



KÖZLEKEDÉSBIZTONSÁGI
SZERVEZET

TRANSPORTATION SAFETY
BUREAU

FINAL REPORT

2006-0161-5 RAILWAY ACCIDENT

**Between Szolnok and Újszász stations
12 December 2006**

The sole objective of the technical 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 is not the purpose of this activity to apportion blame or liability.

This present investigation was conducted on the basis of

- Act CLXXXIV of 2005 on the technical investigation of aviation, railway and marine accidents and incidents (hereinafter referred to as Kbt.),
- MET Decree 7/2006. (II. 27.) on the regulations of the technical investigation of serious railway accidents, railway accidents and incidents.
- In absence of other related regulation of the Kbt., the Transportation Safety Bureau of Hungary conducted the investigation in accordance with Act CXL of 2004 on the general rules of administrative authority procedure and service,
- Kbt. and MET Decree 7/2006. (II. 27.) jointly serve the compliance with the following EU acts:
Directive 2004/49/EC of the European Parliament and of the Council of 29 April 2004 on safety on the Community's railways and amending Council Directive 95/18/EC on the licensing of railway undertakings and Directive 2001/14/EC on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure and safety certification (Railway Safety Directive)
- The competence of the Transportation Safety Bureau of Hungary is based on the Kbt. until 31st December 2006 and on Government Decree 278/2006 (XII. 23.) from 1st January 2007 respectively.

Under the aforementioned regulations

- The Transportation Safety Bureau of Hungary shall investigate serious railway accidents.
- The Transportation Safety Bureau of Hungary may investigate railway accidents and incidents which - in its judgement - would have resulted in serious accidents in other circumstances.
- The technical investigation is independent of any administrative, infringement or criminal procedures.
- This present final report shall not be binding, nor shall an appeal be lodged against it.

Incompatibility did not stand against the members of the IC. Persons participating in the technical investigation did not act as experts in other procedures concerning the same case and shall not do so in the future.

The IC shall safe keep the data having come to their knowledge in the course of the technical investigation. Furthermore, the IC shall not be obliged to make the data – regarding which the owner of the data could have refused the disclosure of the data pursuant to the relevant act – available to other authorities.

This present final report

was based on the Draft Report prepared by the IC and accepted by the Director-General of TSB. The Draft Report was sent to the relevant parties - defined by law - for reflections. At the same time, the relevant parties and organisations were also informed and invited to the closing discussion of the Draft Report.

The following organisations were represented at the closing discussion which was held on 4th November 2008:

- National Transport Authority,
- Safety Organisation of MÁV-Trakció Zrt.

Abbreviations

BIG	Safety Directorate (of MÁV Zrt.)
CSM	Engine driver on duty on his own in the driver's cab ("CSak Mozdonyvezető" = "Engine driver only")
MET (GKM)	Ministry of Economy and Transport (Gazdasági és Közlekedési Minisztérium)
TSB	Transportation Safety Bureau
Kbvt.	Act CLXXXIV of 2005 on the technical investigation of aviation, railway and marine accidents and incidents
MÁV Zrt.	Hungarian State Railways Plc. (Magyar Államvasutak Zártkörűen Működő Részvénytársaság)
ÖJÜ	Automatic signal system
IC	Investigating Committee
VBO	The competent Regional Railway Safety Department of BIG MÁV Zrt.

Summary

Type of occurrence	Railway accident
Character	Collision of trains
Time of occurrence	22 hours 28 minutes, 12 th December 2006
Location of occurrence	between Szolnok and Újszász stations
Type of railway system	National
Type of movement	Regional passenger train
Fatalities/injuries	1 person seriously injured
Infrastructure manager	MÁV Zrt.
Extent of damage	substantial
Registration number of the involved train(s)	trains no.3351 and no. 35731
Operator	MÁV Zrt.
State of Registry	Hungary

Location of the occurrence

Main line no. 120a, Budapest Keleti pu. – Újszász - Szolnok, left track, section 663+85, between Szolnok and Újszász stations.

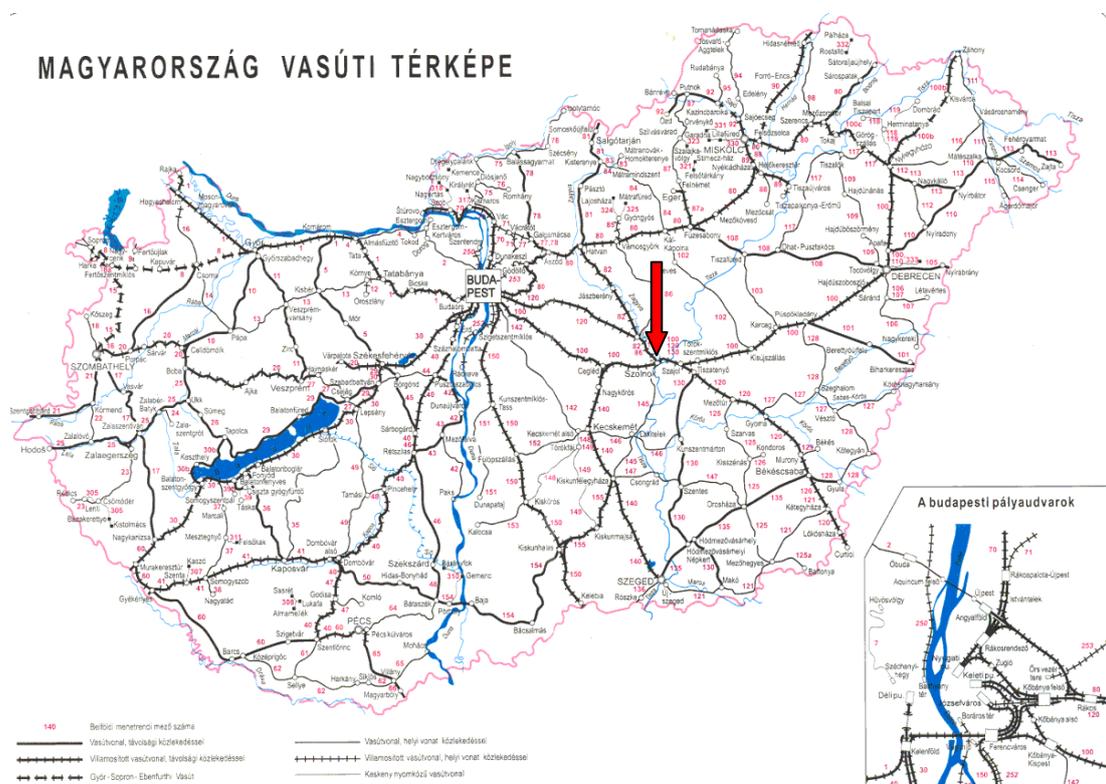


Figure 1: The location of the accident on the railway map of Hungary

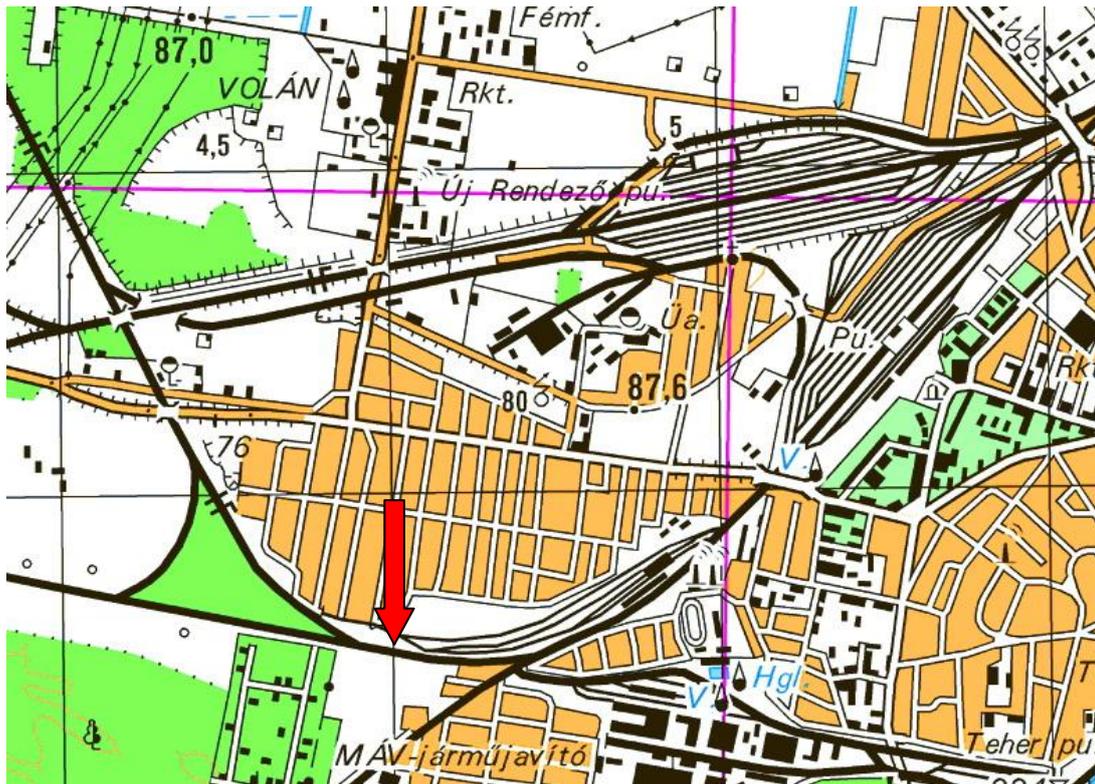


Figure 2: The location of the accident in Szolnok area

Reports and notifications

The head of traffic operations control of MÁV Zrt. reported the occurrence to the TSB duty services at 22 hours 35 minutes on 12th December 2006.

The on duty personnel of TSB reported the occurrence to TSB's head of department on duty at 22 hours 36 minutes on 12th December 2006.

The appointment of the Investigating Committee

The Director-General of TSB appointed the following Investigating Committee (hereinafter referred to as IC) to investigate the railway accident:

Investigator-in-charge	István Simon	accident investigator
Members of the IC	Márton Kovács Dr.	field investigator technician
	Gábor Szeremeta	accident investigator

As István Simon is no longer the civil servant of TSB, the Director-General of TSB appointed Gábor Szeremeta as the Investigator-in-charge on 2nd January 2007. Due to reorganisation within TSB, Róbert Karosi was appointed as a member of the IC on 1st September 2008 to substitute Márton Kovács Dr.

Overview of the course of the occurrence

- following the accident, the IC conducted a site survey.
- requested and received the necessary documents.
- evaluated the strip chart recorder.
- interviewed the witnesses present at the site of the accident.

- examined/checked the operation of the signal box.

1. Factual information

1.1 Course of the event

At 22 hours 28 minutes on 12th December 2006, train no. 35731 - running from Szolnok to Jászapáti - collided into the rear of train no. 3351 - running from Szolnok to Budapest Keleti pu - being stopped at entry signal "N" (indicating "Stop") at 'CD' junction of Szolnok, on the left track in section no. 663+85 between Szolnok and Újszász stations.

1.2 Injuries to persons

Injuries	Staff	Passengers	LC users	Others
Fatal	-	-	-	-
Serious	-	1	-	-
Minor	1	5	-	-

1.3 Damage to railway vehicles

The locomotive (registration no. V43-1249, operating in the rear) of passenger train no. 3351 became unserviceable. Amount of damages:

8.000.000 HUF

The motor coach (registration no. Bzmot 212) of train no. 36731 sustained substantial damage and was advised to be written off. Amount of damages:

10.000.000 HUF

The amount of damages in the two other coaches (Reg. no. 50 55 2428 617-4 and 50 55 2428 575-4) of the train:

7.000.0000 HUF

1.4 Damage to infrastructure

The infrastructure was not damaged in the course of the accident.

1.5 Other damage

The operator did not inform the IC about other damages.

1.6 Personnel information

1.6.1 Engine driver of train no. 3351

- 33 year-old man
- employee of MÁV since 1998
- has taken the relevant examinations and has adequate knowledge of the line
- possesses a valid medical certificate
- participated in various periodical courses

1.6.2 Engine driver of train no. 35731

- 58 year-old man
- employee of MÁV since MÁV since 1966
- has taken the relevant examinations and has adequate knowledge of the line
- possesses a valid medical certificate
- participated in various periodical courses

1.7 Train information

Train number	3351
Train type	passenger train
Characteristics of train service	Runs daily Szolnok – Újszász - Budapest Keleti pu. Speed (according to timetable): 100/100 km/h.
Type of traction	CSM
Registration number of locomotive	V43-1249
Owner of locomotive	MÁV Zrt.
Owner of carriages	MÁV Zrt.
Number of carriages	Seven 4-axle-passenger carriages
Length of train	182 m
Tonnage	325 t

Train number	35731
Train type	passenger train
Characteristics of train service	Runs daily between Szolnok and Jászapáti. Speed (according to timetable) between Szolnok and stations: 80/80 km/h.
Type of traction	CSM
Registration number of locomotive	Bzmot 212 + 2 carriages
Owner of locomotive	MÁV Zrt.
Owner of carriages	MÁV Zrt.
Length of train	42 m
Tonnage	55 t

1.8 Meteorological information

At the time of the accident, the weather was calm and clear with +2 C° degrees outside temperature and normal visibility.

1.9 Description of rail track and signal box

The accident occurred on a two-track electric main line (Budapest Keleti pu. – Újszász - Szolnok) between Újszász and Szolnok stations.

After the exit points of Szolnok station, the rail track runs in a 950 metre-radius bend in a 1002 metre distance, beyond that it runs in a 800 metre-radius bend. The rail track lies on a 1.1 ‰ slope from the points to section no. 664+50, beyond that it lies on a 0.5 ‰ downward slope until section no. 660+00.

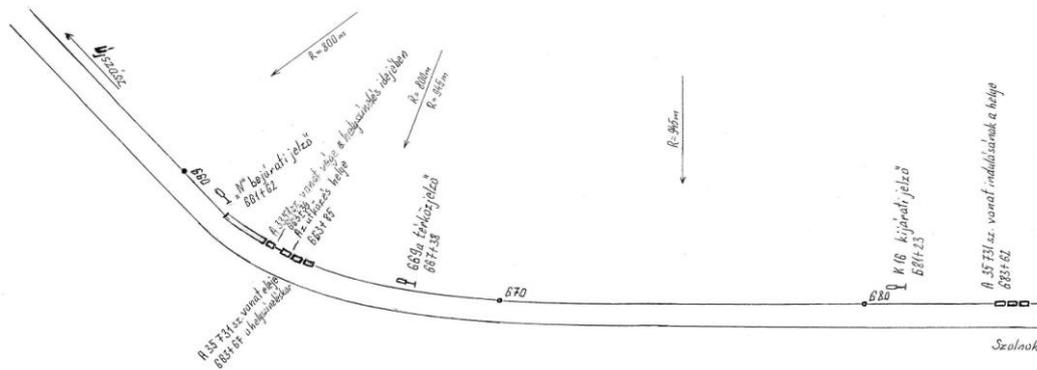


Figure 3: The schematic picture of the location of the accident

An automatic block signal operates on the line which is capable of train-control. Szolnok „CD” junction is (remote-) controlled by Szolnok I. centre by a D 55 type signal box which can be operated manually or can be set to operate automatically. In this section at CD junction, there is an “N” entry signal which controls the points on the left track, and the other points are controlled by “J” signal.

Block signal AT 669 separates the line between Szolnok station and CD junction into two block sections. From Szolnok towards Újszász, the first “T2” block section is 684-metre and the second, “T1” is 576-metre long. The signals were operated in automatic remote-controlled mode by a computer. All movements and changes are recorded and stored in the memory of the computer.

1.10 Communications

Communications devices did not have an effect on the occurrence of the accident, therefore their detailed description is not required.

1.11 Station information

The accident occurred on the open track. The characteristics of the two neighbouring stations did not have an effect on the occurrence of the accident, therefore their detailed description is not required.

1.12 Data recorders on railway vehicles

Train no. 3351 was running with control car no. 50 55 82-07 312-6 in the front and locomotive no. V43-1249 in the rear. The control car was equipped with a TELOC system, RT 9 type strip chart recorder which operated normally, however, its clock was 4 minutes late.

Locomotive no. V43-1249 was equipped with a TELOC system, RT 9 type strip chart recorder which worked normally and showed the correct time.

Train no. 35731 was running with motor coach no. Bzmot 212 and two other carriages. The motor coach was equipped with a TELOC system, RT 12 type strip chart recorder which operated normally, however, its clock was 2 minutes fast.

2. Analysis

Based on the log file of the signal box at Szolnok station, the following can be established:

At 22 hours 13 minutes on 12th December 2006, locomotive no 3391 (running solo) was signalled out from platform XXI (left track) of Szolnok station. The locomotive passed the line-clear signals until signal "J" which changed from "Line clear" signal to "Stop" signal at 22 hours 15 minutes 55 seconds.

4374	Újszász	2006.12.12 22:15:49	ZJ	zavar
4375	Újszász	2006.12.12 22:15:55	J	zavar szabadban
4376	Újszász	2006.12.12 22:15:56	J	zavar szabadban

Figure 4: Log file entries

At 22 hours 23 minutes 29 seconds, the movements inspector of Szolnok station released the J-C locked route with emergency release. After the timing, the route became released at 22 hours 25 minutes 52 seconds. The line-clear signal appeared on signal "J" at 22 hours 26 minutes 24 seconds.

4508	Újszász	2006.12.12 22:23:29	N	ÖJÜ üzemmód kikapcsolva
4509	Újszász	2006.12.12 22:23:29	J	ÖJÜ üzemmód kikapcsolva
4510	Újszász	2006.12.12 22:23:29	C	ÖJÜ üzemmód kikapcsolva
4511	Újszász	2006.12.12 22:23:29	KO-J	parancs kiadva
4550	Újszász	2006.12.12 22:25:46	ZJ	zavarjelzés alapállapot
4551	Újszász	2006.12.12 22:25:52	KO	kényszeroldás időzítés alapállapot
4552	Újszász	2006.12.12 22:25:52	G/K	szabad
4562	Újszász	2006.12.12 22:26:24	J	szabad

Figure 5: Log file entries

Solo locomotive no. 3391 was followed by passenger train no. 3351 which departed from platform XIII of Szolnok station at 22 hours 17 minutes. Having passed the points, it arrived at "T2" block section at 22 hours 21 minutes 11 seconds, and at "T1" section at 22 hours 22 minutes 00 seconds. Section "T2" became clear at 22 hours 22 minutes 16 seconds, after train no 3351 ran on. Train no. 3351 stopped at entry signal "N" indicating "Stop" as locomotive no. 3391 was standing in the next section ahead at signal "J".

4454	Újszász	2006.12.12 22:21:11	N	T2 térköz foglalt
4455	Újszász	2006.12.12 22:21:11	N	TCS térköz szabad
4456	Újszász	2006.12.12 22:21:13	B-g	parancs kiadva
4457	Újszász	2006.12.12 22:21:19	B2	+ első lezárás
4458	Újszász	2006.12.12 22:21:19	B3	+ első lezárás
4459	Újszász	2006.12.12 22:21:20	B	szabad
4460	Újszász	2006.12.12 22:21:20	AS618	vonat által csukott
4464	Újszász	2006.12.12 22:21:22	B-g	parancs nyugta: OK
4474	Újszász	2006.12.12 22:21:37	AS604	nyitott
4476	Újszász	2006.12.12 22:22:00	N	T1 térköz foglalt
4480	Újszász	2006.12.12 22:22:10	G-m	parancs kiadva
4481	Újszász	2006.12.12 22:22:10	B	T1 térköz foglalt
4482	Újszász	2006.12.12 22:22:16	N	T2 térköz szabad

Figure 6: Log file entries

Train no. 35731 departed from platform XVI of Szolnok station at 22 hours 25 minutes.

Having passed the exit points, the train arrived at “T2” block section at 22 hours 27 minutes 02 seconds. From here, it ran on to “T1” section - which was occupied by train 3351 - at 22 hours 27 minutes 34 seconds. The memory of the computer registered this time as block section “T2” becoming clear.

4570	Újszász	2006.12.12 22:27:02	N	T2 térköz foglalt
4582	Újszász	2006.12.12 22:27:34	N	T2 térköz szabad

Figure 7: Log file entries

20-22 seconds after this, at approximately 22 hours 28 minutes, train no. 35731 collided with the rear of train no. 3351.



Figure 8: Motor coach no. Bzmot 212 after the collision

At the moment of the collision, train no. 3351 was about to depart as the “Line-clear” signal had appeared on signal “N” at 22 hours 27 minutes 35 seconds.

4585	Újszász	2006.12.12 22:27:35	N	szabad
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Figure 9: Log file entries

The engine-driver had already released the brakes for departure. As a result of the collision, the train rolled 46 metres forward, and since the pressurised air system got damaged, the brakes were activated automatically. This time was also registered by the computer as the train passed signal “N” at 22 hours 28 minutes 21 seconds when it turned to red again.

The IC recorded the following facts in the course of the site survey:

- The front of train no. 3351 was standing 5 metres beyond signal "N" indicating "Stop" (towards Budapest). The rear of the train was in section no. 663+39. The right hand side rear light of locomotive no. V43-1249 was intact and provided white light. The also intact red glass light-cover was found in the tall grass beside the rails the following day. The tail marker disk was broken but still on the rear of the damaged locomotive.



Figure 10: Locomotive no. V43-1249 after the collision

- The front of Bzmot 212 motor coach of train no. 35731 was in section no.663+67. The front of the locomotive thoroughly broke and the driver's cab became crushed. The lever of the D2 type brake valve was found in emergency brake position.



Figure 11: The driver's cab of Bzmot 212 motor coach after the collision

- The first carriage behind the motor coach derailed with its rear axle.
- The visibility at the time of the accident was not hindered either at the site of the accident or at the track before the accident site. (The engine driver of train no. 35731 described the weather conditions similarly.)
- Block signal no. 669 beside the left track gave out a red signal which was clearly visible.
- The signal box at control centre I. of Szolnok station indicated the situations after the accident as follows:
 - N-J route is locked for train no. 3351, signal N in Stop position, section L/N occupied.
 - T1 block section of the left track is occupied (by trains no 3351 and 35731).
 - J-C route is locked, "Line-clear" signal on signal J turned back to "Stop"
 - T1 block section of the left track at C-Újszász, signal C indicating "Line-clear".

The IC had the track circuit between signals AT 666/69 and N (Szolnok - Szolnok CD junction) examined. The examination found that the track circuit detects the running vehicles adequately.

Based on the evaluation of the strip chart recorder of train no. 35731, the following can be established:

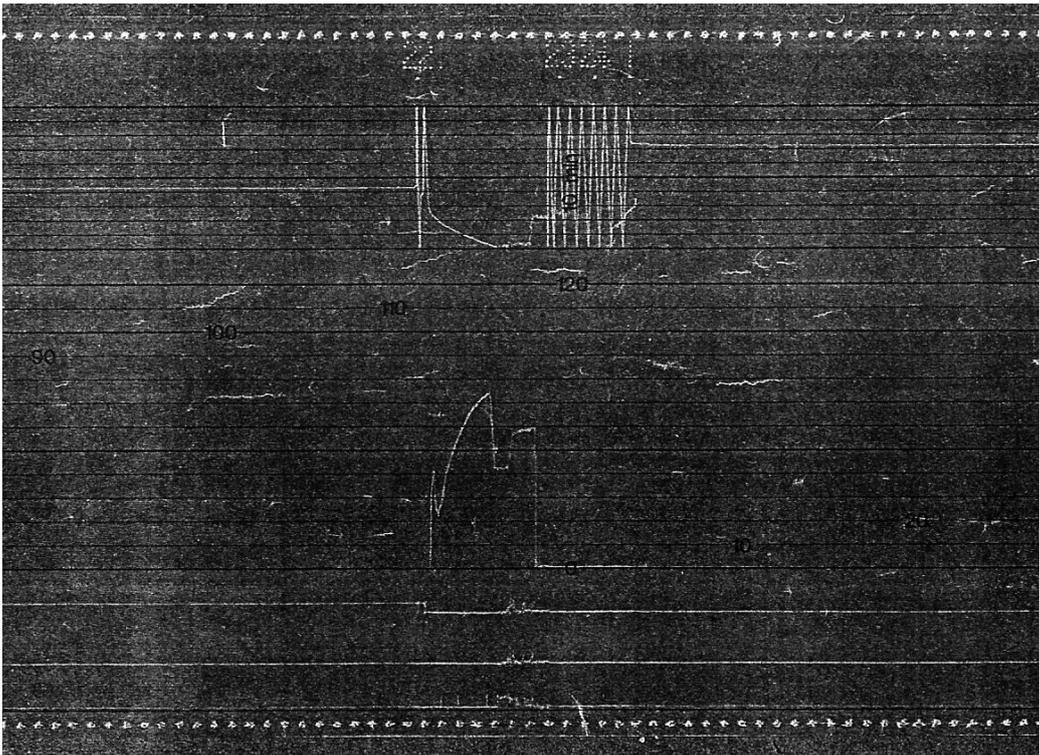


Figure 12: The strip chart recorder of Bzmot 212 motor coach

- Train no. 35731 departed from Szolnok station at 22 hours 25 minutes, with a 3-minute-delay. After departure, the train accelerated to 42 km/h and then following the brake test, it decelerated to 22 km/h.
- Afterwards it gradually increased the speed to 75 km/h and then decelerated by applying the brake.
- The collision occurred at the speed of 42 km/h at 22 hours 28 minutes. It is most likely that the effect of the emergency braking prior to the collision could not develop by this time.

The engine-driver told the IC during the interview that he had seen the two yellow pre-signals of the exit signal of Szolnok station. However, his attention passed over the first block signal indicating "Stop" and he while concentrating on the further located entry signal N indicating red, prepared for stopping the train.

The IC established at the site that while running in a high-radius bend, both signals are clearly and separately visible.

3. Conclusions

3.1 Factual statements directly connected to the occurrence of the accident

The occurrence of the accident can be directly related to human factors. According to the IC's establishments, the accident occurred as a result of train no. 35731 passing block signal 669/a indicating "Stop", to which it previously received the yellow pre-signal.

3.2 Regulatory system

After reviewing the relevant traffic regulations, the IC established that they regulate the current traffic situation adequately.

3.3 Factual statements indirectly connected to the occurrence of the accident

The IC does not wish to make further factual statements in relation to the occurrence of the accident.

4. Safety recommendations

According to the findings of the IC, such occurrences can be avoided by complying with the relevant rules, therefore it is not necessary to issue safety recommendations.

4.1 Observations and opinions

The participants of the closing discussion held on 4th November 2008 did not make any reflections on the Draft Report.

Budapest, 14th November 2008

Gábor Szeremeta
Investigator-in-charge

Róbert Karosi
Member of IC