



MINISTRY OF TRANSPORTS AND INFRASTRUCTURE
ROMANIAN RAILWAY AUTHORITY - AFER

ROMANIAN RAILWAY INVESTIGATING BODY



INVESTIGATING REPORT

On the accident occurred on the 13th April 2010 in the railway station Arad



Final edition

The 21st of June 2010

NOTICE

With reference to the **railway incident** occurred on the **13th of April 2010**, at **01:06** hour, in the Branch of the Railway County Timisoara, in the **railway station Arad**, by dispatching the passenger train no. 473-2 in another direction than that stipulated , that is to Aradul Nou instead Glogovat, passing the switch no. 53 that gave access to Aradul Nou, taking into account the request of Romanian Railway Safety Authority – ASFR, by the paper no. 2120/192/2010, according to the art. 49, paragraph (2), letter d) from the *Regulations for the investigation of the accidents and incidents, for the development and improvement of the safety on Romanian railway and subway network*, approved by Government Decision 117/2010, Romanian Railway Investigating Body carried out an investigation.

Through the investigation, the information on the respective incident 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 21st June 2010

Approved by,
Dragos 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 incident occurred on the 13th of May 2010, in the Branch of the Railway County Timisoara, in the railway station Arad, by dispatching the passenger train no. 473-2 in another direction than that stipulated.

I. CONTENT

I. Preamble	5
I.1. Introduction	5
I.2. Investigation	5
 A. <u>INCCIDENT RESUME</u>	 6
A.1. Brief presentation	6
A.2. Direct cause, subiacent causes and root causes	7
A.2.1. Direct cause	7
A.2.2. Underlying causes	7
A.2.3. Root causes	7
A.3. Severity level	7
A.4. Safety recommendations	7
 B. <u>Investigating report</u>	 8
B.1. Description of the incident	8
B.2. The incident circumstances	9
B.2.1. Involved parties	9
B.2.2. Train composition and equipments	10
B.2.3. Railway equipments	10
B.2.4. Means of communications	10
B.2.5. Starting the railway emergency plan	10
B.3. The consequences of the incident	10
B.3.1. Losses and injured people	10
B.3.2. Material damages	10
B.3.3. The consequences of the incident in the railway traffic	10
B.4. External circumstances	10
B.5. Investigation	11
B.5.1. The summary of the of the involved railway staff testimonies	11
B.5.2. The safety management system	11

B.5.3. Norms and regulations. Sources and references for investigation	12
B.5.4. Operation of the technical equipments, infrastructure and rolling stock	12
B.5.4.1. Data about the equipments	12
B.5.4.2. Data about the lines	12
B.5.4.3. Data about the operation of the rolling stock and technical equipments	12
B.5.5. Interface man-machine-organization	12
B.6. Analysis and conclusions	13
B.7. The incident causes	14
B.7.1. Direct cause	14
B.7.2. Underlying causes	14
B.7.3. Root causes	14
C. <u>Safety recommendations</u>	15

I. PREAMBLE

1.1 Introduction

On the **13th of April 2010**, at **1,05 hour**, in the Branch of the Railway County Timișoara, in the railway station Arad, the passenger train no. 473-2 was dispatched to another direction than that stipulated (to Aradul Nou instead Glogovaț), passing the switch no. 53, that gave access to the direction Aradul Nou.

It was appointed as very serious railway event in accordance with the provisions of art. 14, group A, point 5c from the Instructions for the prevention and inquiry of the railway accidents and events no. 003/2000, approved by Minister of Transports Order no. 210/2000.

1.2 Investigation

According to the provisions of the Instructions for the prevention and inquiry of the railway accidents and events no. 003/2000, approved by Minister of Transports Order no. 210/2000, the railway event was inquired by a commission, consisting in representatives of economic involved economic agents, respectively representatives of the public railway infrastructure administrator (National Railways Company CNCF „CFR” SA Bucuresti) and the national railway passenger undertaking (National Railway Passenger Company „CFR Calatori” SA Bucuresti).

During the inquiry, a series of divergences appeared between the members of the commission for the inquiry of the railway event appointed according to the *Instructions for the prevention and inquiry of the railway accidents and events no. 003/2000*, approved by Minister of Transports Order no. 210/2000, as follows:

1. the representatives of the Branch of the Railway County Timișoara from CNCF „CFR” SA Bucuresti stated that the railway event occurred following the making of the exit route in the electronic interlocking system from the deflecting section 1A1 of the railway station Arad in another direction (Aradul Nou instead Glogovaț) by the outside movements inspector without watching the position of the route-indicating exit signal Y1, as well as non-watching of the position of the route indicating signal by the driver of the train 473-2 and the train departure, having as result the passing of the switch no. 53 that gives access to another direction.
2. the representatives of the Branch of the Railway Passenger County Timișoara from SNTFC „CFR Calatori” SA Bucuresti agreed the deed appointment but stated that the driver was not directly guilty for the event occurrence because he does not dispatch the trains, and he complied with the open position of the exit signal, respectively the signal „starting of the train running” given by the outside movements inspector. Also, the driver did not take measures to stop the train as soon as he observed the position of the switch 53.

In this situation, the representative of the Branch of the Railway County Timișoara, as president of the inquiry commission submitted the unfinished inquiry file to Romanian Railway Safety Authority and in accordance with the provisions of the Instructions for the prevention and inquiry of the railway accidents and events no. 003/2000, approved by Order of Minister of Transports no. 210/2000, the director of Romanian Railway Safety Authority appointed an inquiry commission, consisting in specialists of Romanian Railway Safety Authority in order to finish the inquiry.

On the 12th of May 2010, according to the art. 49, paragraph (2), letter d) of the Regulations for the investigation of the accidents and incidents, for the development and improvement of the

railway safety on Romanian railway and metro network, approved by Government Decision 117/2010, Romanian Railway Safety Authority submitted an application to Romanian Railway Investigating Body by the paper no. 2120/192/2010, enclosing to the inquiry file in divergence, unfinished by Romanian Railway Safety Authority.

Romanian Railway Investigating Body, taking note about the application of Romanian Railway Safety Authority in accordance with art. 49, paragraph (2), letter d) of the Regulations for the investigation of the accidents and incidents, for the development and improvement of the railway safety on Romanian railway and metro network, approved by Government Decision 117/2010 and taking into account that the presented event is an incident according to the provisions of art. 8, point 1.5, letter c) from the same legal paper, Romanian Railway Investigating Body decided to start the investigation.

Through the Decision no. 21 from the 13th of May 2010 of OIFR director, one appointed the investigation commission:

- Cristian BOBE –investigator in charge
- Sorin BURLEA – investigator
- Mihai OLARU - investigator

A. INCCIDENT RESUME

A.1. Brief presentation

On the 13th of April 2010, the passenger train no. 473-2, consisting in 5 coaches, 20 axles, 258 t, 159 m, hauled by the locomotive EA 477-742-7 (belonging to the locomotive shed Arad), ran between Curtici – Bucuresti Nord.

On the 13th of April 2010, at 01:00 hour, the passenger train no. 473-2 arrived in the railway station Arad, on the line 1A1, having a delay of 8 minutes against the hour stipulated in the train diagram.

In order to dispatch the train from the line 1A1 from the railway station Arad to Glogovat, the inside movements inspector made the exit route from the line 1A1, with the exit signal Y1 on permissive position and the route indicator position „G”, corresponding to the direction Glogovaț.

After about 65 seconds from the making and locking of the exit route (signal Y1 with the position „green”, and the indication of the figure „3” and the direction „G”) for the train 473-2, on the display of the electronic system was signaled the wrong occupation for about 1 second of the switch section 19-41 (section situated in the exit route of the passenger train no. 473-2). Following it, at 01:01:49 hour, the exit signal Y1 passed on non-permissive position (red).

In these conditions, in order to put on the open position the signal Y1, the inside movements inspector unlocked deliberately the previous route and the re-making of the dispatching route of the train no. 473-2, from the line 1A1, but this time wrong to Aradul Nou.

After putting the exit signal Y1 on open position, at 01:05:37 hour, with route made wrong to Aradul Nou, the outside movements inspector gave the signal „train departure”, without checking and seeing that the route indicator displayed another running direction.

After receiving the signal „train departure”, the driver put into the run the train, without checking and ensuring that the route indicator of the exit Y1 indicate the direction established in

the working timetable for the train 473-2 and not other direction, and after 384 m and passing the switch no. 53 (giving access to Aradul Nou), he took measures for stop and stopped the train.

A.2. Direct cause, underlying causes and root causes

A.2.1. Direct cause

The railway incident occurred following the human mistake in the dispatching of the train no. 473-2 in another direction (Aradul Nou instead Glovova), through:

- 1) making of the exit route in another direction and the lack of checking on the display of the ordered route;
- 2) putting of the signal on "train departure" without checking the position of the route indicator.

Contributing factors

To the railway incident contributed also the human mistake consisting in the train departure from the line 1A1 of the railway station Arad to Aradul Nou, without checking and ensuring that the route indicator indicated the established route from the working timetable of the train 473-2, followed by the passing of the switch no. 53 that gave access to Aradul Nou.

A.2.2. Underlying causes

None.

A.2.3. Root causes

None.

A.3. Severity level

According to the incidents classification stipulated in art. 8 of the *Regulations for the investigation of the accidents and incidents, for the development and improvement of the railway safety on Romanian railway and metro network*, approved by Government Decision 117/2000, taking into account the activity where it happened, the event is classified as railway incident according to the art. 8, point 1.5, letter c).

A.4. Safety recommendations

None.

B. INVESTIGATING REPORT

B.1. Incident presentation

On the **13th of April 2010**, the passenger train no. 473-2 arrived in the railway station, on the line 1A1, at 01:00 hour, with a delay of 8 minutes against the stipulated hour from the train diagram.

For the dispatching of the train from the line 1A1 of the railway station Arad to Glogovat, at 01:00:42 hour, the inside movements inspector made the exit route from the line 1A1, with the exit signal on permissive position and the route indicator on the position „G”, corresponding to the direction Glogovat.

After about 65 seconds from the making and locking of the exit route (signal Y1 with the position „green”, and the indication of the figure „3” and the direction „G”) for the train 473-2, on the display of the electronic system was signaled the wrong occupation for about 1 second of the switch section 19-41 (section situated in the exit route of the passenger train no. 473-2). Following it, at 01:01:49 hour, the exit signal Y1 passed on non-permissive position (red).

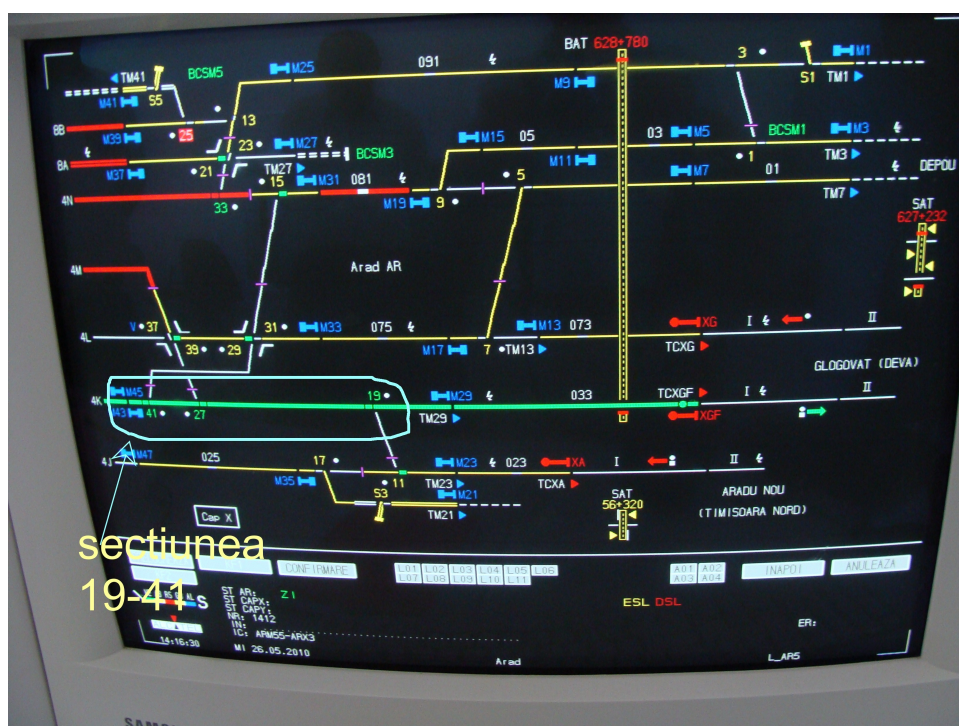


Photo 1 – The display on the monitor of the electronic interlocking system of the switch section 19-41

In these conditions, in order to put on the open position the signal Y1, the inside movements inspector unlocked deliberately the previous route and the re-making of the dispatching route of the train no. 473-2, from the line 1A1, but this time wrong to Aradul Nou.

After putting the exit signal Y1 on open position, at 01:05:37 hour, with route made wrong to Aradul Nou, the outside movements inspector gave the signal „train departure”, without checking and seeing that the route indicator displayed another running direction.

The driver pressed the locomotive controls and the train started to run from the line 1A1 of the railway station Arad to Aradul Nou, without checking and ensuring that the route indicator of the exit signal Y1 indicated the direction established in the working timetable for the train 473-2 and

B.2.2. Train composition and equipments

The passenger train no. 473-2, consisting in 5 coaches, 20 axles, 258 t, 159 m, hauled by the locomotive EA 477-742-7 (belonging to the engine shed Arad) ran between Curtici and Bucuresti Nord.

The equipment for the indication and record of the speed (IVMS), the safety and vigilance equipments (DSV) and the equipment for the punctual control of the speed (INDUSI) from the locomotive of the train no. 473-2 were active and in operation from the functional point of view.

B.2.3. Railway equipments

The railway station Arad has an interlocking system type ESTWL 90 RO (Alcatel) for the switches and signals, adjusted to the a.c. point motor type EM5 and a.c. point motor type SIEMENS S700K.

B.2.4. Communication means

The communication between the driver and movements inspectors, as well as between the driver and the train crew was ensured by radio.

B.2.5. Start of the railway emergency plan

There were necessary no operations for the traffic restarting.

B.3. Incident consequences

B.3.1. Losses and casualties

None

B.3.2. Material damages

None

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

The railway incident generated a delay of the passenger train no. 473-2 of 13 minutes.

B.4. External circumstances

On the 13th of Aprilie 2010, between the hours 00:00 and 01:00, the visibility was good, clear sky, the temperature was about 7°C.

In the railway station Arad, lines 2A1, 3A1, 4A1, 6A1, 7A1, 9A1 were open, the line 1 was occupied by the train 473-1.

At the railway incident place the line is straight and on flat.

The visibility of the light signals positions was in accordance with the provisions of the specific regulations in force.

B.5. Investigation

B.5.1. Brief presentation of the involved staff testimonies

From the statements of the **inside movements inspector** on duty in **the railway station Arad** from the 13th of Aprilie 2010 results:

- the passenger train no. 473-2 entered with delay into the railway station Arad, on the line 1A1, at 01:00 hour;
- around 01:01 hour, the open position of the signal Y1 with dispatching route made to Glogovat, passed on non-permissive position;
- he unlocked deliberately the initial made route and made a dispatching route for the train 473-2. The dispatching route was erroneously made by him, to Aradul Nou instead Glogovat;
- the train started to run, passed the exit signal Y1 on the stop position and on the display of the interlockig system the switch section 57-53 was occupied;
- when the switch section 57-53 was occupied, he observed that the exit route was erroneously made and took measures to stop it by the station RER;
- after the train stop, it was shunted back to the line 1A1, the unlocking of the dispatching route made to Aradul Nou, making of a new dispatching of the train 473-2 to Glogovat and its dispatching;

From the statements of the **outside movements inspector** on duty in **the railway station Arad** on the 13th of Aprilie 2010, results:

- around 01:01 hour, the free position of the signal Y1 with dispatching route made to Glogovat, passed to position non-permissive;
- he notified the inside movements inspector, end X, about it;
- after about 2 minutes the signal Y1 passed again on permissive position but he was not enlightened about the position of the train route indicator;
- he found aut about the routing of the train 473-2 to another direction, when be was back to the movements office, from the radio notifications of the inside movements inspector end X and by the diver of the train 473-2.

From the statements of **the driver** of the locomotive EA 477-742-7, hauling the passenger train no. 473-2 from the 13th April 2010, results:

- he admitted that first time the position of the signal Y1 was open to G, and at the second clearance of the signal, when the train left, he is not sure if the there was G or A;
- because first time the signal position was green to G, second time he did not ensured because he considered that it was not possible to be another position at a new open position of the signal;
- he is not sure of the signal position.

B.5.2. Safety management system

The safety management system was drawn up by CNCF „CFR” SA, on the 21st of December 2009 Romanian Railway Safety Authority granted the safety authorization part A, at the moment of the incident CNCF „CFR” SA having its own safety management system.

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

In the railway incident investigation one took into account the next:

- the inquiry file no. 4/3/7 from the 15th of Aprilie 2010 of the railway incident drawn up by the inquiry commission, appointed in accordance with the provisions of the

Instructions for the prevention and inquiry of the railway incidents and events no. 003/2000;

- photos after the incident taken by the members of the inquiry commission and by the members of the investigation commission;
- the reading minutes of the records of the speed recorders of the locomotive involved in the incident ;
- questionnaires of the involved employees;
- regulations for the train running and railway vehicles shunting – no. 005/2005, approved by Minister of Transports, Constructions and Tourism Order no. 1816 from the 26th of October 2005;
- documents concerning the running and train traffic regulation;
- the signaling regulations 004/2006, approved by Minister Order no. 1482 from the 4th of August 2006;
- instructions for the railway locomotive staff activity – no. 201/2007, approved by Minister of Transports, Constructions and Tourism Order no. 2229 from the 23rd of November 2006.

B.5.4. Operation of the technical equipments, infrastructure and rolling stock

B.5.4.1. Data about the equipments

The railway station Arad has an interlocking system type ESTWL 90 RO (Alcatel) of the switches and signals ajusted to the a.c. point motors type EM5 and a.c. point motors type SIEMENS S700K.

B.5.4.2. Data about the lines

Concerning the topography of the lines in the railwaz station Arad, one found out:

- the straight line 1A1 up to the exit signal Y1;
- the curve after the switch no. 57 from the line 1A1, end X (the section between the signal and the switch no. 57) has the radius of 313 m;
- the section between the switch no. 11 (extreme switch of the railway station from Aradul Nou) and the entry signal XA from Aradul Nou is in curve with radius of 301 m;
- the maximum gradient 0,2‰ between the tip of switch no. 11 and the entry signal YA.

B.5.4.3. Data about the operation of the rolling stock and its technical equipments

At the locomotive EA 477-742-7, hauling the passenger train no. 473-2, INDUSI equipment was in operation and sealed, the safety and vigilance equipment in operation and sealed, the speed recorder sealed, the breake equipment of the locomotive in operation.

B.5.5. Interface man-machine-organization

The cause of the railway incident from the railway station Arad is based on a human mistake type sensory-motor, consisted in making the exit route in another direction and the lack of checking on the display of the ordered direction, followed by human lacks of the other involved staff, that did not carry out a well know action sub-plan.

The initial information of the route indicator, indicatoing the good route (Glogovat) was like an redundant information, remaining in the visual memory of the staff.

B.6. Analysis and conclusions

The inside movements inspector, according to the art. 208, paragraph (2) of the Regulations for the train running and shunting of the railway vehicles no. 005/2005, approved by Minister of

Transports, Constructions and Tourism Order no. 1816/2005, has also the next tasks in the train dispatching; to make the exit route and to check on the track diagram or on the display if it is suitable for the train, line and ordered route and if the exit signals, respectively the route signals, are on open position.

The outside movements inspector, according to the provisions of the art. 197, paragraph (2), letter a) and art. 208, paragraph (2), letter f) of the Regulations for the train running and shunting of the railway vehicles no. 005/2005, approved by Minister Order no. 1816/2005, has also the next tasks in the train dispatching:

1. to put the signal on „train departure”
2. to check the exit signals, respectively the route signals, where there are, are on open position.

The driver, according to the provisions of the art. 119, paragraphs (1), (2), (3), art. 120 and 121 of the Instructions for the activity of the locomotive staff no. 201/2007, has also the next tasks in order to occupy the running line:

1. before the train departure from a railway station the locomotive staff has to consult the working timetable;
2. before the train departure from a railway station the locomotive staff has to take his job, following the positions of the fixed signals and the indications given by the railway station staff and the train crew;
3. the locomotive staff check if the position of the exit signal is open for the hauled train;
4. the driver starts the running only after receiving the departure order, that will be confirmed by an attention signal given by the driver with the whistle or siren;
5. the locomotive staff follows all time the position of the railway station exit signal.

In the signal category are included also the indicators, that through their inscription, shape and position, give indications or complement the position of the signal (according to the art. 1, paragraph (2) of the Signalling Regulations no. 004/2006 approved by Minister Order no. 1482/2006), and the signal position is an order that has to be met with immediately, without condition, by all possible means by the staff in charge with the railway traffic (according to the art. 1, paragraph (4) of the Signalling Regulations no. 004/2006, approved by Minister Order no. 1482/2006).



In accordance with the provisions of the art 121 of the Signalling Regulations no. 004/2006, the route indicator:

- is a rectangular panel that indicates through white lightened letters the train running direction;
- is fitted under the light units of the running signals from the lines from which one can make routes in more directions;
- the letter that indicates the running direction shall be displayed at the indicator in the same time with the permissive positions of the respective light signals.

Concerning this incident, the equipment had a normal operation.

From the electronic records resulted:

- at 01:00:42 hour, the signal Y1 was put on open position to Glogovat;
- following the accidental occupation of the track section from the hour 01:01:47, for one second, the signal Y1 passed on close position at 01:01:49;
- at 01:05:37 hour the signal passed on open position to Aradul Nou;
- at 01:12:296 hour the signal Y1 passed on open position to Glogovat.

Also, during the establishment of the operation and visibility conditions of the exit signal Y1 by the inquiry commission, on the 14th of Aprilie 2010, one found aut that the electronic equipment operated normally, being conformity between the ordered route and the signal position (including this of the route indicator)

B.7. The incident causes

B.7.1. Direct cause

The railway incident occurred following the human mistake in the dispatching of the train no. 473-2 in other direction (Aradul Nou instead Glovovat), through:

- 1) making of the exit route in another direction and the lack of checking on the display of the ordred route;
- 2) putting of the signal on"train departure" without checking the position of the route indicator.

Contributing factors

To the railway incident contributed also the human mistake consisting in the train departure from the line 1A1 of the railway station Arad to Aradul Nou, without checking and ensuring that the route indicator was on the established route from the working timetable of the train 473-2, followed by the passing of the switch no. 53 that gave access to Aradul Nou.

B.7.2. Underlying causes

None.

B.7.3. Root causes

None.

C. SAFETY RECOMMENDATIONS

None.

This investigation report shall be sent to CNCF „CFR” SA – administrator of the public railway infrastructure, SNTFC „CFR Calatori” SA – railway passenger undertaking and Romanian Railway Safety Authority.

Members of the investigation commission:

- Bobe Cristian - investigator in charge _____
- Burlea Sorin - investigator _____
- Olaru Mihai - investigator _____