

MINISTRY OF TECHNOLOGY AND INDUSTRY TRANSPORTATION SAFETY BUREAU

FINAL REPORT (EXTRACTION)



2022-0381-5 (HU-10217)

Railway accident / Level crossing accident Mindszent - Hódmezővásárhelyi Népkert, 5th April 2022

Translation

This document is the translation of Points 1, 5 and 6 of Hungarian version of the Final Report. Although efforts have been made to translate the mentioned parts of the Final Report as accurately as possible, discrepancies may occur. In this case, the Hungarian Final Report is the authentic, official version.

Basic principles of the safety investigation

The purpose of the safety investigation fulfilled by Transportation Safety Bureau (TSB) as National Investigation Body of Hungary is to reveal the causes and circumstances of serious railway accidents, railway accidents and railway incidents and propose recommendations in order to prevent similar incidents. The safety investigation is not intended to examine and determine fault, blame or liability in any form.

The findings of the safety investigation are based on an assessment of the evidence available and obtained by TSB in the course of the investigation, taking into account the principles of a fair and impartial procedure. In the Final Report, the persons involved in the occurrence shall be referred to by the positions and duties they had at the time of the occurrence.

The Final Report shall not have binding force and no appeal proceedings may be initiated against it.

This safety investigation has been carried out by TSB pursuant to relevant provisions of

- Act CLXXXIV of 2005 on the safety investigation of aviation, railway and marine accidents and incidents;
- Commission Implementing Regulation (EU) 2020/572 of 24 April 2020 on the reporting structure to be followed for railway accident and incident investigation reports;
- in the absence of other related regulation of the Act CLXXXIV of 2005, the TSB conducts the investigation in accordance with Act CL of 2016 on General Public Administration Procedures.

Act CLXXXIV of 2005 is to serve compliance with Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety.

The competence of the TSB is based on Government Regulation № 230/2016. (VII.29.) on the assignment of a transportation safety body and on the dissolution of Transportation Safety Bureau with legal succession.

The safety investigation is independent of other investigations, administrative infringement or criminal proceedings, as well as proceedings initiated by employers in connection with the accident or incident.

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1. SUMMARY

On 5 April 2022 at 6:50 a.m., the passenger train № 32610, consisting of a Series 117 motor train, collided with a van in the crossing protected with the (serviceable) warning light system № AS187 between Mindszent and Hódmezővásárhely Népkert stations.

As a result of the incident, the train derailed and overturned on its side; 5 people died in the road vehicle and 2 people suffered serious injuries. On board the train, 4 people suffered serious injuries and had 11 minor injuries.

The occupants of the train were able to leave the derailed vehicle more than 20 minutes after the incident only, partly with external assistance.

The IC found that the traffic light had been working properly at the time of the incident, and the driver of the road vehicle entered the crossing despite the traffic lights' prohibitive aspect.

It was also found that there are unsecured parts in the passenger compartment of the railway vehicle that could cause injury to passengers if the vehicle derails or overturns; and that the possibility of escape is limited because there are no means of opening doors, windows and roof vents in an emergency, or, partially, they are not even designed as escape routes.

TSB issues a safety recommendation relating to a review of the crossing and possible modification of the design of the rolling stock.

4. ANALYSIS OF THE OCCURRENCE

4.2 Vehicles and technical equipment

4.2.5 The passenger compartment of the railway vehicle

The accident caused the rolling stock to derail and overturn. In the passenger compartment of the vehicle, the IC found several parts displaced from their installation positions, such as

- the covers of the mounting holes in the floor, which have sharp, angled edges, fell between the seats (Figure 1);
- oil was leaking into the passenger compartment through some mechanical openings that opened during the accident, and the oil must have been at a high temperature due to the engine and propulsion system;
- the driver's cab's door;
- the seat pans of two seats, and;
- a number of smaller parts and accessories.



Figure 1: Mounting holes in the floor, and loose covers

These parts could have caused injury to passengers or aggravate injuries they suffered from other causes.

The covers built into the floor cannot be fixed, i.e. their displacement is a design feature. The seat covers can be fixed, i.e. their displacement is a maintenance and operational deficiency.



Figure 2: Location of the displaced parts and passengers: red circle: seriously injured, orange circle: slightly injured; green circle: not injured orange ring: not identified, 3 of them lightly injured, 1 of them not injured banded objects, arrows: displaced vehicle parts

4.2.6 The railway vehicle from the aspect of passenger evacuation

Passengers must leave an overturned vehicle sooner or later, the injured must be rescued, and in extreme cases, if there is a fire in the vehicle (which many passengers said they feared would happen), a quick escape is a lifesaver. In the present situation, the evacuation of the occupants was completed 22 minutes after the collision at the earliest.

Passengers may have several options for leaving an overturned vehicle:

a) access doors

The access doors then faced up: a passenger climbed out through the rear door shortly after the collision, and then, partly with his help, a few more passengers climbed out through the other door. This involved climbing upwards into the passenger compartment of the vehicle. A prerequisite was to open the door, but

- a. the necessary emergency release is located under a pane of glass to be broken (and there is no means of breaking it on the vehicle), and
- b. it is also made more difficult by the heavy weight of the door panel.

The use of the emergency release was not necessary this time because the accident caused the vehicle's air system to be vented, thus eliminating the air pressure that was holding the door closed.

b) side windows

The side windows also faced upwards, so they were also accessible by climbing up in the passenger compartment, provided that

- a. the material and structure of the glass can be broken: that condition was met,
- b. and there is a means to break them: however, this vehicle is not equipped with such means (an emergency hammer).

This escape route was not used this time.

c) roof vent

It was on the side of the overturned vehicle, which would have provided the easiest exit compared to the previous solution. However, the roof vent design does not allow the removal of the cover in a way familiar from buses. The opening was therefore finally cleared by the disaster management staff.

d) front windows (windscreens)

Although they are relatively easy to reach when the vehicle is lying on its side, they are designed to protect the driver from larger objects that hit the vehicle while it is moving, even at 80 km/h, and therefore they are very difficult to break through using manual means. In the present situation it took between 6 and 12 minutes using a pickaxe. Several passengers eventually got out of the vehicle this way, but only after a long time.

This is why this option is not a real, viable rescue route – while, paradoxically, it is the route through which most people were now evacuated.

Overall, the vehicle is not suitable for passengers to get out easily on their own if it overturns, they can only rely on properly equipped external helpers. In the most serious case (fire), this poses an immediate risk to their lives.

4.2.6.1 Solutions applied

Similar vehicles are also in operation on the Czech rail network, therefore TSB has contacted the Czech railway accident investigation body. According to the information received, the upgrading of the rolling stock included the following measures in order to meet modern safety requirements

- the access doors were significantly redesigned, with the addition of a more easily accessible emergency opening;
- a window on each side is fitted with breakable glass designed for escape and the passenger compartment is fitted with window-breaking hammers (Figure Figure 3).



Figure 3: modernisation of similar vehicles in the Czech Republic

Regarding the modernisation of the doors, the IC notes that it could be justified by the poor protection of the existing structure against the closing problems of the external side doors (see the accidents in Rátka in 2012 and 2013¹).

¹ TSB occurrence numbers: 2012-0423-5 and 2013-0667-5

5. CONCLUSIONS

5.1 Summary

5.1.1 Direct causes

Acts, mistakes, events or conditions or a combination thereof the elimination or avoiding of which could probably have prevented the accident or incident:

a) the driver of the road vehicle entered the level crossing despite the flashing red light of the well-functioning warning light system.

5.1.2 Indirect causes

Acts, mistakes, events or conditions which influenced the occurrence by increasing its probability, accelerating the effects or the severity of the consequences, but the elimination of which would not have prevented the occurrence:

- a) the unfavourable position of the sun made the checking of the warning lights difficult (but not impossible by their design);
- b) the unfavourable forces of the collision caused the railway vehicle to derail and turn over;
- b) parts have been released in the passenger compartment of the overturned railway vehicle, partly due to a design defect and partly due to a maintenance-operation defect (4.2.5).

5.1.3 Systemic factors

Causal or contributing factors of organisational, management, social or regulatory nature which are likely to have an effect on similar or related occurrences, particularly including regulatory framework conditions, the design and use of the safety management systems, the skills of the personnel, the procedures and maintenance:

a) the design of the railway vehicle does not allow for rapid evacuation/rescue of passengers from the wreck (4.2.6).

5.2 Actions taken

On 9 May 2022, MÁV Zrt. applied to the Csongrád-Csanád County Government Office for a change in the method of protection of the level crossing, specifically the installation of a lifting barrier.

5.3 Additional notes

Factors that are not related to the occurrence of the incident but are risk factors:

a) in the days after the incident, one of the reduced visibility triangles at the level crossing was no longer unobstructed, due to foliation.

5.4 Proven procedures, good practices

No factor to reduce the consequences of the incident or avoid a more serious outcome was been identified by the IC.

5.5 Lessons learnt

The incident provides a lesson that, although avoidance is based on the need for drivers to drive in a careful and orderly manner,

- the use of warning lights equipped with a lifting barrier can help ensure careful driving;
- and the severity of the consequences of the events that occur will be influenced by the ease and speed with which the injured can be rescued from the derailed vehicle, especially if, in the worst case, additional hazards such as fire (4.2.6) also occur.

6. SAFETY RECOMMENDATION

6.1 BA2022-0381-5-01

During the inspection, the IC found that the view to the railway track is not ensured in the area of Mindszent settlement, at the level crossing in the railway section 187, during the foliation period, as required by Decree 20/1984 (XII. 21.) of the Ministry of Transport.

number: BA2022-0381-5-01

addressee: Csongrád-Csanád County Government Office

responsible for introduction: MÁV Zrt. and Csongrád-Csanád County Government Office

> TSB recommends Csongrád-Csanád County Government Office to review the construction of the railway crossing in section 187 on the Tiszatenyő-Szentes-Hódmezővásárhely railway line and to take the necessary measures to ensure visibility of the railway track as required by law.

By adopting and implementing this recommendation, it will be possible to ensure that drivers of road vehicles have the opportunity to ensure safe passage even in the event of a failure or poor visibility of the warning lights.

6.2 BA2022-0381-5-02

During the investigation, the IC found that the passenger compartment floor of the Series 117 (Bzmot) motor train sets had unsecured and sharp, pointed-edged covers which, if the vehicle derailed and overturned, could cause injuries to passengers if they were dislodged; and could allow hot and flammable materials to enter the passenger compartment from the engine compartment.

number: **BA2022-0381-5-02**

addressee: Railway Authority Division, Ministry of Technology and Industry

responsible for introduction: MÁV-Start Zrt.

The TSB recommends that the technical certificates for the 117 series (Bzmot) motor vehicles be reviewed and, if necessary, amended to ensure that there are no unsecured parts in the passenger compartment that could cause injury to passengers if the vehicle derails or even turns over.

By adopting and implementing this recommendation, it is possible to avoid the risk of passenger injuries being worsened by loose parts of the vehicle in the event of a derailment accident.

6.3 BA2022-0381-5-03

During the investigation, the IC found that the rescue or escape of passengers from the Series 117 (Bzmot) motor train set and its trailers is difficult: the roof hatch cannot be opened, and there is no means of breaking the glass covering the emergency doors of the side windows and access doors.

number: BA2022-0381-5-03

addressee: Railway Authority Division, Ministry of Technology and Industry

responsible for introduction: MÁV-Start Zrt.

The TSB recommends that the technical approvals of the Series 117 (Bzmot) motor vehicles and their trailers be reviewed and, if necessary, amended to ensure that the vehicles are fitted with the necessary emergency exits (doors and windows that can also be used as emergency exits) and that the vehicle is equipped with the necessary accessories.

If this recommendation is adopted and implemented, passengers in an accident with similar consequences can leave the vehicle more quickly, and can be rescued and receive medical care sooner.