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3 April 2012

Ms Carolyn Griffiths  
Chief Inspector of Rail Accidents  
Rail Accident Investigation Branch  
Block A, 2nd Floor  
Dukes Court  
Dukes Street  
Woking GU21 5BH

Dear Carolyn

**Runaway and Collision of a Road-Rail vehicle near Raigmore, Inverness, on 20 July 2010**

I write to report<sup>1</sup> on the consideration given and action taken in respect of the recommendations addressed to ORR in the above report, published on 11 July 2011 2011.

The annex to this letter provides details of the consideration given/action taken in respect of each recommendation where recommendations 1 and 2 have been implemented<sup>2</sup>, recommendation 4 is being implemented and recommendation 3 is in progress.

We do not propose to take any further action in respect of recommendations 1, 2 and 4 unless we become aware that any of the information provided becomes inaccurate, in which case I will write to you again<sup>3</sup>. We expect to update you on progress with recommendation 3 by 30 September 2012.

We expect to publish this response on the ORR website on 16 April 2012.

Yours Sincerely

Chris O'Doherty

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

<sup>2</sup> In accordance with Regulation 12(2)(b)(i)

<sup>3</sup> In accordance with Regulation 12(2)(c)



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## **Initial Consideration by ORR**

All recommendations contained in the report were addressed to ORR when RAIB published its report on 11 July 2011.

After considering the report / recommendations we passed:

- recommendations 1, and 2 to Liebherr-Great Britain Ltd who provided its responses on 9 September 2011; and
- recommendation 3 and 4 to Network Rail who provided its response on 6 September 2011.

Details of measures being taken to implement these recommendations are provided below.

ORR also brought the report and recommendations to the attention of: London Underground Limited, London Overground Infrastructure (Rail for London), High Speed 1, Manchester Metrolink, Nexus, Docklands Light Railway and the Heritage Rail Association (to bring it to the attention of its members) as it was concluded that there are equally important lessons for them.

As part of the investigation, working jointly with RAIB ORR commissioned Health and Safety Laboratory (HSL) to provide technical support to the investigation, specifically in the area of control systems. The report produced by HSL was used by RAIB in coming to its conclusions.

## **Recommendation 1**

*The intention of this recommendation is that RRVs of the type involved in the accident should be modified to prevent the circumstances arising in the future.*

Liebherr-Great Britain Ltd should undertake modifications to the type 1033, and similar RRVs (those RRVs with this type of interlocking design), to avoid the scenario where a machine that is in a free-wheel state is prevented from raising or lowering either rail axle. This should be achieved without the need for the machine operator to override the interlock function

### **Details of steps taken or being taken to implement the recommendation**

1. Liebherr-Great Britain Ltd in its response of 9 September 2011 advised ORR that:

*Liebherr confirm that a secondary independent proximity switch has been designed, tested and approved.*

*The proximity switch confirms the existing potentiometer the position of the rail gear. This eliminates as far as reasonably practicable any and all risks of a 'free on rail' situation occurring.*

*Liebherr has already undertaken this product update to all A900CZW-1033 machines affected and introduces this additional safety feature to all ongoing A900czw-1384*

*models. The briefing document has already been circulated to the ORR and Network Rail dated 2 August 2011 fully detailing these changes and associated risk assessments in commercial confidence.*

*The product update was fully endorsed by Network Rail and the ORR prior to successful implementation.*

## **ORR Decision**

2. After reviewing all the information received from Liebherr-Great Britain Ltd ORR concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Liebherr-Great Britain Ltd has:

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

ORR will write to RAIB again it becomes aware that the information above is inaccurate.

**Status: *Implemented***

## **Recommendation 2**

*The intention of this recommendation is to improve the ergonomics and labelling of the RRV controls.*

Liebherr-Great Britain Ltd should undertake a review of the design of the human-machine interface on the type 1033, with particular reference to:

- ergonomics/labelling of buttons; and
- counter-intuitive operating procedures and specific operation of the HA and VA controls in the RRV machine cab; [VA: front chassis lock/unlock; HA: rear chassis lock/unlock]

and implement the findings of this review on existing machines, and amend its procedures to require an ergonomic assessment to be included in the design process

## **Details of steps taken or being taken to implement the recommendation**

3. Liebherr-Great Britain Ltd in its response of 9 September 2011 advised ORR that:

*As part of the product updates undertaken under recommendation 1, Liebherr has fitted additional labels to the operator's panel to assist with interpretation of symbols, specifically representing front and rear axle operations.*

*In addition, new software has been deployed such that rail axle selection is now achieved by a 'Toggle Function' between the front and rear switch. When the switch light is 'ON' that axle is locked and the other (unlit) axle is active. This removes any possible misunderstanding of the operator as to which axle they have selected.*

*Leibherr believe that proper and comprehensive operator training should support the changes made to the operation of the rail gear and this formed part of the briefing already undertaken with the fleet owners concerned.*

*However, Liebherr support adequate training and on-going assessment of machine operators by the equipment owners. Employing a different symbol to those currently deployed for all machine operations is unlikely, in Liebherr's opinion, to remove or reduce the likelihood of operator error.*

*Leibherr will investigate and consider if modification of the operator screen is required on any future machine editions replace the temporary signage currently fitted. This would form part of the ergonomic assessment already undertaken on a product, which has global distribution.*

### **ORR Decision**

4. After reviewing all the information received from Liebherr-Great Britain Ltd and confirming that it has re-labelled machine controls in English, ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Liebherr-Great Britain Ltd has:

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

ORR will write to RAIB again if it becomes aware that the information above is inaccurate.

**Status: *Implemented***

### **Recommendation 3**

*The intention of this recommendation is that an appropriate safety integrity level (SIL) for the control systems of RRV machines should be established and implemented on future builds.*

Network Rail should undertake a review of the safety requirements that it specifies for RRVs, with the objective of determining appropriate safety integrity level (SIL) for any safety functions that are required within the control systems of the machine, and implementing verification and approval arrangements that are appropriate for this SIL.

This should, among other things, provide assurance that potential failure modes of interlocks, and similar safety systems, have been identified and suitably mitigated (with reference to actions taken following the RAIB's RRV Class Investigation recommendations 1 & 2.

### **Details of steps taken or being taken to implement the recommendation**

5. Network Rail in its response of 6 September 2011 advised ORR that:

### **Initial review of requirements**

*Network Rail mandates that all equipment of this type should be compliant with RIS-1530-PLT [Rail Industry Standard for Engineering Acceptance of On-Track Plant and Associated Equipment]. Currently this standard requires via the clauses noted below;*

*5.7.4.1 The design shall be such that there shall be no credible single point failure that would cause the system to fail unsafe (that is, allow the corresponding movement to continue or commence). Any fault, including unacceptable differences in signals, shall cause the system to fail to a safe condition.*

*They shall be duplicated. Systems using sensors or other types of switch shall either be self-verifying at start-up or shall have continuous monitoring of the signals from the sensors or switches for out-of-range conditions.*

*or*

*As an alternative to duplication of sensors and switches, an arrangement of a single sensor or switch may be used, provided there is a permanent monitoring of the plausibility of its signals by means of other sensors or switches not of the same safety device.*

*5.10.6 Safety systems shall be designed, as far as reasonably practicable, to be failsafe and tamperproof. The manufacturer shall demonstrate that credible failure modes have been considered.*

### **Determination of SIL Level, Planned completion by May 2012 which includes some provision for a small scale change to the RIS.**

*Network Rail will work with the RSSB [Railway Safety Standards Board] who publish RIS-1530-PLT on behalf of the Rail Industry to review these clauses and whether specifying a SIL is appropriate (it may be better to stipulate that SIL or a similar process must be used and further define the minimum severity of outcome of a single event) and the role of the VAB in assessing compliance.*

*Timescale: 31 May 2012*

6. Network Rail in its updated response of 21 November 2011 advised ORR that:

*The nature of the work that we will be undertaking with RSSB will centre on the use of SIL rated components and how these might be used within a system.*

*We discussed the rationale behind our original response with ORR in a meeting on the 15th November 2011.*

*In summary, our rationale is that by stating SIL ratings, we need to be careful to avoid people buying individual components that carry a SIL rating e.g. ECU's, Sensors etc. and then combining them into a system assuming that the overall SIL of the system will be defined by the individual components.*

*The nature of our response was to try and ensure that designers and manufacturers followed SIL or another appropriate fault tree analysis such that system safety was the focus.*

*To support our discussions with RSSB, ORR has committed to arranging a meeting with a representative from HSL [Health and Safety Laboratory], which is the laboratory that was involved in the investigations into Raigmore, so that we can make sure that the desired result can be achieved.*

## **ORR Decision**

7. ORR did not consider that the initial response from Network Rail adequately addressed the recommendation.

8. ORR therefore wrote to Network Rail on 17 October 2011 asking it to provide a better understanding of how it is giving consideration to specifying Safety Integrity Levels for Road Rail Vehicles (RRVs,) and therefore asked that it provided ORR with more information detailing the review process it will be carrying out with RSSB including the aims, objectives and milestones for the review.

9. Network Rail responded on 21 November 2011 with the information provided above. To ensure his recommendation is fully addressed and Network Rail's proposed solutions are robust ORR has commissioned further technical support from HSL. ORR, Network Rail and HSL will be meeting on Friday 23 March to progress this work..

10. After reviewing all the information received from Network Rail ORR concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

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

ORR will write to RAIB again if it becomes aware that the information above is inaccurate.

**Status: *In progress*** – to update RAIB by September 2012

## **Recommendation 4**

*The intention of this recommendation is that the role of the machine controller, in respect of the deployment of the rail wheels of an RRV, should be clarified.*

Network Rail should undertake a review of the role of the machine controller for all types of RRV during on and off-tracking, with particular emphasis on whether it is necessary for the controller to advise the machine operator on whether the rail wheels of the RRV are fully deployed (with reference to the RAIB's RRV Class Investigation recommendation 2).

This review should take into account the potential for operator error and/or the malfunction of the machine (paragraph 205).

## **Details of steps taken or being taken to implement the recommendation**

11. Network Rail in its response of 6 September 2011 advised ORR that:  
*Review of existing training materials used for Machine Controllers & Machine Operators is complete.*

*Updates to the relevant training packages in line with the requirements of recommendation J1.2 from the staff injury incident at Ashby will be extended to cover the intent of recommendation 4.*

*This will be combined with changes being made to the current Competence & Training in On Track Plant Operation standard, NR/L2/CTM/025 [Competence & Training in Track Plant Operation], which is currently due for release in December 2011.*

*It is anticipated that a roll out period of 6 months will be required after this time to enable compliance, therefore target timing is set as 30 June 2012.*

*Timescale : 31 June 2012*

12. Network Rail in its updated response of 21 November 2011 advised ORR that:

*The governing standard NR/L2/CTM/025 - machine operator competence, is being re-written into NR/L2/CTM/224, which covers Machine Operator, Machine / Crane Controller and lift planners, and will address the competence elements of these personnel. This is scheduled for a compliance date of September 2012.*

*Out of this standard, training modules will and are being reviewed through biannual reviews and the interface and communication between the Machine Controller and Machine Operator for on tracking machines and the deployment of rail axles is part of this process.*

## **ORR Decision**

13. ORR did not consider that the initial response from Network Rail adequately addressed the recommendation.

14. ORR therefore wrote to Network Rail on 17 October 2011 asking it to clarify what the outcomes of the review of the machine controller role were, and what changes are being made in the machine controller role and the associated training packages. ORR also asked for sight of the outcomes of the review; including reasoning and conclusions. The response received on 21 November 2011 is included above. ORR is aware that Network Rail have implemented a programme to retro-fit direct acting rail wheel brakes to Type 9b RRVs

15. After reviewing all the information received from Network Rail ORR concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

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

ORR will write to RAIB again if it becomes aware that the information above is inaccurate.

**Status: *Network Rail taking action to implement the recommendation***