting with pilot versions in late Spring this year. More detailed timescales will be developed as consultation progresses.

It is relevant to add that this project integrates 'Non-Technical Skills' (NTS) in the CMS where appropriate. This means, for example, that the NTS 'situational awareness' is incorporated in our training concerning responding to faults.

Whilst we conclude consultation on the new approach to CMS, current promotional and refresher training continue to cover responding to unusual train faults under pressure.

Jubilee line train operators have been briefed about the outcomes of the investigation.

B. Support to Maintain Concentration

As the RAIB report notes, work was already underway to explore how we can better support train operators to maintain concentration as a result of their investigation into a trap and drag incident in 2018. This has taken on board findings from this later incident.

In addition to the recommendations made by the RAIB we have engaged extensively with train operators and our Trades Unions to better understand the topic and taken a number of steps:

- *Explored how technology may be able to assist with this challenge and tied in with the RSSB's research on this topic following the ORR's call to better understand this opportunity.*

- *produced a London Underground version of the recent RSSB training video explaining the risk of 'Cognitive Underload' and how to mitigate this risk. This includes the risk arising when transitioning from low to high workload. This will be ready to include in training from June 2020.*
- *Canvassed for research partners to design and trial a range of tactical approaches such as adding visual features to our tunnels in order to provide stimulation in key locations. This has included a research and development funding bid to a DfT scheme and corresponding with the rail research unit at the University of Birmingham. We have not been successful progressing with these bodies to date but we have also briefed the TfL Innovation Team who are currently looking for further options for finding research partners and funding. This is ongoing and we will keep the ORR updated as there are any developments.*

C. Train Simulators

As mentioned above, train operators are schooled in dealing with faults through a variety of methods: in classrooms, on live trains and by use of cab simulators. The latter are, in general, used when trainees are not ready to operate trains and, on occasion, when rolling stock is not available.

Part of this RAIB recommendation was to consider use of simulators to practice fault finding which prompted a review of these assets. Since they are usually procured when new stock is commissioned, they are not available on every line. In several cases our review showed that modifications of cab and signalling equipment has not been fully replicated and reliability is also a significant challenge, especially on older machines.

The LU Line Operations and Skills Development teams are discussing options for a more effective suite of cab simulators with our Asset Strategy Sponsor. However, due to the core focus of this team being on LU's overarching fleet replacement strategy and 25-year investment plans work is unlikely to be progressed further on this for the next 6 months. LU believes that the other methods of training used for unusual train faults combined with improvements to CDP and quick reference guides is sufficient in the interim. The ORR will be kept informed of progress in this area.

D. Quick Reference Guides

As per our response to the ORR on 1 September 2019, every train operator is given a personal copy of what we term a 'defect guide' relevant to their stock. This is designed to enable fast access to key information to act as a prompt, especially if they are dealing with an unusual fault and/or feel under pressure. As a result of the RAIB recommendation, their use is being reinforced in annual refresher training and a reminder was sent to all train operators on 13 September 2019.

Since the previous response, we've begun a review of how we communicate procedures such as these to front line colleagues through printed materials like

prompt cards and leaflets which can be carried and referred to when they are involved in incidents or failures. Our aim is to ensure these types of publication are effective for their users, always current and aligned with each other, with our training and Rule Book.

This is a large-scale exercise since we are including in its scope all the key operational procedures used by station, train, service control and incident response colleagues. Therefore, we consider that it will take us eighteen months to conclude this work (summer 2021). We will share progress with the ORR and, in due course, would be interested in gathering views on best practice.

Recommendation 3

The intent of this recommendation is to improve the reliability of the 1996 stock trains where such unreliability has the potential to have an adverse effect on safety.

London Underground should review options and, if appropriate, introduce procedures for routine downloading and review of data from Jubilee line train management systems, with the aim of better understanding, predicting, and preventing possible future failures with potential to impact adversely on safety

ORR decision

13. LUL have developed a process for the routine download and analysis of Train Management System (TMS) data.

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

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

Status: Implemented.

Information in support of ORR decision

15. On 15 October 2019 London Underground Ltd provided the following initial response:

Staff from our engineering department worked closely with RAIB inspectors during the course of their investigation and provided extensive technical support and expertise to assist them with their enquiries. This collaborative approach enabled RAIB to gain valuable insight into the electronic fault monitoring of our fleet. In addition to this, our technical subject matter experts had significant input that assisted RAIB with the formulation of this recommendation.

Following the publication of the RAIB report in July 2019, train data has been proactively reviewed on a regular basis since August 2019. This has enabled the

identification of faults where there have been increased volumes of data on the bus. Identifying such anomalies raises "Predictive" work orders which are then logged in our Maximo fault reporting system by our Fleet Technicians.

The process of investigating and resolving these work orders is ongoing and we are still in the process of learning how this proactive approach can be best implemented to reduce possible faults. As appropriate, we are balancing this process with urgent and reactive fleet safety issues.

This important work will continue to evolve and our aspirations in this area include the use of the existing Case for Continual Safe Operation ("CCSO") to formally manage and control "Preventive" work orders and further improve processes. Given the technical nature of this work, we would be happy to provide ORR staff with a demonstration at our depot of how this data is being down loaded and the methods used to analysis this information.

16. On 13 March 2020 London Underground Ltd provided the following update:

The LU Fleet Management Team are progressing the development of the Train Management System (TMS) download and analysis process. This is due to be completed by the end of April 2020.

This process is taking place in the background before it is formalised with the Fleet Engineering Team who are identifying causes of TMS fault reports. Asset Management System Work Orders are then generated. Through this process, those components identified as generating high volumes of TMS fault events are prioritised. Some specific examples include:

- *Heat and vent system, fleet replacement of defective components is ongoing, this will be picked up via overhaul to replace he saloon ventilation system with an improved system*
- *Audio Visual communications system, saloon display power supply faults – engineering investigation is ongoing*
- *Errors in the TMS, this is being progressed with Alstom for a resolution.*

We will organise a site visit with the ORR (Catherine Hui) by the end of May 2020 to demonstrate the TMS download and analysis process.

Recommendation 4

The intent of this recommendation is to improve train operators' knowledge about the effects insufficient amounts of sleep can have on performance.

London Underground should review and, where necessary, revise its competence and fatigue risk management systems for train operators in order to increase awareness of the adverse effects on human performance from insufficient sleep and inappropriate eating patterns.

ORR decision

17. LUL have taken a number of actions aimed at improving fatigue management of train controllers, including updated training material, encouraging self-reporting of

fatigue and an app to self-assess sleep health. LUL were planning to relaunch the app in April 2020 and we have asked if this was successfuland the extent of take up among operational teams.

18. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, London Underground Ltd 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

19. On 15 October 2019 London Underground Ltd provided the following initial response:

The TfL Fatigue Management System has been reviewed in relation to content on the effects that insufficient sleep can have on performance. Whilst there is material and content on this topic, we feel that this can be strengthened so that it is more explicit and fully explains the potential consequences of insufficient sleep and inappropriate eating patterns.

In the short term, promotional training will be reviewed so that it is clear on this. This will be completed by the 29 November 2019 and will include any necessary updates.

Longer term, this will be built into the TfL Fatigue Improvement Work Programme. The scope of this programme is currently being developed and timescales can be made available in due course when the extent of this work is fully mapped out.

20. On 13 March 2020 London Underground Ltd provided the following update:

In the short term, a number of actions have been undertaken including:

- *Updating training material to strengthen the information included on the potential consequences of insufficient sleep and inappropriate eating patterns*
- *Launching a web-based 'Sleep Health – Self Assessment Tool' in December 2019. This provides staff with individual reports providing tailored feedback on aspects of their life that negatively impact on sleep health. The take up of this was mostly from office-based staff so this will be re-launched in April 2020 to encourage better use of this by operational teams e.g. by providing hard-copy surveys. This has been discussed with our Trades Unions, who are supportive.*
- *Rolling out a process to encourage self-reporting incidences of fatigue. This will enable managers to provide support to individuals and better understand when and where fatigue is occurring. It will also promote a more transparent, supporting, culture. This will be in place across all LU*

Line Operations teams by the end of April 2020. To date, only a few reports have been made on the Lines where we have introduced this, so we are planning to run more high profile communications throughout Spring 2020 to highlight that being open about fatigue, seeking support and discussions solutions is encouraged.

We are also producing a 'wellbeing' video which will cover how individuals can manage themselves to meet fitness for duty requirements.

Longer term, this work will be aligned with the wider TfL Fatigue Improvement Work Programme. We have recently recruited a Manager to lead and Project Manage this over a 6-month period. They will be in position from April and will be able to ensure that we integrate key requirements into our management system. We will ensure that the ORR are updated as this work progresses.

As always, we are happy to share further detail of any of these activities with the ORR. Emma Burton will continue to work with the ORR's TfL team to ensure that the ORR is kept up to date as our work progress.