



MINISTRY OF TRANSPORTS AND INFRASTRUCTURE
ROMANIAN RAILWAY AUTHORITY - AFER

ROMANIAN RAILWAY INVESTIGATING BODY



INVESTIGATING REPORT

on the railway accident occurred on the 27th of September 2010 on the range of activity of CF
Brasov Regional Branch between the railway station CFR Miercurea Ciuc – Hm CFR Sanraieni



FINAL EDITION
Date: the 4th of February 2011

NOTICE

With reference to the railway accident occurred on the **27th of September 2010**, around **7:50a.m.**, on the range of activity of **CF Brasov Regional Branch**, on the running section Brasov – Deda, between the railway station CF Miercurea Ciuc and the flag station Sancraieni, at km. 90+530, consisting of the collision between the locomotive EA 40-0919-7 (isolated locomotive that was running as train aid no. 2 on current line closed) and the last coach in the composition of the passenger train no. 4504 that was stopped in current line (the locomotive of the passenger train no. 4504 was at km. 90+300), Romanian Railway Investigating Body carried out an investigation, according to the provisions of the Government Decision no. 117/2010. Through the investigation, the information on the respective accident was gathered and analyzed, the conditions were established and the causes determined.

Romanian Railway Investigating Body investigation did not aim to establish the guilty or the responsibility in this situation.

Bucharest, the 4th of February 2011

Approved by
Dragoş FLOROIU
Director

*I agree the compliance with the legal provisions
on the investigation performance and
drawing up of this Investigation Report,
that **I submit for approval***

Chief Investigator
Sorin CONSTANTINESCU

This approval is part of the Report for the investigation of the accident occurred on the 27th of September 2010, at 7:50a.m., on the range of activity of CF Brasov Regional Branch, on the running section Brasov – Deda, between the railway station CF Miercurea Ciuc and the flag station Sancraieni, at km. 90+530.

I. Preamble

I.1. Introduction	4
I.2. Investigation process	4
A. Brief presentation of the accident	5
A.1. Brief presentation	5
A.2. Causes of the accident	6
A.2.1. Direct cause	6
A.2.2. Underlying causes	6
A.2.3. Root causes	6
A.3. Severity level	6
A.4. Safety recommendations	6
B. Investigating report	7
B.1. Description of the accident	7
B.2. The accident circumstances	9
B.2.1. Involved parties	9
B.2.2. Forming and equipments of the train	10
B.2.3. Railway equipments	10
B.2.4. Means of communications	11
B.2.5. Triggering the railway emergency plan	11
B.3. The consequences of the accident	11
B.3.1. Deaths and injuries	11
B.3.2. Material damages	11
B.3.3. Consequences of the accident in the railway traffic	12
B.4. External circumstances	12
B.5. Investigation course	12
B.5.1. The summary of the of the involved staff statements	12
B.5.2. Safety management system	15
B.5.3. Norms and regulations. Sources and references for the investigation	16
B.5.4. Work of the technical installations, of the infrastructure and of the rolling stock	16
B.5.4.1. Data on the installations	16
B.5.4.2. Data on the lines	16
B.5.4.3. Data found on the work of the rolling stock and of its technical installations	17
B.6. Analysis and conclusions	17
B.6.1.	17
B.6.2.	17
B.6.3.	18
B.7. The accident causes	18
B.7.1. Direct cause	18
B.7.2. Underlying causes	18
B.7.3. Root causes	18
C. Safety recommendations	19

I. PREAMBLE

I.1. Introduction

With reference to the railway accident occurred on the **27th of September 2010**, around **7:50a.m.**, on the range of activity of **CF Brasov Regional Branch**, on the running section Brasov – Deda, between the railway station CF Miercurea Ciuc and the flag station Sanraieni, at km. 90+530, consisting of the collision between the locomotive EA 40-0919-7 (isolated locomotive that was running as train aid no. 2 on current line closed) and the last coach in the composition of the passenger train no. 4504 that was stopped in current line (the locomotive of the passenger train no. 4504 was at km. 90+300), Romanian Railway Investigating Body carried out an investigation, according to the provisions of the Government Decision no. 117/2010, in order to prevent accidents with similar causes, by establishing the conditions and determining the causes. Romanian Railway Investigating Body investigation did not aim to establish the guilty or the responsibility, its aim being to improve railway safety and to prevent railway incidents or accidents.

I.2. Investigation process

On the 27th of September 2010, General Inspectorate for Traffic Safety in CNCF “CFR” SA informed Romanian Railway Investigating Body about the accident occurred on the 27th of September 2010, around 7:50a.m., on the range of activity of CF Brasov Regional Branch, between the railway station CF Miercurea Ciuc and the flag station (hm) Sanraieni, at km. 90+530, consisting of the collision between the locomotive EA 40-0919-7 (isolated locomotive that was running as train aid no. 2 on current line closed) and the last coach in the composition of the passenger train no. 4504 stopped in current line at km. 90+300.

On the 27th of September 2010, OIFR, being informed about the occurrence of a railway accident, went to its place and found the following:

- collision of the last coach in the composition of a passenger train by an isolated locomotive;
- injury of the guard of the passenger train;
- damage to the isolated locomotive and to a coach in the composition of the passenger train no. 4504.

At the place of the accident were presents representatives of:

- Prosecutor of the Court of Appeal Miercurea Ciuc,
- Mobile Service for Emergency, Resuscitation and Extrication – SMURD,
- Labor Inspectorates Brasov and Harghita;
- National Railway Company “CFR” – SA,
- National Company of Railway Passenger Transport “CFR Calatori” – SA,
- Romanian Railway Safety Authority.

Taking into account that the occurrence is defined as accident under the art. 3 letter l of the *Law 55/2006 on railway safety* and that this accident is relevant for the railway system, under the art. 19, paragraph (2) of the *Law no. 55/2006 on railway safety*, corroborated with the art. 48, paragraph (1) of *Regulations for the investigation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety*, approved by Government Decision no. 117/2010, Romanian Railway Investigating Body decided to start an investigation. So, through the decision no. 33 of the 27th of September 2010 of the OIFR Director, the investigation commission was appointed consisting of:

- Bobe Cristian – main investigator,
- Burlea Sorin - investigator,

- Paul Sever - investigator,
- Marcu Ioan - Head of General Inspectorate for Traffic Safety Brasov in CNCF “CFR” SA,
- Jarcău Cornel - Regional SC Inspector in Brasov Branch of Railway Passenger Transport – SNTFC “CFR Calatori” SA.

A. BRIEF PRESENTATION OF THE ACCIDENT

A.1. Brief presentation

On the 27th of September 2010, around 7:50a.m., on the running section Brasov - Deda, occurred the collision between the electric locomotive EA 40-0919-7 (directed as train aid, running isolated as train aid no. 2) and the last coach in the composition of the passenger train no. 4504 (that was stopped in current line between the railway station CF Miercurea Ciuc and the flag station Sanraieni, because of a technical failure occurred at the towing locomotive EA 40-0198-8).

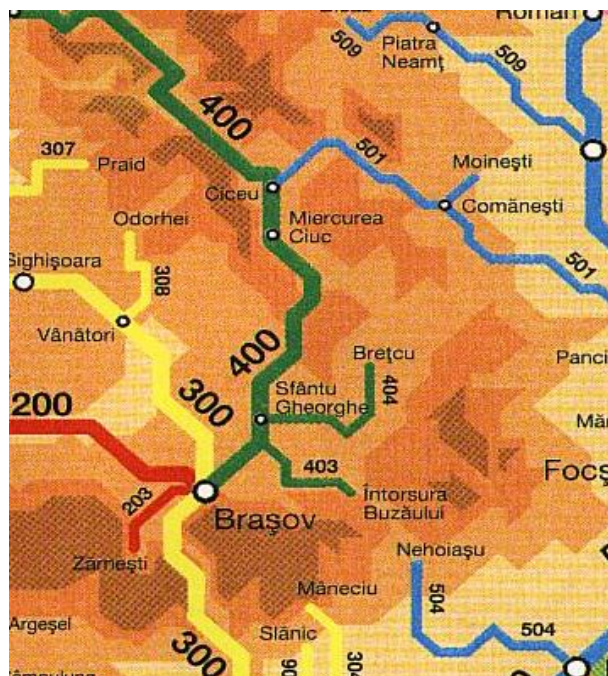
The place of the collision is located on the range of activity of CFR Brasov Regional Branch between the railway station CF Miercurea Ciuc – hm Sanraieni, at km. 90+530. The configuration of the railway path is in level, curve to the right in the running direction of the isolated locomotive (from Miercurea Ciuc to Sanraieni) with radius of 500 m, over-elevation of 120 mm, in mixed cross profile.

The passenger train no. 4504 (running on the section Toplita – Brasov) was composed of 8 coaches and was towed with the electric locomotive EA 40-0198-8 (belonging to Brasov locomotive depot - RTFC Brasov in SNTFC “CFR Calatori” – SA), being stopped at km. 90+300 between the railway station Miercurea Ciuc and hm Sanraieni because of the failure of the towing locomotive.

The electric locomotive EA 40-0919-7 (belonging to RTFC Brasov in SNTFC “CFR Calatori” – SA) was directed as locomotive aid for the train no.4504 and ran isolated as train no. 17576 on the distance Siculeni-Miercurea Ciuc, then as train aid no. 2 from the railway station CFR Miercurea Ciuc to the km. 90+300.

The railway accident occurred as a consequence of the collision between the isolated locomotive EA 40-0919-7 and the last coach of the passenger train no. 4504, that was stopped in current line. The consequences of the collision consisted of:

- injury of the guard of the passenger train no. 4504;
- damage of the locomotive aid running isolated;
- damage of the last coach in the composition of the passenger train no. 4504;



A.2. Causes of the event

A.2.1. Direct cause

The collision occurred as consequence of the unstopping of the locomotive aid EA 40-0919-7 (that was running isolated as train aid no.2) at the regulated distance to the signal coach of the passenger train no. 4505 (stopped in current line).

The unstopping of the locomotive at the regulated distance occurred as consequence of the fact that the locomotive driver did not identify the real position of the train stopped in current line due to the inaccurate values of the kilometric positions indicating the running speeds on the closed current line registered by the movement inspector in the traffic order, in conjunction with conditions of poor visibility caused by fog.

A.2.2. Underlying causes

The driver of the locomotive aid EA 40-0919-7, after receipt and assimilation of the traffic order (according to the provisions of the art. 90 paragraph (2) of the Instructions for the activity of locomotive staff in railway transport no. 201/2007) although he did not know the real kilometric position of the place where was the train stopped, he did not notice that the data on the kilometric position was incorrectly registered to the kilometric positions existing on the interval between the railway station CFR Miercurea Ciuc and the flag station Sancraieni. So the locomotive aid EA 40-0919-7 should have run from the railway station Miercurea Ciuc (km 95+077) to the flag station Sancraieni to the km. 89+300 (kilometric position below the actual kilometric position where was stopped the passenger train) with the maximum speed of 40 km/h and from there to run to the km. 90+025 (km. position where was stopped the passenger train 4504) back to the railway station CFR Miercurea Ciuc, with the speed of 20 km/h.

A.3. Severity level

According to the provisions of the art. 3, letter 1 of the Law no. 55/2006 on railway safety, corroborated with the provisions of the art. 7, paragraph (1), letter a of the Regulations for the investigation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety, approved by Government Decision no. 117/2010 the event is categorized as accident.

A.4. Safety recommendations

None.

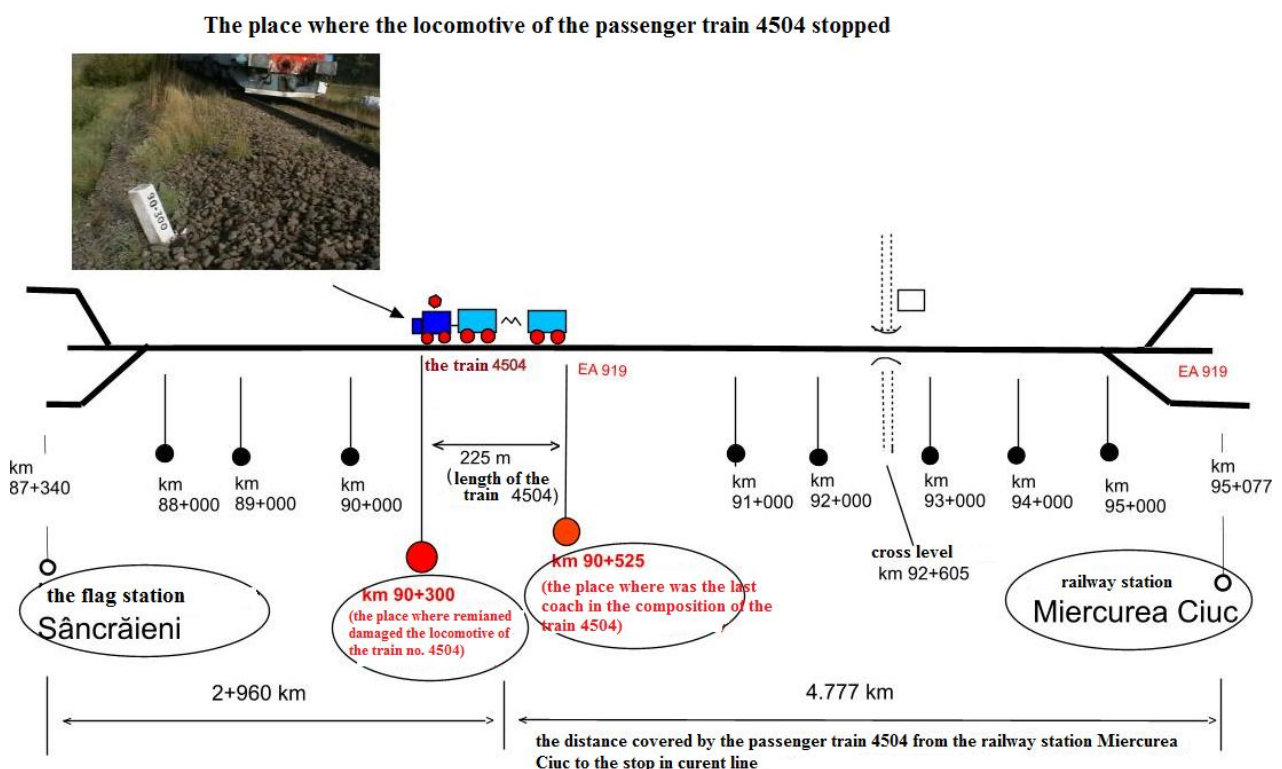
B. INVESTIGATING REPORT

B.1. Description of the accident

On the 27th of September 2010, the passenger train no. 4504 left from the railway station CFR Toplita at 4:23a.m., running, according to the direction allocated through the running plan, between the railway stations CFR Toplita and Brasov. The train was composed of 5 coaches, 20 axles, 150 m, 238 tons, having the automatic braked weight as in service book 202 t in fact 325 t, by hand as in service book 26 t in fact 98 t. From the railway station CFR Siculeni the train was towed with the locomotive EA 40-0198-8 belonging to Brasov locomotive depot, driven and served in simplified system by the locomotive driver belonging to Brasov locomotive depot – Ciceu Shed.

The passenger train no. 4504 arrived to the railway station CFR Miercurea Ciuc at 6:30a.m. and after attaching at the end of the train a group of 3 coaches, based on the indication of “free” of the exit signal, at 6:52a.m. it left from the railway station CFR Miercurea Ciuc to the flag station Sanraieni. The train was composed of 8 coaches, 32 axles, 225 m, 383 tons, having the automatic braked weight as in service book 326 t in fact 517 t, by hand as in service book 46 t in fact 163 t, towed with the locomotive EA 40-0198-8 belonging to Brasov locomotive depot, driven and served in simplified system by the locomotive driver belonging to Brasov locomotive depot – Ciceu Shed.

From the railway station CFR Miercurea Ciuc the passenger train no. 4504 ran on the distance Miercurea Ciuc – Sanraieni, and at km 90 + 300 (km. position next to the locomotive), after running 4 + 777 km., at 7:04a.m., it stopped due to a failure of the graduator of the locomotive EA 40-0198-8.



The locomotive driver announced through the radio-telephone station the movement inspector of the flag station Sancraieni about the failure of the locomotive EA 40-0198-8 and asked for a locomotive aid.

After this request, the RC operator of Tg. Mures Traffic Controller ordered to close for traffic the current line Miercurea Ciuc – Sancraieni and to allocate the locomotive aid EA 40-0919-7 from the railway station CFR Siculeni, driven in simplified system by the locomotive driver belonging to Brasov locomotive depot –Ciceu Shed.

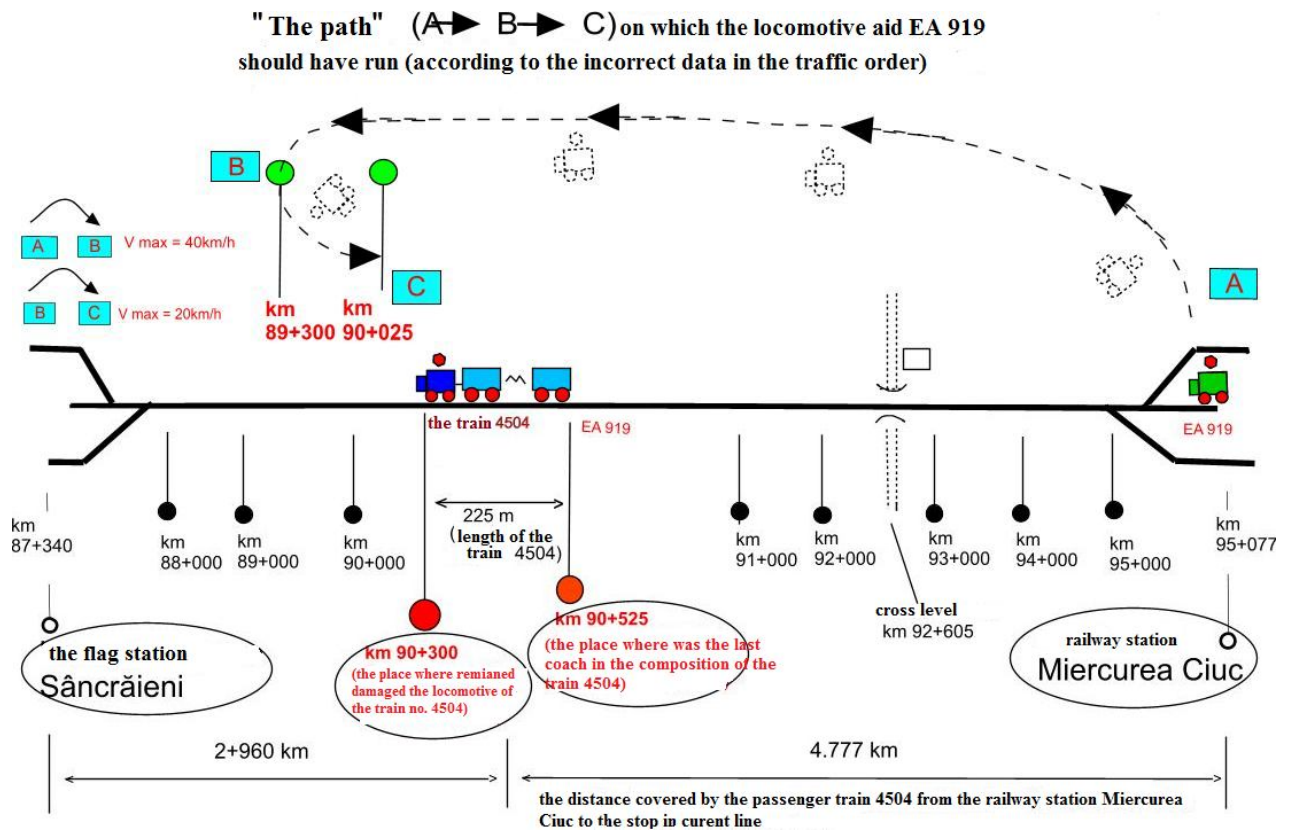
The isolated locomotive EA 40-0919-7 was directed as train no.17576, at 7:20a.m., from the railway station CFR Siculeni and arrived in the railway station CFR Miercurea Ciuc at 7:33a.m.

The movement inspector of the railway station CFR Miercurea Ciuc proceeded to prepare the traffic order in order to direct the isolate locomotive EA 40-0919-7 on the closed current line, establishing the following running conditions:

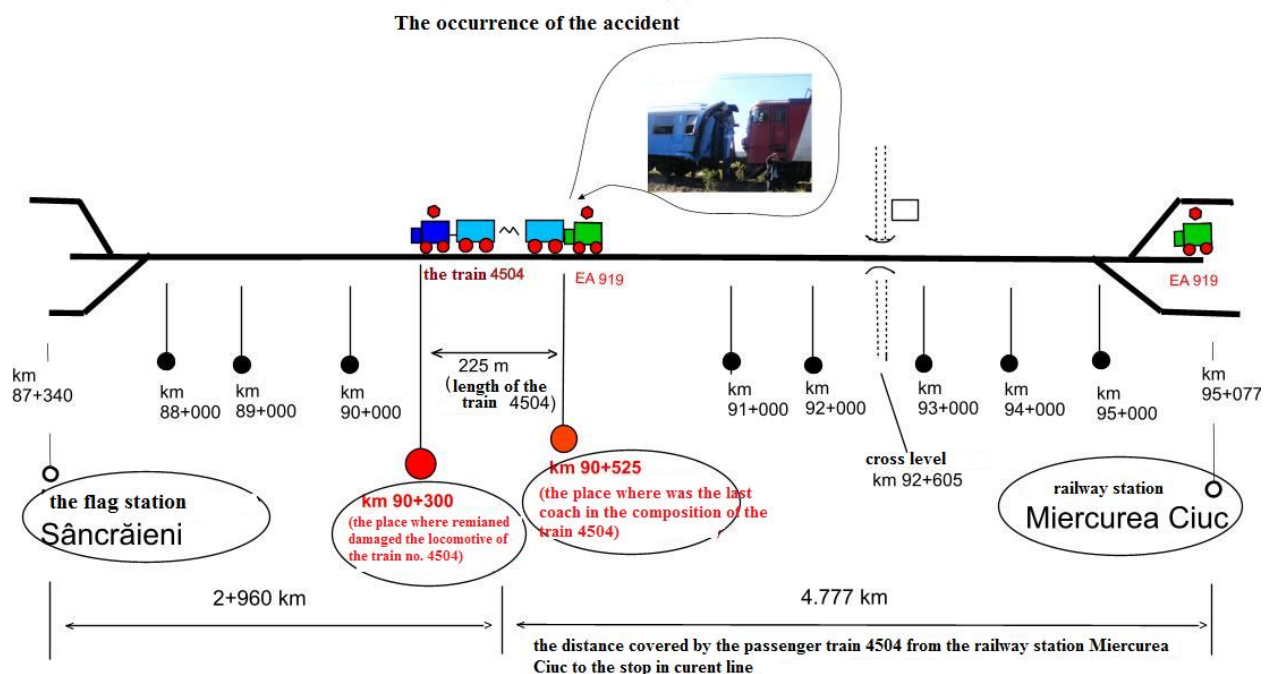
- *„Run on the current line M. Ciuc - Sancraieni closed, with departure M. Ciuc at 7:34 a.m.”.*
- *„Exit line I with the signal Y I with a red light failure on stop”.*
- *„Run with a maximum speed of 40 km/h to km. 89+300 from where run with a maximum speed of 20 km/h to the km. 90+025 to the train where give help for the train 4504, which you push to the railway station Sancraieni, enter the railway station Sancraieni with the normal signal”.*
- *„Contact the train 4504 through the radio-telephone station”.*
- *„Run uninformed to canton 93- km. 92+605 particular attention”.*

The driver of the locomotive EA 40-0919-7, although he did not know the kilometric position of the place where the help should be given or where were stopped the train, he did not notice that the data on the running of the locomotive aid registered in the traffic order was incorrect, so it should have run to the flag station Sancraieni to the km. 89+300 with the maximum speed of 40 km/h and from there, practically, to turn back and to run to the railway station CFR Miercurea Ciuc to the km. 90+025, with the maximum speed of 20km/h.

At 7:35a.m., the locomotive EA 40-0919-7 was directed as locomotive aid, on the closed current line, based on the traffic order no. 0018530 prepared by the movement inspector of the railway station CFR Miercurea Ciuc.



The locomotive aid EA 40-0919-7 ran between the railway station CFR Miercurea Ciuc and the place where was stopped in current line the passenger train no. 4504, with speeds within 17 and 40 km/h, and around 7:44'02" a.m., at a speed of 23 km/h collided the last coach in the composition of the train no. 4504.



At the place of the accident was found that the consequences of the collision were:

- injury of the guard of the passenger train no. 4504;
- damage of the locomotive EA 40-0919-7, damages to the driving station I:



- the pads had the front plates slightly deformed;
 - corner windows broken;
 - central headlights broken;
 - front protection bar deformed.
- damage of the coach no. 50531957073-3, the last in the composition of the passenger train no. 4504:
 - front sleeper (head of handbrake) displaced to inside of the coach;
 - the pivot of the pallet from the bogie with R1-4 (handbrake) broken and the bogie displaced to the center of the coach;
 - the upper side of the coach box deformed and displaced to the center of the coach;
 - the traction, collision and linking devices, deformed and broken;
 - the front platform deformed to inside the coach;
 - the toilet cabin and the compartment 1 deformed;
 - the backbone of the chassis and of the coach box compromised.



B.2. The accident circumstances

B.2.1. Involved parties

The running section where occurred the railway accident is managed by CNCF “CFR” SA and maintained by its employees.

The railway infrastructure and superstructure are managed by CNCF “CFR” S.A. and maintained by the employees of Lines District 4 Miercurea Ciuc of Section L6 Gheorgheni, CF Brasov Regional Branch.

The railway communications installations from the railway station CFR Miercurea Ciuc and from the flag station Sanraieni are managed by CNCF “CFR” S.A. and maintained by the employees of SC Telecomunicatii CFR S.A.

The railway communications installations on the locomotives are the property of SNTFC “CFR Calatori” SA and are maintained by its employees.

The locomotives EA 40-0919-7 and EA 40-0198-8 and the coaches in the composition of the passenger train are the property of SNTFC “CFR Calatori” SA and are maintained and inspected in transit by its employees and the repairs are performed by companies authorized as railway suppliers.

The installation of railway traffic control from the railway station CFR Miercurea Ciuc, and the installations signaling, centralization and blocking (SCB) from the railway station CFR Miercurea Ciuc are managed by CNCF “CFR” SA and maintained by employees of SCB District Miercurea Ciuc in Section CT 1 Brasov, CF Brasov Regional Branch.

The investigation commission questioned the employees involved in the railway traffic control, the locomotive and train staff involved in the accident and other witnesses, respectively:

- IDM on duty in the railway station Miercurea Ciuc on the 27th of September 2010;
- IDM on duty in hm Sanraieni on the 26th/27th of September 2010;
- the locomotive driver who drove the train aid no. 2 (locomotive EA 40-0919-7) on the 27th of September 2010;
- the conductor who served the passenger train no. 4504 on the 27th of September 2010;
- the locomotive driver who drove the passenger train no. 4504, on the 27th of September 2010;

- RC operator from Tg. Mures Traffic Controller, on duty on the 27th of September 2010;
- barrier keeper from the barrier post no. 93 – km. 92+605, on duty on the 27th of September 2010.

B. 2.2. Forming and equipments of the train

The passenger train no. 4504 was composed of 8 coaches, 32 axles, length 225 m, 383 tons, having the automatic braked weight as in service book 326 t in fact 517 t, by hand as in service book 46 t in fact 163 t and was towed with the locomotive EA 40-0198-8 (belonging to Brasov locomotive Depot – sub-unit of SNTFC “CFR” Calatori SA) driven and served in simplified system by the locomotive driver belonging to Brasov locomotive Depot – Ciceu Shed.

The locomotive EA 40-0919-7 that ran as locomotive aid belongs to Brasov locomotive Depot (sub-unit of SNTFC “CFR” Calatori SA) and was driven and served in simplified system by the locomotive driver belonging to Brasov locomotive Depot – Ciceu Shed.

The safety and vigilance equipments (DSV), the equipment for the point control of the speed and hitchhiking (INDUSI) and the radio telephone stations in the equipment of traction means (towing locomotive of the passenger train no. 4504 and the locomotive aid) were active, being sealed and were instructionally working and its automatic brake was active.

B.2.3. Railway equipments

The current line at km. 90+530, in the area of the railway accident is in level, in curve to the right with radius of 500 m. The superstructure is type 65 with indirect clamping type K, in active condition, on concrete sleepers T 17, technically appropriate, built in rail without joints system, with the prism of broken stone complete, simple line electrified.

The railway accident occurred on an area where the maximum running speed of the trains provided in service book was of 90 km/h.

On the 27th of September 2010, next to the place of the accident, were not performed works at the lines or at the railway installations.

The weather on the area of the accident between 7:03a.m. – 8:03a.m., was insuring a horizontal visibility of 50 m, fog with invisible sky, air temperature of + 8°C, and calm wind.

The railway station CFR Miercurea Ciuc, from where was sent the locomotive aid EA 40-0919-7, is equipped with installation with electrodynamics centralizations (CED) type CR-3 (centralization with relays), with Domino console and semiautomatic line block with relays (BLSAR).

B.2.4. Means of communication

The communication between the locomotive driver and the movement inspectors and between the locomotive driver and the train party is provided through the radio-telephone installation.

The area of km. 90+300, located between the railway station CFR Miercurea Ciuc and the flag station Sanraieni is not listed in the records of SC “Telecomunicatii CFR” SA as an area uncovered by radio signal.

B.2.5. Triggering the railway emergency plan

Immediately after the railway accident, triggering the intervention plan for first aid to victims, remove damage and restore train traffic had two components:

- announcing the unique national system for emergency calls 112 by the conductor of the passenger train no. 4504 involved in the railway accident, after which at the place of the accident came representatives of Mobile Service for Emergency, Resuscitation and Extrication – SMURD, of the Railway Police Operative Service and of the Prosecutor of the Court of Appeal Harghita.

- Announcing about the railway accident in accordance with the provisions of *Regulations for the investigation of the accidents and incidents, for the development and improvement*

of Romanian railway and subway safety, approved by Government Decision no. 117/2010, after which there came representatives of the public railway infrastructure manager (CNCI “CFR” SA - CF Brasov Regional Branch), of the railway undertaking (SNTFC “CFR Calatori” SA), of Romanian Railway Authority - AFER and of Railway Police Operative Service.

B.3. Accident consequences

B.3.1. Deaths and injuries

After the accident resulted the injury of the guard of passenger train no. 4504 who was in the last coach in the composition of the train, at its last intercommunication door.

The injured was transported and hospitalized (the 27th of September 2010, at 10:00a.m.), at the County Emergency Hospital Miercurea Ciuc.

At discharge (the 16th of October 2010, at 8:38a.m.), the patient had the following diagnosis: „transverse plague inner side right thigh with facial skin necrosis abductor dilacerations; right ischium fracture without displacement; obesity; varicose disease of lower limbs”.

B.3.2. Material damages

The value of the material damages, according to the estimates prepared by the owner of the rolling stock and the manager of the public railway infrastructure, is the following:

- **at the line** - none;
- **at the installations** - none;
- **at the locomotive EA 40-0919-7**, according to the estimate no. 234/E/d/874/2010 of “CFR SCRL BRASOV” SA – Brasov Repairs Section amounted of **- 3.445.61 lei**;
- **at the coaches -**
 - coach no. 50531957073-3 (amortized asset value)
(according to the situation no. 543/A/852 of the 29th of September 2010 of RTFC Brasov – Serv. CIST) **- 3 770.21 lei**
 - coach no. 50532147610-1 (amortized asset value)
(according to the situation no. 543/A/852 of the 29th of September 2010 of RTFC Brasov – Serv. CIST) **- 4 379.68 lei**
 - coach no. 50532057467-4 (amortized asset value)
(according to the situation no. 543/A/852 of the 29th of September 2010 of RTFC Brasov – Serv. CIST) **- 3 177.33 lei**
 - coach no. 50531955012-3
(according to the price calculation no. 51/T/2010 of SC “CFR - SIRV Brasov”) **- 657.6502 lei**
 - coach no. 50532054049-3
(according to the price calculation no. 52/T/2010 of SC “CFR - SIRV Brasov”) **- 794.5953 lei**
 - coach no. 50532054002-2
(according to the price calculation no. 53/T/2010 of SC “CFR - SIRV Brasov”) **- 964.0257 lei**
 - coach no. 50532055042-7
(according to the price calculation no. 54/T/2010 of SC “CFR - SIRV Brasov”) **- 732.9029 lei**
 - coach no. 50532055102-9
(according to the price calculation no. 55/T/2010 of SC “CFR - SIRV Brasov”) **- 787.8429 lei**
- **at the environment** - none;
- **other damages (train delays)** – estimate minutes passenger train delays no. 457/1115/2010 of Brasov Locomotive Depot in SNTFC “CFR Calatori” SA – RTFC Brasov. **-1 319.36 lei**

Total amount of the material damages **- 20 029.207 lei**

B.3.3. Consequences of the accident in the railway traffic

The simple current line between the railway station Miercurea Ciuc and the flag station Sanraieni was closed for traffic on the 27th of September 2010, from 7:00a.m. to 1:44p.m. Because of the railway accident 3 passenger trains were delayed of a total of 665 minutes.

B.4. External circumstances

On the 27th of September 2010, during the time between 7:03 a.m. – 8:03 a.m. the horizontal visibility was of 50 m, fog with invisible sky, air temperature of +8°C and calm wind.

In the area of the railway accident the line is in curve to the right in the running direction of the isolated locomotive.

The visibility of the light signals was according to the provisions of the specific regulations in force.

B.5. Investigation course

B.5.1. The summary of the of the involved staff statements

The movement inspector on duty in the railway station Miercurea Ciuc (employee of CNCF “CFR” SA - CF Brasov Regional Branch) of the 27th of September 2010 from 7:00 a.m. stated as follows:

- after taking over the service on the 27th of September 2010, with the current line Miercurea Ciuc-Sancraieni occupied with the passenger train no. 4504, was announced by the RC operator that the train remained damaged;
- he received a written notification from the RC operator that the train had remained damaged at km. 90+300 and the current line Miercurea Ciuc-Sancraieni had been closed;
- he received a written notification from the RC operator that the additional train 17576 would run, locomotive aid from the railway station Siculeni;
- after arrival of the isolated locomotive (train no. 17576) in the railway station, he sent it as locomotive aid no. 2 to the passenger train no. 4504 to push it in the flag station Sanraieni according to the RC operator notification;
- he personally handed to the locomotive driver the traffic order to send the locomotive aid;
- he knew that between the railway station Miercurea Ciuc and the flag station Sanraieni the numbering of the mileage landmarks is descending, but he miscalculated the kilometric position where was the last coach of the passenger train no. 4504, respectively the kilometric position up to which the locomotive aid had to run with the speed of 40 km/h, according to the service instructions (he subtracted the length of the train 225 m to the position where was the locomotive of the train 4504 respectively km. 90+300, obtaining the value 90+025, then he subtracted also a kilometer to find out the kilometric position to which the locomotive aid had to run with the speed of 40 km/h, obtaining the value of 89+300, that he listed in the traffic order, in place of adding the train length and a kilometer);
- on the 27th of September 2010, between 6:30 a.m. - 7:00a.m., in the area was dense fog, reason for which he wrote in the traffic order that the driver of the locomotive aid contact through the radio-telephone station the driver of the train 4504;
- after leaving of the locomotive aid, he did not heard any communication between the driver of the locomotive aid and the passenger train no. 4504, but only between the passenger train no. 4504 and hm Sanraieni, without clear understanding of the communications;
- he announced verbally and in written the driver of the locomotive aid that the locomotive would run unnoticed at the crossing level from km. 92+650 (canton 93);
- before the locomotive aid left he contacted the flagman from the canton 93 and announced him verbally that a locomotive aid was going to run on the line.

The locomotive driver who drove the train aid no. 2 (locomotive EA 40-0919-7), on the 27th of September 2010, stated as follows:

- normal running conditions on the section Siculeni - Miercurea Ciuc as train 367-2;
- he received from the IDM of the railway station Miercurea Ciuc the traffic order that he acknowledged confirming it by signature and was directed to give help to the passenger train no. 4504;
- he was sent from the railway station Miercurea Ciuc in conditions of fog with limited visibility 4-5 meters running with the speed within 32-38 km/h;
- he tried to contact through the radio-telephone station the driver of the passenger train no. 4504 but he failed, in the area being a reception problem of these installations.
- in the area of km. 90+530 he noticed at a distance of about 10 meters, the last coach in the composition of the passenger train no. 4504, taking action to rapid brake by manipulating the driver valve KD 2 in the position of rapid braking;
- after the impact he took actions to insure the locomotive by tightening the handbrake and the direct brake;
- he announced Hm Sancraieni about the occurred impact;
- he found in the coach an injured person about which he learned later that was the guard of the train 4504;
- he knows that the kilometric landmarks are in increasing position in the direction Brasov - Miercurea Ciuc (decreasing for the section Miercurea Ciuc - Sancraieni);
- after reading the traffic order received in the railway station Miercurea Ciuc he did not notice any discrepancy between the records of the order and the condition on spot of the kilometric landmarks, realizing that the kilometric positions were incorrect only after he noticed the last coach of the passenger train no. 4504;
- next to the canton 93 he took actions reduce the speed until he was sure that the barrier was closed and the agent was at his work station.

The movement inspector on duty in hm. Sancraieni on the 26th/27th of September 2010 stated as follows:

- on the 27th of September 2010, at 7:04 a.m. the driver of the train 4504 stated through the radio-telephone station that the towing locomotive EA 40-0198-8 of the train was damaged with the graduator between the railway stations Miercurea Ciuc-Sancraieni at km. 90+300 and asked a locomotive aid;
- he made the registration in the register of free way, commands and movement, then he announced about it the operator from RC Tg. Mures;
- he received the notification from the RC operator of closing the current line between the railway stations Miercurea Ciuc-Sancraieni and of running on the closed current line of the train aid no. 2 with departure from the railway station Miercurea Ciuc to the passenger train no. 4504 remained damaged at km. 90+300 from where it would push the train to Hm Sancraieni;
- he registered the departure note of the train aid no. 2;
- he made the service delivery and reception (at 7:50a.m.) and he gave over the service with the current line occupied between the railway stations Miercurea Ciuc-Sancraieni with train 4504 that remained damaged at km. 90+300 and with train aid no. 2 without a new arrival note;
- he was still on duty at the time of the accident (7:50 a.m.);
- he tried to contact the driver of the locomotive aid but he did not answer the radio-telephone;
- he did not hear communications between the driver of the train 4504 and the driver of the locomotive aid;
- at the time of the accident there was fog with a visibility of about 50 meters.

The train conductor who served the passenger train no. 4504 on the 27th of September 2010, stated as follows:

- he served the train on the section Siculeni-Miercurea Ciuc where were attached three coaches, continuing to serve the train on the section Miercurea Ciuc-Brasov;

- after leaving from the railway station Miercurea Ciuc he noticed that the train stopped and he was announced by the guard that the locomotive was damaged and that a locomotive aid was going to come from the railway station Miercurea Ciuc;
- while walking to the last coach to link the locomotive aid, when he got to the end of the last coach he heard a big bang, being struck down the aisle;
- after the fall he saw that the guard was caught between the twisted irons and he called 112;
- in the moment of the accident there was fog.

The guard who served the passenger train no. 4504 on the 27th of September 2010, stated as follows:

- he served the train on the section Siculeni - Miercurea Ciuc where were attached three coaches continuing to serve the train on the section Miercurea Ciuc-Brasov;
- he required the instructional signaling of the train and that the final lights remain lit because there was fog in the area;
- between the railway stations Miercurea Ciuc-Sancraieni the train stopped and he was announced by the driver of the train through the R.T.F. station that the locomotive was damaged;
- he went to the locomotive and after the checks performed by the driver in the engines box they established to declare the locomotive damaged and to ask for the locomotive aid;
- after sending the request and receiving the confirmation from the I.D.M. in the railway station Sancraieni he was announced that would be sent the locomotive aid from the railway station Miercurea-Ciuc to the end of the train;
- after the acknowledging together with the train driver about the sending of the locomotive aid he established together with the train conductor how to announce the passengers, how to mark the train and how to link the locomotive aid
- by marking the train he understands the signals with portative instruments to the locomotive driver in order to couple the locomotive to the train
- after he went to announce the passengers about the train delays (from the head of the train to the last coach) while he was on the platform of the last coach in order to descend, he was caught by the locomotive between the front wall and the door of the toilet cabin, then he lost consciousness.

The locomotive driver who drove the passenger train no. 4504 on the 27th of September 2010, stated as follows:

- normal running conditions on the distance Siculeni-Miercurea Ciuc;
- after leaving the railway station Miercurea Ciuc the locomotive graduator did not work, being obligated to stop the train in current line between the railway stations Miercurea Ciuc-Sancraieni at km. 90+300;
- he announced about the damaged locomotive and he asked a locomotive aid at about 7:04 a.m., fact confirmed by the IDM in Hm Sancraieni with no. 8;
- around 7:50 a.m. he felt a strong hit because of the locomotive aid that had crashed the train 4504;
- he checked the locomotive that he was serving, but visually he did not find damages;
- because of the low visibility (dense fog), he could not see the consequences of the impact.

The RC operator from the Tg. Mures Traffic Controller on duty on the 27th of September 2010 at wire RC 1 Harman-Siculeni, stated as follows:

- at 7:04 a.m. the IDM in Hm Sancraieni transmits the telephonogram with no. 8 through which he announces that the passenger train no. 4504 towed with EA 40-0198-8 remains damaged at km. 90+300 with the graduator and he asks a locomotive aid;
- at 7:17 a.m. by the order no. 8 he introduces in traffic the locomotive aid from the railway station Siculeni to the railway station Miercurea Ciuc as train 17576 in the conditions of the train 367-2 with departure from Siculeni at 7:20 a.m.;

- at 7:18 a.m. by the order no. 9 he closes the current line Miercurea Ciuc-Sancraieni and introduces in traffic the locomotive EA 40-0919-7 aid no. 2 to push the passenger train no. 4504 remained damaged at km. 90+300 in Hm Sancraieni;
- at 9:50 a.m. the operator from passenger traction announced him that the locomotive aid had hardly crashed the train 4504.

The guardian of the barrier from the barrier post no. 93 located at km. 92+605, on duty on the 27th of September 2010, stated as follows:

- after taking over the service he received the order to close the current line Miercurea Ciuc-Sancraieni because the train 4504 had remained damaged in current line;
- he received the written order that a train aid no. 2 would run;
- he was informed verbally that the locomotive had left the railway station Miercurea Ciuc;
- after receiving the traffic order of the train aid, he did not open the barrier;
- he remained outside at the fixed place, with the yellow flag, waiting for the locomotive aid to pass, that ran without stopping around 7:40 a.m. signaled;
- at that time there was dense fog, low visibility, noticing the arrival of the locomotive near the passage at a distance of about 2-3 coaches.

B.5.2. Safety management system

To complete their tasks and responsibilities, the public railway infrastructure manager National Railway Company “CFR” SA and the railway undertaking National Passenger Railway Company “CFR Calatori” SA had implemented their own safety management system.

In this context, CNCF “CFR” SA and SNTFC “CFR Calatori” SA insure the control of associated risks to the activity of manager, respectively undertaking.

B.5.3. Norms and regulations. Sources and references for the investigation

In the investigation of the railway accident one took into account:

norms and regulations

- Technical Regulation of Rail Operation no. 002 approved by the Order of the Minister of Transport, Constructions and Tourism no. 1186 on the 29th of August 2001;
- Instructions for the activity of locomotive staff in railway transport no. 201/2007, approved by the Order of the Minister of Transport, Constructions and Tourism no. 2229 on the 23rd of November 2006;
- Regulation for trains running and shunting of the railway vehicles – no. 005/2005 approved by the Order of the Minister of Transport, Constructions and Tourism no. 1816 on the 26th of October 2005;
- Regulation for towing and braking – no. 006 approved by the Order of the Minister of Transport, Constructions and Tourism no.1815 on the 26th of October 2005.

sources and references

- photos taken immediately after the railway accident by the members of the investigation commission;
- minutes of reading the speedometer bands of the locomotive involved in the accident, and also of the towing locomotive of the passenger train no. 4504;
- documents on the board records of the locomotive provided by the responsible with their maintenance;
- documents on the driving process and regulation of the train traffic;
- inspection and interpretation of the technical condition of the locomotive and of the train involved in the accident;

- questioning of the staff involved in coordinating the railway traffic, the locomotive staff and the train staff involved in the accident and also other witnesses;
- minutes prepared after the findings at the locomotive and the coach involved in the accident;
- roadmap of the locomotive aid;
- transport documents of the train;
- movement records from the railway station Miercurea Ciuc and the flag station Sanraieni;
- documents on the maintenance of the running lines provided by the responsible with their maintenance;

B.5.4. Work of the technical installations, of the infrastructure and of the rolling stock

B.5.4.1. Data found on the installations

The railway station CFR Miercurea Ciuc, from which was sent the locomotive aid EA 40-0919-7, is equipped with installation with electrodynamics centralizations (CED) type CR-3 (centralization with relays), with Domino console and semiautomatic line block with relays (BLSAR).

Sending of the locomotive aid EA 40-0919-7 on closed current line was made based on the traffic order prepared by the movement inspector from the railway station CFR Miercurea Ciuc.

B.5.4.2. Data found on the lines

The current line at km. 90+530, in the area of the railway accident is in level, in curve to the right with radius of 500 m.

The superstructure is type 65 with indirect clamping type K, in active condition, on concrete sleepers T 17, technically appropriate, built in system rail without joints, with the prism of broken stone complete, simple line electrified.

The railway accident occurred on an area where the maximum running speed of the trains provided in the service book was of 90 km/h.

The weather in the area of the railway accident between 7:03 a.m. – 8:03 a.m., was insuring a horizontal visibility of 50 m, fog with invisible sky, air temperature of +8°C, and the wind was calm.

B.5.4.3. Data found on the work of the rolling stock and of its technical installations

The locomotive EA 40-0919-7 had the installation “INDUSI” in function and sealed, the safety and vigilance device (DSV) in function and sealed, the speedometer installation sealed, the brake installation of the locomotive was in function and sealed, the locomotive handbrake was tighten, the handle of the valve FD1 of the direct brake was in braking position and the brake valve type KD2 was in neutral position.

The speed of the locomotive aid EA 40-0919-7, on the running distance Miercurea Ciuc and up to the place where was stopped the passenger train no. 4504, was of maximum 40 km/h. The impact speed of the locomotive with the train at standstill was of 23 km/h.

B.6. Analysis and conclusions

B.6.1. The way of braking of the isolated locomotive near the locomotive of the train at standstill

From the analysis of the minutes of reading the speedometer band results that were not taken in time the necessary braking actions to stop safely in front of the train at standstill.

B.6.2. Collision of the passenger train no. 4504 at standstill in current line

The collision of the train at standstill in current line, by the locomotive EA 40-0919-7 that was running isolated as locomotive aid, was determined by an accumulation of human errors, such as:

- after wrong calculations, in the traffic order prepared by the movement inspector of the railway station CFR Miercurea Ciuc were listed the kilometric positions from which were restricted the running speeds of the locomotive EA 40-0919-7 on the closed current line

between the railway station CFR Miercurea Ciuc and hm. Sancraieni. According to the records in the traffic order, the locomotive EA 40-0919-7 should have run from the railway station CFR Miercurea Ciuc (km. 95+077) to the flag station Sancraieni, up to the km. 89+300 (kilometric position where according to the calculations made by the movement inspector would have represented the place where remained the passenger train no. 4504) with the maximum speed of 40 km/h, and from there, practically, to turn back and to run to the railway station CFR Miercurea Ciuc, to the km. 90+025, with the maximum speed of de 20km/h.

This was due to the error of the movement inspector when calculating the kilometric positions of limiting the speed of the locomotive EA 40-0919-7 by considering the kilometric landmarks in increasing direction from the railway station Miercurea Ciuc to the flag station Sancraieni and not decreasing as they were on spot.

According to the conditions listed in the traffic order, even if the last coach in the composition of the passenger train no. 4504 was placed at km. 90+530, the locomotive aid EA 40-0919-7 should have run with the maximum speed of 40 km/h from the railway station CFR Miercurea Ciuc (located at km. 95+077) to the flag station Sancraieni up to the km 89+300, and from there, practically, to run in opposite direction and to move to the railway station CFR Miercurea Ciuc, up to the km 90+025, with the maximum speed of 20km/h.

- the driver of the locomotive aid EA 40-0919-7, after receipt and acknowledge of the traffic order (according to the provisions of the 90, paragraph (2), chapter XI of the Instructions for the activity of locomotive staff in railway transport no. 201/2007) prepared by the movement inspector from the railway station CFR Miercurea Ciuc, although he did not know the kilometric position of the place where the help should have been given or where the train was stopped, he did not notice that the data on the running of the locomotive aid was incorrect, so that according to the records it should have run from the railway station CFR Miercurea Ciuc (km. 95+077) to the flag station Sancraieni, up to the km. 89+300, with the maximum speed of 40 km/h and from there, practically, to turn back and run to the railway station CFR Miercurea Ciuc, up to the km 90+025, with the maximum speed of 20km/h.

In is mentioned that if the driver of the locomotive aid EA 40-0919-7 had noticed the wrong information in the traffic order, the accident could have been avoided because he should have act according to the provisions of the art. 16, letters c and d of the *Regulations for the investigation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety, approved by Government Decision no. 117/2010*, that provides that the staff with responsibilities in the railway traffic safety is obligated to “*announce verbally and in written by event report, any irregularity noticed on the railway traffic safety*” respectively, if “*the irregularity noticed endangers imminently the railway safety he has to personally take immediate actions to prevent the dangerous situation and to advice in any way the nearest sub-unit management*”.

B.6.3. Findings on the professional training of the employees

- there were not complied the provisions on the compliance by the driver of the locomotive EA 40-0919-7 with the conditions listed in the traffic order („*Contact the train 4504 through the radio-telephone station*”- statement made pursuant to the provisions of Regulation for trains running and shunting of the railway vehicles – no. 005/2005, annex 1 – situations when a traffic order is handed to the locomotive driver) and of the Instructions for the activity of locomotive staff in railway transport no. 201/2007, chapter X, art.79(1): “*The traffic order is a standard and with series form, through which is informed in written the locomotive driver, and when the case the shunting chief, about the conditions regarding the train traffic and/or performance of the shunting*”.

B.7. The accident causes

B.7.1. Direct cause

The collision occurred as consequence of the unstopping of the locomotive aid EA 40-0919-7 (that was running isolated as train aid no.2) at the regulated distance to the signal coach of the passenger train no. 4505 (stopped in current line).

The unstopping of the locomotive at the regulated distance occurred as consequence of the fact that the locomotive driver did not identify the real position of the train stopped in current line due to the inaccurate values of the kilometric positions indicating the running speeds on the closed current line registered by the movement inspector in the traffic order, in conjunction with conditions of poor visibility caused by fog.

B.7.2. Underlying causes

The driver of the locomotive aid EA 40-0919-7, after receipt and assimilation of the traffic order (according to the provisions of the art. 90 paragraph (2) of the Instructions for the activity of locomotive staff in railway transport no. 201/2007) although he did not know the real kilometric position of the place where was the train stopped, he did not notice that the data on the kilometric position was incorrectly registered to the kilometric positions existing on the interval between the railway station CFR Miercurea Ciuc and the flag station Sancraieni. So the locomotive aid EA 40-0919-7 should have run from the railway station Miercurea Ciuc (km 95+077) to the flag station Sancraieni to the km. 89+300 (kilometric position below the actual kilometric position where was stopped the passenger train) with the maximum speed of 40 km/h and from there to run to the km. 90+025 (km. position where was stopped the passenger train 4504) back to the railway station CFR Miercurea Ciuc, with the speed of 20 km/h.

B.7.3. Root cause

None.

C. Safety recommendations

None.

This Investigating Report will be sent to Romanian Railway Safety Authority, to the manager of the public railway infrastructure CNCF “CFR” SA and the passenger railway undertaking SNTFC “CFR Calatori” SA.

Members of the investigation commission:

- BOBE Cristian – main investigator
- BURLEA Sorin – investigator
- PAUL Sever - investigator
- MARCU Ioan - Head of General Inspectorate for Traffic Safety Brasov in CNCF “CFR” SA
- JARCĂU Cornel - Regional SC Inspector in Brasov Branch of Railway Passenger Transport – SNTFC “CFR Calatori” SA