

Rail Accident Investigation Branch Recommendations on Sandilands – March 2019:

The Rail Accident Investigation Branch (RAIB) conducted an independent investigation into the tragic overturning of a tram at Sandilands, south London. They published their report in December 2017 and included 15 recommendations to address safety on London's tram network as well as other networks across the country.

We have made significant progress on the recommendations for London and have completed some of the most vital. Some of the recommendations set out by the RAIB require the implementation of new systems and technology not seen on the UK's trams before, and so significant designing, testing and procurement, including seeking out innovative manufacturers who can transform tram safety, has been needed.

We continue to work alongside the wider tram industry to ensure all of the recommendations outlined are met as quickly as possible.

Recommendation 1: ORR should work with the UK tram industry to develop a new body to enable more effective UK-wide cooperation on matters related to safety, and the development of common standards and good practice guidance.

This recommendation is for the wider industry and is being led by UK Trams and ORR. A 'Light Rail Safety Standards Board' (LRSSB) has been established to provide regulation and consistency of safety standards across the industry. A Chief Executive Officer and four non-executive board members, including a representative from TfL, have been appointed.

Recommendation 2: UK tram operators, owners and infrastructure managers should jointly conduct a systematic review of operational risks and control measures associated with the design, maintenance and operation of tramways.

This is part of the programme of work for the Light Rail Safety Standards Board. In collaboration with Trams Operated Limited (TOL), operator of London Trams, TfL has reviewed its route risk assessments and network risk model and shared these with the wider UK tram industry to help inform the basis for an industry wide risk model.

Recommendation 3: UK tram operators, owners and infrastructure managers should work together to review, develop and install suitable measures to automatically reduce tram speeds if they approach higher risk locations at speeds which could result in derailment or overturning.

TfL began working on the feasibility of introducing this new safety system shortly after the tragic overturning of a tram at Sandilands. A contract was awarded to Engineering Support Group Limited (ESG) on 14 December 2018 to build and install a new system that will automatically apply the brakes and bring a moving tram to a controlled stop if exceeding the speed limit at designated locations. It will be installed by the end of 2019 and initially be configured to priority high risk locations as suggested by the RAIB but will have the flexibility to be introduced elsewhere on the tram network. The new system, which is technically complex and not seen on a tram system in the UK before, will also automatically alert the operations control centre if speeding is detected.

The feasibility and scoping work for this system has been shared with other tram owners and operators to assist in the development of a programme for installing similar suitable systems to their networks.

Recommendation 4: UK tram operators, owners and infrastructure managers should work together to research and evaluate systems capable of reliably detecting driver attention state

and initiating appropriate automatic responses if a low level of alertness is identified. Such responses might include an alarm to alert the tram driver and/or the application of the tram brakes.

This recommendation was addressed using available technology in October 2017. Working with Trams Operated Limited (TOL), TfL implemented a Driver Protection Device (manufactured by Seeing Machines). Also known as 'Guardian', this device uses advanced sensors and image processing technology to track the micro-movements of the driver's eyes, facial expressions and head to identify fatigue and distraction events. When an event is detected, the driver receives an immediate in-cab audible alarm and in the case of fatigue events, a physical seat vibration alert designed to restore the driver to an alert state.

London Trams and TOL are the first public transport owner/ operator team to implement the Guardian device on trams. This device has been commended by the ORR and has been shared and demonstrated to the UK Tram industry for possible implementation on other tram networks.

This system is designed to detect driver inattentiveness and provide an alert, but does not, itself, apply the brakes, as suggested as an option in the recommendation. As detailed in recommendation three, an automatic braking system has been procured and will be installed by the end of 2019 as a separate measure.

Research work being undertaken by UK Trams is exploring what an appropriate automatic response would be if a low level of driver attentiveness is detected, such as the application of brakes. TfL will review this research to ensure the system in use is compatible with the outcomes.

Recommendation 5: UK tram operators, owners and infrastructure managers, in consultation with the DfT, should work together to review signage, lighting and other visual information cues available on segregated and off-track areas based on an understanding of the information required by drivers on the approach to high risk locations such as tight curves.

Shortly after the tragic overturning, additional speed restrictions and associated signage was installed near Sandilands and at three other locations on the network. A permanent speed reduction was implemented across the network meaning the maximum speed trams could travel was reduced to 70km per hour (previously 80km per hour). Enhanced chevron signs were installed at the four sites with significant bends to provide an additional visual cue for drivers and more speed signs, along with additional lineside digital signage, is providing added speed warnings to drivers.

New temporary lighting has also been installed on the approach to the Sandilands tunnel and, in collaboration with road tunnel lighting experts, the tunnel will get a full lighting upgrade with work expected to be complete in 2019.

Additionally a new system called iTram, derived from proven technology on buses, which will provide drivers with an in-cab speed alert is currently being tested and will be fitted to all trams.

Recommendation 6: UK tram operators and owners should, in consultation with appropriate tram manufactures and other European tramways, review existing research and, if necessary, undertake further research to identify means of improving the passenger containment provided by tram windows and doors.

Working with safety experts, a number of options were tested and a new higher specification film that is 75 per cent thicker (from 100microns to 175microns) has been fitted to all tram doors and windows to improve containment. This was completed in March 2019 and the solution was shared with UK Trams to inform their work under the RAIB's recommendation to review options for enabling the rapid evacuation of a tram which is lying on its side after an accident.

Recommendation 7: UK tram operators and owners should install (or modify existing) emergency lighting so that the lighting cannot be unintentionally switched off or disconnected during an emergency.

A new emergency lighting system, which will operate independently of the trams' battery in the event of an emergency, has been procured and will be installed in 2019.

Recommendation 8: UK tram operators and owners should review options for enabling the rapid evacuation of a tram which is lying on its side after an accident.

This recommendation is being led by UK Trams on behalf of the industry.

Recommendation 9: The ORR should carry out a review of the regulatory framework for tramways and its long-term strategy for supervision of the sector. This should be informed by a new assessment of the risk associated with tramway operators and consideration of the most effective means by which supervision can contribute to continuous improvement in passenger safety.

This recommendation is assigned to the ORR.

Recommendation 10: Tram Operations Limited (TOL) and London Trams (TfL) should commission an independent review of its process for assessing risk associated with the operation of trams.

An independent review was jointly commissioned by TfL and TOL. The route risk assessments and risk model for the London Trams network have now been completed and are subject to regular reviews by TfL and TOL, with processes in place to make sure that learnings from incidents occurring away from the London Trams network are also captured and factored into these regular reviews. The findings of this review have been shared with the wider UK tram industry to help inform industry wide safety standard.

TfL and TOL have jointly reviewed the safety risks associated with operation of London Trams. The review examined tram operation, asset management and maintenance activities. Specific areas of focus included process management, the competence of our people, management systems, assets, infrastructure and external influences. As a result, the Hazard Event List from the previous Safety Risk Model has been updated and risk associated with each hazardous event type (and their corresponding controls) have been catalogued.

Recommendation 11: Tram Operations Limited (TOL), drawing on expertise from elsewhere in the First Group organisation, should review and where necessary improve the management of fatigue risk affecting its tram drivers with reference to the ORR's good practice guidance.

TOL have engaged a specialist consultancy and is implementing a safety improvement plan designed to address this recommendation through their own internal safety governance arrangements. In addition to the installation of driver protection devices, which have been

fully operational for over a year, TOL has reviewed roster planning and provided fatigue management training for all staff.

Recommendation 12: Tram Operations Limited (TOL) should commission an external expert or organisation to review the way it learns from operational experiences.

TOL has implemented a “Just Culture” Programme, a long term project involving significant culture change, through their own internal safety governance arrangements to address this recommendation. The programme encourages greater communication between colleagues and senior management, while also focusing on customer service and disability awareness training.

Recommendation 13: Tram Operations Limited (TOL) and London Trams (TfL) should improve processes, and where necessary, equipment used for following up both public and employee comments which indicate a possible safety risk. The improved process should ensure complaints are dealt with promptly and within time periods.

One of the first actions TfL took immediately after the tragedy was to enhance the customer complaints process so that all tram reports were managed by one dedicated TfL team, with any relating to safety prioritised for immediate investigation. Any allegation of a safety breach is taken extremely seriously and customers are encouraged to report any concerns. To enable this, improvements have also been made to the TfL website to more clearly signpost where people can make comments with a specific option to record if a comment relates to a safety issue or incident.

Recommendation 14: London Trams (TfL) and Tram Operations Limited (TOL) should review, and where necessary, improve their processes for inspection and maintaining on-tram CCTV equipment to greatly reduce the likelihood of recorded images being unavailable for accident and incident investigation.

The CCTV recording equipment on all Bombardier trams (type involved in Sandilands) was replaced and upgraded to digital shortly after the overturning. The equipment on Stadler trams, which make up the remainder of the fleet, had adequate functionality. Further work to upgrade CCTV on the wider fleet is also now planned and will be completed this year..

Recommendation 15: London Trams (TfL) and Tram Operations Limited (TfL) should review and where necessary revise existing tram maintenance and testing documentation to take account of experience gained and modification made since the trams were brought into services and ensure that these documents are kept up-to-date.

TfL and TOL are jointly addressing this recommendation with a programme to review and revise maintenance standards. This is progressing well and will be completed by December 2019.