Responses to ORR's January 2022 consultation on draft Goal Setting Principles for Railway Health and Safety: Draft Appendix for operation of passenger trains in Unattended Train Operation configuration

Goal Setting Principles for Railway Health and Safety: Draft Appendix for operation of passenger trains in Unattended Train Operation configuration | Office of Rail and Road

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ASLEF

ASLEF Consultation Response – ORR Goal Setting Principles for Railway Health and Safety: Draft Appendix for operation of passenger trains in Unattended Train Operation configuration

1. The Associated Society of Locomotive Engineers and Firemen (ASLEF) is the UK's largest train driver's union representing over 21,000 members in train operating companies and freight companies as well as London Underground and light rail systems.

2. We welcome this opportunity to comment on the ORRs proposal to clearly outline the considerations to be made when introducing GOA4 UTO services.

3. We note that the proposals look to clearly outline what factors are to be considered when duty holders are attempting to introduce GOA4 levels of automation to the railways and we believe this is a sensible approach to ensure that health and safety is kept as a top priority when outlining the factors for consideration when working to deliver UTO.

4. We agree with the intention to focus the supplement on the issues identified in BS EN 62267:2009 '*Railway applications. Automated urban guided transport (AUGT). Safety requirements.'*

5. It is sensible to build on the research that has already been carried out to look in to the safety requirements of automated urban guided transport. We would also suggest that other UTO services in other countries are continually monitored so that any lessons from incidents can be learned and if needed the additional factors can be updated.

6. The push to fully automate the operation of trains is highly complex and incredibly difficult to deliver with current infrastructure, as such we do not believe the GOA4 principles should form part of the main Goal Setting Principles for Railway Health and Safety as it will impact on multiple principles and could require a complete rewrite of the current Goal Setting Principles which were reissued by the ORR in 2017.

7. The desire to fully automate trains is unlikely to be realised outside of very restricted settings such as those currently in use as 'people movers' at airports or the proposed UTO on Glasgow's subway, although this is still to be extensively trialled. The operation of GOA4 requires a greater control of the

environment in which the services are operating, this can be realised more easily on underground systems but it still brings with it great complexity and cost to amend current systems or integrate new networks with existing ones.

8. Despite Docklands Light Railway, London Underground and Tyne & Wear Metro being mentioned in the draft document on page 3, the complexities of running UTO in an exposed environment such as that of Tyne & Wear Metro, DLR and parts of London Underground are not touched upon. Whilst it may be technically possible, (at a great cost) to run UTO on parts of Britain's metro systems, the cost to implement this on current networks would be extensive. Therefore, it is appropriate that the principles act as a supplement to the Goal Setting Principles to avoid wastage of resources on attempts to implement UTO on current networks when the money could be better spent on further electrification of the network, improvements to stations and to the rolling stock to improve passenger and driver comfort and safety.

9. The requirement to change from GOA4 services to at the least GOA3 and below services to access wider parts of the rail network can also impact on the attractiveness of UTO services to rail passengers by complicating journeys as passengers will be required to change at stations to access services with a driver on board.

10. Due to these complexities and costs, we believe that it is appropriate that the GOA4 principles act as a supplement to the Goal Setting Principles as we would not want the inclusion of these principles in the main goal setting principles to lead to planners to try and force GOA4 on to parts of the network at the expense of investment in areas which would provide a better return to passengers, staff and the wider economy sooner.

11. The draft supplement covers all of the operational safety points that we would expect it to in conjunction with the GSPfRH&S for a train to operate in UTO mode, we do however have some concerns with the proposals and we will work through these concerns one by one.

12. On page 6, in relation to the movement of a service from a platform after an obstacle is either detected ahead of the train or at the Platform Train Interface (PTI), there is reference to an authorised person recording the reason for the on-board train control system setting off an alarm and applying the emergency brake. It is not clear if this person is intended to be physically present or if it can be overridden by a person in the control room, we believe that due to the potential faults, blind spots and obstructions that can impact on the quality of CCTV for safe train dispatch, this ambiguity should be removed to clearly state that an authorised person will physically inspect the reasons for the activation of the detection system.

13. On page 6, point 9 the draft document states that, when stopped on the network at a position other than in a station platform, a GOA4 train in UTO service when given permission to move by the signalling system shall not be capable of moving until a positive signal of confirmation that it is safe to move is received by the operating system from the on-board train control system. There is no mention of what should happen when the on-board train control system does not give confirmation that is safe to proceed. This is slightly touched on under point 13 on page 7 but again there is ambiguity around where the person authorised to record the reason for the stopped train will physically be when assessing the situation.

14. On page 7 under derailment, there is specific mention of a UTO train entering into service from a depot and the requirement for the train to be able to detect derailment of its running gear, there is however, no mention of obstacle detection when a UTO train is entering service from a depot. We also assume this detection of derailment and obstructions would also apply for a UTO train leaving service to enter a depot, it would be sensible to remove any assumptions by explicitly stating that both detection systems would be in operation in both circumstances.

15. On Page 7, point 13, there is no mention of the GOA4 train in UTO service leaving or entering a depot despite it being mentioned under point 10 on the same page, this should be included with 'line-running or departing a platform' to ensure that there is no ambiguity around when obstacle detection is to be operating.

16. In terms of omissions in the document, our concerns on some of the points have been laid out above but for the benefit of analysis we will mark out exactly what we believe is lacking and where.

17. On page 6 under point 9 there is no mention of what to do when a UTO service is stopped on the network and unable to start due to the on-board train control system not giving a positive signal to start moving again. This leaves a gap in the draft between a UTO service starting and stopping due to an obstacle. If for example a service was stopped at red signal and was then given permission to move by the signal if it then does not move, the principle under point 13 does not apply as it has already stopped. The service could not be able to move due to a fault with the obstacle sensors or there may be an obstacle which has appeared between being stopped by a signal and being given permission to move on. There should be a provision for an authorised person to investigate if the UTO service is not moving after being given permission by the signalling system.

18. The point above could be resolved by amending point 13 to include *"Any train stopped by activation of either obstacle detection equipment while line-running, departing a platform or continuing after a signal has stopped it…"* this would

ensure that in the situation outlined under point 17 of our response would be dealt with in the same manner as the service coming to an abrupt stop whilst line running or not continuing whilst at the platform.

19. Point 10 on page 7 of the draft mentions entering into service from a depot but there is no mention of the opposite scenario where a service is entering a depot. If it is the intention of the ORR to explicitly state that the services can run in UTO mode from the depot, we would assume that operators of the services would also look to run the trains in UTO mode back to the depot. To ensure that there are no safety oversights, point 10 should include 'entering the depot from service' as well. It should also be made clear when entering and leaving a depot in UTO mode that the derailment and obstacle detection is still prescribed to be running on the train. Accidents can unfortunately occur at depots and we have lost members due to such accidents, we would not want any UTO trains to be running into and out of depots without the factors to be considered, explicitly stating that obstacle and derailment detection will be running in both circumstances.

20. We also have concerns that there is no mention of malicious entry to the controls / driving cab. We would assume that the trains would have controls on board to enable the train to be moved by an authorised person physically on board in certain circumstances. These controls would be locked away when the train is running in UTO. We believe therefore, that there is an omission in the draft that the train is able to start moving without the on board train control system checking to ensure that the panel to access the controls is shut / locked. This should also be touched on when it comes to the train stopping as a reason for the emergency brakes to be applied or at the very least for control to be alerted and to investigate the reason why the train is reporting that the control panel is accessible whilst in UTO.

21. Further to malicious entry to controls we also hold concerns around cyber-attacks impacting on the safety and ability to control UTO services from control. This would impact on point 26 and 27 on page 11, there should perhaps be provision for the on board systems to initiate a TSEA for factors beyond being contactable by voice by a controller to try and counter any faults or malicious attacks to the on board computer systems.

22. An additional factor which we think is missing from the draft factors is for UTO trains to be required to meet height, offset and curve requirements to provide step free/ level boarding. This omission could lead to UTO services, not being accessible to passengers with mobility issues and with no assistance due to a lack of staff on the service potentially limiting the wider appeal of such services.

23. Overall we agree that the additional factors to be considered for operation of passenger trains in GOA4 should be a supplement to the GSPfRH&S and we agree with the approach of building on the issues identified BS EN 62267:2009 '*Railway applications. Automated urban guided transport (AUGT). Safety*

requirements. We do continue to hold safety concerns with GOA4 particularly in emergency situations where on GOA3 and below a member of staff/driver on board would be able to immediately react and deal with the situation. GOA4 is likely to be operating on services that are running in tunnels and there is a lack of clarity on how authorised personnel will access or move trains that have emergencies in these situations. We are also concerned with the overreliance on computer systems and the pressure this could place on control who will be expected to respond to incidents, remotely operate trains and assess issues on the network.

Mick Whelan
ASLEF
General Secretary
77 St John Street
London
EC1M 4NN

Railway Industry Association

Anonymised RIA Member Responses to 'Goal-setting Principles for Railway Health and Safety, Appendix 1'					
Page	**Para.**	***(or)***	**Goal Setting Principle**		**Comment/Feedback**
n/a, General Comment					The document should also discuss what additional controls are required to prevent passengers being taken into reversing sidings or depots. This may require additional checks to be undertaken on platforms of terminating stations by station/platform dispatch staff, so it is another control that is required due to the fact that GOA4 has been introduced.
n/a, General Comment					It would be beneficial to discuss the general rule regarding maintenance requirements for GOA3/4 railways i.e. lineside maintenance is only undertaken during engineering hours in this document.
n/a, General Comment					The commentary on UTO needs to reinforce topics, including on accident investigation (no driver to provide information so enhanced logging of operational data and monitoring is needed) along with rigorous control of remote asset management and maintenance (e.g. CSM M obligations). This is in addition to the obvious issues of the complexity of the risk assessment (CSM RA), what's the system boundary, the dual mode driving of cars (e.g. Tesla) and who is responsible if something goes wrong in this mode is a sharp reminder of the challenges of mixed or supervisory operation.
n/a, General Comment					There is one area that is not well covered and that is the RAMS requirements of the rolling stock. It is generally acknowldeged that the reliability and availability for certain systems needs to be greater on UTO trains. There needs to be significantly higher Reliability and Availability performance on systems such as passenger doors, traction power, brakes, etc. This needs to include an appreciation of technical and functional safety. Driverless LRV metro systems have the most stringent RAMS requirements.
n/a, General Comment					Physical security requires consideration, both in an unauthorised access from outside the train, as well as significant on-train security concerns.
n/a, General Comment					This document needs to better consider the implications of, and align with, IEC62290 (Railway applications – Urban guided transport management and command/control systems – Part 1: System principles and fundamental concepts)

2	2				Regarding the statement that "functions normally provided by the signaller will be replaced when GOA4 is implemented".. GOA4 implementation so far has not replaced the signaller, although any form of automated traffic management function certainly reduces the signaller's workload but this is not linked to ATO at all. Furthermore as GOA4 deployment has increased the workload and importance of the role, the "Traffic Controller" (the modern term for the Signaller) has become a key component of the GOA4 railway in as much as one cannot operate the railway without a human in that position. Please reconsider how this section is phrased, and it is also worth emphasing the importance of the Traffic Controller's role and the Human Factors implications of the increased workload.
5	7 a)				Please add a definition for "the operating system" as it is open to interpretation.
7	11				Regarding the requirement to detect trackside obstacles, should the emphasis be on obstacles in the guideway/fouling the structure gauge rather than just trackside? Depending on maximum permissible speed, the distance ahead that a dangerous object will need to be detected could be quite significant, therefore a forward-looking radar or an a.i. image recognition detection system may be challenged in these situations and there will need to be more practical considerations applied in this case. Today GOA4 metros do not have this technology, so this may be overly constraining. It may be better to also considering management of the environment itself, focussing on prevention of obstacles getting onto the track. Measures would include intrusion detection systems, reducing lineside trees and vegetation, routine inspections (the sweep train), prevention and detection of trespass, enhanced fencing etc.
8	14				Opening Doors - It would be beneficial to also describe an example of the emergency situation mentioned (e.g. Evacuation in between stations) where the requirements to allow door opening will only require that the train is stationary and the brakes are applied.
8	17				Closing Doors - regarding obstacle detection between train (car body) and PED, it would be beneficial to discuss what type of system is detecting the obstacle in this case, is it the sensitive edge of the doors (PED and / or train) or another system e.g. infra-red beam, scanner system, pressure mat which would be a third, independent system for obstacle detection. The document should also consider gaps introduced by curved platforms, and requirements to detect an obstacle that has fallen into the gap and prevent train movement if an obstacle is detected in that space.

13	34				Line Availability validation. It is important to emphasies that a sweep train will need to be operated (at lower than line speed) with a member of staff in the cab observing the guideway, as an obstacle detection system will not always be able to detect a track defect.
13	35				Management of Low Adhesion - Current experience shows that even GOA2 operation with low adhesion is problematic, and in some cases GOA2 operation reverts to GOA1. Therefore any GOA4 line should be designed to allow for GOA1 operation if required even though it may be a very rare occurence e.g. in degraded / emergency modes and also when low adhesion makes ATO inoperable. In addition to the train sliding during braking, wheel spin during acceleration should also be considered as potential problems for ATO.
13	36				Recovery of a stalled train - Recovery may require staff to walk to a stalled GOA4 train and board it, and this presents a signficant safety risk especially if the member of staff is going to have to walk on the guideway to approach it. Therefore requirements to safely manage the associated risks presented in this scenario should be discussed in this document. This also applies to paragraph 44.
14	40				As a general rule, CCTV coverage of the entire length of the line is an important requirement for GOA4 operation. It is especially useful to deal with situations where trespassers have been detected or a self-evacuation (detrainment) event has occurred such as described here, as it will allow the Control Centre to view the guideway and trackside locations and any access / egress points.
15	46				Operation in the presence of track workers - UTO operation should be suspended for sections of track where the presence of a person has been detected.
n/a, General Comment					*Cybersecurity issues require a more thorough consideration (Not just IT security), in the sense of the new TS50701, EN50126 etc. The ORR 2017 H&S general doc contains quite a few points that aren't fully appreciated (people just go to the TSIs ?). What they have written as a safety regulator overlaps with what is implemented under the cybersecurity principles. A few examples are extracted below, highlighted. This is not a complete list. There needs to be software lifecycle management and the prediction of reasonably foreseeable scenario elements, including plenty of edge cases. The UTO appendix does refer to 6.4 and 6.5 but it's more around remote control and communication with passengers rather than systems level software control (at least at first reading).*

			6.4: Communications		To help you achieve this outcome, you should at least consider: a) communications between the train, train crew and control or signalling centres; b) communications between the members of the train crew on-board the train; c) communications between the train crew and passengers; d) passenger emergency alarm facilities; e) provision of information for passengers with either visual or auditory impairments; f) maintenance and monitoring of communication equipment; g) availability of communication systems in degraded operations or emergency situations, including fire; and h) Prevention of malicious interference of any such communication equipment including any software.
			6.5: Powered systems		The electrical and other powered systems and equipment on-board trains should not endanger other systems or people. The systems covered by this principle include on-board electrical, mechanical, air or hydraulic systems or equipment including electric traction current collection, main and auxiliary power systems and all electrical control systems including software. *** g) unauthorised access to, or use of, equipment (including software systems) and the prevention of malicious interference; ****

			6.8: Compatibility with train control system		To help you achieve this outcome, you should at least consider: a) the service braking performance allowed for by the train control system; b) the acceleration and deceleration rates allowed for by the train control system; c) the effects of electro-magnetic interference and the arrangements to be employed to guard against interfering with the train control system; d) the compatibility with train position detection arrangements; e) the data transfer arrangements between the train and the train control system; f) the presentation and availability of train control information at the driving position; g) the implications of transitions between different signalling and train protection systems; and h) whole lifecycle management of on-board signalling and train protection systems.

Page 2: what about public perception, emergency situations where there is not a human being present?

Page 5: what about degraded mode where it is not an emergency but there maybe be operational issues / non-normal operations?

Page 5: Note: Para (8) - Even if PEDs are fitted there remains a risk that someone falls between the platform and the train. Detection of the gap between the train and the platform at the PED door positions should be a requirement. Alternatively, can RS manufacturers introduce gap closers and intelligent sliding steps?

Page 6: Perhaps too hard for this document - but do we need to specify a distance from the train that is clear of obstacles? I believe this will ultimately come down to a trade-off between performance, safety and cost of PED fitment

Page 6: Should you specify the height as well e.g. from platform to (at least) top of doors?

Page 6: does this need a bit more on how this is done looking ahead / in axle counter areas / where the object does not conduct?

Page 6: How would an obstacle be detected on the track, ahead of the train? If the train detects the obstacle, it'll be either because the train's "cow-catcher" has hit it and retracted and/or that the train wheels have gone over it and been displaced vertically. If the object is small enough, the cow-catcher should be able to move it away from the path of the train.

Page 6: Note, if a train "detects" an obstacle by hitting it, it is likely to be derailed. The application of EB only helps to reduce the consequences of a derailment - e.g. if the train derails and moves into the path of an oncoming train at least the combined collision speed will be lower than if the EB had not been applied.

Page 6: Note, there may be circumstances when part of the train might remain within the platform and the rest within a tunnel section. Such a scenario will require tunnel evacuation, using walkways, back to the station, through the platform end doors.

Page 6: and managed safely

Page 6: Does there need to be anything in here about what the train will do for the passengers on the stuck train i.e. announcements? There could be a fair time (and potentially a traumatic situation for some) where there is no human present to help manage the event and the train.

Page 7: can there be an indication of a de-railament to help mitigate the consequence?

Page 7: Again, not sure if it is appropriate but should there be something about what the train does for the passengers on board? Without a human on board to give comfort to people that the situation is under control, you could have a pot of people panicking and making their own decisions to self-evacuate.

Page 7: This cannot be achieved by the driver of a GOA1 train currently. Should there be a "where reasonably practicable" qualification here?

Page 7: Are there any on-board systems available to detect obstacles ahead of the train in the forward direction? The only systems I'm aware of apply the EB once the train has actually hit an obstacle (either displacing a cow-catcher or lifting one or more wheels). There are also track-side

systems/ equipment that are placed at high risk locations such as ahead of tunnel portals/abutments, o/h bridge parapets, deep cuttings etc that detect falling objects but these system either raise an alarm at the OCC or automatically energize the railway. The problem with these latter systems is their poor reliability (frequent false positives) that impact operation performance - e.g. each time the sensors detect a pigeon (say). This lack of reliability will have knock-on safety implications.

Page 7: I am not aware of how this would work but assuming you have some tech that can do this, looking ahead with some time to intervene and mitigate the consequence?

Page 7: Is it necessary to bring the train to a stand if the obstacle is no longer detected?

Page 7: Is the idea that trains will detect obstacles using camera devices? I'm not aware of any such systems currently available on the market.

Page 7: The authorized person(s) must be competent to decide if the train is fit to continue AND if the infrastructure is fit for operations service.

Page 8: Para (14) - Would it ever be acceptable for the doors to open when the train was not stationary? This paragraph could be read as suggesting that it could be in an emergency, which is not defined.

Page 8: Do you need to specify, and on the correct side?

Page 8: It is not always possible to detect the cause of the failure from a quick visual inspection. Especially if there are more complex interlocking issues between the train doors and the platform doors.

Page 8: Manually? So needs a manual function too?

Page 9: Note: some UTO systems around the world have experienced significant RCF/GCC defects associated with the vehicle-rail dynamics of consistent braking and acceleration at the same track locations over a period of time.

Page 9: How do low adhesion times / areas get considered by these systems?

Page 9: Very important to ensure systems allow good voice audibility and clarity and to provide the OCC with adequate CCTV coverage in each carriage.

Page 9: Is there a need for control to be able to be able to monitor live CCTV from the train? This would seem essential in UTO for monitoring passenger behavior, and ensuring passenger security.

Page 9: This goes some way to answering some of my previous questions, but I think there needs to be some great clarity in specifying how / when / frequency of these messages for the different situations where people may require information? Just noted this is partially covered in section below but leaving in for now.

Page 9: The systems available on-board should comprise a mixture of passenger information displays, prerecorded messages and long-line PA.

Page 10: The Operators' SMS could/should include a set of minimum operating requirements, critical asset lists and procedures for emergency special working.

Page 10: Note, many UTO systems around the world build flexibility into their systems by including adequate pocket tracks and turn-backs etc. But these are generally green-field projects, where it is more reasonably practicable for these features to be designed into the system.

Page 10: And appropriate / timely announcements to the passengers on the emergency stricken train.

Page 10: The operations concept for all UTO systems must be based around trains always being brought to a stop at the nearest station, for any type of emergency situation, especially in the case of on-board fires.

Page 10: With appropriate audio / visual confirmation of this action to the passengers.

Page 10: ,

Page 10: Should this be 'operator's' (if it is a singular operator this is referring to) or are there multiple operators being referenced in which case this is correct.

Page 11: Think there needs to be something about the quality / understandability of the technology / link. And the communication capabilities of the person on the end.

Page 11: It is essential that the daily train checks test all these on-board comms systems before trains leave the shed to go into service.

Page 12: The OCC should have full mimic-board visibility of depot and siding train movements.

Page 12: The SIL allocation requirements apply across the whole system, not only depots and sidings. However, worth noting that UTO train shed door opening and closing will also require a high level of safety integrity and reliability.

Page 13: Is route proving to be attended or non attended?

Page 13: Or after severe weather events etc?

Page 13: This is a little vague compared to other sections of the document and it is unclear what is required to meet this requirement. Would a train borne detection system that detects when braking performance is less that expected be sufficient?

Page 13: This answers a previous comment in some ways but I do not know how this would be done.

Page 13: With a commensurate announcement to passengers that this is happening to avoid confusion or them becoming frustrated / taking their own action.

Page 13: The SMS should obviously include plans and procedures for degraded, abnormal and emergency mode operations, including evacuations from tunnels and viaducts.

Page 13: Communications, including CCTV.

Page 14: Para (40) – mentions authorized door opening to an extent where a person could pass through it. Person is ambiguous – would this protect a child or a small dog?

Page 14: What about fires in tunnels and other infrastructure?

Page 14: Should evacuation and escape be a separate section? There are other reasons for considering evacuation and escape other than trains fires e.g. terrorism.

Page 14: Means in terms of the instructions or means in terms of the way in which the doors etc operate?

Page 14: However, the operations concept shall make clear that whenever reasonably practicable, this should always be from a station.

Page 14: Does there need to be something in here about how the stranded train operates to allow passengers to dis-embark once the rescue train gets there?

Page 14: Obviously, the rule book and CMS will set out the arrangements and the competence requirements for this mode of train operation and how how to maintain competence, given that the on-train competent person should only rarely have to do this type of line-of-sight driving. Maintaining route knowledge will also be key for these infrequent occasions.

Page 14: Trackside at all, or not in the area where they would be caught by the obstacle detection?

Page 15: Will there be anything to prevent maintenance and inspection personnel being on the walkway with trains operating?

Page 15: Most UTO systems have alarms from doors that can access the railway connected to the OCC in case an unauthorized person accesses the infrastructure.

Transport for London

From: [redacted]
Sent on: Thursday, March 31, 2022 2:57:48 PM
To: [redacted]
CC: [redacted]

Subject: Consultation on GOA4 UTO, Goal setting principles for Health and safety.
Attachments: Summary of Review comments on ORR GOA4 Principles.xlsx (28.02 KB)

Dear Michele

Please find attached a response to the ORR consultation on behalf of TfL. Our detailed comments on each of the specific clauses in included in the attached excel file. The specific questions asked on the consultation website are detailed below.

1. We have focused the supplement on the issues identified in BS EN 62267:2009 “Railway applications. Automated urban guided transport (AUGT). Safety requirements.”
    1. Do you agree with this approach? **Yes**
    2. If you disagree please provide your reasons.
2. Do you agree with our intention to publish such Factors for Consideration dealing with automated systems operating to the GOA4 principles as a supplement to the existing Goal Setting Principles for Railway Health and Safety? **Yes, but note general comment below in 4**
    1. If you disagree please provide your reasons.
3. If you agree with our approach to publish a supplement, do you believe the factors for consideration developed in the supplement suitably and sufficiently address the operational safety issues associated with safe operation of a train in UTO (unattended train operation) mode. **See detailed comments in attached Excel file. We have only included those clauses which we have comments on.**
4. Do you consider there are issues that **are not included** in our draft supplement that you believe should be included.
    1. If you believe there are such issues please identify them and set out your reasoning in each case. **There is a general observation regarding “transition” and if the principles adequately address how to deal with transition of an existing railway from a level of operation below GOA4 to GOA4 UTO and what provisions may be required for temporary and possible permanent transition boundaries. This also includes dealing with adjacent railways (where historically there is no physical demarcation). We note Mixed depots are specifically covered, but not the same scenario on the running lines.**
5. Do you consider there are issues that **are included** in our draft supplement that you believe should be excluded.
    1. If you believe there are such issues please identify them and set out your reasoning in each case. **See detailed comments against each clause responded to.**

6. Are you aware of any ongoing research, trials, or other innovation work that might change expectations on the reasonable practicability of delivering safety systems to support GOA4 UTO operations? Particularly if the outcome of that work might require modification of our draft factors for consideration.
    1. Please provide details where further information on such work can be obtained. **LU and the Elizabeth line have work underway in this field. We can provide more information on request**

If you have any need for clarifications or follow up, please do not hesitate to contact me
Kind Regards
Ian

Ian Rawlings | Head of Profession - Vehicles | TfL Engineering
Transport for London | Working flexibly
Mobile: [redacted]
E-mail: [redacted]

Comments for Page 8
GOA4 UTO Factors for operation of doors (GPRHS Principles 3, & 6)

Opening doors
14) The doors of a GOA4 train in UTO service may only be enabled for opening (other than in an emergency situation) when the train is stationary, correctly berthed in a station platform and the brakes are applied.

15) A GOA4 train in UTO service must be equipped with systems that confirm this state before doors can be enabled for opening.

#new#) If doors of a train in service are obstructed following activation of the door opening cycle, the system, shall be configured to stop the door opening sequence and reset.

#new#) It shall not be possible for the starting process of the train to be activated or reset either automatically or by human intervention in a manner which permits the train to move during this reset period.

At the Platform
#new#) A GOA4 train operating normally shall be constrained from being able to move as long as doors are detected as being open

#new#) A GOA4 train that is operating in a degraded mode shall be constrained from being able to move as long as doors are detected as being open

Closing doors
~~16) Where a platform is fitted with PEDs, the PEDs shall open before the train doors open and close after the train doors close.~~

17) If ~~either PEDs or~~ the train doors of a train in service are obstructed, and not closed and locked, it shall not be possible for the train systems that enable movement to be activated or reset either automatically or by human intervention, in a manner which permits the train to move. Movement should remain inhibited until the obstacle is no longer detected and train doors~~, and PEDs if fitted,~~ proven closed and locked.

18) If ~~either PEDs or~~ doors of a train in service are obstructed following activation of the door closing cycle, the system, shall be configured to stop the door closing sequence and reset to a doors-open condition.

19) It shall not be possible for the starting process of the train to be activated or reset either automatically or by human intervention in a manner which permits the train to move during this reset period.

20) After a defined number of attempts at reset by the door close process, an alarm shall be raised, and the doors shall remain open until reset by an authorised person. The authorised person shall independently record the cause of the failure of door closing and that it is safe to continue before closing the doors and reactivating the train.

Platforms with PEDs
#new#) Where a platform is fitted with PEDs, the PEDs shall open before the train doors open and close after the train doors close.

Comments for Page 8
GOA4 UTO Factors for operation of doors (GPRHS Principles 3, & 6)

#new#) If PEDs are obstructed (either during opening or closing), it shall not be possible for the train systems that enable movement to be activated or reset either automatically or by human intervention, in a manner which permits the train to move. Movement should remain inhibited until the obstacle is no longer detected and PEDs proven open or closed and locked.

#new#) If PEDs are obstructed following activation of the door opening or closing cycle,the system, shall be configured to stop the door closing sequence and reset.

#new#) It shall not be possible for the starting process of the train to be activated or reset either automatically or by human intervention in a manner which permits the train to move during this PED reset period.

#new#) After a defined number of attempts at reset by the PED door open or close process, an alarm shall be raised, and the doors shall remain open until reset by an authorised person. The authorised person shall independently record the cause of the failure of door and that it is safe to continue to open or close the doors.