



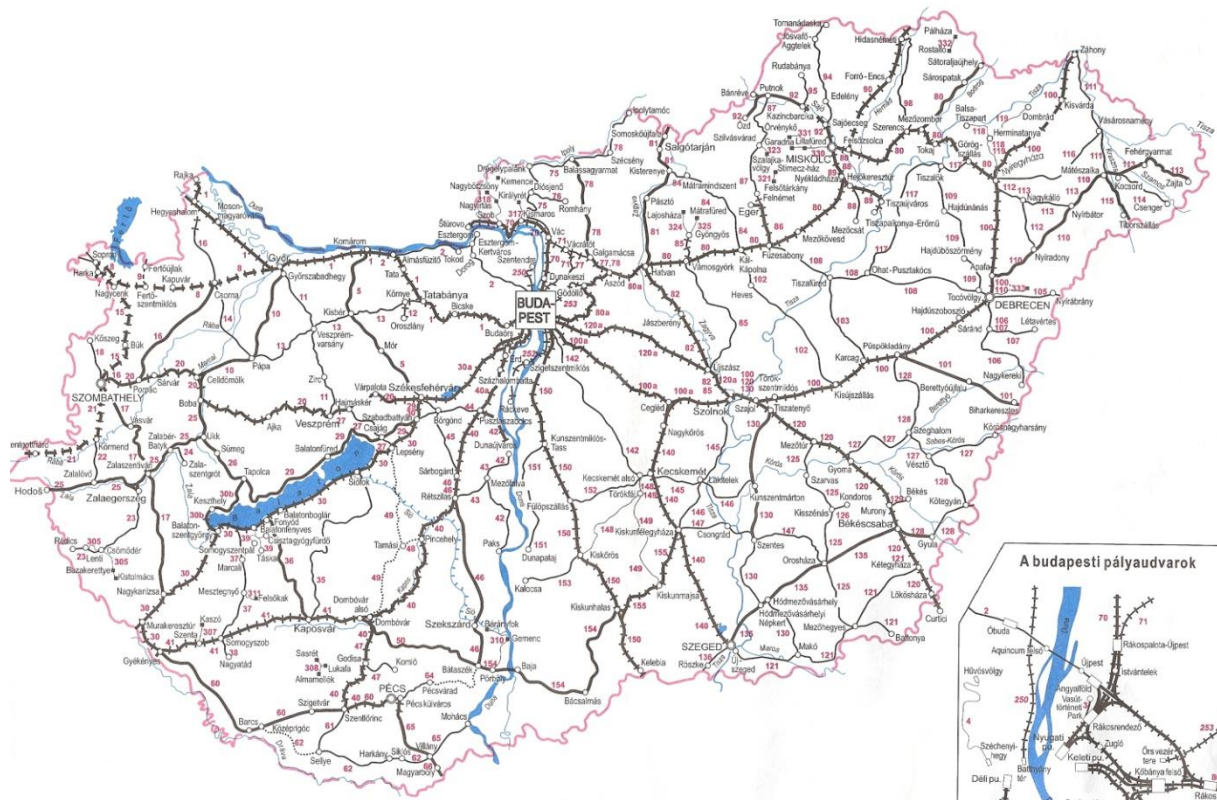
MINISTRY FOR
INNOVATION AND TECHNOLOGY
TRANSPORTATION SAFETY BUREAU

ANNUAL REPORT 2018
Transportation Safety Bureau
Hungary

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RAILWAY NETWORK IN HUNGARY



Basic data of the infrastructure:

<u>National lines:</u>	7690 km IM: MÁV (94%), GySEV (6%) Trans-European network: 2830 km (37%)
<u>Regional lines:</u>	480 km (100% narrow gauge)
<u>Suburban lines:</u>	210 km
<u>Local tramway network:</u>	in Budapest, Debrecen, Miskolc, Szeged
<u>Level crossings:</u>	6041 (48% active, 52% passive)

SUMMARY

Hungary fully implemented all essential requirements concerning accident investigation of the Railway Safety Directive 2004/49/EC in its national law.

Transportation Safety Bureau was established on 1st January 2006 as the legal successor of Civil Aviation Safety Bureau (founded in 2002). TSB operates in a multimodal form. Its main duty is the independent safety investigation of aviation, railway and marine accidents and incidents. Within the organisational framework of TSB, the Railway Department began to operate on 1st March 2006.

Pursuant to Government Decree 230/2016. (VII. 29.) on the assignment of a Transportation Safety Body and the termination of Transportation Safety Bureau with legal succession, the independent organisational status (as a central authority) of Transportation Safety Bureau was terminated with an effect of 1 September 2016, and TSB was integrated in Ministry of National Development as a division. As part of this integration, the functions supporting the operation of the organisation (finance, communication, law, IT, HR) were wound up, and their responsibilities were transferred to the Ministry and other entities and units of public administration. As a result of such reorganisation, the Railway Department of TSB, which used to work with a clear professional profile dedicated to railway, became Railway and Dispatcher Department. The year 2017 was the first full year of our operation in the new form of organisation.

In year 2018 after the parliamentary elections in the new structure of the government the TSB integrated into the Ministry for Innovation and Technology. In this ministry the TSB organized to directly under the control of the Secretary of State. The new state did not required change in inner structure and operation of TSB.

In 2018, there was no occurrence (serious accident) on the railways which the Railway Department of TSB was, pursuant to the regulations, obliged to investigate.

TSB decided at its own discretion to conduct independent safety investigation into 30 occurrences.

During year 2018, TSB published 19 final reports closing 420 investigations, including 9 safety recommendations. 3 of these recommendations have been implemented; implementation of 6 recommendations is in progress.

At its own discretion, TSB included in the scope of the safety investigation some occurrences of signals passed at danger (SPADs), taking into consideration hazards and high frequency of these cases with an otherwise fortunate outcome. Based on previous positive experiences, TSB monitored with particular consideration the occurrences related to level crossings (LC accidents) and to persons injured by railway vehicles, initiating safety investigations in cases that appeared to be instructive. In 2018, we laid great emphasis on revealing the root causes of the occurrences, especially in the aspects of human and organisational factors.

In 2018, we also set out the lessons learnt in the area of safety culture if we found it necessary and possible.

Abbreviations	
IC	Investigating Committee
LC	Level crossing
MÁV Co.	Hungarian State Railways Plc.
NIB	National Investigation Body
NSA	National Safety Authority (the National Safety Authority of Hungary)
RSD	Railway Safety Directive (2004/49/EC directive)
TSB	Transportation Safety Bureau

1. INTRODUCTION

The Transportation Safety Bureau of Hungary (TSB) as a multimodal organisation for the investigation of accidents was established on 1st January 2006.

The Annual Report 2018 of TSB - in accordance with Article 23 (3) of the Railway Safety Directive 2004/49/EC - gives an account on the following:

- the implementation of 2004/49/EC Railway Safety Directive into the Hungarian law,
- the relations of TSB with other concerned organisations,
- the philosophy and process of the independent safety investigation at TSB,
- the overview of the past 12 months from transport safety point of view,
- the experiences of the independent safety investigations carried out by TSB,
- the safety recommendations issued by TSB and the provisions made in relation to the recommendations, and
- the participation of TSB in the work of the European Railway Agency.

Legal basis - The implementation of the Safety Directive in the Hungarian law

Hungary implemented all essential requirements concerning accident investigation of Railway Safety Directive 2004/49/EC in Act CLXXXIV of 2005 on the safety investigation of aviation, rail and marine accidents and incidents. Based on the Directive, Transportation Safety Bureau was established on 1st January 2006 and – as a multimodal organisation - is responsible for the independent safety investigation of aviation, railway and marine accidents and incidents.

The detailed regulations of the safety investigation are included in the decrees of Act CLXXXIV of 2005 which were separately issued for the three modes of transport by the Minister of transport. The decree on the regulation of the safety investigation of serious railway accidents, railway accidents and incidents (7/2006 GKM) was issued on 27th February 2006.

Powers of TSB have been extended: previously, the scope of TSB activity had not included investigations of accidents and incidents occurred on local railways. Serious accidents are not frequent on these railways (underground railway, cogwheel railway, tram – Budapest, Miskolc, Debrecen, Szeged), nevertheless, related hazards are high, considering the high number of passengers transported daily. Extension of the investigation scope by including these railway systems was justified by this hazard, completion of the safety investigations additionally generated being possible by an allocation of minor extra resources.

Act CLXXXIV of 2005 on the safety investigation of aviation, rail and marine accidents and incidents was also amended parallel to this, the amendment concerning TSB activity by introducing the institution of accident investigation of the operator in the railway sector as well. Positive experiences of the accident investigation system of the operator, well established in the aviation sector, can be effectively applied to enhance safety in the railway sector also. Therefore, according to the new regulation for occurrences not included in the serious accidents category required to be investigated by the National Investigation Body (NIB), in case NIB takes decision on not conducting a safety investigation of the occurrence, the safety unit of the railway undertaking will be requested to conduct the investigation of the operator and inform NIB on the results in a report.

This regulation does not aim the duplication the safety system, it does not concern investigations required by the safety management system (SMS). Its objective is to ensure that reports, being issued anyway by the accident services of railway undertakings, would be forwarded to NIB, furthermore, authorizes NIB to request additions, when necessary, to these reports – by this, the regulation helps NIB in collecting data on safety issues. Involving organisations already actors of the SMS in the activity of NIB does not require extra resources (HR, etc.) on either side, nevertheless, it broadens significantly the information base of NIB activity and, by this, the enhancement possibilities of railway safety.

These rules were implemented into the decree on the regulation of the safety investigation of serious railway accidents, railway accidents and incidents (7/2006 GKM) issued on 27th February 2006, the new number of this decree: 24/2012 NFM issued on 8th May 2012.

Within the organisational framework of TSB, the Railway Department began to operate on 1st March 2006 pursuant to the regulations.

The national Act guarantees the complete independence of TSB from all other actors of the concerned transport sector. The Act defines the objective of the independent safety investigation as follows:

‘The objective of the independent safety investigation is to reveal the causes and circumstances of serious railway accidents, accidents and incidents and to initiate the necessary technical measures and make recommendations in order to prevent similar cases in the future.’ It also states that ‘it is not the purpose of the investigation carried out by TSB to apportion blame or legal liability’.

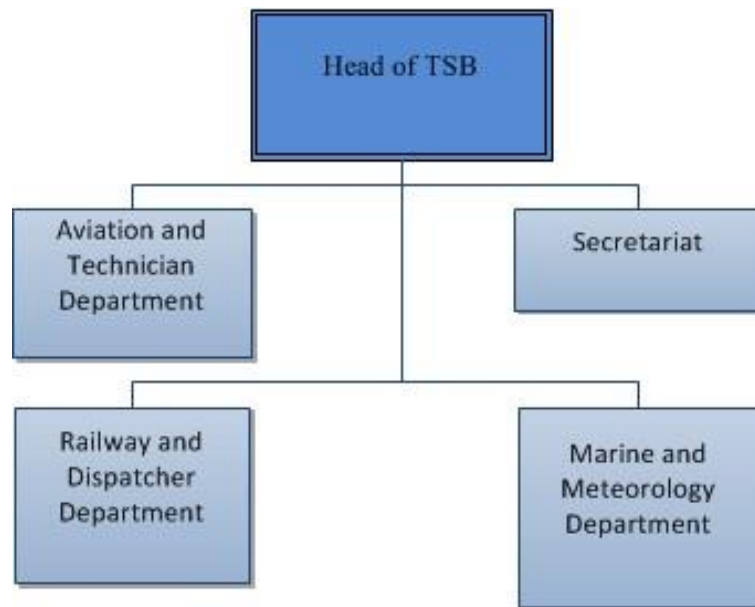
The Act contains the rights and responsibilities of the investigators defined in the Safety Directive.

According to the national regulations:

- All aviation, railway and marine occurrences shall be reported to TSB.
- The members of the Investigating Committee of TSB are authorized to be present at the site of any occurrence and to conduct the safety investigation parallel with the police investigation (if there is one).
- Based on the results of the investigation, TSB is entitled to issue safety recommendations and recommend immediate preventive actions before the completion of the investigation, if necessary. The implementation of safety recommendations is not obligatory, however, the addresses must report to TSB once a year whether they have accepted or rejected them. (The addresses must forthwith respond to the recommended immediate preventive actions.)
- The anonymity of the relevant parties is guaranteed. TSB shall make public the final reports on the results of the investigation. However, the final report shall not contain data based on which the relevant parties can be identified. The final report shall not be used in criminal procedures.

1.1 Organisation of TSB Hungary

The organisation and relations of the NIB is shown in organogram.

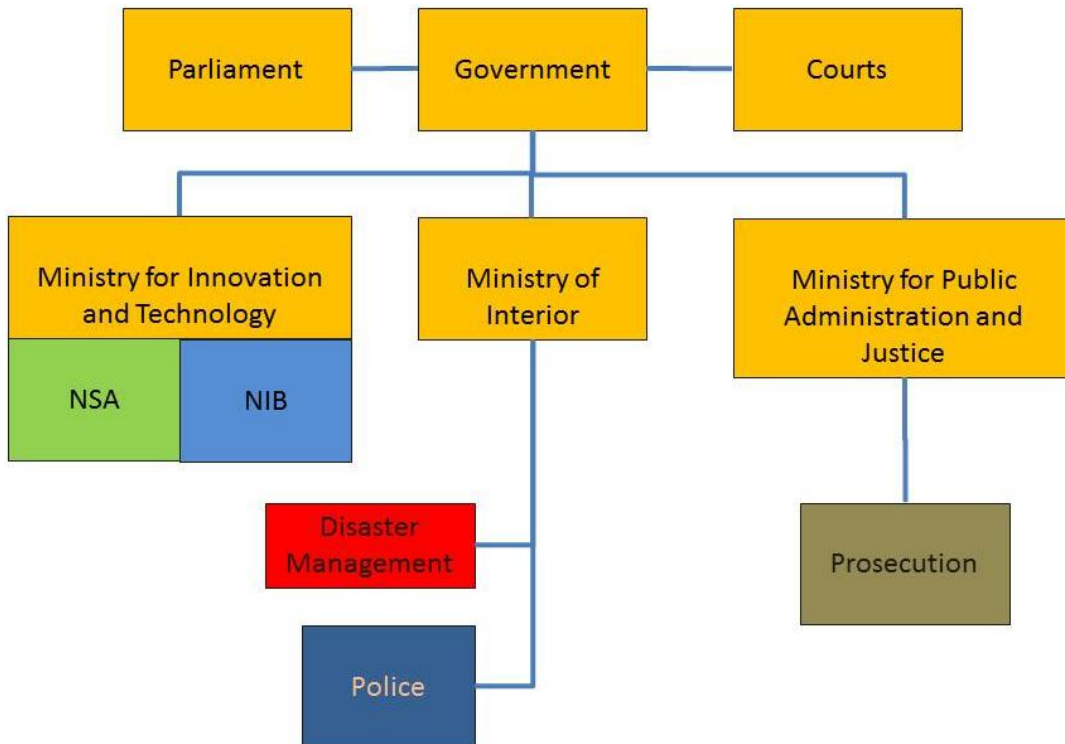


The organisation of the TSB

- TSB regards prevention as the main objective of its activity. TSB endeavours to share the findings, the results and the experiences of the safety investigations with a wide circle of organisations in the profession as well as with the civil sector.
- TSB was established on 1st January 2006. The Aviation Department and the 24/7 Duty Services operated from the beginning of 2006 and the other departments and units grew gradually during the year. The Railway and the Marine Department began to work officially on 1st March 2006.
- The Railway Department consists of 8 investigators and the Head of Department.

1.2 Organisational flow of TSB Hungary

The following chart shows the system of relations of the NIB:



System of relations

- Within Ministry for Innovation and Technology, NSA is ranked Deputy State Secretariat, and TSB is a Division. Accordingly, NSA is positioned at a higher level, the addressee of the safety recommendations is different within the same entity, and supervision is common at the ministerial level.
- The Ministry for Innovation and Technology is the national regulator.
- Based on the outcome of the investigations, TSB may issue safety recommendations to the National Safety Authority (NSA). The implementation of safety recommendations is not mandatory; the addressees however are obliged to compile an annual report on their response (acceptation, implementation, or refusal).
- TSB is part of the Ministry for Innovation and Technology. The Head of TSB works under direct supervision of the State Secretary. According to the national law, the Minister shall not instruct TSB in matters concerning the independent investigations, but, according to the organizational rules, the Minister has the power to do so.
- TSB reports to the government annually on the activities of TSB, the lessons learned from the independent investigations, the processes and trends concerning transportation safety.
- The general rules regarding the operation of the railways are currently defined by the state-owned MÁV Co., the largest infrastructure manager in Hungary. The National Safety Authority only assents to the amendments to the rules.

- TSB is authorized to get access to all data relevant to the occurrence in question (including data stored on data recorders).
- The Investigating Committee of TSB may conduct its site investigation simultaneously with the police investigation.
- TSB and the police may help each other's work with exchange of factual data and results of expert analyses. The IC may withhold information obtained in the course of the investigation from other authorities in occurrences when the owner of the information would have had the right to do so.
- TSB, the police and the disaster management mutually inform each other about the received occurrence reports.

2. INVESTIGATION PROCESS

2.1 Independent basis of the investigation

Pursuant to national law, TSB is independent of all persons and organisations whose interests are contrary to the duties of the investigating organisation, in particular:

- authorities granting permission to put vehicles into service,
- authorities granting permission and controlling the operation and the maintenance of the vehicles,
- authorities issuing driving licences,
- the organisation operating the transport infrastructure,
- transport companies,
- railway undertakings
- the organisation determining railway tariffs,
- the organisation distributing routes,
- the safety authority and
- all regulators in the field of railways.

Under the national law, the civil servants of TSB shall not be the owners, senior officials or employees of the above mentioned organisations.

The Director-General and the Investigating Committee of TSB shall not be instructed in their scope of duties concerning the safety investigation.

Functional independence of TSB remained intact during its operation within the Ministry.

2.2 Accident investigation philosophy of TSB Hungary

Under the Hungarian regulations, TSB shall investigate serious railway accidents.

The definition of ‘serious accident’ under the national regulations - in accordance with the Railway Safety Directive 2004/49/EC – is as follows:

‘Any train collision or derailment of trains, resulting in the death of at least one person or serious injuries to five or more persons or extensive damage to rolling stock, the infrastructure or the environment of at least HUF 500 million and any other similar accident with an obvious impact on railway safety regulation or the management of safety’.

Apart from serious accidents, the national regulations permit TSB to investigate other occurrences – at its own discretion – that may have an impact on the safety of rail transport as well as on the regulations and management of railway safety.

TSB availed itself of the opportunity provided by the regulations to decide which occurrences – apart from serious accidents – are to be investigated. TSB based its decisions regarding which occurrences require investigation on the following fundamental principles:

- **occurrences resulting in serious injuries to persons, extensive material damage and/or hindering railway transport significantly,**
- **the latent danger of the occurrence can be considered significant – irrespective of its actual consequences,**
- **accidents or incidents recurring at the same site or in the same manner**

should be investigated.

When deciding which occurrences to investigate - besides the ones with serious consequences - it helps a great deal that the Railway Department regularly requests information from railway undertakings and relevant authorities on occurrences which are not investigated in details. The collection and evaluation of these data provides the possibility to be able to discover recurrence and certain tendencies in the accidents. These observations can create basis for further investigations.

In order to increase efficiency in decision making, it is necessary to gain as much information as possible. The institution of accident investigation of the operator has been introduced in the railway sector as well. Positive experiences of the accident investigation system of the operator, well established in the aviation sector, can be effectively applied to enhance safety in the railway sector also. Therefore, according to the new regulation for occurrences not included in the serious accidents category required to be investigated by NIB, in case NIB takes decision on not conducting a safety investigation of the occurrence, the safety unit of the railway undertaking will be requested to conduct the investigation of the operator and inform NIB on the results in a report.

2.3 The investigation process of TSB

The Duty Services of TSB (dispatchers) receive the reports of the occurrences 24 hours a day.

The members of the Investigating Committee (IC) are appointed by the Head of TSB or by his deputy on duty. The IC consists of one field investigator technician and at least one accident investigator. In case of more serious or complicated occurrences, one of the heads of department on duty TSB may be present on the site. Since 1st of January 2019, the technician is not member of the IC because of an organizational change, which resulted in a reduction of headcount.

If an occurrence is not obliged to be investigated under the law, the head of the concerned department advises the Head of TSB to decide whether or not to conduct an investigation.

The Investigating Committee carries out the site survey (parallel with other authorities) and decides on the direction of the investigation, the required technical and technological examinations as well as selecting the organisations and/or experts to be initiated in the investigation if necessary.

Other processes are the same as those specified in the ERA guide relating to technical investigations: collecting of data, investigative interviews, analysis etc.

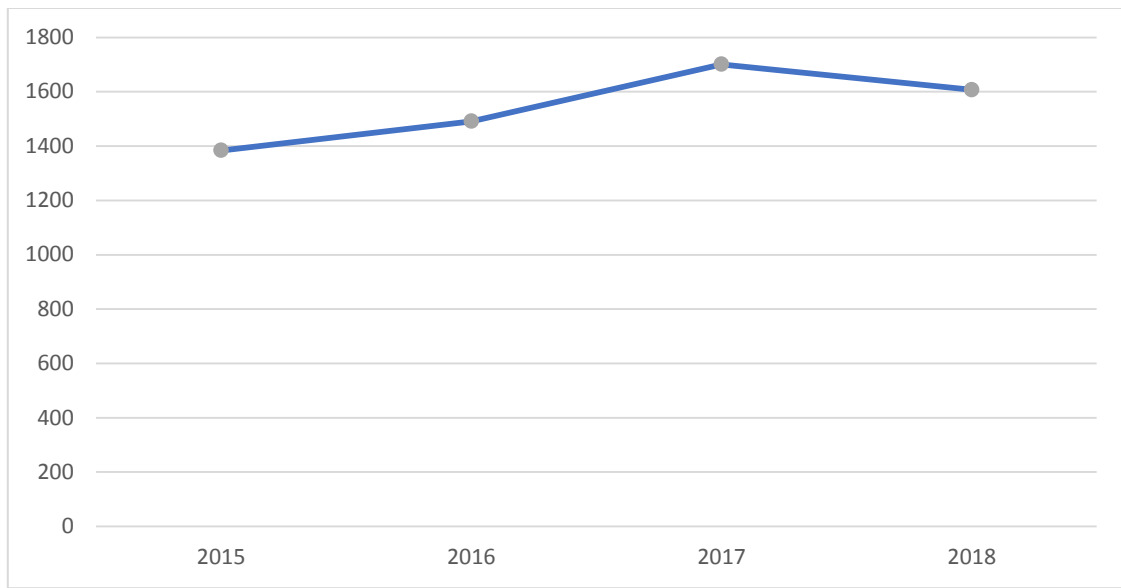
The draft reports on the occurrences are discussed by a board made up of the heads of departments of TSB.

The relevant parties of the investigation may make reflections on the draft report within 60 days from the date of receipt which is to be evaluated when compiling the final report. After this 60-day-period, TSB convenes a meeting for a final discussion with the participation of the representatives of the persons and organisations concerned. The purpose of the final discussions is that all concerned parties can hear the comments sent in reflection to the draft report as well as the viewpoint of TSB regarding the comments before the completion and publication of the final report. According to Hungarian law, the investigators may decide whether or not to include the parties' comments in the final report, the comments of an NIB of a Member State have to be included. Subsequently, the final report is made public.

All the three major departments of TSB have a separate 'Investigators' Manual' which lays down the methodological and technical requirements based on which the investigations shall be conducted by the investigators of TSB, taking the special characteristics of the given mode of transport into account.

3. OVERVIEW OF THE YEAR 2018

3.1 Notifications

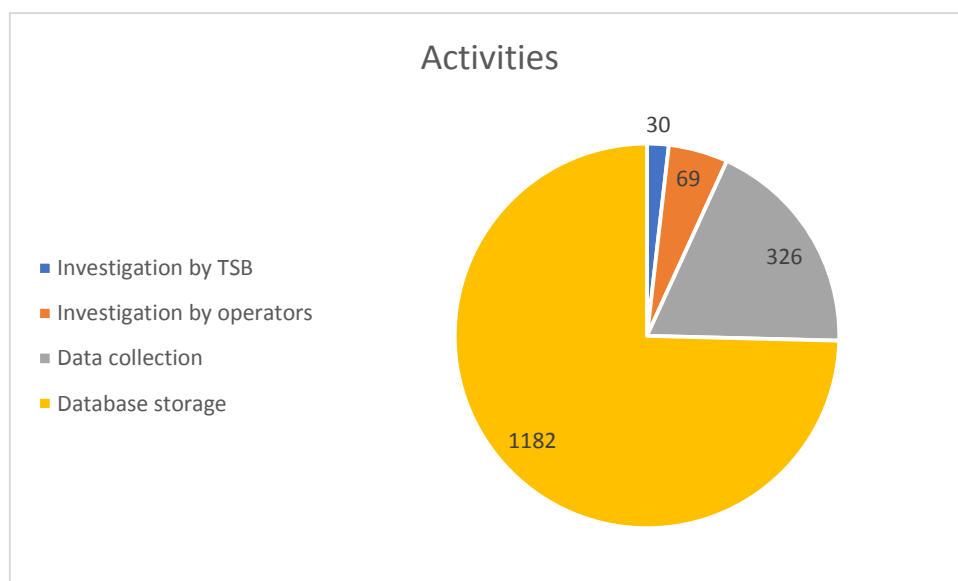


Numbers of notifications

Our duty service received 1607 notifications in total in 2018, which is 5.6% decrease compared to the previous year. No major conclusions can be drawn from the magnitude of the decline, but rather from the stochastic nature of accidents and unexpected rail events.

Breakdown to track networks also reflects a decrease in the total number of notifications. The decrease is not significant, except for the figure indicating the decrease of notifications arriving from the metro network: 30 to 22.

3.1 Investigations



Activities following notifications in 2018

In 2018, we decided to perform an immediate *site survey* (based on data in the notifications) on 49 occasions; such surveys were usually performed by a team of three members. 33 of the 49 site surveys affected locations in the national railway network, which shows that the consequences of the accidents and incidents in such networks are more serious, and that the investigation into such accidents/incidents is more likely to require detailed data collection at the scene.

Detailed data collection was performed on 326 occasions in total. A purpose of detailed data collection was to find out whether the occurrence may offer such lessons to learn which justify the performing of a full investigation by us. In these cases, we asked the railway companies for information and data, and decided on the investigation on the basis of such inputs. Another form of detailed data collection is when we ask the competent authorities for information relating to whether a case where a person by a vehicle was a suicide or an accident caused by rolling stock in motion. This is needed because, pursuant to the relevant EU regulation, classification must be made on the basis of a decision of the authorities.

In 2018, we commenced a *full safety investigation* in 30 cases. With regard to the nature of the given occurrence, an investigating committee of 2 to 5 members is appointed to perform the investigation. When staffing an investigating committee, we ensure that investigators with relevant professional knowledge and experience be available in each committee for a successful investigation. Such areas of expertise are, for instance: traffic control, mechanics, infrastructure or human and organisational factors. The investigating committee is chaired by a member appointed by the Head of TSB, and such chair is responsible for successful and timely completion of the investigation. Compared to the headcount, it can be seen that an investigator had to chair 4.2 investigating committees on average in 2018, due to changes to the headcount during the year. This number significantly exceeds the quantity of 2 investigations/year specified by the European Union Agency for Railways in its activity assessment report on the operation of Railway Department TSB in 2012.

In 2018, TSB requested operators to investigate 69 occurrences. In the railway sector, since 2012 – similarly to aviation – TSB has the opportunity to request information from operators on the causes of railway occurrences which need no investigation by TSB but may offer a lesson to learn in connection with general safety on rail transport. Today, the conditions of investigation by the operator are given: in order to meet the personal requirement of the performing of investigation by operators, accident investigation training sessions are running since 2013. Over 200 people involved in the investigation of occurrences completed the courses.

This value is 16 less than that of 2017. An advantage of this practice is that we gain more detailed information from the reports made of the investigations performed by the operators, and we are also informed on the preventive safety recommendations of the railway companies.

3.3 Safety Investigations started by TSB in 2018

Attachment-A

Technical investigations started by TSB in the area of railway transport in 2018

Date 2018	Description of the occurrence	Classification
01.01.	The moving train № IC 932 was hit by a dangling part of the overhead line the between Győr and Gyórszabadhegy stations. The locomotive driver injured slightly.	Railway accident
01.06.	The train № 85829 burst opened the switch № 14 while leaving the station Szentlőrinc. There was no derailment and personal injury.	Railway incident
01.21.	In Budapest, the crossroads of Török Flóris street and Nagysándor József street a tram № 52 derailed with one bogie. No one was injured.	Railway accident
01.27.	An empty tanker wagon of the freight train № 92719 derailed at Ferencváros station. No one was injured.	Railway accident
02.04.	In Budapest, a tram which was leaving the terminal of Határ út derailed. No one was injured.	Railway accident
02.07.	In Budapest, on the underground line № 2 between Blaha Lujza square and Astoria stations two work train crashed. One person was injured slightly.	Railway accident
03.18.	The engine of the freight train № 44281-2 derailed while incoming to the marshalling station Budapest, Soroksári út. No one was injured.	Railway accident
04.10.	The narrow gauge train № 30235 derailed with one bogie while incoming to the station Szépjuhászné. No one was injured.	Railway accident
05.24.	In Budapest, the tram № 24 derailed with one bogie at the Orczy square. No one was injured.	Railway accident
05.29.	The train № 2936 which was leaving the station Pestszentimre was running towards the train № 2923 which was arriving from the station Gyál. After the warning of the engine drivers via cellphones the two trains stopped with the distance of approximately 1.5 kilometres away from each other.	Railway incident
05.30.	The buffer wagon of the freight train № 45198 derailed with one axle on the switch № 28 while incoming to Hegyeshalom-rendező marshalling station. No one was	Railway accident

Date 2018	Description of the occurrence	Classification
	injured.	
06.05.	In Budapest, a tram № 4 which was leaving the terminal of Újbuda-Központ derailed. No one was injured.	Railway accident
06.06.	In Debrecen, the crossroads of Széchenyi street and Kossuth street the tram № 1 collided with a bus. The tram derailed due to the crash. One person was injured seriously and 12 more slightly.	Railway accident
06.11.	In Miskolc, at Majláth station two parking narrow gauge wagons broke away and eventually, kilometres away, at the terminal of Dorottya street they broke through the bumper and collided into the middle of a tram just passing by at the time. The tram derailed due to the crash. One person was injured slightly.	Railway incident
06.23.	Three empty tanker wagons of the freight train № 95817 derailed on the switch № 9 while incoming to Ivánca station. No one was injured.	Railway accident
07.06.	The moving train № IC 682 was hit by a working grabber machine at Gödöllő station. No one was injured.	Railway accident
07.08.	In Budapest, on the line of the cogwheel railway (line № 60) at Erdei iskola station a train derailed on a switch. No one was injured.	Railway accident
07.15.	The train № EC 272 passed the exit signal of Göd station at danger without authorization and burst opened the switch № 7. No one was injured.	Railway incident
07.21.	The train № 7224 derailed on the switch № 2 while incoming to Kunszentmárton station. No one was injured.	Railway accident
07.26.	The freight train № 45484-1 passed the entry signal of Debrecen station at danger and burst opened the switch № 7/B. No one was injured.	Railway incident
07.28.	The train № 34494 passed the exit signal of Tatabánya station at danger without authorization and burst opened the switch № 17/a. No one was injured.	Railway incident
08.24.	The train № 343-2 passed the exit signal of Dömsöd station at danger without authorization, burst opened the switch № 1 and stopped in front of the train №	Railway incident

Date 2018	Description of the occurrence	Classification
	7927.	
09.18.	At Berettyóújfalu station, the train № 6433 arrived without a preliminary notification to an occupied track. The staff tried to conceal the incident.	Railway incident
09.28.	The train № IC 514 collided with an automobile at a protected level crossing between Rákosliget and Pécel stations. Four occupant of the automobile injured seriously.	Railway accident
10.05.	At Ózd-alsó station after getting off, a passenger's backpack was trapped by the closing door when the train started to move. The passenger, hanging on the door was dragged through a significant distance and later died in the hospital.	Railway accident
10.25.	The train № IC 7706 collided with an automobile at a level crossing between Székkutas and Orosháza stations. Four occupant of the automobile died.	Railway accident
12.05.	In Budapest, the tram № 42 which was leaving the terminal of Határ út derailed with one bogie. No one was injured.	Railway accident
12.09.	The train № 9531 passed the exit signal of Zalaegerszeg station at danger with the false authorization of the outer station inspector, burst opened three switches and stopped in front of the train № IC 958 (moving opposite direction) with the distance of 500 metres.	Railway incident

4. INVESTIGATIONS COMPLETED IN 2018 WITH THE ISSUED RECOMMENDATIONS

In 2018, 19 final reports were compiled and published on the website of TSB, closing 20 investigations. Further 17 draft reports were compiled and sent to the relevant parties for reflections. The above investigations were closed and the final reports were published at the beginning of 2018 considering the 60 days provided by law for the relevant parties to reflect on the draft report.

The final reports issued in 2018 analysed occurrences of the following types:

- Derailment 6 occurrences
- Accident at LC 2 occurrences
- SPAD 3 occurrences
- Collision of trains 1 occurrences
- Collision to obstruct 1 occurrence
- Injury caused by rolling stock 1 occurrence
- Other 4 occurrences

Investigations completed in 2018 by the amount of damages:

In 2018, the damages related to an occurrence exceeded EURO 150,000 in 2 cases, and no case over EURO 2 Million.

Number of investigations lasting longer than one year over 2014-2017

Year	at the end of 2016	at the end of 2017	at the end of 2018
Amount	13 (8)	8(6)	14(13)

Numbers in brackets show the amount of reports sent to relevant parties until the end of the year.

5. INVESTIGATIONS CLOSED IN 2018.

2016-0898-5

Overview of the occurrence

The train № 5736 approaching on track 4 of Újszász Station derailed with its leading bogie on the switch № 6. No one was injured. The railway track and the motor train set involved were damaged. The IC attributes the occurrence to the impaired condition of the switch № 6, because the hook lock of the switch tongue (in the direction of the turnout) did not reach its end position when the switch was operated: a gap of unknown width remained between the switch tongue and the stock rail. When the wheel of the motor train set rolled on it, it opened up the switch then derailed on it.

The IC proposes safety recommendations relating to:

- necessity of requiring full-scale inspection of switches after track maintenance,
- the review the order of cyclic reviewing of safety installations and the risks associated to the lack of it,
- the use, registration and *individual identification* of the lead or paper seals applied in safety installations.

CONCLUSIONS

Factual statements directly connected to the occurrence of the incident

The IC attributed the occurrence to the following direct causes:

- the hook lock of the switch tongue (in the direction of the turnout) did not reach its end position when the switch was set for the train: a gap (the width of which could not be determined exactly) remained between the switch tongue and the stock rail.
- the edge of the switch tongue missed in a length of ca. 600 mm, which allowed the left wheel of the first wheel pair to enter the gap between the switch tongue and the stock rail, and this, in turn, further opened the switch tongue,
- the flange of the left wheel of the second axle rolled into the gap between the opened switch tongue and the stock rail,
- the wheels rolled on along the stock rails, and the right wheels of the axles of the first and second wheel pairs derailed at the 12th sleeper, while the left wheels at the 15th sleeper,
- in the meantime, the rim hit the rear end of the switch tongue, reset it into its originally intended position, and partly hooked it.

Factual statements indirectly connected to the occurrence of the incident

The IC makes the following findings of fact relating to indirect causes:

- the switch № 6 is not equipped with a latch in the direction of the turnout, although the relevant rules require one.

Other risk factors

- the feedback of the entry signal “B” was out of service on the day of the occurrence,

- the lack of the inspection of the safety installations – and thus, the lack of repair or replacement of the worn-out parts – largely increased the risk of inappropriate operation of the safety installations,
- the practice of management and registration of the paper seals (which had replaced lead seals) at the station led to significant impairment of safety culture, and consequently, of transport safety.

SAFETY RECOMMENDATION(S)

BA2016-0898-5-01: The IC found that full-scale inspection, measurements and documentation thereof had not been performed after track maintenance. The levelling of a turnout is associated by dislocation of the structure of the switch and the operating point of the operating installation; for that reason, the relevant rules require measurement after an intervention, however, it is not specified exactly what to measure and how to document such measurement.

TSB recommends Railway Authority Division, Ministry of National Development to consider reviewing whether the requirements relating to track supervision in the safety management system of MÁV Zrt. include properly the inspections to be performed after track maintenance, including measurements and their documentation.

By acceptance and expected implementation of the safety recommendation, track supervision would have better chance to identify any turnouts which may have got in hazardous state during track maintenance, and to certify the serviceable state of switches after track maintenance.

BA2016-0898-5-02: The IC found that there was a non-eliminated defect, known for 10 months, in the report back on the safety functions of the safety installation, and the general inspection of such safety installation had been missed, i.e. it had not been performed by the time of the investigation.

TSB recommends Railway Authority Division, Ministry of National Development to consider reviewing whether the safety management system of MÁV Zrt. includes the general inspection system of safety installations correctly, whether general inspections and the elimination of shortcomings are performed according to such general inspection system, and whether the shortcomings and missing steps of such general inspection system are revealed during the safety inspections, and whether the associated risks are managed.

By acceptance and expected implementation of the safety recommendation, it could be ensured that the operating organisation maintains its installations in safe condition.

BA2016-0898-5-03: The IC found that the management and registration of paper seals are chaotic, duplicated, usage does not take place in logical sequence, and their transfer is inaccurate.

TSB recommends Railway Authority Division, Ministry of National Development to consider reviewing whether the safety management system of MÁV Zrt. includes the use, management and registration of the metal and paper seals used in the safety installations. TSB recommends introduction of seals which are given a unique identifier as part of the manufacturing process.

By acceptance and expected implementation of the safety recommendation, other than normal operations of safety installations would be traceable, which is necessary and indispensable for maintaining safety on a continuous basis.

2016-0952-5

Overview of the occurrence

The tram passed the main entry signal of the terminal at danger, the same time when the control panel operator had already operated the first switch affected by that tram. The second bogie of the tram derailed due to switch operation under the vehicle.

The IC found that the tram driver's attention had been distracted by another event, and, as it is known, the signal installation (falsely) senses the switch free for some time after a signal overrun. The design and the practice of operation of the signal installations plus the related training (i.e. the technical and organisational factors) together do not sufficiently support conscious observation of signals and appropriate driving of the vehicle; consequently, the driver's practical knowledge will become less certain.

CONCLUSIONS

Factual statements directly connected to the occurrence of the incident

The driver of the vehicle did not observe the signal on the main signal, passed it, and entered the terminal right at the moment when the control panel operator initiated the operation of the switch.

Factual statements indirectly connected to the occurrence of the incident

The tram driver's attention was distracted by another event.

The feedback of the switch operating apparatus still indicated that the signal was free when the tram had already rolled onto the switch.

The design and the practice of operation of the signal installations plus the related training (i.e. the technical and organisational factors) together do not sufficiently support conscious observation of signals and appropriate driving of the vehicle.

The uncertain responsiveness was further impaired by another, unknown stress.

The employer has no uniform program during the education of the drivers to assist the management of events which take place in the passenger area.

Fatigue originates partly in the roster system.

Other risk factors

The IC makes no such statement.

SAFETY RECOMMENDATION

Similar cases can be avoided by observing the rules, but observing the rules is largely influenced by fatigue originating in the roster, and proper preparation of employees for the circumstances of their works, e.g. in this case, for passenger management.

A BKV Zrt. provided extraordinary training, related to the characteristic features of the signal system. The investment plan for 2019 includes construction of a system for checking the availability of the switching zone.

2016-1027-5

Overview of the occurrence

The locomotive type SIEMENS Vectron X4 was in shut-down state on the dead-end track № VI at Ferencváros Station, when it broke away. Bursting open the switch № 78 it rolled out through Track VI of the station, in the direction of the station in Soroksári út, it entered the right hand side track, covered a distance of ca. 4.5 km, when it was directed on the dead-end track № III of Soroksár Station, where it derailed with 4 bogies on an pile of earth at the end of the truck, while it hit the entry signal 'C' over.

No one was injured in the occurrence; the locomotive was damaged.



Figure: The locomotive hit the earth pile and derailed

During the investigation, the IC performed several tests with the locomotive involved in the accident, in a joint effort with the railway company operating the locomotive, Hungarian, German and Austrian experts from SIEMENS (manufacturer of the locomotive), Knorr-Bremse (manufacturer of the brake system), and also requested opinions from an external, independent expert.

The IC issued a safety alert through the European Railway Agency, because early findings of the investigation suggested that the runaway may have occurred due to defects or shortcomings in design or manufacturing. Locomotives of this type are in service in several European countries, so it was necessary to caution all railway companies operating type SIEMENS Vectron X4 locomotives of the potential defect.

The investigation found that, due to contamination in the triple valve, the spring brake had been able to get released without external impact within a short time (ca. 20 minutes), rendering the properly (i.e. in the manner specified in the operation manual of the locomotive) shut-off locomotive unfastened (unbraked).

In addition to informing the German Federal Railway Authority (Eisenbahnbundesamt) supervising its activity, SIEMENS AG., the manufacturer of the locomotive, cautioned all of its affected clients of the possible defect, and recommended temporary actions to them, and then eliminated the revealed defect in such manner that it replaced the type DRV7D-TSO double check valve with type DRV7-T double check valves by September 2017 in all locomotives manufactured by it.

CONCLUSIONS

Factual statements directly connected to the occurrence of the incident

There was contamination in the triple valve of the properly shut-off locomotive, which made the valve leak, which in turn allowed pilot pressure of the redundant function to exhaust completely through the double check valve, as a result of which the brake cylinders got released while the spring brake remained released, so the locomotive became unbraked, and it broke away on the track which had a downslope of 7 ‰.

Factual statements indirectly connected to the occurrence of the incident

The IC makes no such statement.

Other risk factors

The dimensions of the chocks used regularly to stop runaway vehicles (or the very similar retaining chocks used to replace them) are not sufficient for stopping a vehicle which has a hanging part within 130 mm in front of the wheel and above the upper surface of the rail.

SAFETY RECOMMENDATION

ACTIONS TAKEN

Till exploration of the defect by the investigation was pending, the companies which operate type Vectron locomotives in Hungary took action to provide that such locomotives be secured also by fixing chocks against runaway.

In its letter issued in March 2017 (subject: Interpretation of requirements relating to the securing of rolling stock against runaway), Railway Safety Division, MÁV Zrt. advised its contracted partners that MÁV Zrt. expected stricter procedures relating to the rules of braking rolling stock to a stop on its railway network than the Instructions F.2 and E.2. Protection against runaway shall in each case be performed using fixing chocks in addition to applying the spring brake.

Till exploration of the defect was pending, Siemens cautioned all the companies operating Vectron locomotives worldwide of the potential source of danger, and suggested alternative shutdown and fixing methods (by manual bleeding of the spring brake) until the defect was found.

After the defect was found, SIEMENS started to replace all type DRV7D-TSO double check valves with type DRV7-T double check valves in all Vectron locomotives affected.

SAFETY RECOMMENDATION(S)

With regard to the actions taken by the companies which manufacture or operate the locomotive type in connection with the Safety Alert issued by TSB Hungary, it is not necessary to issue a SAFETY RECOMMENDATION.

Lessons learnt

Of the rules related to the stopping of runaway trains, the one (mentioned in the first place on the basis of the instructions in effect) including stopping the vehicles by brake blocks is ineffective with some new vehicle types because of the design of their chassis, as the vehicle pushes the brake block off the rail with no slowing of the vehicle. The employees should be cautioned of this phenomenon, and it should be expected that other solutions listed in the instruction may be effective for stopping runaway vehicles.

2016-1112-5

Overview of the occurrence

A locomotive, just detached from and leaving its train (which ended its journey here due to a planned track possession) at Kapuvár station ran over three persons who had got off that train as passengers and were crossing the track right in front of the locomotive. Two passengers died on the spot and one passenger was injured lightly.

The IC attributed the accident to human factors on the part of the passengers and the staff involved in shunting, and to organisational factors. The passengers crossed the track without paying attention at a place not designated for crossing. The staff involved in shunting did not apply the rules applicable to their activity (they did not even know those rules), and did not recognise the dangers originating in the behaviour of passengers who were getting off the train at both sides and busy to catch the replacement bus. The railway company failed to pay sufficient attention to the aspects of passenger safety when preparing the track possession technology.

CONCLUSIONS

Figure depicts the personal (yellow), organisational (orange) and technical (green) factors which led to the accident (red).

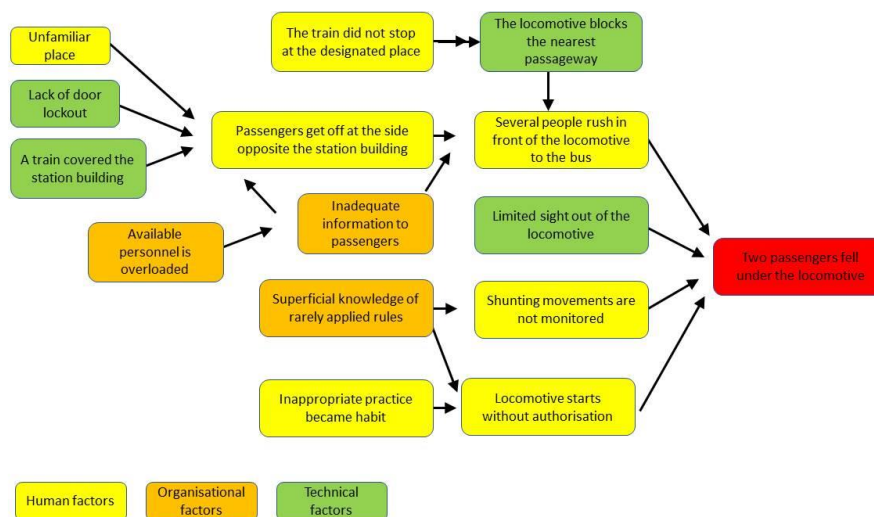


Figure: Contributing factors

Factual statements directly connected to the occurrence of the incident

- The passengers did not use the designated crossing place to cross the tracks, but crossed the track right in front of the locomotive, while being in the blind section of the locomotive.
- The passengers staying near the track were not informed that shunting would be started.
- The locomotive driver started shunting without approval from the shunting master.
- The locomotive driver was aware of the blind section of his vehicle, and he had been informed that passengers were moving near his vehicle (at both sides), still he started moving.
- The locomotive driver gave an audio signal as warning of the hazards of the start of the locomotive at the moment when he started the move, and not in advance to provide sufficient time for those potentially staying in the blind section to leave the track clearance.

- The shunting master knew the locomotive driver's intent to start the move but failed to tell him that he had not been authorised to start it yet. By doing so, he accepted that the locomotive would start moving soon, still he did not prepare for it, and did not escort it, and did not take action to prevent a move which would endanger passengers.
- The train stopped at a location other than the designated spot.

Factual statements indirectly connected to the occurrence of the incident

- The employees involved in the accident were not aware of the rules to be applied.
- The passenger information system which had been prepared to transfer extra information relating to the track possession lacked visual and audio elements, and the elements which were based on face-to-face communication could not fulfil their function. The information provided for passengers was not sufficient for them to travel safely.

Other risk factors

- Visibility to the outside from the locomotive was limited.
- The operating instruction relating to the track possession does not specify the passenger safety tasks in detail.
- The safety management system of the railway company did not identify the improper work practice which had already occurred before during the track possession, and thus no action could be taken to eliminate such practice.

SAFETY RECOMMENDATION

Similar accidents can be avoided by observing the relevant rules, so the IC proposes no recommendation.

Lessons learnt

Two types of error may be related to the occurrence as cause: knowledge-based error and routine-based error.

Prevention of both types of error falls within the scope of responsibility of the railway company. Railway companies rightly expect their employees to know the rules, and provide relevant regular training for them. However, the rules applied in the daily routine are interiorised better and easier to recall. In contrast, knowledge of rules that are used rarely or not at all will fade, and the staff may not necessarily remember the existence (is there a rule at all?), recall (what is the content of the rule?) or apply (does the rule apply to this situation?) the rule.

When a task to be performed is significantly different from those performed before, it would be necessary (at the railway company level) to facilitate the efforts to recall rules not used for a long time.

Routine-based errors can be characterised by the sentence 'We do it this way...' Such practices, which often are known by local employees only, are not always in accordance with the instructions and may imply risks for safety. Such hazardous practices can be managed by systematic inspection of processes and elimination of inappropriate practices by the railway companies.

According to the IC, the case serves as a lesson also in the sense that the organising of works with track possession goes beyond the tasks of normal operation and requires the use of a change management process during which the safety critical factors accompanying the changed operating conditions.

2016-1244-5

Overview of the occurrence

On 9 November 2016, at the level crossing (AS491) protected with serviceable warning lights and half-barriers located between Kápolnásnyék and Gárdony stations, the train № 846 travelling on the right hand track crashed with an automobile which had got stuck on the track before. As a result of the collision, the train pushed the automobile aside to the left. The driver of the automobile had got out prior to the collision and was staying near the rear left part of the automobile at the time of the collision. No one was injured.

The investigation revealed that the driver of the automobile started crossing while the warning lights were white, but then he did not realised in the dark that his automobile had not yet got across the level crossing fully, and he drove it in between the two tracks where it got stuck. He was not able to remove his vehicle before the arrival of the train, nor could he notify the station staff of the danger.

The IC revealed such an imperfection of the layout of the level crossing which may be directly related to the occurrence, i.e. which in itself implies a safety risks, namely that no public lighting is installed at the level crossing, despite relevant legal requirements; therefore TSB issues a safety recommendation to Transport Inspectorate, Fejér County Government Office, proposing an action.

CONCLUSIONS

Factual statements directly connected to the occurrence of the incident

The driver of the automobile did not realised in the dark that his automobile had not yet got across the level crossing fully, and he drove it in between the two tracks where it got stuck; he was not able to remove his vehicle before the arrival of the train, nor could he notify the station staff of the danger.

Factual statements indirectly connected to the occurrence of the incident

At the time of the occurrence, the layout of the level crossing did not comply with the requirements in effect, because the level crossing was not illuminated although there was public lighting near the level crossing.

Other risk factors

The IC makes no such statement.

SAFETY RECOMMENDATION

BA2016-1244-5-01: *The investigation found that the required illumination is not provided at the level crossing located in the railway section 491+16 between the railway stations Kápolnásnyék and Gárdony. The level crossing does not comply with the provisions in Subsection (17) Section 9, KM Regulation 20/1984. (XII. 21.).*

TSB recommends Transport Inspectorate, Fejér County Government Office to consider inspecting the illumination of the level crossing, and obligating the affected entities to provide the condition required by relevant regulation as necessary.

According to the IC, by acceptance and expected implementation of the safety recommendation, the risk of accidents for a similar reason can be reduced significantly.

2016-1284-5

Overview of the occurrence

A number 49 tram derailed on a switch located at its stop at Csóka street in Budapest when the driver wanted to move backwards with the vehicle to give way for the reverse performing tram number 19. No one was injured.

The IC attributed the occurrence to human factors on the part of the driver of the number 49 tram who started the movement without making sure of the actual situation of the vehicle (it stood on a non-return switch with one bogie in front of the switch and with one bogie behind the switch).

At the same time, the IC highlights that, in safety critical situations, clear (preferably verbal) communication may prevent similar cases.

The IC found it unnecessary to issue a safety recommendation.

CONCLUSIONS

Direct causes

The direct causes of the occurrence were as follows:

- the second bogie of the tram entered the switch in diverging direction, while the leading bogie was moving straight on, which made the vehicle derail;
- the driver did not make sure of where his vehicle was staying.

Indirect causes

The factors behind the direct causes of the occurrence:

- the driver of number 19 tram was not aware of the local procedural practices, so he did not pull over to the depot side to perform reverse;
- the driver of number 49 tram had no information on the planned reverse, so he followed the number 19 tram which was leaving the stop;
- the quality of safety critical communication between the two drivers was poor, limited to gestures only.

Root causes

Causes which are distant from each other both temporally and spatially (located in the regulatory environment and in the safety management system) but which are related to the operation of the system:

- the dispatcher failed to notify the driver of the number 49 tram that the number 19 tram moving ahead of him should perform reverse;
- the basic principles of safety critical communication are not included in the training.

Other risk factors

The investigation revealed no such factors.

Lessons learnt

The case serves as a lesson for the following:

- the spill-over effects of short-term actions should also be taken into account when resolving a disruption of traffic;

- the importance of providing thorough training of new employees and colleagues redirected from other areas relating to local practices;
- nothing shall be done in a safety critical situation until the task is clear.

SAFETY RECOMMENDATION

Similar occurrences can be avoided by complying with the rules and paying sufficient attention by the staff, therefore no safety recommendation is necessary.

2016-1322-5

Overview of the occurrence

The freight train № 93128 and a vehicle combination of a tractor + semi-trailer collided at the unprotected level crossing in railway section 97 of the Győr – Veszprém line.

The shunter staying in the driver's cab suffered severe, life-threatening injuries in the accident, and died in the hospital.

The front of the locomotive was badly damaged, as well as the tractor and the trailer; the level crossing and the railway line were closed to road and railway traffic for the duration of the investigation of the scene. Hazardous material did not spill into the environment from the 16 tank wagons carrying petroleum derivative. One bogie of the locomotive and one bogie of the second wagon derailed.

The position of the IC is that the accident occurred due to human factors on the part of the truck driver.



CONCLUSIONS

Factual statements directly connected to the occurrence of the incident

The truck driver entered the level crossing without finding out if a railway vehicle was approaching the level crossing, and he was not able to leave the level crossing before the train got there.

Factual statements indirectly connected to the occurrence of the incident

No traffic sign warning of the level crossing was available at the roadside at the time of the occurrence.

Other risk factors

The IC makes no such statement.

SAFETY RECOMMENDATION

ACTIONS TAKEN

The company managing the road installed a traffic sign warning of the level crossing ahead.

Preparation for technical protection of the level crossing was underway at the time of the accident: in 2017, the operator of the railway infrastructure installed warning lights and half-barriers controlled by train-protecting signals.

SAFETY RECOMMENDATION

As similar accidents can be avoided by observing the relevant rules, and because the operator of the railway network significantly increased the safety level of the level crossing, no safety recommendation is necessary.

Lessons learnt

The traffic of the level crossing had increased significantly for a few years due to the traffic of the industrial park established nearby. A level crossing protected with warning lights and half-barriers was constructed in the railway section 85 in 2014, to serve the traffic of the industrial park, but during its construction, it was not connected to the industrial park by road, so road vehicles invariably access the industrial park across the level crossing located in railway section 97.

The real estate developments and investments nearby level crossings are factors which generate road traffic, the effects of which on the traffic of the level crossing (and potential necessity to increase the level of protection) needs to be studied during the planning and execution of such investments, for the sake of maintaining the safety of traffic on the railway and on the road alike, despite the changes to the circumstances.

2016-1351-5

Overview of the occurrence

The subway trains running in automatic (unmanned) mode stopped in the tunnel, a few metres before the platform at Szent Gellért tér station (train T12 running in the direction of Keleti Pályaudvar) and at Fővám tér station (train T07 running in the direction of Kelenföld), respectively. After the stopping, passengers on the train T12 smelt the odour of smoke. The cause of the extraordinary stop was the activation of the platform protection system of Fővám tér station, which the staff could not manage to reset, so the track could not be re-energised, and the passengers had to get off in the tunnel and be rescued from there. Before organised rescue could have been started, the passengers of the train T12 opened the doors using the emergency openers, got off onto the track and walked along the tunnel in the direction of Szent Gellért tér station.

With assistance from the station staff, the passengers of the train T07 got to the platform of Fővám tér station using the rescue sidewalk.

No one was injured during the occurrence.

According to the investigation, the source of the odour of smoke was that the cooling of the resistors stopped work due to power shut-off of the track, which made the resistor temperatures increase, and the deposit of dust on the hot resistors caused the odour of smoke. Investigation of the scene by the disaster management authority found no sign of fire or extremely high temperature on the train.

TSB issues a safety recommendation related to the occurrence, proposing that the emergency communication system of the M4 subway be reviewed.

CONCLUSIONS

Direct causes

Direct causes of the occurrence were as follows:

- a) Due to power supply error, the platform protection system of Fővám tér station de-energised the track, so two trains stopped in the tunnel.
- b) During braking of the train T12, the system could not feed the energy generated by braking back to the de-energised track, so that energy was into heat through electrical resistors, which caused unpleasant odour and a minor quantity of smoke due to the dust which had deposited on the resistors.
- c) As an effect of supposed emergency situation, the passengers using the emergency call units overloaded the available communication channel as well as the dispatcher.
- d) As a result of the lack of information caused by the overload of the communication channel, passengers began to leave the train.

Indirect causes

The findings regarding competences, procedures and maintenance which were related to the factors listed above:

- a) Due to the design of the communication system installed on the line, the management of emergency calls has priority, so general information cannot be performed till an active emergency call is on.
- b) The train T12 stopped at a point of the line where no escape sidewalk is available.

Root causes

Causes which are distant from each other both temporally and spatially (located in the regulatory environment and in the safety management system) but which are related to the operation of the system:

- a) The tasks of the 'BLP' dispatcher suddenly multiply in an emergency situation, thus hindering efficient work.

SAFETY RECOMMENDATION

BA2016-1351-5-01: *During the investigation, the IC found scarcity of communication channels along the M4 subway line. Due to priority of the emergency calls coming from the trains, the dispatcher can only speak to all passengers through the passenger information function when there is no active emergency call from the train. In the case of a real emergency situation and panic, the passengers on the train will probably use all emergency calling units, making the use of the passenger information audio system – and thus, the controlling of evacuation – impossible.*

Transport Safety Bureau recommends a BKV Zrt. to consider reviewing the possibilities of communication between the passengers and the dispatcher on the subway line M4, and to take action to prevent the narrowing of passenger information in an emergency situation.

By acceptance and expected implementation of the safety recommendation, emergency communication between the traffic managing staff and the passengers may become more effective.

ACTIONS TAKEN

After the closing of the investigation, BKV Zrt. continues identifying the possibilities of improving the communication channel between BLP dispatcher and the passengers on the trains. Within the framework of that effort, they further simplify the method of use of the emergency call device by placing information sheets in the passenger cabins, and they specify in detail an effective method for BLP dispatcher for managing incoming emergency calls.

2017-0004-5

Overview of the occurrence

On 2 January 2017, at 18:11 pm, the locomotive of the passenger train № 2846 became unserviceable at Budai út stop between the stations Ceglédbercel-Cserő and Cegléd, so it was not able to continue its way on its own.

Instructed by the traffic controllers, the Intercity train № 616, which was following the passenger train on the open line, contacted the tail of the other train in order to push it to Cegléd station. The train № 616 began to push the passenger train with the train control system of each train in the 'Shunting' mode, and without coupling the two trains.

When approaching the phase break before Cegléd station, the train № 616 dropped somewhat behind so that the locomotive driver could perceive the phase break. However, the speed of the passenger train exceeded 40 km/h (due to a slope), which activated the train control system, in turn stopped the train by triggering the emergency brake system, and then the follower train № 616 moving at a speed of 36 km/h, bumped into the passenger train slowed down by the emergency braking. Two members of the train crew were seriously injured, and 3 passengers of the Intercity train had minor injuries. The locomotive of the train № 616 became unserviceable, and the last three wagons of the passenger train were damaged.

The IC attributed the occurrence to a series of human and organisational factors.

With regard to the action taken by the railway company, TSB is not issuing a safety recommendation, but the Lessons learnt section are dealt with.

CONCLUSIONS

Direct causes

The factors which had direct effect on the occurrence were as follows:

- a) The train № 616 did not fall behind the passenger train in front of it after the push was ended.
- b) The two trains were not coupled.

Indirect causes

Indirect causes of the occurrence:

- c) There was no continuous communication contact between the two locomotive drivers.
- d) The train control devices were not set properly for the task.

Root causes

Causes which are distant from each other both temporally and spatially (located in the regulatory environment and in the safety management system) but which are related to the operation of the system:

- e) The unregulated, unsafe activity (pushing of trains by other trains) was a common activity.
- f) MÁV Zrt. as railway network operator found that kind of assistance necessary, but failed to specify rules to be applied in such situations.
- g) The rules in the system of existing instructions were not focused on given situations but the rules applicable for a given situation need to be collected from various places, i.e. the structure of instructions is inappropriate.

- h) Due to inappropriate safety culture, the person who recognised the unsafe and non-compliant nature of the activity made no attempt to direct the attention of the stakeholders on the problem.
- i) Due to inappropriate safety culture, no one demanded accurate regulation, although this form of assistance was applied quite often.

Other risk factors

The IC reveals no such factor.

Lessons learnt

Working in a situation of conflict between the objectives is one of the lessons learnt from the occurrence which should be highlighted. The staff involved in the occurrence kept in mind the most important operational objective: clear the track as soon as possible.

They attempted to achieve this objective by performing an activity which had not been permitted, neither regulated, and it was highly safety critical. In an appropriate company culture, if a conflict between objectives occurs, safety will have privilege over all other factors, and both the statements and behaviours of the top management as well as the operative management will verify this.

ACTIONS TAKEN

The push of trains by other trains was suspended temporarily after the occurrence, and MÁV Zrt. initiated negotiations for the sake of elaborating procedures to be followed in similar situations. TSB was also invited to those negotiations, but, with regard to the requirement of its independence, TSB was not authorised to participate directly in the elaboration of the regulation. As a matter of course, TSB shared our relevant comments and experiences during such negotiations.

The IC highlights two factors of the contents of the instruction issued:

- The possibility of continuous communication between the two locomotive drivers shall always be provided;
- The train needing assistance and the train assisting it shall be coupled.

SAFETY RECOMMENDATION

Regarding that MÁV Zrt. prepared special regulation on providing assistance to unserviceable trains, the IC finds that similar occurrences can be avoided by observing the relevant rules, and thus no safety recommendation is needed.

2017-0119-5

Overview of the occurrence

On 26 January 2017, at 08:56 at Csengele station, the train № 702 passed the V2 exit signal at danger without prior authorisation, entered the reception track previously set up for the train № 7037 (moving from the opposite direction), burst opened the switch № 3 which was in wrong position for it, and finally stopped at a distance of 410 metres from the arriving train. The train № 7037 stopped at the open line.

According to the IC, the occurrence can be traced back to human factors. The locomotive driver of the train № 702 was involved in an official telephone conversation while approaching Csengele station and he did not realise the danger signal, neither its pre-indication, nor the meaning of the more frequent vigilance warning, so he was not able to stop his train at the required point.

The IC did not find it necessary to issue a safety recommendation, but drew lessons to learn in connection with safety critical communication and the internal instructions of the company.

CONCLUSIONS

Factual statements directly connected to the occurrence of the incident

The telephone conversation with the locomotive running foreman divided the attention of the locomotive driver of the train № 702 en-route, and he did not realise the situation despite pre-indication of the danger signal and frequent vigilance warning, so he disregarded the display of the exit signal, and tried to move across Csengele station according to the timetable and the usual situation.

Factual statements indirectly connected to the occurrence of the incident

The locomotive drivers had not been informed on the relocation of the place where their trains were to pass each other. This fact cannot be added to the direct causes of the occurrence, because such relocated passing of the trains could have been performed safely by managing the signals in a compliant way and by observing the relevant instructions on the part of the locomotive drivers, but it may be stated that providing the affected staff with additional information would have more favourable effect on safety in similar cases.

Other risk factors

The 'KÖFI' traffic manager set a clear signal at the entry signal of the station for the train № 7037 without making sure beforehand that the train № 702 had stopped.

The state of the locomotive radio unit of the train № 702 was not suitable for communication. As the mobile phone provided for the locomotive driver was serviceable, communication with him had not become impossible, but in this situation, he could only be contacted through one channel only, and that channel was occupied from time to time.

SAFETY RECOMMENDATION

Similar cases may be avoided by observing the rules, therefore the IC does not propose any safety recommendation.

Lessons learnt

In the opinion of the IC, the case offers the learning that the importance of additional information and the role of the related communication in the prevention of accidents should

be emphasized at the periodical training of the staff involved in the supervision of traffic management.

In the opinion of the IC, the terms “by verbal instructions” and “by additional verbal instructions” should also be used in addition to the term “by remote control” in the instructions, because, as this occurrence also confirms, traffic control does not take place exclusively handling the safety installations, but its basic functions should include the sharing of safety critical information as well. It applies especially when a process familiar for a long time (e.g. passing through a station) is changed for a single occasion.

It would be similarly important to learn how to prioritise tasks in, so that the staff who manage traffic directly can develop a priority of the tasks related to their activities, as a result of which the safety critical tasks (e.g.: make sure that a train has actually stopped) take precedence over other tasks (e.g.: administration or settling things).

ACTIONS TAKEN

The traffic control coordinator at Szeged Regional Directorate, MÁV Zrt. used the Book of Ordinances to call the attention of ‘KÖFI’ traffic controllers with emphasis to the requirements to be observed relating to the crossing point transfer of trains. In addition to discussing the most critical procedures occurring in such situations, the entry in the Book of Ordinances which refreshes necessary knowledge also directs attention to the importance of giving verbal notification of such changed situation.

2017-0374-5

Overview of the occurrence

On 28 March 2017, at 09:19 am, the crane of a rail-carrying work train № 14449 departing from Dunaújváros station hit the entry signal “A”. The third wagon of the train derailed after the collision.

The IC found during the on-site investigation that the accident had been caused by the folded-out state of the boom of the crane. While the train was moving, the part reaching beyond the loading clearance hit the post of the entry signal, and the forces of the crash caused the third, rail-carrying wagon to derail. No one was injured due to the occurrence.



The position of the IC is that the occurrence could have been avoided by observing the relevant requirements in effect therefore it is not necessary to issue a safety recommendation.

CONCLUSIONS

Factual statements directly connected to the occurrence of the incident

The train crew started to move the train with the boom secured in its folded out position, despite the fact that it visibly reached beyond the loading clearance, which they should have been aware on the basis of their qualification as well.

Factual statements indirectly connected to the occurrence of the incident

As the shunting movements with folded-out boom had been performed on a regular basis, that mistake became a norm.

As a result, neither the outer station inspector nor the staff members appointed to receive the trains at the upper end of the station did realise that a part reached beyond the loading clearance, so they did not take any preventive action for the safe movement of the train.

The distance between the entry signal located in Railway Section № 259 + 03 and the axis of the track is less than the value specified in Instruction № D. 54, due to the leaning state of the signal.

Other risk factors

The IC revealed no other risk factor.

SAFETY RECOMMENDATION

Similar cases can be avoided by observing the relevant rules therefore the IC does not propose that a safety recommendation be issued.

2017-0720-5

Overview of the occurrence

At Ferencváros station, a light engine arriving on a closed route was detoured (not in the direction determined by handling the safety installations) by a switch. The investigation found that the actuator apparatus of the switch tongue had come apart, which made the light engine derail, and then get back on the track again.

According to findings of the investigation, a connecting bolt between the switch tongue and its tab had loosened and broken, which the maintenance personnel did not realise; in addition, for design reasons, the safety installation had not detected the inappropriate position of the switch tongue.



CONCLUSIONS

Direct causes

The factors which had direct effect on the occurrence were as follows:

- a) the linkage between the switch tongue and the switch tongue tab was disrupted due to fracture of a bolt,
- b) the defect was not detected by the safety installation.

Indirect causes

Comments relating to competences, procedures and maintenance which are directly related with the factors listed above:

- a) the switch tongue - switch tongue tab linkage was secured in such manner that it could loosen subsequently,
- b) the loose state and starting fracture of bolts were not detected by track supervising inspections, but the existing processes are not even able to detect such defects.

Root causes

Causes which are distant from each other both temporally and spatially (located in the regulatory environment and in the safety management system) but which are related to the operation of the system:

- a) the design of the safety installation is not suitable for detection of abnormal position of the switch tongue.

Other risk factors

Factors which are not related directly to the occurrence, but increase risk:

- a) certain dimensions of the switches (e.g.: clamp gap) change (i.e. get out of the tolerance area) quicker than the length of the maintenance cycle,
- b) the track maintenance service does not have the documentation of the constructions actually applied in recent switches.

Proven procedures, good practices

The following served mitigation of the consequences of the occurrence as well as prevention of a more serious outcome:

- a) the locomotive driver realised that his vehicle was moving on the switch abnormally, so he stopped it despite that it had remained on track; thus, he prevented it from continuing its travel on a wrong track, and also prevented a more serious further damage to the locomotive which now had a damaged suspension already.

Lessons learnt

As regards defects occurring during switch operation, an accident can be prevented by serial connection of the control rod, the switch tongue and the check rod in the safety installation (e.g.: the check rod is connected to the switch tongue by a separate tab); in that case, a defective connection with the switch tongue tab can be detected.

If the switch tongue - switch tongue tab connection is omitted from such serial system, then the 'safe life' safety strategy¹ can be applied (which does not mean that the risk of malfunction is fully excluded).

Check of bolted joints, which was performed during the actions taken as well, may reduce the risk of similar defects causing derailment.

ACTIONS TAKEN

MÁV Zrt. ordered an extraordinary investigation to perform obstacle tests and to check bolts. Repair or replacement was necessary in 7 cases on the network.

According to information from the track network operator, when assigning the extraordinary targeted inspection, the staff was instructed to be very strict, e.g. to replace bolts (or to replace rivets by bolting) even in the case of the slightest doubt.

The replaced bolts and rivets were not visibly loose. If leakage of rust was seen adjacent to the bolt then it had to be fastened (or replaced if fastening was not possible already). If leakage of rust was seen adjacent to a rivet, then it was replaced by bolt.

¹ A safety strategy in which no defect of a given system element is expected, i.e. it is accepted as perfect. This does not mean absolute exclusion of malfunction but that a hazardous malfunction may only occur at an acceptable level of probability. This strategy either requires a maintenance system which provides high reliability or the system elements may only be used within strictly specified lifetimes.

SAFETY RECOMMENDATION

BA2017-0720-5-01: *Relating to the occurrence, the IC found that interruption of the switch tongue to control rod linkage in the switches implies the risk of derailment, although such cases occur relatively seldom on the network. However, in circumstances other than those of this occurrence, derailment may entail very serious consequences. Under existing track supervision practice, such defects are difficult to detect in the phase of their formation.*

Transport Safety Bureau recommends Railway Authority Division, Ministry for Innovation and Technology to consider ordering MÁV Zrt. to perform a risk analysis in order to determine whether the switch tongue to control rod to check rod linkage is sufficiently reliable or is it necessary to add its regular check to the rules of the safety management system.

By acceptance and expected implementation of the safety recommendation, the risk of accidents caused by malfunction of parts of switches may be reduced.

2017-0771-5

Overview of the occurrence

On 17 June 2017, at 20:30 pm, the two trailing bogies of the number 24 tram (registration number: 1548) derailed on the switch № K1415 while approaching Közvágóhíd tram terminal. Due to the abnormal motions generated in the course of derailment, the pantograph got jammed in the overhead contact line and fractured.

After investigating the scene of the accident, the IC found that derailment had been caused by the lack of immovableness (caused by technical defect) of the entry switch.

As the rules in effect at the time of the occurrence did not require the switch operating personnel to check secure fastening of the switch when operating the switch on the spot, the IC proposes that a safety recommendation be issued.

CONCLUSIONS

Direct causes

The factors having direct effect on the occurrence were as follows:

Malfunction of the switch № K1415 was caused by fracture of the so-called link-block support plate. The unfastened switch mechanism was not able to fix the switch in its end position.

In absence of fastening, the switch tongues opened wider and wider under the first few wheels of the vehicle moving onto the switch, and the wheels of the fourth bogie were able to roll in between the opened switch tongue and the stock rail, which caused the vehicle to derail.

Indirect causes

- a) According to the IC, it may be related to the occurrence indirectly that the control panel operator's knowledge related to manual switch operation was not deep enough. While operating the switch manually, a skilled and experienced operator should have already realised the lack of immovableness of the switch, and mechanical abnormality of the switch should also have been suspected due to unusual force dynamic effects. At the same time, the lack of fastening of the switch could also have been realised after opening the cover of the link-block structure.

Other risk factors

- b) In addition to traffic-related work, the control panel operator also performs commercial activity. This may highly distract their attention from their work related to traffic control during the rush hours.

ACTIONS TAKEN

In accordance with the Safety Recommendation № BA2017-0771-5-1, BKV Zrt., in a joint effort with a 'KTI' Railway Examination and Certification Centre, reviewed and modified the Control Panel Operators' training Program, as a result of which a higher number of hours will be provided for acquiring the practical skills related to the switch than previously. Simultaneously, during the periodical training of control panel operators, the practical course material relating to switches was also updated.

SAFETY RECOMMENDATION

BA2017-0771-1 According to the position of the IC, the control panel operator did not realise the lack of the force fastening the switch tongues when manually setting the centrally controlled switch which had lost its end position. This suggests that they probably had insufficient knowledge of the torque needed to operate the switch, and of the mechanical forces which act when a switch with a link-block structure gets fixed.

TSB recommends BKV Zrt. to consider laying greater emphasis in the control panel operators' practical training on the traffic safety conditions to be checked when manually operating centrally operated switches which have lost its end position control, and to consider how the inspection of the fastening of such switches could be integrated in the list of compulsory tasks.

By acceptance and expected implementation of the safety recommendation, it would become more likely that the control panel operator has sufficiently detailed knowledge to realise a dangerous situation when manually operating a centrally operated switch which has lost its end position control in the case of unfastened condition of such switches.

2017-0850-5

Overview of the occurrence

On 7 July 2017, a number 28A tram, type T5C5, and on 29 October, a number 37 tram, type TW6000, derailed on the same switch, with one bogie each, while approaching the dead-end track of the terminal.

The IC traced the occurrence back to a technical problem related to the switch and to attention problem of the drivers of the vehicles, but also found that the rules relating to the switch signals were not consistent, i.e. as they were not in line with the capabilities of the switch operating apparatus used at the spot of the occurrence.

Therefore the IC proposed that a safety recommendation be issued in order to create accordance between the switches and the rules related to them.

CONCLUSIONS

Direct causes

The factors which had direct effect on the occurrence were as follows:

- a) the switch got stuck up between two positions, and
- b) the drivers of the vehicles did not realise that situation.

Indirect causes

Comments relating to competences, procedures and maintenance which are directly related with the factors listed above:

- a) the switch works unreliably when used with trams running within the relevant speed limit but in its upper range;
- b) the switch signal gives a false signal aspect indicating an end position when the switch is between two end positions.

Root causes

Causes which are distant from each other both temporally and spatially (located in the regulatory environment and in the safety management system) but which are related to the operation of the system:

- a) the instruction provides no consistent, useful rules relating to the switch signals and to the reliability of the signal aspects;
- b) vehicle drivers report only part of the malfunctions detected.

Other risk factors

The IC makes no such statement.

Proven procedures, good practices

By realising the emergency situation immediately and taking action quickly, both vehicle drivers contributed to mitigating the consequences and preventing a more serious outcome of the respective occurrences.

Lessons learnt

Each occurrence could have been avoided by paying sufficient attention by the drivers.

However, the driver's attention can be supported by valid, reliable feedback, and cannot replace the reliability and reasonably error-free work the switches.

One of the conditions of achieving technical reliability is that all defects and malfunctions detected should be reported consistently.

ACTIONS TAKEN

No preventive action was taken related to the occurrence during the investigation. However, the track network operating company expressed their intent to replace the switch operating apparatuses involved in the occurrence.

SAFETY RECOMMENDATION

BA2017-0850-5-01: *The investigation found that the switch signal involved in the occurrence was not suitable for reliable indication of the end position of the switch, although the aspect of the signal referred to an end position according to its description in the instruction.*

Transport Safety Bureau recommends BKV Zrt. to consider reviewing the harmony between the technical solutions and the rules of signalling on their tram network, and taking action to create compatibility between the rules and the technical capabilities of available equipment.

By acceptance and expected implementation of the safety recommendation, the switch signals used will provide valid information or can be interpreted with their limits taken into account.

2017-1036-5

Overview of the occurrence

On 16 August 2017, a tram derailed with two bogies on a temporary crossover at the temporary terminal station Haller utca / Soroksári út in Budapest. The derailed tram rolled on, damaged the road separation caps, and stopped after 53 metres, with its pantograph broken.

The IC traced the occurrence back

- partly to a technical factor: the structure of the temporary crossover had been dislocated compared to its normal position, due to a loosened bolt; and
- partly to human factors on the part of the driver, who had been driving the vehicle at a speed significantly exceeding the relevant speed limit.

The construction of the structure, the technology of its installation and failure to detect the malfunction (despite previous report on anomalous movement received from a tram driver) contributed to the occurrence.

Although TSB issues no safety recommendation relating to the occurrence, but the lessons learnt from it are discussed in Section Lessons learnt.

CONCLUSIONS

Direct causes

The factors which had direct effect on the occurrence were as follows:

- a) the down ramp of the temporary crossover did not fit accurately with the track,
- b) the tram was running at a speed significantly exceeding the speed limit while leaving the temporary crossover.

Indirect causes

Comments relating to competences, procedures and maintenance which are directly related with the factors listed above:

- a) the bolt fastening the downward ramp got loose due to shortcomings of installation works, and
- b) the defect was not identified despite the fact that it had been reported;
- c) the construction of the structure lacked the solution for lateral support which had been part of its design nevertheless.

Root causes

Causes which are distant from each other both temporally and spatially (located in the regulatory environment and in the safety management system) but which are related to the operation of the system:

- a) the track network operator does not have the drawing and specifications of the actual execution, and the manufacturer of the structure could not produce the same either;
- b) it is difficult to keep to the relevant, such low speed limit with the tram on the actual structure.

Other risk factors

Factors which are not related directly to the occurrence, but increase risk:

- a) the end points of low-speed stretches are not adjusted properly to the ends of the structure requiring such speed limit.

Proven procedures, good practices

The IC identified no process or practice which would have served to mitigate the consequences of the occurrence or to prevent a more grievous outcome, but found some which gave a chance (which did not come true in this case) to avoid the occurrence:

- a) the driver of another tram driver detected the defect earlier and reported it, giving also the location precisely;
- b) the track network operator sent out its suitable working team staying the closest to the scene within short time.

Lessons learnt

Similar cases may be avoided by:

- a) securing the nut of the bolt fastening the downward ramp against loosening;
- b) selecting a holmaking technology or a flat washer type which provides appropriate seating of the flat washer onto the rail;
- c) ensuring the possibility to check the tight state of the nut by appropriate tools or design.

More reliable and compliant operation may be achieved by:

- d) providing availability of the drawings and technologies related to the actual construction;
- e) pegging out the speed limits at the ends of the structure requiring such speed limit as accurately as possible, especially in the case of low speeds;
- f) by the tram drivers' observing the speed limits.

ACTIONS TAKEN

During the investigation, the track network operator took no action related to the occurrence or the risks revealed.

SAFETY RECOMMENDATION

Similar cases may be avoided by applying those discussed in Chapter Lessons learnt therefore no safety recommendation needs to be issued.

2017-1078-5***Overview of the occurrence***

The outer station inspector authorised the driver of the train (heading to Lókösháza) departing from main track number IV, Békéscsaba station to start while the exit signal (out of his sight) was still at danger due to a freight train coming from the opposite direction. The train started, and by the time the engine driver realised the exit signal indicated danger, he was not able to stop in front of it, so his train passed the exit signal № V4 and burst opened the switch № 19. The freight train stopped in front of the falling back entry signal.

In addition to human factors related to the outer traffic manager and the locomotive driver, the occurrence may also be traced back to the lack of repeating signal along Track IV and to the lack of continuous signalling at the station. The latter two safety issues had been known by the affected organisations for two years (since putting the safety installation into operation), but due to organisational factors, the problem had not been solved by the time of the occurrence.

There are slow and obscure decision processes in the investment system, modifications in the electrical safety installations take long, there are no enforceable deadlines for legal reasons.

The repeating signal and continuous signalling were put into operation two months after the occurrence. The IC issued no safety recommendation, but worded lessons learnt relating to the occurrence and to the reconstruction of Békéscsaba Station.

CONCLUSIONS**Direct causes**

The factors which had direct effect on the occurrence were as follows:

- a) the outer station inspector authorised the train to depart without being instructed by the chief traffic manager, and he failed to ensure that the exit signal displays clear,
- b) the locomotive driver started his train without preparing for subsequent checking of the entry signal which could not be seen from the starting point.

Indirect causes

Comments relating to competences, procedures and technical background which are directly related with the factors listed above:

- a) the exit signal № V4 of the station was not visible from the regular starting point of trains, and there was no repeating signal to give information on the aspect of the signal;
- b) continuous signalling was not in use at the station,
 1. an error due to a design problem (related to simplified installation) was identified during initial commissioning,
 2. the problem was eliminated two years later only;
- c) even minor modifications are fairly complicated and time consuming, due to the technical system of electrical safety installations and the related regulation and the practice of the industry.

Root causes

Causes which are distant from each other both temporally and spatially (located in the regulatory environment and in the safety management system) but which are related to the operation of the system:

- a) the regulation does not require the installation of repeating signal for the track geometry and visibility situations involved in this case;
- b) continuous signalling was planned in a simplified layout initially, due to a substitute installation (ETCS) to be put into operation in the uncertain future;
- c) elimination of the risks identified in the course of the project is very slow and difficult through the official channel;
- d) the developer of the infrastructure was not able to take the necessary actions due to lack of information;
- e) the project supervisory bodies had practically lost control:
 1. projects built on one another leg years behind, making the execution of other tasks impossible,
 2. on that ground, it was possible to cancel deadlines of signed contracts in such manner that the contractor does not even keep to the deadlines of the project elements not affected by the precondition.

Other risk factors

Factors which are not related directly to the occurrence, but increase risk:

- a) the safety installation was designed for environmental conditions which was changed in the course of execution;
- b) when perceiving his anomalous situation, the locomotive driver took somewhat long to realise that it was an emergency requiring intervention;
- c) the station comprises a mixed architecture, so even a short shunting movement may involve moving on a set of track requiring several different technologies.

Proven procedures, good practices

The possibility of avoiding the occurrence is implied by the fact that professionals of the track network operator company identified the risks and found it necessary, in addition to the requirements, to install repeating signals and argued for implementation of the same despite an opposing environment.

Lessons learnt

The occurrence could have been avoided by observing the rules of authorisation and appropriate behaviour on the part of the locomotive driver.

Even the most careful employees are likely to make similar mistakes during a long time of service, therefore it is important to manage identified risks in a timely manner in order to reduce the time of working in hazardous circumstances, thus reducing the chances of making a mistake.

The mixed architecture (as far as safety installations are concerned) of the station raise the question that if installation in full was not possible then was it reasonable to choose a partial solution or should the earlier *status quo* (complete absence of safety installations) have been maintained. The position of the IC is that in a similar situation a track network operating company needs to perform risk analysis and make decisions as necessary on the basis of its result.

ACTIONS TAKEN

About two months after the occurrence, in the night from 30 November to 1 December 2017, software was changed in the safety installation, the repeating signal 'V4ism' was put

into operation, and continuous signalling was turned on along 6 tracks (Tracks I-V and Track VIII).

SAFETY RECOMMENDATION

Similar cases may be avoided by observing the relevant rules (rules of authorisation, approaching a main signal which is out of sight) and by paying due attention by the personnel; the actions taken reduce significantly the likelihood of making mistakes during this activity. Accordingly, therefore there is no need to issue a safety recommendation.

2017-1393-5

Overview of the occurrence

On the stormy day of 29 October 2017, there were significant delays in the South Transdanubian region, and the safety installation for contra-flow exclusion also malfunctioned between Cece and Vajta stations on the railway line № 46. Due to his tasks involving other lines, the line movements inspector refrained from working for the line № 46, so it was the station traffic controllers' task to organise transfer of the crossing points of trains (because of the delays). In that context, the traffic controllers authorised both the express train № 838 coming late from Cece and the passenger train № 8303 coming late from Vajta to start despite the fact that the exit signals were at danger, so the trains began to approach each other.

Realising the mistake, the two traffic controllers took action to stop the trains.

The IC found that the occurrence was in the first place due to non-compliant, ambiguous communication between the traffic managers who actually were aware of the relevant rules. Beforehand, the line movements inspector had refrained from making decisions relating to the line № 46, leaving the decisions to be made on crossing point transfers with the station crew.

In addition, the IC found that the training of the personnel includes only the knowledge of instructions, i.e. they are not formally prepared for the basic principles and conscious use of safety-critical communication.

The IC issued a safety recommendation relating to review of the training materials affected.

CONCLUSIONS

Direct causes

The factors which had direct effect on the occurrence were as follows:

- a) Vajta station authorised the train № 8303 to depart in the direction of Cece when the train № 838 had already been on its way in the direction of Vajta;
- b) after Cece and Vajta stations had given traffic related announcements of multiple ambiguity to each other.

Indirect causes

Comments relating to competences, procedures and maintenance which were directly related with the factors listed above

- a) the contra-flow exclusion function of the section block did not work, probably due to stormy weather;
- b) the order of stops of the train № 838 was changed bypassing the chain of command, and the stations were not notified of it;
- c) the traffic management staff did not give support the station staffs with the transfer of crossing points;
- d) it is general practice on the line that the traffic manager staff use the regular phrases of the announcements inappropriately or not at all, and fail to listen to ACKs (acknowledgements) carefully.

Root causes

Causes which are distant from each other both temporally and spatially (located in the regulatory environment and in the safety management system) but which are related to the operation of the system:

- a) due to its layout, the overhead contact system does not tolerate the impacts of weather, e.g. stormy winds with (not even extremely strong) gusts, so the storm caused tear of contact wires and significant delays in traffic, as a consequence;
- b) the practice of traffic organisation lacks reduction of traffic load in the case of capacity decrease;
- c) the traffic manager personnel are not trained in safety-critical communication and other non-technical skills.

Other risk factors

The IC identified no other risk factors during this investigation.

Proven procedures, good practices

The following served mitigation of the consequences of the occurrence as well as prevention of a more serious outcome:

- a) the traffic managers took action quickly after realising the emergency situation, and the supporting information technology systems were available to them.

Although it did not influence the occurrence, it should be mentioned that the personnel were aware of the rules of requesting and giving authorisation.

Lessons learnt

The emergency situation could have been avoided if:

- a) the rules of requesting and giving authorisation had been observed,
- b) the line movements inspector had participated in decision making related to transfer of the crossing points.

When the electronical authorisation system will be launched it is expected to reduce the likelihood of similar occurrences, but attention must be paid to the elaboration of appropriate procedures to be followed in the case of malfunction of such system, as well as to the associated initial and refreshing training.

Implementation of more storm-resistant infrastructure elements should be given more emphasis in the future.

The IC reminds the affected railway companies of their obligation to observe the legal provisions relating to the alteration of the scenes of occurrences.

ACTIONS TAKEN

The operator of the railway network has reported an action taken, namely that, on 2 March 2018, they issued an instruction related to the conditions of operating voice recording systems designed for technical purposes of traffic management or for passenger information.

The instruction provides detailed rules for access rights and the relating data protection principles. But it does not cover the necessity and frequency of replay and check or the duty to act, so it offers no solution to the problem discussed in the Final Report.

SAFETY RECOMMENDATION

BA2017-1393-5-01: *The Investigation Committee of TSB found that low level of safety-critical communication significantly contributed to the occurrence. That skill is not included in the initial or refreshing training of the personnel.*

Transport Safety Bureau recommends Railway Authority Division, Ministry for Innovation and Technology to consider reviewing the training syllabuses, with highlight on non-technical skills (e.g.: communication, decision making, team work

etc.), involving the affected railway companies as well as training and examination organisations in the effort. We recommend taking action as necessary depending on the results of such review.

By acceptance and expected implementation of the safety recommendation, training syllabuses and corresponding training courses may be developed that are compliant with the requirements of the stakeholders in the sector as well as with transport safety. Such training courses convey not only the knowledge of instructions but also teach skills of using the rules, thus contribute to improvement of the safety of transport.

2017-1544-5

Overview of the occurrence

On 30 November 2017, the trailing bogie of the a tram approaching Közvágóhíd terminal, Budapest, passing two green lights derailed on the first switch approached. The IC found that the derailment occurred due to switch operation under the tram: the control panel operator had applied emergency release right in front of the approaching tram and reversed the switch while the tram was still above it.

The IC traced back the occurrence to human factors on the part of the control panel operator who had failed to check the position of the vehicle before applying emergency release on the one hand, and on the other hand to human factors on the part of the tram driver who had not paid sufficient attention to the display of entry signal.

The outworn safety installation at the terminal contributed to the occurrence because due to it, emergency release had become an element of routine work, and was not a special operation anymore.

CONCLUSIONS

Direct causes

The factors which had direct effect on the occurrence were as follows:

- a) the control panel operator operated the switch under the approaching tram with the aim of changing the route to another track, having applied emergency release of the track route right in front of the approach of the tram, and reversed the switch without checking that the switch was unoccupied,
- b) the tram driver did not realise the change the display of the signal green to red right before arriving there.

Indirect causes

Comments relating to competences, procedures and maintenance which are directly related with the factors listed above:

- a) the signal equipment was outworn, normal operations are hindered by technical errors very often;
- b) the control panel operator regularly applied emergency release as a routine, without exercising due care;
- c) the terminal is very busy, which makes careful, attentive handling of the errors of the signal system more than difficult.

Root causes

Causes which are distant from each other both temporally and spatially (located in the regulatory environment and in the safety management system) but which are related to the operation of the system:

- a) the track network operator runs an outworn signal system which is not up to the task at such a busy terminal.

Other risk factors

Factors which are not related directly to the occurrence, but increase risk:

- a) the logging of special operations is done in a very simplified manner, e.g. it does not reflect the time and cause of such operations, and the relevant rules do not specify requirements either;

- b) the control panel operator also performs tasks that are not related to traffic management, which distracts their attention;
- c) people walk through the service area at the terminal on a regular basis.

Proven procedures, good practices

The IC identified no such factor.

Lessons learnt

The unreliable, outworn signal system does not support safe management of the traffic, especially at a busy terminal.

However, the tram driver would have had the chance to prevent the occurrence by paying due attention to the signal.

The control panel operator made a so-called routine-based error, which can only be prevented by providing suitable technical conditions and by strict enforcement of compliance with the rules and procedures.

ACTIONS TAKEN

The track network operator has performed repairs to the signal system of the terminal.

SAFETY RECOMMENDATION

Similar occurrences can be avoided either by complete reconstruction or replacement of the signal equipment or by limiting the traffic of the terminal, taking into account the limited capabilities of the equipment.

6. SAFETY RECOMMENDATIONS

SUMMARY OF RECOMMENDATIONS

In 2018, the addressee of the safety recommendations was primarily the National Transportation Authority, as National Safety Authority (NSA). TSB deviates from this practice only when it issues safety recommendations to organisations which are not under the scope of authority of the NSA (e.g. rescue services), or the supervision rights are at a regional authority (e.g. supervision of level crossings). This way it could be achieved that when the addressee of the recommendation is a railway undertaking, the response would not come from the addressee itself for which the implementation would involve considerable work and/or financial sources but an outside, impartial professional organisation would respond to the recommendation. The other advantage is that when the recommendation suggests eliminating conditions/factors that are unlawful or pose risks to transport safety, the NSA has the possibility to oblige the relevant parties with deadlines to take action, which would increase efficiency in the implementation of recommendations. Disadvantage of this process – laid down in the RSD – is that it brings delay in the implementation process, and there are some cases, when the NSA has no legal right to take action in topics, which could be solved easily by the IM or RU.

In 2018 the Railway Department of TSB published 19 final reports closing 20 investigations, including 9 safety recommendations. 3 of these recommendations have been implemented, implementation of 6 recommendations is in progress.

Issuance of safety recommendation is usually preceded by consultation with the railway companies involved and National Transport Authority. As a result of such consultations, it is often unnecessary to issue a safety recommendation formally, because the railway companies recognize the anomalies and take action voluntarily to eliminate such anomalies. Therefore no immediate preventive recommendation was issued in 2018.

Response	2016	2017	2018
Accepted and implemented	7	2	3
Accepted and partially implemented	-	-	-
Accepted, implementation in progress	8	12	6
Accepted, no information on implementation	-	-	-
Rejected	-	-	-
No answer	1	2	-
Total	16	16	9

THE SAFETY RECOMMENDATIONS —2018

Annex B

Safety recommendations issued in 2018

BA2016-0898-5-01: The IC found that comprehensive inspection and documented measurement of the switches were not performed after realignment of the track. Realignment of the turnouts entails dislocation of the switch structure and the operating point of the setting apparatus, due to which the applicable regulation requires measurement following such intervention; however, it is not specified exactly what to measure and how to document it.

TSB recommends Railway Authority Division, Ministry of National Development to consider reviewing whether the track supervision requirements in the safety management system of MÁV Zrt. sufficiently cover the inspections and measurement following track realignment, as well as documentation thereof.

In the case of accepting and implementing this recommendation, the track supervision unit would have better chance to detect those turnouts which got into hazardous condition during track realignment, and to verify safe condition of the switches following track realignment.

BA2016-0898-5-02: The IC found that the feedback report on the safety installation functions had included a defect known but not corrected for 10 months, and the general inspection had not taken place, i.e. it had not been done by the time of the investigation.

TSB recommends Railway Authority Division, Ministry of National Development to consider reviewing whether the safety management system of MÁV Zrt. sufficiently covers the system of general inspection of safety installations, whether elimination of shortcomings takes place according to such system, and whether the shortcomings and outstanding steps of such system are revealed during safety inspections, and whether associated risks are handled.

In the case of accepting and implementing this recommendation, it could be provided that the operating organisation keeps their safety installations in safe condition.

BA2016-0898-5-03: The IC found that handling and registration of paper seals at the railway station is chaotic, duplicated, usage is not in the right order, and their handing over is inaccurate.

TSB recommends Railway Authority Division, Ministry of National Development to consider reviewing whether the safety management system of MÁV Zrt. sufficiently covers the usage, handling and registration of metal and paper seals used on safety installations. We recommend introduction of such a seal system where the seal is given an individual identification code during manufacturing.

In the case of accepting and implementing this recommendation, the extraordinary handlings of safety installations could be tracked, which is essential to maintaining safety continuously.

BA2016-1244-5-01: The investigation found that the required illumination is not provided at the level crossing located in the railway section 491+16 between the railway stations Kápolnásnyék and Gárdony. The level crossing does not comply with the provisions in Subsection (17) Section 9, KM Regulation 20/1984. (XII. 21.).

TSB recommends Transport Inspectorate, Fejér County Government Office to consider inspecting the illumination of the level crossing, and obligating the affected entities to provide the condition required by relevant regulation as necessary.

According to the IC, by acceptance and expected implementation of the safety recommendation, the risk of accidents for a similar reason can be reduced significantly.

BA2016-1351-5-01: During the investigation, the IC found scarcity of communication channels along the M4 subway line. Due to priority of the emergency calls coming from the trains, the dispatcher can only speak to all passengers through the passenger information function when there is no active emergency call from the train. In the case of a real emergency situation and panic, the passengers on the train will probably use all emergency calling units, making the use of the passenger information audio system – and thus, the controlling of evacuation – impossible.

Transport Safety Bureau recommends a BKV Zrt. to consider reviewing the possibilities of communication between the passengers and the dispatcher on the subway line M4, and to take action to prevent the narrowing of passenger information in an emergency situation.

By acceptance and expected implementation of the safety recommendation, emergency communication between the traffic managing staff and the passengers may become more effective.

BA2017-0720-5-01: The IC found that disruption of the connection between the switch tongue and the linking rod of the switch implies the hazard of derailment derailing, although similar cases occur in the network relatively seldom. In circumstances other than in this case, derailing may have very serious consequences. Relying on the current system of track supervision, similar defects are not easy to identify during the process of formation of the defect.

Transportation Safety Bureau recommends Railway Authority Division, Ministry of National Development to consider ordering MÁV Zrt. to perform risk assessment in order to see whether the reliability of the switch tongue to adjusting rod to inspection rod connection in switches is acceptable, or is it necessary to include regular inspection of such connections in the rules of the safety management system.

By acceptance and expected implementation of the safety recommendation, the risk of accident caused by malfunction of parts of switches can be reduced.

BA2017-0771-5-01: According to the position of the IC, the control panel operator did not realise the lack of the force fastening the switch tongues when manually setting the centrally controlled switch which had lost its end position. This suggests that they probably had insufficient knowledge of the torque needed to operate the switch, and of the mechanical forces which act when a switch with a link structure gets fixed.

TSB recommends BKV Zrt. to consider laying greater emphasis in the control panel operators' practical training on the traffic safety conditions to be checked when manually operating centrally operated switches which have lost its end position control, and to consider how the inspection of the fastening of such switches could be integrated in the list of compulsory tasks.

By acceptance and expected implementation of the safety recommendation, it would become more likely that the control panel operator has sufficiently detailed knowledge to realise a dangerous situation when manually operating a centrally operated switch which has lost its end position control in the case of unfastened condition of such switches.

BA2017-0850-5-01: The investigation found that the switchpoint light of the switch involved in the occurrence is not suitable for displaying the end position of the switch reliably, although the signal displayed would indicate accurate end position according to the definition of the displayed signal in the instruction.

Transportation Safety Bureau recommends Budapesti Közlekedési Zrt. to consider reviewing the harmony of the technical solutions and rules of signalling applied with

the switchpoint lights along the tram network of the Company, and to take action to reach harmony between the rules and the capabilities of available technical equipment.

By acceptance and expected implementation of the safety recommendation, the switchpoint lights applied may provide true information or can be interpreted with taking their limitations into account.

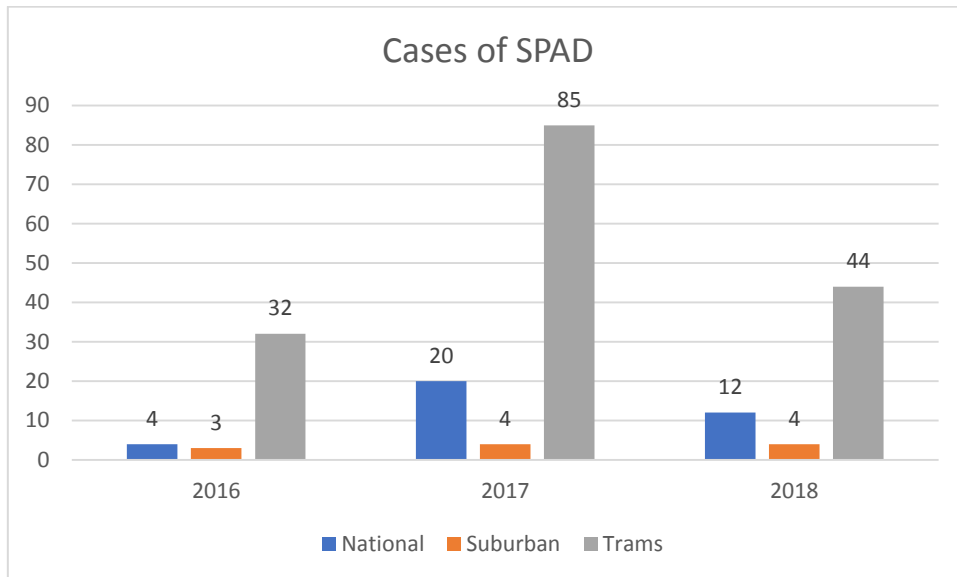
BA2017-1393-5-01: The investigation performed by the Investigating Committee of TSB found that the low level of safety critical communication had contributed significantly to the occurrence. This item is not part of the training or advanced training of the personnel.

Transportation Safety Bureau recommends Railway Authority Division, Ministry of National Development to consider reviewing the training syllabuses, in a joint effort with the training and assessment organisations of the affected railway companies, with special emphasis on non-technological knowledge (e.g. communication, decision making, team work, etc.). On the basis of the findings of the investigation, we recommend taking action as necessary.

By acceptance and expected implementation of the safety recommendation, the training syllabuses and, subsequently, training courses may be developed in accordance with the requirements of players in the industry and transport safety. Such training courses which are not limited to transfer the knowledge of instructions may convey the skill of application of rules, and thus contribute to the improvement of transport safety.

7. HIGH PRIORITY TOPICS IN 2018

Signal Passed at Danger (SPAD)



Numbers of SPADs (2016-2018)

Unauthorised passing the signal at danger is one of the most hazardous incidents in railway transport. The number of incidents of passing the signal at danger decreased in comparison to 2017 both in the national and the suburban networks.

We are pleased to note that these indices have improved in 2018. There were only 44 occurrences of this sort in the local tram network, which is very positive, especially in comparison with the year 2017. We can say that, similar to 2017, there was no major danger situation in 2018 either. However, the negative trend of data must be taken into account when evaluating the activity of vehicle drivers. It should also be mentioned that, due to relatively low speeds, better visibility and the road traffic lights, signal overrun by tram drivers implies substantially lower risk than the same error committed in the heavy-rail network. Of the signal overruns which occurred in the train networks in 2018, 22 took place in the area of Budapest Közlekedési Zrt (BKV), which reflects significant improvement compared to the 79 events of 2017, and shows that in 2017, the action plan compiled by the safety staff of the company brought good results as expected.

Signal overruns occurring in the national railway network represent occurrences of higher risk. The number of such events has also decreased, from 20 to 12, compared to 2017. TSB decided to start its own investigation into 5 cases of signal overrun.

Signal overruns were attributed to human factors related to the locomotive drivers in each case; technical factors are rarely involved. For that reason, it would be important to provide training and preparation sessions for the personnel in the related subjects (situation awareness, fatigue, safety critical communication, etc.).

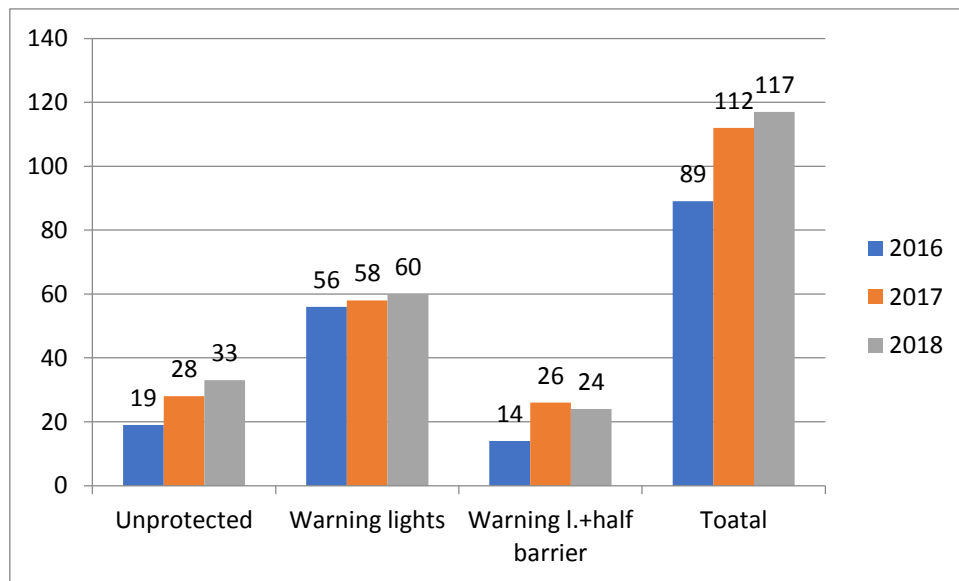
Human and organizational factors

During our investigations performed in 2018, we laid significant emphasis on investigating into human and organizational factors including elements of the Safety Management System.

During our investigations, we identified 32 direct causes in total, of which 20 were human or organizational factors, while 44 of the 30 indirect causes belonged to this category.

Such causes included fatigue, the loss of situational awareness, and dangerously low levels of safety critical communication and many times the poor safety culture.

Level crossings



The number of accidents at level crossings increased by 5 in 2018 compared to 2017.

One not properly working railway warning light system was involved in one accident, while an unserviceable half-barrier & warning lights system also was involved in one accident in 2018. TSB started a full investigation into both occurrences. The rest of the accidents at level crossings can be attributed to human factors on the part of vehicle drivers and, occasionally, pedestrians.

8. OTHER ACTIVITIES

Trainings

In order to maintain and improve the professional knowledge of the investigators, the trainings organised based on our training plan continued in 2018. In that year, training was provided in the form of in-house training sessions. More experienced colleagues shared their knowledge and skills in the subjects of taking photographs, measuring techniques, etc.

One colleague of ours obtained an additional degree in the investigation expert specialty at Széchenyi István University, Győr.

These studies can be utilised effectively in the investigations.

International Cooperation

TSB continued to participate actively in the work of the European Railway Agency (ERA) The cooperation with ERA (with its costs covered by the EU) offers the opportunity for TSB to participate in compiling the system and methodologies of the assessment of National Investigation Bodies,

Outside of the ERA, some of the European investigating bodies (e.g. Germany, Austria, Switzerland, Czech Republic, The Netherlands, Luxemburg, Belgium, Estonia, Romania, etc) established a regional cooperation forum whose work TSB also participates in. Within the framework of this forum – besides discussing local problems and making recommendations towards ERA – there is an opportunity to learn about the investigation procedure of certain accidents and gain experience in the investigation of various types of rarely occurring occurrences.

International Activities

The personnel of R&DD took part in various international activities in 2018.

The European Union Agency for Railways (ERA) brings together the national investigating bodies into a working group. The head of Railway and Dispatcher Department attended the plenary session of the working group on three occasions.

The Regional Conference of Central & Eastern European Investigating Bodies is held twice a year; last year the first was held in Germany. On this event and was attended the head of the railway department.

International conferences, meetings and working group sessions offer excellent opportunities to establish good professional contacts, share experiences, and acquire new methods to be used in our own activities.