

Oliver Stewart
RAIB Recommendation Handling Manager



18 December 2024

Mr Andy Lewis
Deputy Chief Inspector of Rail Accidents

Dear Andy,

RAIB Report: Freight train derailment at London Gateway, Essex on 24 December 2021

I write to report¹ on the consideration given and action taken in respect of the recommendations addressed to ORR in the above report, published on 19 December 2023.

The annex to this letter provides details of actions taken in response to the recommendations and the status decided by ORR. The status of all 3 recommendations is '**Open**'.

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.

Yours sincerely,

Oliver Stewart

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

Initial consideration by ORR

1. All 3 recommendations were addressed to ORR when the report was published on 19 December 2023.
2. After considering the recommendations ORR passed recommendation 1 to VTG Rail, recommendation 2 to GB Railfreight, and recommendation 3 to RSSB 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. ORR also brought recommendations 2 & 3 to the attention of FOCs asking them to co-operate with other FOCs (Rec 2) and RSSB (Rec 3). ORR did not ask these organisations to provide a reply.

Recommendation 1

The intent of this recommendation is to ensure that the vulnerability of the Ecofret 2 triple-wagon to derailment due to longitudinal compressive forces is fully understood and that the risk of this occurring is appropriately controlled.

VTG Rail, supported by Wabtec UK Ltd, should investigate the dynamic behaviour of Ecofret 2 triple-wagons to better understand the operating conditions that result in longitudinal compressive forces acting on these wagons, their behaviour under such forces, and their capacity to resist derailment. This investigation should be used to identify appropriate mitigation measures such as design changes and operating restrictions, and should specifically include consideration of:

- improvements to the bar coupler arrangement
- control of lateral suspension movement
- wagon payload restrictions

(paragraphs 179a.i, 179a.ii and 179a.iii).

This recommendation may also be applicable to other owners or operators of rolling stock made up of freight wagons that are permanently coupled together using bar couplers at both ends.

ORR decision

4. VTG has conducted an assessment of the longitudinal compressive forces (LCF) which act upon the Ecofret2 wagons in a triple formation. The assessment identified three possible derailment mitigations: continue with loading restrictions; increase drawbar length; or increase tare mass by ballasting.
5. Further work on the recommendation by VTG has been paused, subject to the outcome of RSSB work to address rec 3, as this should validate whether the maximum value of 565kN for straight line derailment (SLD) due to LCF is correct. The RSSB work has also been paused pending progress with T1352 (Characterizing Longitudinal Brake Forces and Defining Operational Safe Threshold Limits). We have asked RSSB for an update on progress and expected completion date for T1352.

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

- taken the recommendation into consideration; and
- is taking action to close it

Status: Open.

Information in support of ORR decision

7. On 11 April 2024 VTG Rail provided the following initial response:

Since the publication of the RAIB investigation report into the derailment at London Gateway, VTG have contracted a package of work with Belper Rail Engineering Limited which will allow us to try and determine the longitudinal compressive forces (LCF) which act upon the Ecofret2 wagons in their triple formation under certain known operating conditions and the way in which the wagons behave under these forces.

This work will be completed using the Quasi-static technique which will allow us to compare the current predicted LCF performance of the wagons to any possible/proposed wagon design modifications and quantify any subsequent increase to resistance to derailment. For information, the Quasi-static technique was previously used by VTG to try and determine the LCF acting on the original Ecofret1 wagon pre and post drawbar modification. This technique predicted that the resistance to full derailment for Ecofret1 improved from the original 410kN pre modification to 600kN post modification.

Note: this technique and results were used as the basis for the Ecofret2 during the design and acceptance stages and this work determined that the resistance of Ecofret2 to full derailment was 510kN which is greater than the hypothesised worst-case force of 500kN (VTG) and 451kN (RAIB) during braking so it is still not fully understood even today, as to why the Ecofret2 wagon derailed at London Gateway.

As described in the RAIB report, currently there are no recognised dynamic analysis tools or assessment processes available to industry today which would allow us to fully understand and accurately determine the resistance to derailment for such wagon designs/configurations and neither are there any standards or guidance documents which identify the allowable limits. For this reason, VTG are initially using the Quasi-static technique as this has previously allowed us to successfully compare and predict/estimate LCF under different operating conditions with wagons of original and modified designs.

This in the first instance will provide us with an indication as to what technical modifications may be available and the benefits (increase in resistance to derailment) which they may bring. The timescales for this initial work is estimated to be 4 to 6 weeks but this is dependent on Wabtec releasing some technical information to VTG & Belper Rail Engineering Limited relating to the characteristics of the primary and secondary suspension for the TF20 bogie, for which Wabtec are currently stating is their IPR but we are hopeful that we can get their full support. (Please do not publish any reference to the IPR issues we are facing with Wabtec).

Whilst this work will provide us with some comparisons of standard design vs. proposed modified designs, it is not VTG's intention to progress with any modification work until the work to implement Recommendation 3 has been completed.

We would also like to review the work the RAIB carried out as part of their investigation using a computer model which was partially developed to simulate the longitudinal dynamic behaviour of the train and also the partially developed vehicle dynamics simulation model to represent the complete Ecofret2 triple-wagon. However we feel at this stage these models may be limited in their application because the RAIB were unable to complete & conclude their work using these methods so again we will need to wait until Recommendation 3 has been completed/implemented.

VTG have already engaged with the RSSB and will work closely with them to try and understand the measures which they (and RU's & industry) are proposing to take to implement Recommendation 3. Our initial meeting with the ORR is planned for the 2nd May at which point we will further understand their intentions and timescales. This work will help to inform VTG as to what is the best technical solution as it is anticipated that we will be able to refine & validate our initial work completed using the Quasi-static technique. This will also provide us with some clearly defined limits against which we must comply.

In addition to the above, VTG has issued clear loading instructions to our customer (GB Railfreight) which both we and the RAIB are confident mitigate any further risks of derailment of Ecofret2 due to train dynamics and LCF which exceed the derailment resistance of the Ecofret2 wagon configuration in its current form. It is predicted that the loading instructions alone, increase the derailment resistance of the Ecofret2 wagon to between 850kN and 930kN which is almost double the worst-case LCF during braking.

8. On 16 September 2024 VTG Rail provided the following update:

*VTG eventually managed to overcome the IPR issue with Wabtec and obtain all the information required to carry out the assessment work, this is now complete. The derailment assessment was carried out to allow us to understand how we could **possibly** close out Recommendation 1. For information, please find attached a copy of the assessment report.*



FWA-R25 Issue B
SLDLCF summary.pdf

I can further advise that now VTG have completed this assessment work, that we are going to 'pause' until the work that is required to close out Recommendation 3 is concluded as this should validate our current thoughts on whether the maximum value of 565kN is correct or whether it could be more or possibly less.

I trust this information is useful and demonstrates how we are progressing with Recommendation 1, I can also advise we are helping and providing information to

GBRF in relation to Recommendation 2 and we are also on the Steering Group and Working Group for Recommendation 3.

Recommendation 2

The intent of this recommendation is to ensure that freight trains are configured and operated in such a way that the longitudinal compressive forces generated in service are not sufficient to cause derailment.

GB Railfreight, working where appropriate with relevant industry working groups, should review the risks associated with longitudinal train dynamics when operating freight trains. It should use this to inform the development of instructions, best practice guidance and training for operations staff so that longitudinal compressive forces are not generated that exceed the derailment resistance of the wagons forming the train. This work should include consideration of:

- the management of brake application and traction demands
- the effects of the train air brake system configuration, setting, degradation and operation
- the control of slack and pre-load in screw coupling and buffer arrangements
- the need for train configuration and payload restrictions and limits

(paragraphs 179b.i and 179b.ii).

This recommendation may also be applicable to other freight operating companies

ORR decision

9. GBRf has provided a plan addressing each of the four points in the recommendation:

- GBRf is reviewing the guidance provided to train drivers (General Operating Appendix) on management of brake applications and traction demands to include consideration of LCF.
- In considering the effects of the train air brake system configuration, setting, degradation and operation, GBRf considered using Class 6 (goods) timing instead of Class 4 (passenger) timings for intermodal trains. GBRf concluded the potential performance impact and the requirement for a Rule Book deviation made use of Class 6 timings not viable.
- GBRf is reviewing control of slack and pre-load in screw coupling and buffer arrangements on UICX intermodal vehicles, the findings of which will inform the standards, training, briefing and staff competence assessment criteria.
- GBRf has revised its loading standards to ensure where possible that trains are loaded from front to back, addressing longitudinal forces.

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

- taken the recommendation into consideration; and

- is taking action to close it

Status: Open.

Information in support of ORR decision

11. On 9 May 2024 GB Railfreight provided the following initial response:

Whilst we believe that GBRf's actions in respect of the incident were appropriate and reasonable in all the circumstances, and were not causative in respect of this incident, GBRf welcomes the opportunity to further improve safety and will therefore take all steps necessary to comply with the recommendations as set out within the Report.

Recommendation 2 of the Report requires GB Railfreight, working where appropriate with relevant industry working groups, to review the risks associated with longitudinal train dynamics when operating freight trains. As a result of the review, GB Railfreight should develop appropriate instructions, best practice guidance and training for staff so that longitudinal compressive forces are not generated that exceed the derailment resistance of the wagons forming the train.

In reviewing the risks, the Report specifically raised 4 areas of focus. Taking each of those areas in turn, we set out the measures we propose to take in respect of the same:

1. Management of Brake Application and Traction Demands

GB Railfreight proposes to address this area as follows:

- *GBRf will review the practical handling guidance for GBRf train drivers (Train Managers) on braking techniques and include the definition of longitudinal compressive forces. The guidance and operating procedures will also be amended.*
- *The amended practical handling guidance on braking techniques will be incorporated into GB Railfreight's supplementary operating instructions (General Operating Appendix) and driver training materials. They will also be incorporated through the standardisation of operating procedures for mentors and disseminated through briefings and ongoing training and assessment. This is to include the following stages:*
 - *Analysis of the above available material and test data;*
 - *Review of Train Driver (TM's) training and briefing material, assessment criteria and current standards;*
 - *Review and amendments to ongoing competence management system criteria (EDS); and*
 - *Development and creation of new/revised operating procedures detailing professional driving techniques.*
- *GBRf will review of traction protocols, as outlined in GBRf operating instructions, which will be reinforced by specific instructions dependant on traction type, environment, train length etc.*
- *Through assessment feedback data, verification, and operational manager workshop feedback, GBRf can then determine the effectiveness of the measures introduced.*

- *It is expected that the timeline for the implantation of this paragraph 1 will be as follows:*
 - *12 weeks, for the available material and test data analysis;*
 - *12 weeks for the review and creation of new material to support the training, briefing and assessment required; and*
 - *24 weeks to ensure the successful delivery of all of the above through assessment analysis and feedback.*

2. Effects of the train air brake system configuration, setting, degradation and operation

GB Railfreight proposes to address this area as follows:

- *Currently, as with all FOCs, GB Railfreight is required to use the 'Passenger' setting in respect of Class 4 intermodal trains. Notwithstanding this, GB Railfreight will carry out a review of its Class 4 intermodal trains and see if timings can be reduced to Class 6 to allow Goods timings to be operated as opposed to 'passenger'. Where there is a difference, GBRf would present the findings to RSSB and seek a deviation from the rule book requirement.*
- *To try and improve brake releases GBRf will review the braking systems on new build vehicles to seek an improved brake propagation timings where possible.*
- *It is expected that the timeline for the implementation of paragraph 2 to be as follows:*
 - *12 Weeks, from the completion of the available material and test data analysis.*

3. Control of slack and pre-load in screw coupling and buffer arrangements

GB Railfreight proposes to address this area as follows:

- *An examination of UIC intermodal vehicles, akin to the pertinent train, has already been conducted on 3 April 2024.*
- *The findings from the session referred to above will inform the standards, training, briefing and ongoing competence assessment criteria for all operational staff, trainers and assessors.*
- *We expect the timeline for the implementation of paragraph 3 to be as follows:*
 - *12 weeks, from the completion of the available material and test data analysis; and*
 - *24 weeks thereafter to ensure the successful delivery of all of the above through assessment analysis and feedback.*

4. Need for train configuration and payload restrictions and limits

GB Railfreight proposes to address this area as follows:

- *GBRf's Loading Standards standard has already been revised and reissued to ensure where possible that trains are loaded from front to back, addressing longitudinal forces. The updated loading pattern has been approved, with corresponding updates made to planning systems and operating procedures.*
- *We note here that no such payload restrictions existed at the time of the incident and that GB Railfreight had been working in accordance with VTG's loading guidelines in respect of the wagons. Following the identification and allocation of resources, GB Railfreight would look to commence fully with items 1, 2, and 3 by no later than 30/06/2024.*

12. On 9 December 2024 GB Railfreight provided the following update:

Regarding Point 1 – We are currently conducting a full review of the GOA which is due release in January 2025. However, specific attention has been given to the modules that have a direct impact on how a train is marshalled and handled. As such, the following have been prioritised – Module A1 Coupling and Uncoupling, and the Professional Driving Modules of B1 to B5.

Regarding Point 2 – After careful consideration GBRf have concluded that this is no longer viable. The reason for this is the performance issues potentially incurred by the re-classification of Class 4 intermodal services for the duration of the trial and the requirement to apply for a Rule Book Deviation with respect to allowing a Class 4 train to run in Goods timings. There is a view that long term this would not be supported.

Regarding Point 3 – As per Point 1, this is well underway in respect of our operating instructions (GOA), and we continue to develop our understanding of how a driver can influence the effects of longitudinal compressive forces and give guidance on how this is best managed. This is supported by our Industry Sponsorship of the RSSB research group T1352 – Characterising longitudinal brake forces and defining operational safe threshold limits, which commenced last week.

Recommendation 3

The intent of this recommendation is to establish a robust and pragmatic industry-wide framework for managing the risks of freight train derailments due to longitudinal train dynamic effects.

RSSB working with the freight operating companies should initiate a programme of work to raise the rail industry's understanding of longitudinal compressive forces in freight trains and the associated derailment risk. This work should incorporate:

- identifying, developing and validating analysis tools and techniques
- determining and validating relevant derailment criteria

- reviewing and developing a suitable derailment resistance assessment process
- identifying limits for longitudinal compressive force that can be generated in operational service, and the practical means by which it can be assured that these are not exceeded.

RSSB should develop a timebound programme for the implementation of any appropriate changes identified, such as new or revised standards, guidance and operating rules

ORR decision

13. RSSB has been liaising with VTG, GBRf and Huddersfield University to consider a project to improve understanding of LCF in freight trains and its place in the risk profile.

14. RSSB has started research project T1352 (Characterizing Longitudinal Brake Forces and Defining Operational Safe Threshold Limits) which is expected to be completed in 2025, although RSSB have not yet provided a specific timescale. The aim of the research project is to improve understanding of longitudinal compressive forces in freight trains and the associated derailment risk. The research project is closely linked to work being done to address recommendations 1 and 2.

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

- taken the recommendation into consideration; and
- is taking action to close it

Status: Open.

Information in support of ORR decision

16. On 8 April 2024 RSSB provided the following initial response:

RSSB should develop a timebound programme for the implementation of any appropriate changes identified, such as new or revised standards, guidance and operating rules (paragraph 180a).

Having discussed the recommendation internally, I am pleased to report that RSSB accepts the recommendation. We are currently consulting with industry partners, including the University of Huddersfield, with a view to scoping a project to raise GB rail's understanding of longitudinal compressive forces in freight trains and its place in the risk profile. We will need to triangulate this with ongoing research, such as project T1301, which looks at improving freight train timetabling, and so on. We are also planning, with duty holders, to work with those addressing Recommendations 1 and 2, in order to cover as many aspects of those recommendations as efficiently as possible.

Updates and target completion dates will be provided in our regular monthly recommendations tracking updates.

17. In November 2024 RSSB background information for research project T1352 was added to the RSSB website:

This work is in response to recommendations 3 of London Gateway RAIB report (RAIB Report 14/2023), and will assist the responses to recommendations 1 and 2.

It will provide the industry with understanding of longitudinal compressive forces in freight trains and the associated derailment risk, by:

- 1. reviewing existing analysis tools and techniques to assess the forces*
- 2. determining and validating relevant derailment criteria*
- 3. developing suitable derailment resistance assessment processes*
- 4. identifying limits for longitudinal compressive force that can be generated in operational service*
- 5. identifying the practical means by which it can be assured that these are not exceeded.*