

**NEAR COLLISION OF TRAINS
NO. IC568 AND 5503 BETWEEN ASZÓD
AND TURA RAILWAY STATIONS
ON 16 MAY 2011**

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DEFINITIONS AND ABBREVIATIONS

OTD: The train driver is on duty on his own in the driver's cab ("only train driver")

IVTCD: Integrated Vigilance and Train Control Device

ITCD: Integrated Train Control Device

CTCD: Combined Train Control Device

MET: Ministry of Economy and Transport

TSBH: Transportation Safety Bureau of Hungary

Transport Investigation Act: Act CLXXXIV of 2005 on the technical investigation of aviation, railway and marine accidents and incidents

ESP: External Service Point

MÁV-START Plc.: MÁV-START Railway Passenger Transport Private Company Limited by Shares

MÁV-TRAKCIÓ Plc.: MÁV-TRAKCIÓ Railway Traction Private Company Limited by Shares

MÁV Plc.: Hungarian Railway Private Company Limited by Shares

TCBD: Train Control Board Device

SG: Spacing group (consolidated feedback of several spacing groups)

CI: Committee of Investigation

FTRW: Free Trade Union of Railway Workers

INTRODUCTION

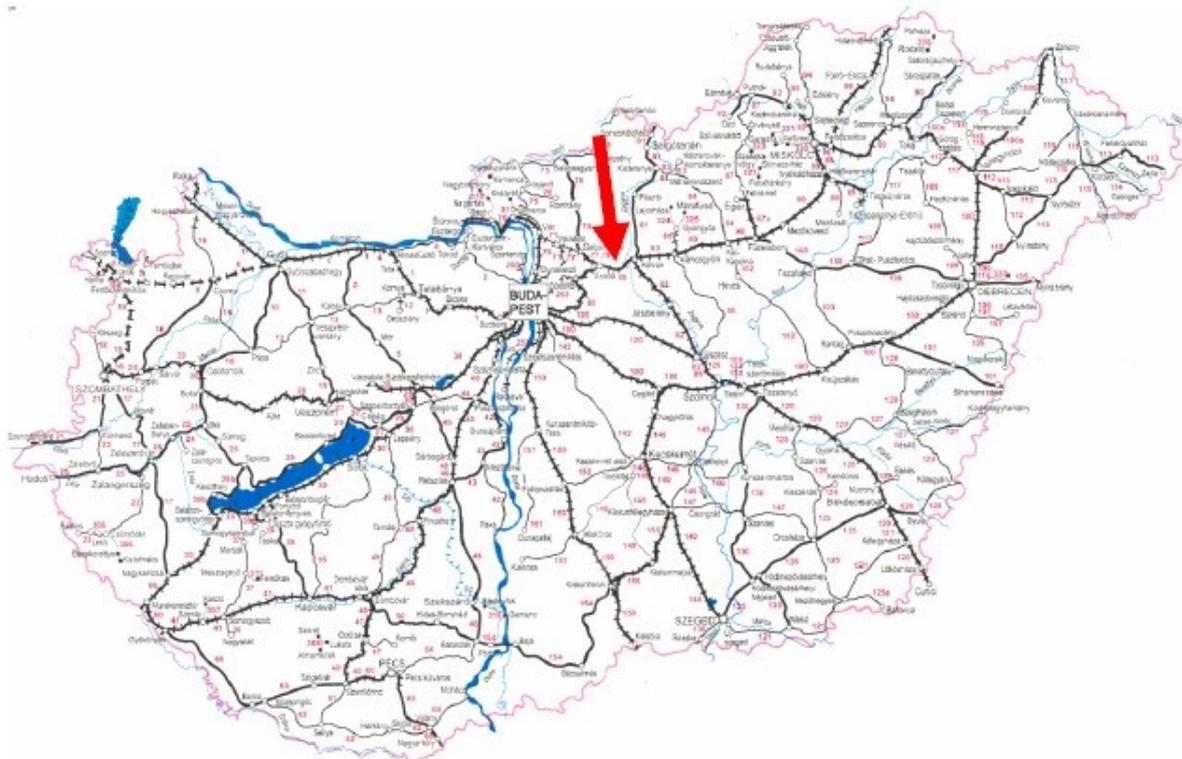


Figure 1: Location of the near-collision

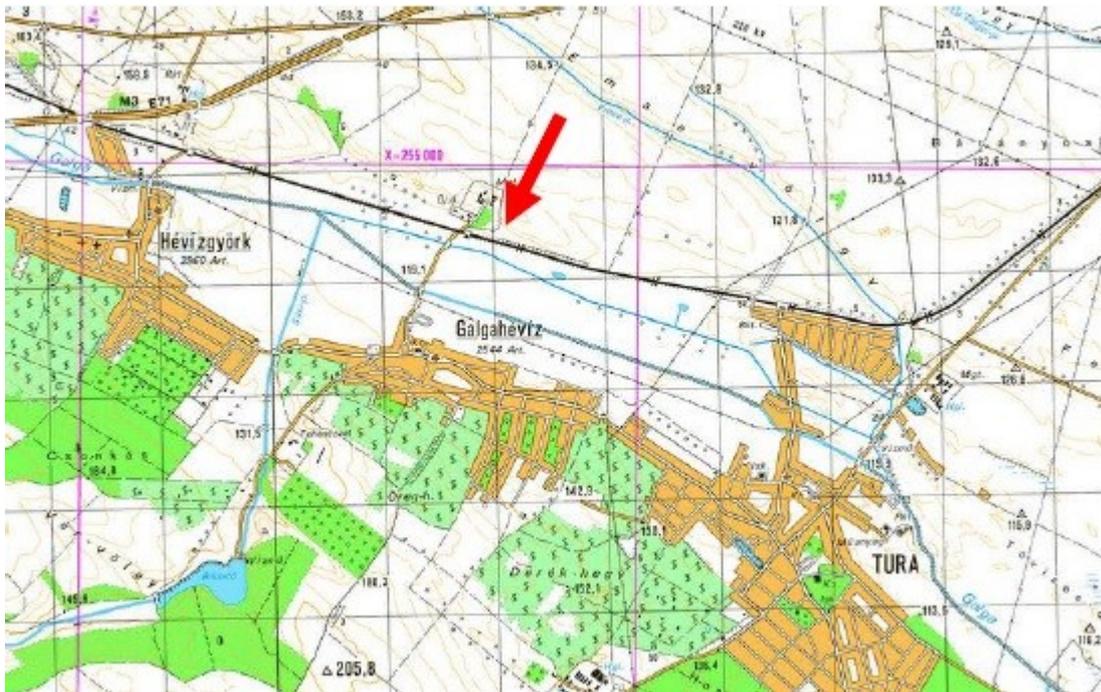


Figure 2: Close-up view of the location

The purpose of this presentation is to explore the causes and circumstances leading to serious railway accidents, minor railway accidents and unexpected railway incidents, as well as to initiate professional measures and make proposals for the prevention of similar incidents. The presentation is not intended to investigate or establish culpability or responsibility.

On 16 May 2011 at 16 hours and 43 minutes the rail line controller claimed, after having consulted the railway signalling dispatcher, that the automatic spacing signal system was out of order due to failures of the railway signalling system between Tura and Aszód railway stations, therefore, the rail line controller ordered that only one train may run in the section between the two stations. At 18 hours and 16 minutes Train No. 5503 left Tura railway station on the right-hand side track heading toward Aszód railway station and ran toward IC Train No. 568. The traffic duty officer of Tura railway station realized it shortly after the entrainment that Train No. 5503 left the station on the right-hand side track instead of the left-hand side track, as planned originally. The traffic duty officer notified the rail line controller about this fact, who was able to reach the train driver of IC Train 568 by a ground-to-train radio and ordered him to stop the train immediately. After stopping the train, the train driver of IC Train No. 568 gave light signals to Train No. 5503 heading to the IC Train, and the chief ticket inspector of the IC Train hurried towards the other train running from the opposite direction to warn the train driver about the situation. The driver of the other train saw the signals and stopped his train. The two trains stopped at 1,630 meters apart from each other.

According to the findings made by the CIA, the incident was caused by the fact that the traffic duty officer of Tura railway station failed to set the switch to the direction leading to the correct (left-hand side) track line, when setting the track line for Train No. 5503, and failed to realize his mistake, when carried out the train's switch and track line inspection procedure.

Another fact that was viewed as a contributing factor to the incident was that the crew of Train No. 5503 had failed to understand clearly the written order delivered to them, they had passed by the exit post prohibiting further progression at a speed exceeding the permitted speed limit, had failed to stop in front of the switch set incorrectly, had proceeded onto the incorrect (right-hand side) track line, and had kept on moving towards to next railway station.

The investigation identified several other factors in relation to the incident, the incremental risk of which may play contributing roles in the occurrence of other potentially more serious incidents caused by similar reasons.

During the professional examination of the incident, the CI issued safety recommendations by proposing the implementation of immediate preventive measures on the basis of the facts explored by that point of time that may have been attributable to the incident, including their findings on:

- the check list for the traffic control personnel,
- the check list for the traction vehicle personnel,
- the entry into force of Decree No. 19/2011. (V.10.) of the Ministry of National Development,
- the tasks to be performed during the training organization registration process,
- the syllabi of basic level and periodic examinations developed by the test centres,
- the professional knowledge of employees exposed to situations endangering the safety of railway traffic.

1. FACTUAL INFORMATION

1.1. Course of events

On 16 May 2011 at around 16 hours and 10 minutes, in the section between Aszód and Tura railway stations, the railway signalling system indicated apparent track occupancy on both track lines of spacing signals T1, T2 and SG, as well as on track lines No. III and IV of Tura railway station (right- and left-hand side through lines). At that time, the railway signalling service personnel were working in the signalling system's relay room at Tura railway station to troubleshoot a system failure reported earlier. They realized that the 75 Hz inverter had broken down, and at the same time they were informed by the traffic duty officer that both through lines between Aszód and Tura indicated apparent occupancy. Once the inverters were repaired, only the SG continued to indicate apparent occupancy on both track lines. Then the railway signalling service personnel headed to Aszód railway station to continue their troubleshooting activity. At around 16 hours and 34 minutes the traffic duty officer at Tura railway station was unable to send a signal to the exit post permitting further progression for Train No. 5515 that was to pull out on Track Line No. IV, in addition to the ongoing apparent occupancy signal on both track lines of the given rail section, therefore, owing to the above reasons and due to previous (and unresolved) failure the rail line controller ordered that as of 16 hours and 43 minutes only one train can run on the section between Aszód and Tura railway stations. After issuing the order on single train traffic, no action was taken for the manual closing of the open-line light barriers for the time while trains pass at the level crossing.

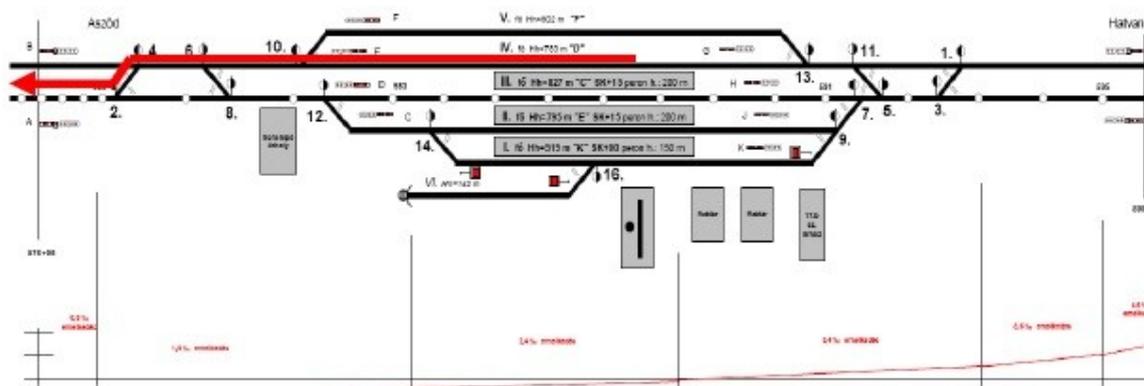


Figure 3: Track line of Train No. 5503 pulling out from Tura railway station

The railway signalling service personnel reached Aszód railway station at around 16 hours and 40 minutes, and did not observe any irregular functioning in the relay room of the railway signalling system. In the meantime they were informed by the railway signalling dispatcher that the AT 526/529 spacing signals are blank, and assuming that it meant a potential source of error, they headed there. After getting to the location, they realized that a short circuit was caused by a burnt grass snake (Figure 7) at the terminal of the spacing box wire. The replacement of the 500 V glass fuse did not resolve the ongoing apparent occupancy signal, the service personnel headed back to Tura railway station.

During the pending single train order, at around 17 hours and 30 minutes the open-line rail barriers marked as AS555, located between Aszód and Tura, and AS597, located between Tura and Hatvan, went into "defect" mode. Meanwhile, switcher No. 12 located at through line No. III at Tura railway station indicated apparent occupancy, therefore, the traffic duty officer decided that Train No. 5516 heading to the railway station on the right-hand side track line should be directed to a diverging direction, i.e. to through line No. IV. Once this was completed, Train No. 5503 held back at the entry post due to the passing of Train No. 5516 pulled in to the railway station on Track Line No. IV. After the arrival of Train No. 5516, the traffic duty officer of Tura railway station gave feedback reporting about the train, and at the same time gave permission to the traffic duty officer of Aszód railway station to start IC Train No. 568.

The traffic duty officer informed in writing the crew of Train No. 5503 about the pending order on single train traffic and the arrangements related to the unmanned exit post and permitted the train to pull out from the station. Upon returning to the traffic duty office, the traffic duty officer was talking over the telephone with the traffic duty officer of Aszód railway station to discuss train traffic issues, when he looked at the track line board and saw that Train No. 5503 was proceeding on the right-hand side track line, instead of running on the left-hand side track line as instructed by the traffic duty officer. At that time IC Train No. 568 had already pulled out from Aszód railway station and was on its way to Tura railway station on the right-hand side track line, heading toward Train No. 5503.



Figure 4: Near collision of the two trains

After recognizing the emergency situation, the traffic duty officer of Tura railway station immediately informed the rail line controller that the two trains were running toward each other on the same rail track. The rail line controller tried to call the train driver of Train No. 5503 through the ground-to-train radio at first, then after several unsuccessful attempts, called the train driver of IC Train No. 568, who answered the call instantly, and ordered him to stop his train immediately.

On the basis of the accounts given by the train driver of IC Train No. 568, when he received this order, his train was just passing by the AS530 light barrier. Upon receipt of the above warning, he performed sharp braking and stopped at Section No. 540+40. Within a short while, another train turned up in the curve after Galgahévíz way-station, and the train driver ordered the chief ticket controller to get off the train and hurry towards the on-coming train while continuously waving the „Stop” signal to the other train. In the meantime, the train driver of the IC train kept flashing his lights at the other train. Within a relatively short time, the train driver of the on-coming train flashed his lights as well, and in a short while the other train started to slow down and then stopped. The distance between the two trains was 1,634 meters.



Figure 5: Train No. 5503

The two trains stopped at approximately 1,630 meters apart from each other, and Train No. 5503 stopped at approximately 70 meters from AS555 light barrier signalling white flashing light to those driving on the highway.

1.2. Description of rail road and railway signalling system

The railway signalling system used at Tura railway station is a single-centre electrodynamic device, which supports the dispositional apparatus located in the traffic duty office in setting the routes, positioning the switchers and commanding the appropriate signalling colour status. Each centrally positioned switch connected to the signalling device and all the main track lines protected by interlocking operate in isolated manner. The track line board, by way of giving feedback reporting on the isolated sections, provides the traffic duty officer with information on the unoccupied or occupied status of the railway station's rail network being part of and connected to the railway signalling system.

A double-track railway line runs to the railway station from the direction of Aszód and Hatvan. Automatic spacing and barrier interlocking devices operate on the sections between Aszód and Tura, as well as Tura and Hatvan railway stations. Automatic spacing signals operate along the outer side of the railway line in both directions between the stations, and the trains run in both directions, and with alternating courses, protected by a system prohibiting their use of the same rail line, and follow one another in automatically operating spacing sections.

There is a double-track railway line between Aszód and Tura railway stations equipped with automatic spacing signals and with an interlocking system for train control, while Tura railway station's train receiving main tracks are equipped with train control devices.

The speed allowed on the track by railway is 120 km/h, the general stopping distance is 1,000 meters. The track section is equipped with individually installed, train-operated, open-line light barriers, which send feedback reports to the near-by traffic duty locations.

Two light barriers are installed on the section between the two railway stations, AS530 light barrier sends reporting to Aszód railway station, while AS555 light barrier sends reporting to Tura railway station.

1.3. Railway station parameters

Tura railway station is located along the double-track electrical main railway line of Budapest-Keleti railway station and Sátoraljaújhely border location, and is situated between Aszód and Hatvan railway stations. At Tura railway station the railway network consists of five main tracks and one loading track. Available lengths of the tracks: length of Track No. I is 519 meters, length of Track No. II is 795

meters, length of Track No. III is 827 meters, length of Track No. IV is 783 meters and length of Track No. V is 806 meters. The railway station's tracks and the railway line are equipped with signal posting devices. There is no highway/railway level-crossing within the territory of the railway station (Figure 3).

1.4. Communication devices

Engines No. V43-1016 and V43-2160 operating IC Train No. 568 and Train No. 5503, respectively, involved in the incident were equipped with properly operating ground-to-train radios, which are suitable for maintaining direct communication between train drivers and dispatching controllers or chief train traffic controllers. The communications given and received through radio are recorded by an audio recorder. The audio material stored in the device is deleted after 72 hours, therefore, it was not available for the CI for review.

The communications between the traffic duty officer of Aszód railway station and the dispatching controller, as well as between the traffic duty officer of Aszód railway station and the railway signalling system's dispatching officer were recorded by an audio recorded in the railway signalling system's room at Aszód railway station, and it was made available to the CI for review.

1.5. Meteorological data

The weather was partly cloudy at the time of the incident, and the temperature was 16 C°. Remote viewing was not limited under natural light conditions.

1.6. Description of organizations/work processes involved in the incident

The interlocking device installed between Aszód and Tura railway stations, as well as the main through lines of the two stations are suitable to regulate the traffic of trains equipped with train control devices.

1.7. Rules and regulations

Traffic Instruction F.2, Section 15.4.2 Train traffic on railway tracks protected with automatic spacing signals:

“Any succeeding trains running on railway tracks protected by automatic spacing signals shall be kept in the spacing section as long as the spacing interlocking device can be used.

Instruction F.2, Section 15.4.2.1. The automatic interlocking device cannot be used, if the signalling service personnel or the rail line controller established that the line's signalling device is malfunctional after consulting the regional railway signalling dispatching officer, and it is supported by evidence (entry in the headed reporting logbook, or communication through a telecommunication device equipped with audio recording capability) that the traffic duty controller has been properly notified about such instruction.

If the automatic spacing interlocking device is deemed to be malfunctioned, trains shall be instructed to follow the single train traffic order in both directions as set out below:

- In case of passenger trains, for transportation safety considerations, the chief ticket controller shall be obliged to perform surveillance services in support of the train driver. The train driver shall be notified to switch off the IVTCD or CTCD devices as required by the provisions set out in Instruction E.1”.

Instruction F.2, Section 15.14. Traffic on wrong track of a double-track railway line protected with automatic spacing signals.

“Traffic regulation is not affected by the reason of progression on the wrong track. The train crew of the train to be diverted to the wrong track of a double-track railway line shall not be notified in writing about the diversion to the wrong track or its underlying reason, if progression to the wrong track is allowed by the signal permitting passing at the individual exit post.

Instruction F.2, Section 15.19.1.2. “The train driver may pass by the switches situated after a malfunctioned main signal at such speed, so that the train can stop short of the arising obstacle. Passing may take place at a speed higher than 15 km/h even under the best visibility conditions”.

Instruction F.2, Section 2.12.2. Checking of centrally positioned switches.

“The correct positioning of centrally operated electrical switches shall be checked, after setting the train's track line, by those responsible for positioning the switches and by those overseeing the activities of the above mentioned employees by checking the lights lit up on the control devices.”

Instruction F.2, Section 3.3.3: "If the interlocking device is malfunctioned on railway lines protected by automatic spacing interlocking system, unless the railway signalling system's dispatching officer provides otherwise, the open-line light barriers located in a given section between two stations shall be closed manually before any train passes by from both directions. In the case of open-line rail barriers sending feedback reporting to nearby stations, the traffic duty officers of the nearby stations shall be ordered to manually close such rail barriers.

In these cases, the train driver may be authorized to start the train only, if the traffic duty officer of the nearby station manually closed the light barrier sending feedback reporting to the nearby station and has properly notified the dispatching station's traffic duty officer about such fact and about the position of the registers, who has entered it into his Headed Reporting Logbook, and has closed the light barriers that send feedback reporting to his service post."

Instruction F.2, Section 15.16.3. Verbal communication of written instructions:

"Upon delivery of written instructions, the contents of the instructions shall be also communicated to the receiver orally. Before acknowledging the receipt of any notification, the receiver shall be required to check, if such written instruction has been issued pertinent to his train. Once such checking is completed, he shall be obliged to read the wording of the instructions received, and then verbally communicate that he has understood and acknowledged the instructions."

Instruction F.2, Section 15.18.7. Stopping of scheduled trains at the duty posts:

"Scheduled trains shall be stopped at all times at the duty posts, if the conditions for the passing of the train are not adequate, or if the passing of the train is prevented by extraordinary events or other circumstances.

If at a given duty post the exit post is provided with a distant signal, or there is an entry post giving a distant signal pertinent to the exit post, then the exit post shall not be operated, the train shall be stopped by the exit post's signal prohibiting passing."

Instruction F.2, Section 12.3 Number of personnel performing duty on trains and control cars:

"The train driver may perform duty on his own in the driver's cabin of the train or control car only, if the following criteria are met."

12.3.1 "On each train, if it is equipped with properly operating:

- INTENDON or equivalent vigilance and train control device (IVTCD or CTCD),*
- Telecommunication device (service telephone, ground-to-train radio or mobile telephone)."*

Instruction F.2, Section 16.2.2 Surveillance obligation is related to:

- "checking the position of the switch, the rail track and the area after the boundary markers before passing over the switch, as much as possible. The above shall be also observed by the employee performing surveillance duty in support of the train driver, if permitted by his other service activities, or if the train driver orders him to do so."

Instruction F.2, Section 16.2.2.3: "Those obliged to perform surveillance duties on the train (control car) shall be required to inform one another about the results of their activities, which shall be repeated by the receiving employee".

Instruction E.1 for application by train crew, Parts I, III and IV and Annex No. 9 Regulations on the use of ground-to-train radio and mobile telephone by train crew.

"10) Upon taking up his duty, the train driver shall be required to report to the traffic controller through the related channel and to inform him that the ground-to-train radio is working properly. From that point on, the train driver shall be required to switch the radio on receiving mode at the appropriate channel. After passing from one control section to another one, the train driver shall be required to report to the competent traffic controller after the entrainment of both the even- and uneven-numbered trains.

14) If the radio breaks down during running, it shall be reported to the traffic controller through the traffic duty officer by the train driver at the first station where the train stops, and the train shall continue its progression."

2. ANALYSIS

2.1. Break-down of the railway signalling device

On 16 May 2011, at 15 hours and 10 minutes, at Tura railway station, after setting the railway track of Train No. 3034, switch No. 12 indicated faulty occupied status, as a consequence the entry post's clear signal turned back into a position prohibiting passing. The traffic duty officer duly reported the failure to the railway signalling dispatching officer, and made arrangements for the troubleshooting of the failure. The working on the troubleshooting of the railway signalling device repaired the faulty switch No. 12 at around 16 hours and 10 minutes, but shortly after the spacing sections indicated faulty occupied status toward Aszód railway station on both tracks, i.e. T1, T2 and SG, as well as on through track lines No. III and IV of Tura railway station, and at Hatvan railway station on both tracks, i.e. T1, T2 and SG also indicated occupied status. The traffic duty officer of Tura railway station consulted the traffic duty officer of Aszód railway station about the status of the spacing sections between the two stations, and they realized that T1, T2 and SG at Aszód railway station also indicated faulty occupied status. Those performing troubleshooting in the relay room of Tura railway station were informed about the latest failure. It was asserted that the inverter of the 75 Hz electrical circuit became malfunctioned, and after it was rectified, the traffic duty officer of Tura railway station detected that only the SG indicated faulty occupied status in the direction of Aszód, whereas, the traffic duty officer of Aszód railway station still detected that T1, T2 and the SG spacing sections still indicated faulty occupied status in the direction of Tura railway station. The service personnel performing the troubleshooting activity assumed that the source of error was the railway signalling device at Aszód railway station, therefore, they headed there to continue the troubleshooting activity. In the meantime, the traffic duty officer of Tura railway station was unable to send a signal permitting passing on the exit post for Train No. 5516 at 16 hours and 34 minutes, which presented a further failure in the railway signalling system. Then the troubleshooting personnel learnt that the spacing signals at the distant signal of the entry post at Aszód railway station were blank, and as they did not detect any failure at Aszód railway station, they headed to the open-line spacing section to continue their troubleshooting activity.

2.2. Order issued on single train traffic

The traffic duty officers of Aszód and Tura railway stations continuously reported to the rail line controller and the railway signalling system's dispatching officer about the failures of the railway signalling system described in Section 2.1 above. At around 16 hours and 43 minutes the rail line controller issued single train traffic order between the two stations due to the ongoing failures of the system. Upon issuing such order, the rail line controller also communicated that he made the related decision after consulting the railway signalling system's dispatching officer. It is evidenced by the audio records recording their communication. Any succeeding trains running on railway tracks protected by automatic spacing signals, and the section between Aszód and Tura railway stations is designated for such traffic, shall be kept in the spacing section as long as the spacing interlocking device can be used. By issuing such order, the rail line controller established that the interlocking system was malfunctioned. In the case of the issue of a single train traffic order, modified traffic and transportation conditions take effect:

- only one train can run in any one section between two stations,
- the train driver shall be required to blank off the IVTCD and CTCD devices,
- the chief ticket controller shall be required to perform surveillance activities in the driver's cabin,
- the open-line light barriers installed in the section between two stations shall be closed manually by the traffic duty officer.

At the time of the issuance of the single train traffic order, Trains No. 3054 and 5515 proceeded according to the rules on spacing sections between two stations, and after their arrival to the related station, the rest of the trains followed the provisions of the single train traffic order.

2.3. Additional failures in the railway signalling system

Under the effect of the single train traffic order, at around 17 hours and 30 minutes, the traffic duty officer of Tura railway station realized that the through main lines (No. III and IV) of Tura railway stations, and both tracks toward Aszód railway station, as well as both tracks toward Hatvan railway station became occupied. The AS555 light barrier located between Tura and Aszód railway stations, sending feedback reporting to the traffic duty office, indicated "malfunction" status, about which the traffic duty officer of Tura railway station notified in writing the train driver of Train No. 565 running

along the related section under the effect of the “malfunction” status. The AS597 light barrier located between Hatvan and Tura railway stations, sending feedback reporting to the traffic duty office of Tura railway station, also indicated “malfunction” status. As the section toward Hatvan railway station was clear, the traffic duty officer attempted to set the light barrier into basic mode, however, he succeeded to do so at 18 hours and 06 minutes only. At around 18 hours and 10 minutes switch No. 12 indicated faulty occupied status again.

2.4. Detection of the source of error

The troubleshooting team arrived at spacing box No. AT526/529 of the entry post's distant signal located at Aszód railway station at around 17 hours and 00 minutes. They established at the location that a grass snake had got in contact with and been burnt at the terminal at top of the transformer, and furthermore, a 500 V glass fuse was burnt out. The team rectified the short circuit caused by the burning, replaced the glass fuse and headed back to Tura railway station. They reached the station at around 18 hours and 15 minutes, and by that time the railway signalling system's service personnel from Hatvan were also present in the relay room of Tura railway station. They were informed by the traffic duty officer of Tura railway station that the faulty occupied status was resolved on both tracks between Tura and Aszód, as well as on the through main tracks of Tura railway station, and only switch No. 12 continued to indicate faulty occupied status. Then they set off along with the railway signalling system's service personnel from Hatvan to find the source of error at switch No. 12.

2.5. The traffic of the trains

2.5.1. Train No. IC568

Train No. IC568 was running in accordance with its time schedule until it reached the Railway Station of Aszód. At the entrance traffic light to Aszód Railway Station, the train stopped for app. 1 minute due to the signal prohibiting its passing; after this period, yellow light was indicated on the entry signal, and the train entered the railway station. Train No. IC568 arrived at Aszód Railway Station at app. 6:11 p.m. Then the traffic duty officer delivered Written Regulation No. 20 to the train crew, according to which: “The train shall travel in single train traffic between Aszód and Tura Stations, and IVTCD must be switched off, the leading ticket controller must provide monitoring services next to the train driver, and the signals of the interlocking devices need not be considered, the exit signal need not be operated and no extra manual signal need to be provided”. This was also said orally by the traffic duty officer. After a short period of time, the shutting-down of the IVTCD can be seen displayed on the speed metering paper strip. Shortly after the shut-off, green light was indicated on the exit signal. This could occur due to the fact that the interlocking system had returned to normal operation in the meantime, and the apparently occupied line between the two stations was no longer indicated. The fact of this event was indicated by the leading ticket controller located on the entrainment side to the traffic duty officer; the duty officer stated that the written order gives opposite instructions. They received the response that the rail line and the rail barriers were closed, and they were allowed to go to the right line with the signalling light indicating free passage, and the train had been released for moving towards the next station. The train crew accepted the “oral” instructions received about the traffic situation, regardless of the fact that they had a valid Written Order with differing instructions.

The train left from Aszód Railway Station at about 6:16 p.m., and accelerated to the speed of 50 km/h. Then, according to the data of the train running recording device, pull force ceased, slight slowing down was witnessed in the distance of app. 400 meters, then the train was accelerated to app. 105 km/h, and then there was intensive braking to a complete halt. The train stop took place at 6:20 p.m., the stopping length was about 500 meters, which indicates sharp braking. The running distance of the train from leaving Aszód Railway Station and the stop was app. 3,700 meters.

2.5.2. Train No. 5503

Train No. 5503 was running in accordance with its time schedule. Based on the speed metering data set of the engine, it can be stated that the train stopped at the entry signal of Tura Railway Station at 6:10 p.m., due to the signal light prohibiting passing. The train started braking from the speed of 117 km/h and it stopped after a distance of 947 meters. After the train stop, two acoustic signals were recorded (one lasting for 3 seconds and one lasting for 4 seconds), presumably, the acoustic signal stated “A train has stopped in front of the entry signal” message. After the stop, the speed of 1 km/h was recorded, and then the train halted after 4 meters. Most probably, the train did not fully stop after the breaking and was slightly moving further then it stopped again. Shortly after this, a short acoustic signal was made (“The train is starting” signal). 2 seconds after the start of the train, the digital driver's

control board indicated “MAX”, and then after running app. 39 meters, at the speed of 24 km/h, three horizontal lines appeared on the digital driver’s control board.

The train stopped at rail No. IV of Tura Railway Station at 6:12 p.m. in front of the traffic control office and the traffic duty officer delivered Written Regulation No. 36, according to which: “The train shall travel in a station distance until Aszód Railway Station, the exit signal is not operated, no extra signalling is carried out, the signals of the interlocking devices need not be considered, and the leading ticket controller should also be in the train driver cabin and IVTCD must be switched off”. The written order was also received by the chief ticket controller, and its content was read out loud by the traffic duty officer. The device EVM 120 was switched off at 6:16 p.m. The written order was recorded in TCBD at 6:16 p.m. Then the traffic duty officer authorised the train to leave the station.

Train No. 5503 left from Tura Station at 6:17 p.m.; it passed the exit signal indicating “Stop” after running app. 320 meters, at the speed of 52 km/h. When it proceeded running, the train had the speed of 62 km/h on rail No. 4, which was the closest shunt rail line, and then the train ran with the speed of 65 km/h on rail No. 2 instead of the regulated speed limit of 15 km/h. Subsequently, slowing down to 40 km/h was recorded, then the train slightly accelerated to 46 km/h, and then went up to 104 km/h. In the following the speed of the train decreased sharply to 33 km/h within 21 seconds, and then after the passing of further 22 seconds, the train slowed down to 15 km/h, sped slightly to 18 km/h and then speed went down to 0. The distance run by Train No. 5503 between the leaving Tura Station and its complete halt was 2.951 km.

The crew realised their fault of moving to a wrong, shunt line after having left Tura Station. While proceeding further, the crew checked the Written Order whether it contains information that they were running on a wrong line, but the Order did not contain such information. By that time the train has already passed an interlocking device on the open railway line, and the device did not indicate any light. When they proceeded further, the crew noticed that the engine of the train running on the line from the opposite direction is giving flashing light signals with different light intensity. The train driver, having sensed the presence of another train on the same railway line, immediately applied sharp braking and returned the flashing light signals indicating the perception of the light signals of the other train. Then the train driver called the Budapest rail line controller, who provided the information that they had a near collision with the IC train, but provided no specific reason for this event to have occurred. Then it became apparent that the Written Order specified a wrong rail line.

2.6. The activities of the traffic duty officer

The traffic duty officer taking part in the event had been serving as a duty officer at Tura Railway Station since 2007. On 16 May 2011, the officer was scheduled to work in daytime duty. While carrying out work in a continuous manner, the duty officer witnessed that railway switch No. 12 had switched to a faulty ‘occupied’ status before the passing of train No 3034 at app. 3:10 p.m. After the duty officer eliminated this problem, faulty ‘occupied’ status signals were indicated on both rail lines between Tura and Aszód stations; then the duty officer of Tura Station was unable to send a control signal authorising passing to the exit signal regarding Train No. 5515. Due to the joint occurrence of these faults, the duty officer ordered single train traffic for the trains. When the station distance traffic order was announced, no measures were taken to manually close rail barrier No. AS555 controlled from Tura Station or rail barrier No. AS597 controlled from Aszód Station. (see Section 1.16 F.2. Ref. 3.3.3)

A further obstacle in the work of the duty officer was the fact that the passing main lines No. III and IV of the station also started indicating faulty ‘occupied’ statuses and rail barriers No. AS555 and AS597 positioned along open rail lines and signalling to the station both switched to “malfunction”. After such events, train No. 5516 left from Aszód Station at app. 5:57; by that time, rail barrier No. AS555 had become totally useless, but the Tura Station duty officer did not enter the request for notification about the useless status of the rail barrier in the Headed Logbook. (The train was properly notified.)

2.6.1. The direct cause

Before the arrival of train No. 5516, the traffic duty officer intended to conduct railway traffic – due to the occurrence of the faulty ‘occupied’ status signal of rail switch No. 12 located at (right-side) shunt line No. III – that he would direct train No. 5516 to a shunt line, to (left-side) shunt line No. IV, and then, after having delivered the Written Order, he would authorise the train to pass at the end-point side of the station to the right-side shunt rail line.

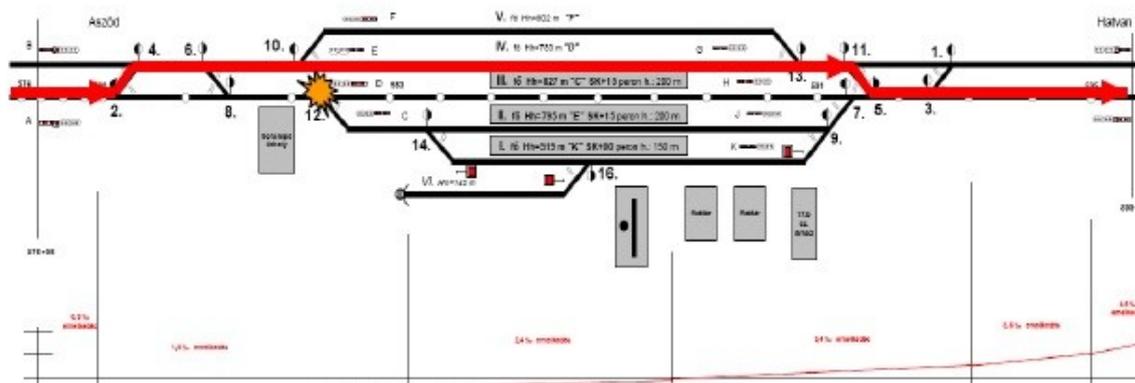


Figure 6: the entry direction of Train No. 5516 due to the apparent 'occupied' status of rail switch No. 12

Due to this event, Train No. 5503 running on the left line towards Tura station from the direction of Hatvan was stopped for a short period due to the entry signal prohibiting passing. The duty officer intended to lead Train No. 5503 to the left-side rail line, and the course authorisation of the train also included this line. After the departure of train No. 5516, the relevant rail switches were set from the end-point side, and a signal indicating the authorisation of passing was sent to the entry signal. Then the duty officer intended to set rail switches No. 2 and 4 to lead the train to the left-side passing main line, but this setting did not take place for an unknown reason. It can also be presumed that the checking of the rail line route was also failed to be carried out or was carried out without paying appropriate attention. (A potential reason for this, according to the description of the events, that was the time when phones were ringing – due to calls from the rail line controller, railway signalling service, etc.).

The duty officer delivered Written Order No. 36 to the train driver and the chief ticket controller of train No. 5503, and he also described the contents of the Written Order orally. After authorising the departure of the train, the duty officer went back to the traffic control office and called the duty officer of Aszód Station. The duty officer has been working at Tura Station since 2007, and during those four years passed until this incident, there were no railway signalling device failures that would require traffic to be controlled as single train traffic mode.

2.6.2. The recognition of failure and measures taken

While, having returned to the traffic control office, the traffic duty officer was talking on the authorisation requiring phone line, he looked up on the rail line indicating board – during the entry and exit of train No. 5503, the 'occupied' interlocking status ceased – and he saw that train No. 5503 was led to the right-side line, not to the scheduled line. The duty officer realised this event on the basis of the reporting signals from the related rail switches No. 2 and 4. By that time the duty officer had been informed that train No. IC568 had left from Aszód station and he realised that both trains were travelling on the right-side line from opposite directions. He immediately called the rail line controller, provided information on the events and requested the stoppage of the trains. The duty officer did not hang up and he heard the rail line controller trying to first contact – repeatedly, without success – the train driver of train No. 5503, then the line controller called the driver of train No. IC568, who immediately responded and the duty officer also heard when the train driver of train No. IC568 reported to the line controller that train had been stopped.

2.7. The roles and operation of ground-to-train radios

When train drivers start their service duties, they have to send in reports through the relevant channel of the given ground-to-train radio to the control officer and they have to declare that the ground-to-train radio is operable, in order that the controlling staff could have appropriate information on the availability of train drivers serving on trains running in their control areas. After a successful radio test, the given train driver must keep the radio No. 2011-211-5 TSB 24 / 33 at receptive status. The train driver of train No. 5503 affected in this case was driving the train from the Railway Station of Eger. However, he did not initiate a test message through the radio. At Hatvan, the radio has to be switched to the appropriate channel, and this also requires that a radio test should be carried out. The radio test was failed to be carried out again. The CI stated that there was no recording that would refer to the faulty operation of the ground-to-train radio in the Operational Logbook of the related trains. At the

time of the occurrence of the investigated event (near collision), the line controller tried to contact the train driver of Train No. 5503, but he did not respond and could not be contacted. On the other hand, the train driver of Train No. IC568, the other train taking part in the incident, heard railway line controller trying to contact someone, and responded within a short time when being contacted. In summary, the CI concluded that no radio test was carried out during the operation of Train No. 5503.

2.8. The activity of the chief ticket controller

Train No. 5503 affected in the incident started his duty as Chief Ticket Controller at Füzesabony Railway Station. The train stopped at Tura Station, where the traffic duty officer delivered Written Order No. 36, and also read out loud its content, and handed over one copy of the Order to the chief ticket controller. According to the Written Order, a monitoring service had to be carried out in the engine operator cabin of the train, because single train traffic had to be maintained between Tura and Aszód stations due to the inability to use the interlocking devices between the stations. The trains left the stations while the signals indicated "Stop". When the train driver and the chief ticket controller noticed the train's passing to the wrong line – to the right-side rail line – the train driver asked the chief ticket controller to check whether the Written Order (read up by the traffic duty officer of Tura Station just 2 minutes before) included passing to this wrong line. The ticket controller read the train driver copy of the Order – that was at hand – but by the time he would read the Order, the train was reaching the first interlocking device, which had no signals indicated on it. They stated that running on the wrong line was not specified on the Written Order, but despite this fact, the chief ticket controller did not instruct the train driver to stop the train immediately. The train driver only applied sharp braking when he had noticed the lights of the train running from the opposite direction on the same rail line. The train was stopped at Galgahévíz Station. At the time of the halt of the train, the light indicated on the light signalling rail barrier was white (i.e. allowing free passage). This could take place due to the fact that the operation of the interlocking device had been restored in the meantime, the course was set towards Aszód and train No. IC568 did not yet pass through the entry point of the light rail barrier, and the device does not sense trains running from the opposite the course.

According to personal accounting of events:

In the course of the train's run – in the period when it was located on the station line – no communication could be heard about another train running from the opposite direction, and there was no instruction to stop, either; the chief ticket controller did not call the train driver's attention to the fact that they moved to a wrong line, neither did he remark that they were running at a speed much higher than the speed limit. In the preceding period, the chief ticket controller did not witness any traffic situation that would have required his "monitoring" duty in the control cabin of the train due to applying single train traffic procedure. There is a respective training session in every quarter, out of which 6 lessons are related to commercial issues and 2 lessons are related to traffic, where the subjects of the training are particularly related to actual traffic; nevertheless, such training also includes labour safety and sometimes railway signalling items as well.

2.9. Other findings

When single train traffic was ordered between Tura and Aszód stations, the keeping of regulations on unusual traffic order and rare instructions became significant. In such occasions, seldom used regulations outside the everyday traffic routine must be strictly followed without any "auxiliary material" or help. From the aspect of the traffic duty officer, the situation was even worse, because the extent of received and transferred also increases. This may easily lead to making mistakes.

3. CONCLUSIONS

3.1. Factual findings directly related to the occurrence of the incident

According to the findings of the CI, the incident took place, because:

- At Tura station, the rail switches were not set to the right (left-side) position for Train No. 5503 to proceed to the right line and the checking of the switch and rail line course did not reveal this mistake.
- The staff of Train No. 5503 did not adequately interpret the contents of the Written Order, and passed next to the exit signal at a speed higher than the speed limit while the signal indicated "Stop".
- Train No. 5503 did not stop at the faulty positioned rail switch.
- Train No. 5503 moved to the wrong (right-side) line and continued moving.
- Not even the chief ticket controller instructed the train driver to stop the train immediately.

3.2. Factual findings indirectly related to the occurrence of the incident

- During the running of Train No. 5503, there were no occasions when radio testing would be initiated. The measures taken by the line controller to eliminate the hazardous situation was unsuccessful, and this can be attributed to the radio being set to the wrong channel, in consideration of the fact that there was no recording about any fault of the ground-to-train radio in the train's Operational Logbook, and there were no oral remarks on the subject, either.

3.3. Risk increasing factors that are not related to the occurrence of the incident

- According to the opinion of the CI, traffic trainings held for chief ticket controllers in every quarter in two hours are not in proportion with their traffic activities and responsibilities related to train traffic.

- The CI also finds the test-based examination system of train drivers to be a risk-increasing factor. The introduction and application of such testing exams for a lengthy period may have also contributed to the fact that the practical knowledge of relatively rarely applied rules and regulations does not reach the required level, primarily regarding seldom occurring events (see Section 1.15).

The materials used are the investigation reports and recommendations of the TSB and MÁV Plc.

31 July, 2013.