MINISTRY OF
CONSTRUCTION AND TRANSPORT
TRANSPORTATION SAFETY BUREAU

FINAL REPORT (EXTRACTION)

2023-0812-5
(HU-10441)

Railway accident / Derailment
Jánoshegy - Szépjuhászné, 14th August 2023

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 14 August 2023, at 13:25 MÁV Zrt. Széchenyi-hegy Children's Railway, the front bogie of the front wagon of train № 30123 derailed in section 49+70 between Jánoshegy and Szépjuhászné stations. There were no personal injuries.

On 1 September 2023, at 15:20, the first bogie of the second wagon of train № 30111 derailed at the same place. There were no personal injuries.

The investigation found no fault in the passenger wagon involved in the first derailment.

The geometry of the railway track was within the operational values but close to the limit. The derailment was caused by the roughness of the worn rails and the design of the track structure. The track geometric limits are given in outdated and insufficiently detailed instructions.

Spots of excessive vertical rail displacement in the track can remain hidden and cannot be measured by the track measurement tools used. The track maintenance organisation cannot adequately perform the track maintenance tasks of the Széchenyi-Hegy Gyermekvasút due to its asymmetric tasks (maintaining a busy, internationally important railway station alongside this railway line) and lack of resources.

The TSB issues safety recommendations on track measurement methods and the track maintenance organisation.

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 wheel load/guiding force ratio of the vehicles concerned reached a critical value at the moment of derailment, because:
   - at the point of derailment, the rate of change in gauge and the change in arc radius caused a large angle of attack and a high guiding force demand at the point of jointing;
   - friction between the rail and the flange was high, because the inner contact surface of the outer rail thread was rough;
   - a heavy rail system is installed in a small radius of curvature and offset, which has contributed to the development of out-of-limit plane distortion at the joints.

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) with the (unloaded) track measurement technology used, the spots of excessive vertical rail displacement that occur cannot be detected.
b) during the second derailment, the wagon was more sensitive to plane distortions, due to lateral loads.

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) complex and asymmetric organisation and limited resources are available for track maintenance;
b) the maintenance of narrow-gauge railway track is based on outdated rules, and the safety recommendation previously issued by the TSB was not followed by actions.

5.2 Actions taken

MÁV Zrt. commented on the draft final report, saying that “in September 2023, the competent Directorate General for Track Maintenance prepared a comprehensive 11+3-point operational safety proposal package for the Children’s Railway, including the renewal of the track supervision and diagnostics system.”

11 of the proposals are maintenance activities (sleeper replacement, ballast replacement, track control, road crossing renovation, clearance of the sight triangle), some of which have been completed by the time the final report is issued; and minor improvements (rail lubricators, reinforced concrete superstructure).

The other 3 proposals are systemic action plans: renewal of instruction D.56, introduction of loaded track geometry measurements (see also: 6.3), track-vehicle interaction study.

5.3 Additional notes

The IC has identified no risk-increasing factors that are unrelated to the occurrence of the accident.

5.4 Proven procedures, good practices

The IC identified no factor that helped to reduce the consequences of the occurrence and avoid a more serious outcome.

5.5 Lessons learnt

Avoiding similar incidents requires not only appropriate and timely regulation, but also an organisation with the resources to enforce it.

6. SAFETY RECOMMENDATION

Safety recommendations, together with the findings and conclusions in the final investigation report, represent important information for the further improvement of railway safety. Accordingly,

- The authorities responsible for safety shall take action as necessary to ensure that safety recommendations are duly taken into consideration and applied where appropriate.
- The organisations responsible for introducing such safety recommendations shall start, with no delay, the risk assessment and risk management activities related to the contents of such safety recommendation within the procedural framework of their safety management system.

Within 90 days of the issue of the safety recommendation, they shall report back to the IC on the actions taken or planned or on their non-acceptance (with justification) of such safety recommendation.

The IC notes that Safety Recommendation № BA2015-0315-5-01 issued on 1 March 2016 remains valid and issues two further safety recommendations in relation to this occurrence:

6.1 BA2023-0812-5-01

During the investigation, the IC concluded that the (unloaded) track measurement technology used does not detect the occurrence of spot of excessive vertical rail displacements, therefore the TSB issues the following safety recommendation:

number: **BA2023-0812-5-01**

addressed to: **MÁV Zrt.**

responsible for the introduction: **MÁV Zrt.**

TSB recommends MÁV Zrt. to consider introducing a measurement procedure on the Széchenyi-Hegy Children's Railway line which is also suitable for detecting track geometry errors caused by spots of excessive vertical rail displacements.

If the recommendation is adopted and implemented, the maintenance organisations will also become aware of spots of excessive vertical rail displacements and the risks they pose.

6.2 BA2023-0812-5-02

During the investigation, the IC concluded that MÁV Zrt. Széchenyi-hegy Children's Railway has a complex and asymmetric organisation for track maintenance, with limited resources, and track maintenance is therefore not implemented efficiently enough, thus the TSB issues the following safety recommendation:

number: **BA2023-0812-5-02**

addressed to: **MÁV Zrt.**

responsible for the introduction: **MÁV Zrt.**

TSB recommends MÁV Zrt. to consider making the track maintenance organisation capable of efficiently carrying out the maintenance tasks of the Széchenyi-Hegy Children's Railway.

The adoption and implementation of the recommendation would benefit the isolated narrow-gauge railway operations, as an organisational structure better adapted to local needs could ensure more efficient maintenance.

6.3 Actions following the safety recommendations

In its comments to the Draft Report, MÁV Zrt. indicated, in relation to the safety recommendation BA2023-0812-5-01, that ‘the technical content of the framework contract concluded between MÁV Zrt. and MÁV KFV Kft. on the “Joint performance of railway substructure, superstructure, bridge and tunnel inspection activities”, effective from 5 December 2023, already includes the paragraph "Measurement of narrow-gauge tracks with a "mobile" optical measuring system’. The 'mobile' optical measuring system will be mounted on narrow-gauge rolling stock, thus implementing a loaded measurement method. As things stand, the procurement of the measurement system and the selection of the vehicle is underway, with plans to replace TrackScan measurement from 2026.’