

## Recommendation Status Report: Overturning of a tram at Sandilands junction, Croydon

This report is based on information provided to the RAIB by the relevant safety authority or public body.

The status of the recommendation(s), as reported to us, are described by the following categories:

### Key to Recommendation Status

<b>Open</b> (replaces Progressing and Implementation On-going)	Actions to address the recommendation are ongoing.
<b>Closed</b> (replaces Implemented, Implemented by alternative means, and Non-implementation)	ORR consider the recommendation to have been taken into consideration by an end implementer and evidence provided to show action taken or justification for no action taken.
<b>Insufficient response:</b>	The end implementer has not provided sufficient evidence that the recommendation has been taken into consideration, or if it has, the action proposed does not address the recommendation, or there is insufficient evidence to support no action being taken.
<b>Superseded:</b>	The recommendation has been superseded either by a newer recommendation or actions have subsequently been taken by the end implementer that have superseded the recommendation.
<b>Awaiting response:</b>	Awaiting initial report from the relevant safety authority or public body on the status of the recommendation.

RAIB concern over the way that an organisation has responded to a recommendation are indicated by one of the following:

**Red** – RAIB has concerns that no actions have been taken in response to a recommendation.

**Blue** – RAIB has concerns that the actions taken, or proposed, are inappropriate or insufficient to address the risk identified during the investigation.

**White** – RAIB notes substantive actions have been reported, but the RAIB still has concerns.

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<b>Report Title</b>	Overturning of a tram at Sandilands junction, Croydon
<b>Report Number</b>	18/2017
<b>Date of Incident</b>	09/11/2016

Rec No.	Status	RAIB Concern	Recommendation	RAIB Summary of current status
18/2017/08	Closed - I	None	<p>The intent of this recommendation is to minimise the risk of people being trapped in an overturned tram where side windows and doors are either facing the ground or facing the sky. Solutions could include the use of removable windscreens at the ends of trams. Implementation may involve tram operators seeking input from appropriate tram manufacturers.</p> <p>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. If the review identifies practical measures which would provide significant benefit to trapped passengers, UK tram operators and owners should:</p> <ul style="list-style-type: none"> <li>i. implement these measures on existing trams if practical to do so in the short term; or</li> <li>ii. provide a time-bound plan to implement these measures on existing trams when practical to do so (eg during planned refurbishment).</li> </ul> <p>Such measures should then be promoted for inclusion in the specifications and standards governing the new builds of trams (paragraph 470).</p>	<p>ORR has reported that UK tram operators and owners has reported that it has completed actions taken in response to this recommendation.</p> <p>ORR proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>
18/2017/09	Closed - I	None	<p>The intent of this recommendation is to ensure that the safety authority responsible for regulation of UK tramways maintains an appropriate, proportionate risk-based level of inspection and oversight to tramway operations.</p>	<p>ORR has reported that ORR has reported that it has completed actions taken in response to this recommendation. ORR proposes to take no further action unless</p>

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			<p>The Office of Rail and Road 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 operations (allowing for low frequency/high consequence events of the type witnessed at Sandilands junction) and consideration of the most effective means by which supervision can contribute to continuous improvement in passenger safety (paragraph 474).</p>	<p>they become aware that the information provided becomes inaccurate.</p>
18/2017/10	Closed - I	None	<p>This recommendation is intended to ensure that Tram Operations Limited's systems for identifying the hazards and assessing the risk associated with its operation are fit for purpose. The requirement for an independent review does not prevent it being carried out by other parts of TfL and FirstGroup provided the requisite expertise is available.</p> <p>Tram Operations Limited and London Trams should commission an independent review of its process for assessing risk associated with the operation of trams (eg collision, derailment and overturning of trams). This review shall consider:</p> <ul style="list-style-type: none"> <li>i. the extent to which the process for risk assessments is capable of identifying and correctly assessing all significant risks, particularly those related to low frequency/high consequence events; and</li> <li>ii. the means by which potential mitigations are identified and evaluated.</li> </ul> <p>The findings of the review shall be incorporated into a documented process for the assessment of operational risk. This should also be shared with other tramways (paragraph 468).</p>	<p>ORR has reported that London Trams and Tram Operation Ltd has reported that it has completed actions taken in response to this recommendation.</p> <p>ORR proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>
18/2017/11	Closed - I	None		<p>ORR has reported that Tram Operations Limited has reported</p>

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			<p>The intent of this recommendation is to minimise risk due to tram driver fatigue associated with both work and out-of-work activities.</p> <p>Tram Operations Limited, drawing on expertise from elsewhere in the FirstGroup organisation, should review and, where necessary, improve the management of fatigue risk affecting its tram drivers with reference to ORR's good practice guidance. As a minimum this should include a review of:</p> <ul style="list-style-type: none"> <li>i. the base roster with particular reference to whether it is appropriate to use a shift rotation pattern of about a week;</li> <li>ii. the management and monitoring of overtime and rest day working;</li> <li>iii. training, briefings and support for tram drivers regarding lifestyle, sleep hygiene and their individual responsibilities regarding fatigue and fitness for duty (including reporting when they feel that fatigue may affect their driving performance); and</li> <li>iv. competence requirements for managers and supervisors that have a role in the management of fatigue risk.</li> </ul> <p>(paragraph 471)</p>	<p>that it has completed actions taken in response to this recommendation.</p> <p>ORR proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>
18/2017/12	Closed - I	None	<p>This recommendation is intended to encourage an organisational culture in which tram drivers feel able and willing to report safety incidents, and in which TOL takes suitable actions in response to information from both staff and the public. The requirement for an external expert does not preclude the review being carried out by other parts of TfL and/or FirstGroup provided the requisite expertise is available.</p> <p>Tram Operations Limited should undertake a review, informed by expert</p>	<p>ORR has reported that Tram Operations Limited has reported that it has completed actions taken in response to this recommendation.</p> <p>ORR proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>

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			<p>input from external sources, covering the way that it learns from operational experience. The areas the review should address are:</p> <ul style="list-style-type: none"> <li>i. fostering the creation of a ‘just culture’ in which staff are more likely to report incidents and safety-related concerns;</li> <li>ii. establishing a common understanding of what constitutes a safety incident when reported by the public, or that should be reported by staff;</li> <li>iii. improving management systems to ensure that safety issues are properly identified from any reports, whether from staff or members of the public, and that appropriate and timely actions are taken in response; and</li> <li>iv. developing improved processes to ensure that suitable lessons are learned by TOL from such reports and that outcomes are fed back to the reporter</li> </ul> <p>(paragraph 468).</p>	
18/2017/13	Closed - I	None	<p>This recommendation is intended to achieve effective and timely responses to allegations of unsafe situations reported by members of the public, or employees. It takes account of CCTV, OTDR and other systems which record data by overwriting earlier information after a period of time. It also takes account of the fact that witnesses’ recollection of events can degrade relatively quickly. London Trams is included in the recommendation as improvements to processes and/or equipment relating to on-tram recording systems may be necessary to ensure a sufficient period for information to be available for downloading. Including workforce comments/complaints in the same system may further improve safety. Effective implementation of this recommendation is likely to include separating safety related comments from customer care</p>	<p>ORR has reported that Tram Operations Limited and London Trams have reported that they have completed actions taken in response to this recommendation. ORR proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>

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			<p>issues and prompting people making comments to provide (where possible) the date, time and location of events.</p> <p>Tram Operations Limited and London Trams should, in conjunction with TfL, 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 which:</p> <ul style="list-style-type: none"> <li>i. improve the effectiveness of identifying complaints that are safety-related (eg time, date, location, safety or customer care event etc);</li> <li>ii. avoid the loss of technical evidence (eg CCTV recordings);</li> <li>iii. minimise the time before witness information is sought; and</li> <li>iv. ensure that appropriate action is taken without undue delay.</li> </ul> <p>(paragraph 468)</p>	
18/2017/14	Closed - I	None	<p>The intent of this recommendation is to maximise the availability of CCTV images which could assist accident and incident investigation (and also the investigation of criminal acts and anti-social behaviour). It considers both technical reliability and processes used to recover images before they are over-written. It is probable that equipment installed since November 2016 on trams similar to that involved in the accident will assist implementation of this recommendation.</p> <p>London Trams, in consultation with Tram Operations Limited, should review and, where necessary, improve its processes for inspecting and maintaining on-tram CCTV equipment to greatly reduce the likelihood of recorded images being unavailable for accident and incident investigation</p>	<p>ORR has reported that London Trams has reported that it has completed actions taken in response to this recommendation.</p> <p>ORR proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>

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			(paragraph 471).  This recommendation may apply to other UK tram operators.	
18/2017/15	Closed - I	None	<p>The intent of this recommendation is to ensure that up-to-date and accurate maintenance and testing documentation is available to tram maintainers.</p> <p>London Trams, in consultation with Tram Operations Limited should:</p> <ul style="list-style-type: none"> <li>i. review and, where necessary, revise existing tram maintenance and testing documentation to take account of experienced gained, and modifications made, since the trams were brought into service; and</li> <li>ii. review and, where necessary, revise the processes for ensuring that these documents are kept up-to-date in future.</li> </ul> <p>(paragraph 471)</p>	<p>ORR has reported that London Trams has reported that it has completed actions taken in response to this recommendation.</p> <p>ORR proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>
18/2017/01	Closed - I	None	<p>The intent of this recommendation is to improve the management of safety risk in the UK tram industry by enabling more effective UK-wide cooperation.</p> <p>ORR should work with the UK tram industry to develop a body to enable more effective UK-wide cooperation on matters related to safety, and the development of common standards and good practice guidance.</p> <p>As a minimum, the purpose and aims of this body should be to:</p> <ul style="list-style-type: none"> <li>i. provide a forum for the discussion of common safety issues and the exchange of experience;</li> </ul>	<p>ORR has reported that ORR in cooperation with UK tram owners, operators and infrastructure managers; DfT and UK Tram, has reported that it has completed actions taken in response to this recommendation. ORR proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>

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			<p>ii. the provision of authoritative and impartial advice and guidance on matters related to safety;</p> <p>iii. managing the development of safety related design and operational standards, and their subsequent maintenance;</p> <p>iv. participation in the development of industry standards and guidance by international bodies;</p> <p>v. sponsoring and project management of the research and development needed to inform the above;</p> <p>vi. gathering data, monitoring and reporting on the industry's safety performance (including comparisons of safety performance on different tramways);</p> <p>vii. providing suitable guidance on effective safety management, including guidance applicable to public highways;</p> <p>viii. working with tramways to help plan industry safety improvement; and</p> <p>ix. disseminating good practice from both the UK and overseas industries.</p> <p>The body should be suitably constituted and funded to enable the effective delivery of the above functions. It should be structured so that ORR promotes, encourages and supports its operation (paragraph 472).</p>	
18/2017/02	Closed - I	None	<p>The intent of the recommendation is to better understand all safety risk associated with tramway operation and then provide updated guidance for the design and operation of tramways (this could be achieved by issuing an updated version of the 'Guidance on tramways' with expanded coverage of operational matters). Particular attention will be required to recognise risks from low frequency / high consequence events which may</p>	<p>ORR has reported that UK tram operators, owners and infrastructure managers have reported that it has completed actions taken in response to this recommendation. ORR proposes</p>



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			<p>not be apparent from precursor incidents on existing UK tramways. Identifying such events is likely to require input from specialists outside the UK tram community, including specialists with knowledge of main line rail and bus environments. Consideration of main line rail and bus issues is intended to inform evaluation of tramway risks; it does not imply that all heavy rail and bus requirements should be applied to tramways.</p> <p>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.</p> <p>The review should include:</p> <ul style="list-style-type: none"> <li>i. examination of the differing risk profiles of on-street, segregated and off-street running;</li> <li>ii. safety issues associated with driving at relatively high speeds in accordance with the line-of-sight principle in segregated and off-street areas, particularly during darkness and when visibility is poor;</li> <li>iii. current practice world-wide and the potential of recent technological advances to help manage residual risk;</li> <li>iv. safety learning from bus and train sectors that may be applicable to the design and operation of tramways;</li> <li>v. consideration of the factors that affect driver attention and alertness across all tram driving scenarios in comparison to driving buses and trains; and</li> <li>vi. guidance on timescales for implementing new control measures (eg whether retrospective or only for new equipment).</li> </ul>	<p>to take no further action unless they become aware that the information provided becomes inaccurate.</p>
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			Using the output of this review UK tram operators, owners and infrastructure managers should then, in consultation with ORR, publish updated guidance on ways of mitigating the risk associated with design, maintenance and operation of UK tramways (paragraphs 467 and 468).	
18/2017/03	Closed - I	None	<p>The intent of this recommendation is to prevent serious accidents due to excessive speed at higher risk locations on tramways. These locations are likely to include all locations where a substantial speed reduction is required for trams approaching at relatively high speed. Implementation of this recommendation may be assisted by work in this area already underway by Croydon tramway organisations.</p> <p>UK tram operators, owners and infrastructure managers should work together to review, develop, and provide a programme for installing suitable measures to automatically reduce tram speeds if they approach higher risk locations at speeds which could result in derailment or overturning (paragraph 465).</p>	ORR has reported that UK tram operators, owners and infrastructure managers have reported that it has completed actions taken in response to this recommendation. ORR proposes to take no further action unless they become aware that the information provided becomes inaccurate.
18/2017/04	Closed - I	None	<p>The intent of this recommendation is to reduce the likelihood of serious accidents due to tram drivers becoming inattentive because of fatigue or other effects. Existing tram systems relying on drivers applying forces to driving controls (driver safety devices) do not necessarily detect an inattentive driver. Implementation of this recommendation may be assisted by work in this area already underway by Croydon tramway organisations.</p> <p>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. The</p>	ORR has reported that UK tram operators, owners and infrastructure managers have reported that it has completed actions taken in response to this recommendation. ORR proposes to take no further action unless they become aware that the information provided becomes inaccurate.

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			<p>research and evaluation should include considering use of in-cab CCTV to facilitate the investigation of incidents.</p> <p>If found to be effective, a time-bound plan should be developed for such devices to be introduced onto UK tramways (paragraph 471).</p>	
18/2017/05	Closed - I	None	<p>The recommendation is intended to provide tram drivers operating on line-of-sight with signage giving visual information cues comparable to those for bus drivers. This recommendation builds on the RAIB's Urgent Safety Advice issued in November 2016 and recognises that driving a tram on line-of-sight has considerable similarities with driving a bus on a public road.</p> <p>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-street areas based on an understanding of the information required by drivers on the approach to high risk locations such as tight curves. Comparison should be made with the cues provided to road vehicle drivers on highways that are designed in accordance with current UK highway standards. Prior to the installation of suitable measures to automatically reduce tram speeds at higher risk locations (Recommendation 3) consideration should also be given to providing in-cab warnings to tram drivers on the approach to high risk locations.</p> <p>The findings of this review should then be used by UK tram operators and tramway owners to improve the information and/or warnings provided to drivers at high risk locations in segregated and off-street areas (paragraph 465).</p>	<p>ORR has reported that (Dutyholder name) has reported that it has completed actions taken in response to this recommendation. ORR proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>
18/2017/06	Closed - I	Blue	<p>The intent of this recommendation is to reduce the likelihood of people being seriously injured or killed by being ejected through tram doors and windows (ie to provide better containment). Although it is not expected</p>	<p>ORR has reported that UK tram operators and owner have reported that it has completed</p>

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			<p>that ejection can always be prevented in case of overturning, the improvement of containment will deliver improved safety in a range of different scenarios such as collision with road vehicles. Any improvement to containment is dependent on the ability of passengers to easily open doors in an emergency. It is expected that implementation will build on similar research already undertaken by RSSB in respect of railway carriage windows.</p> <p>UK tram operators and owners should, in consultation with appropriate tram manufacturers 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. The findings should then be used to:</p> <ul style="list-style-type: none"> <li>i. provide a time-bound plan to modify doors and windows on existing trams when practical to do so (eg during planned refurbishment);</li> <li>ii. promote changes to the specifications and standards governing the doors and windows of new trams; and</li> <li>iii. inform the Department for Transport of the findings to allow implementation of the safety advice at paragraph 492.</li> </ul> <p>(paragraph 469)</p>	<p>actions taken in response to this recommendation. ORR has reported that UK tram operators and owner have reported that it has completed actions taken in response to this recommendation. ORR proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>
18/2017/07	Closed - I	None	<p>The intent of this recommendation is to provide emergency lighting which will operate without connection to remote power supplies such as the tram's main batteries and the overhead electrical supply. Implementation may involve tram operators seeking input from appropriate tram manufacturers.</p>	<p>ORR has reported that UK tram operators, owners and infrastructure managers have reported that it has completed actions taken in response to this recommendation. ORR proposes to take no further action unless</p>

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			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 (paragraph 470).	they become aware that the information provided becomes inaccurate.
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