INVESTIGATING REPORT

on the railway accident occurred in the flag station Pajura,
on the 7th of January 2011

Final edition
The 11th of April 2011

NOTICE

With reference to the railway accident occurred on the **7th of January 2011**, around **6:20 a.m.**, on the range of activity of CF Bucharest Regional Branch, **in the flag station Pajura**, in the running of the train no. 87222-1 (the isolated locomotive DHC 81-0392-1 belonging to SNTFM "CFR Marfa" SA) consisting of the derailment by the second axle from the second bogie of the locomotive (the last in the running direction of the locomotive) in the area of the switch no. 12, 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 11th of April 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 7th of January 2011, at 6:20 a.m., on the range of activity of **CF Bucharest Regional Branch**, in the flag station Pajura.

CONTENT

I. PREAMBLE
I.1. Introduction

With reference to the railway accident occurred on the 7th of January 2011, around 6:20 a.m., on the range of activity of CF Bucharest Regional Branch, in the flag station Pajura, in the running of the train no. 87222-1 (the isolated locomotive DHC 81-0392-1 belonging to SNTFM "CFR Marfa" SA) consisting of the derailment by the second axle from the second bogie of the locomotive (the last in the running direction of the locomotive) in the area of the switch no. 12, 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, its objective being to improve railway safety and to prevent railway incidents or accidents.

I.2. Investigation process

On the 7th of January 2011, Traffic Safety Regional Inspectorate of CNCF "CFR" SA notified Romanian Railway Investigating Body about the accident occurred on the 7th of January 2011, at 6:20a.m., on the range of activity of CF Bucharest Regional Branch in the area of the switches no. 12 from the flag station Pajura, in the running of the train no. 87222-1 (the isolated locomotive DHC 81-0392-1 belonging to SNTFM "CFR Marfa" SA), consisting of the derailment of the second axle from the second bogie of the locomotive (the last in the running direction of the locomotive).

At the place of the accident were present representatives of:
- Romanian Railway Investigating Body,
- Romanian Railway Safety Authority,
- National Company of Freight Transport "CFR Marfa" – SA,
- National Railway Company "CFR" – SA.

Taking into consideration that the occurrence is defined as accident according to the art. 3 point l of the *Law 55/2006 on railway safety* and that this accident is relevant for the railway system, in accordance with the article 19 paragraph (2) of the *Law no. 55/2006 on railway safety*, corroborated with the art. 48, paragraph (1) 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, Romanian Railway Investigating Body decided to start an investigation. So, through the decision no. 44 from the 10th of January 2011 of the OIFR director, the investigation commission was appointed consisting of:

- Bobe Cristian – head of service Romanian Railway Investigating Body - main investigator;
- Stoian Eduard - head of service OIFR -member;
- Cociuban Nicolae – Regional Inspector SC–CF Bucharest Regional Branch - member;
- Mitică Virgil - Inspector SC - CF Bucharest Regional Branch - member;
- Ciolacu Tudor - Regional Inspector SC - Bucharest Intermodal Center - member.

A. <u>BRIEF PRESENTATION OF THE ACCIDENT</u>

A.1. Brief presentation

On the 7th of January 2011, according to the provision RC no. 10 from 5.43 a.m. was provided the running of the train 87222-1 (composed of the isolated locomotive DHC 81-0392-3) from the railway station CFR Bucharest Baneasa to the railway station CFR Chitila through the flag station Pajura. By the provision no. 18, at 5:56 a.m. the movement inspector provider from the station of electronic centralized command 2 (hereinafter refered as PCCE-2) ordered to the needles inspector from the station 6, the check of the path to

send the train 87222-1 from the flag station Pajura to the railway station CFR Chitila and the needles inspector confirmed the receipt of the command to check the isolated section II C, 4-12 and 024.

At 6:02 a.m. the movement inspector provider PCCE-2 asked and received free path from the railway station CFR Chitila, gave the orders to close the barrier from the block section no. 8 at 6:04 a.m. and the barrier from the block section no. 6 at 6:05 a.m. and at 6:06 a.m. he received from the needles inspector the confirmation of the performance of the command of checking the path for the train 87222-1.

At 6:07 a.m. the movement inspector provider PCCE-2 ordered to the needles inspector to prepare the running order and to gave it to the locomotive driver of the train 87222-1 regarding the running of the train based on free way from the flag station Pajura to the railway station CFR Chitila, with passing by the output signal X2 in on stop position and the running with the speed of maximum 20 km/h, which was confirmed by the needles inspector.

After the record of the departure notice for the passenger train no. 7032 from the railway station CFR Mogosoaia, the movement inspector provider PCCE-2 transmitted to the needles inspector the written provision no. 28 at 6:09 a.m. to check the sections 4-12 and IIC in order to receive the passenger train no. 7032, without waiting the sending of the no. 87222-1 from the line 2 which was going to be sent at 6.15 a.m.

At 6:12 a.m. the train no. 87222-1 shunted at the line IIC in the flag station Pajura and after obtaining the free way from the railway station Chitila and receiving the running order, at 6:15 a.m. the train was sent to the railway station CFR Chitila.

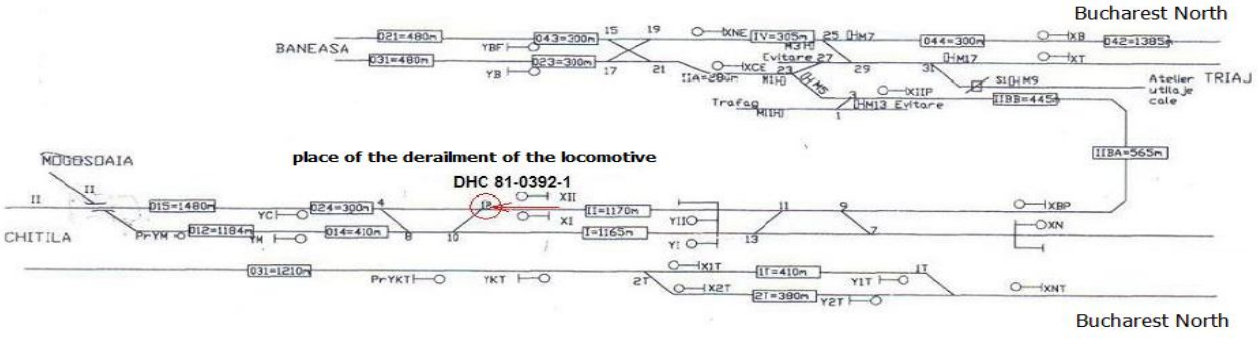
At 6:20 a.m. the movement inspector provider PCCE-2 handles the switches no. 10/12 on the position "-" (minus) with the switch section busy, performing the special command "Forced handling (artificial) of the switch (MFMZ)" to receive the passenger train no. 7032 at the line IIC from the flag station Pajura, without receiving previously the written command from the needles inspector regarding the free condition of the isolated sections 4-12 and IIC as he had ordered at 6:09 a.m.

After the entry of the first bogie and of the first axle of the second bogie of the locomotive DHC 81-0392-1 (in the running direction of the locomotive) on the elements of the switch no. 12 (handles in the output path to the railway station CFR Chitila, placed with access towards the switch no. 4), after handling of the switch no. 12 from the position "+" on the position "-" occurred the derailment of the second axle from the second bogie of the locomotive DHC 81-0392-1 (the last in the running direction of the locomotive), the wheel on the right (in the running direction) being placed on the counter-rail and the wheel on the left being suspended without contact with the construction elements of the switch no. 12.
At 6:20 a.m. the movement inspector provider PCCE-2 recorded in RRLISC that the switch 12 had remained without control on the monitor as consequence of the derailment of the last axle of the locomotive DHC 81-0392-1 running isolated.

There were no deaths or injuries.

There were no damages at the lines, installations or environment.

DRAWING OF H.M. PAJURA



A.2. Direct cause, contributing factors and root causes

A.2.1. Direct cause

The derailment of the last axle of the locomotive DHC 81-0392-1 (running isolated as train no. 87222-1) occurred as consequence of the handling of the switch no. 12 from the position "+" corresponding to the output path performed for the train no. 87222-1, on the position "-" corresponding to the input path of the passenger train no. 7032, with the switch section busy on spot.

The operation activity of the installation of electronic centralizing type ESTW L90RO from the flag station Pajura under the circumstances of some failures occurred as consequence of removing several components (transform type L) from the installation, leads to the display on the monitor associated to the installation of the information regarding the condition of "busy" of the isolated sections 024, 4-12, IIC, irrespective of the real condition of "free" existing on spot, situation in which the handling of the switch was allowed only after receiving the written confirmation on the check of the release of the output path performed for the train no. 87222-1 (the isolated locomotive DHC 81-0392-1).

A.2.2. Underlying causes

None.

A.2.3. Root causes

None.

A.3. Severity level

According to the classification of the accidents provided at the art. 7 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, taking into account the activity in which it occurred, the event is categorized as railway accident according to the art.7, paragraph (1), point b.

A.4. Safety recommendations

None.

This Investigation Report will be sent to the manager of the public railway infrastructure the National Railway Company "CFR" S.A, to SNTFM "CFR Marfa" SA and to the Romanian Railway Safety Authority.

B. INVESTIGATING REPORT

B.1. Description of the accident

On the 7th of January 2011, according to the provision RC no. 10 from 5.43 a.m. was provided the running of the train 87222-1 (composed of the isolated locomotive DHC 81-0392-3) from the railway station CFR Bucharest Baneasa to the railway station CFR Chitila through the flag station Pajura.

The movement inspector provider PCCE-2 recorded at 5:54 a.m. the departure notice of the train 87222-1, notice transmitted to the movement inspector from the railway station Bucharest Baneasa.

On the monitor of the installation associated to the flag station Pajura, the isolated sections IIC, 4-12 and 024 were shown as busy as consequence of the remove of some parts from the installation, the activity of receiving - sending the trains being carried out in fault conditions.

After recording the departure notice of the train no. 87222-1, at 5:56 a.m. the movement inspector provider PCCE-2 sent to the needles inspector from the station 6, the written provision no. 18 on the check on spot of the isolated sections IIC, 4-12 and 024 in order to perform the path for inputs/outputs to the train, provision recorded by the needles inspector with the number. 7.

After sending the departure provision, at 6:02 a.m. the movement inspector asked and obtained "free way" from the railway station CFR Chitila, and then he transmitted provisions to close the barriers from the barrier stations no. 6 and 8, these being confirmed by the barrier guards.

At 6:06 a.m. the needles inspector from the station no. 6 transmitted in written the telephonogram no. 9 on the performance of the check of the sections IIC, 4-12 and 024 which he had found free on spot.

At 6:07 a.m. the movement inspector provider PCCE-2 ordered to the needles inspector to prepare the running order and to give it to the locomotive driver of the train 87222-1 for the running based on the system of telephone agreement ("free way") from the HM Pajura to the railway station Chitila, with passing by the output signal X2 on the position of on stop and the running with the maximum speed of 20 km/h, which was confirmed by the needles inspector number 10.

Meanwhile the movement inspector provider from the railway station CFR Mogosoaia sent at 6:05 a.m. the passenger train 7032, the train running under normal conditions up to next to the input signal YM of the flag station Pajura, where it stopped.

After recording the departure notice for the passenger train no. 7032 from the railway station CFR Mogosoaia, the movement inspector provider PCCE-2 transmitted to the needles inspector the written provision no. 28 at 6:09 a.m. to check the sections 4-12 and IIC in order to receive the passenger train no. 7032, without waiting for the sending of the train no. 87222-1 from the line 2 which was going to be sent at 6.15 a.m.

At 6:12 a.m. the train no. 87222-1 shunted at the line IIC in the flag station Pajura and after obtaining the free way from the railway station Chitila and receiving the running order, at 6:15 a.m. the train was sent to the railway station CFR Chitila.

At 6:20 a.m. the movement inspector provider PCCE-2 handled the switch no. 12 on the position "-" (minus) with the switch isolated section busy, performing the special command of forced handling of the switch to receive the passenger train no. 7032 at the line IIC. This command allows a switch to be handled on the opposite position if the path circuit is busy of faulted.

The handling of the switch with the isolated section busy was performed without having received the written confirmation from the needles inspector on the check of the condition of free of the isolated sections 4-12 and IIC according to the written provision no. 28 transmitted at 6:09 a.m.

As consequence of the handling of the switch no. 12 from the position "+" (plus) on the position "-" (minus) the derailment by the last axle of the locomotive DHC 81-0392-1 occurred.

At 6:20 the movement inspector provider PCCE-2 recorded in the inspection register of the lines and of the traffic safety installations that the switch no. 12 remained without control on the monitor, as consequence of the occurrence of the derailment of the locomotive DHC 81-0392-1.

There were no deaths or injuries.

B.2. Circumstances of the accident

B.2.1. Involved parties

The place where occurred the railway accident is in the flag station Pajura, which is managed by CNCF "CFR" SA – CF Bucharest Regional Branch.

The railway infrastructure and superstructure are managed by CNCF "CFR" S.A. and maintained by the employees of the Lines district no. 4 Bucharest Triaj - Section L2 Bucharest in CF Bucharest Regional Branch.

The installations of railway communications in the flag station are managed by CNCF "CFR" S.A. and maintained by the employees of SC Telecomunicatii CFR SA Bucharest.

The installation of railway traffic control in the flag station Pajura and the installations signaling, centralization and blocking (SCB) in the flag station Pajura are managed by CNCF "CFR" SA and maintained by the employees of the District CE Bucharest North in the Section CT 1 Bucharest of the Regional Branch CF Bucharest.

The installation of railway communications on the locomotive is the property of SNTFM "CFR Marfa" SA and is maintained by its employees.

The locomotive DHC no. 81-0392-1 involved in the railway accident is the property of SNTFM "CFR Marfa" SA – Intermodal Freight Center Bucharest – Bucharest Triaj Depot and is maintained and inspected by its employees and the repairs are performed by traders authorized as railway suppliers.

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

- the movement inspector provider PCCE-2 on duty in the flag station Pajura on the $6^{th}/7^{th}$ of January 2011;
- the needles inspector on duty in the flag station Pajura – block section 6 on the $6^{th}/7^{th}$ of January 2011;
- the locomotive driver towing the train no. 87222-1 (isolated locomotive DHC no. 81-0392-1) on the $6^{th}/7^{th}$ of January 2011;
- the head of shunting of the train no. 87222-1 (isolated locomotive no. 81-0392-1) on the $6^{th}/7^{th}$ of January 2011;
- the wagons shunman of the train no. 87222-1 (isolated locomotive no. 81-0392-1) on the $6^{th}/7^{th}$ of January 2011.

B. 2.2. Forming and equipment of the train

The safety and vigilance equipments (DSV) in operation and not sealed and the equipment for the point control of the speed and hitchhiking (INDUSI) and the radio-telephone stations in the equipment of the traction means of the locomotive were active being sealed and instructionally working. The brake valve type KD2 was on the quick braking position. The locomotive had the inspection on technological process on the 1^{st} of January 2011 at Bucharest Triaj Depot.

B.2.3. Railway equipments

Description of the railway path

The railway accident occurred on the switch no. 12 from the flag station Pajura which has the following features:

- type 65, with radius of 300 m, tangent 1/9, left deviation, flexible needles, with double locking, wooden sleepers,
- the fixing of the metallic parts of the switch on its metallic plates is made through vertical screws and metallic pliers type K;
- the switch is equipped with electro mechanism L 700h Alcatel;

Description of the safety installations for the railway traffic

The flag station Pajura is equipped with installation CE type Alcatel. At the date of the occurrence of the accident the isolated sections 024, 4-12, IIC were showing busy on the monitor of the installation CE.

B.2.4. Means of communication

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

B.2.5. Triggering the railway emergency plan

After the occurrence of the railway accident, triggering the intervention plan to remove damage and to restore trains traffic was performed according to the provisions of the *Regulations for the investigation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety* approved by *HG 117/2010*, was performed the notification regarding the occurrence of the accident after which were present representatives of the administrator of the public railway infrastructure (CNCF "CFR" SA - CF Bucharest Regional Branch), of the railway undertaking SNTFM "CFR Marfa" SA, of the Romanian Railway Authority – AFER and of Romanian Railway Investigating Body.

B.3. Consequences of the accident

B.3.1. Deaths and injuries

None.

B.3.2. Material damages

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

- **at the line** – according to the estimate no. 102/2011 of the Section L2 Bucharest in CNCF "CFR" SA – none;
- **at the locomotive –** isolated locomotive no. 81-0392-1, according to the estimate no. BT/23/2011 of Section Bucharest Triaj in "CFR IRLU" Bucharest amounted to – 91.34 lei without TVA;

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

The current line 301 Q, H.M. Pajura and the railway station Chitila was closed for the railway station on the 7th of January 2011, from 8:05 a.m. to 1:08 p.m. Due to the occurrence of the accident 3 trains were delayed with a total of 270 minutes.

B.4. External circumstances

The weather conditions on the 7th of January 2011, without precipitations, cloudy sky.

In the flag station Pajura, at the time of the occurrence of the accident the occupancy condition of the lines of receiving – sending and of the running distances with the neighbor railway stations was as follows:

- regarding the lines of receiving – sending:
    - the line 1 C - occupied with the passenger train no. 871 from 6:20 a.m.;
- running distances:
    - the current line Mogosoaia – the flag station Pajura occupied with the passenger train no. 7032 from 6:05 a.m.;

B.5. Investigation course

B.5.1. Sumary of the involved staff statements

The movement inspector provider PCCE -2 from the flag station Pajura on duty on the 6th/7th of January 2011, stated as follows:

- he took over the movement service on the 6th/7th of January 2011;

- at taking over the service the installation was in fault regime due to criminals stealing parts of the installation;
- the isolated section I AD Connection Pajura – BCT (P 17) and LIIC, 4-12, 024 out of operation by the CT bodies and busy on the monitor;
- the running systems changed from BLA in "free way" Connection Pajura – Bucharest Triaj (P17), H.M.Pajura – Chitila F 301 Q;
- at 5:45 a.m. he received departure notice from the railway station Bucharest Baneasa as train 87222-1 isolated locomotive for the railway station Chitila;
- at 5:56 a.m. he transmitted written provision to the switchman block section 6 to check the isolated sections IIC, 4-12 and 024 placed in the output path of the train 87222-1;
- at 6:06 a.m. the needles inspector announced in written the check on spot of the sections IIC, 4-12 and 024;
- at 6:07 a.m. he transmitted written provision to be prepared the running order and to be sent the train 87222-1 from the line IIC towards the railway station Chitila F 301Q based on the telephone agreement ("free way") the train 87222-1 getting out from the line IIC at 6:15 a.m. with output signal XII on the position on stop with the speed of maximum 20 km/h up to the next signal with taking into consideration of the signals BLA;
- for the train 87222-1 was obtained free way from the railway station Chitila at 6:02 a.m. the departure notice being sent at 6:15 a.m.;
- after the train 87222-1 went out from the line IIC at Chitila, to perform the receiving path from Mogosoaia at the line IIC for the train 7032 he performed special command MFMZ (forced handling of the switch) around 6:25 a.m.;
- the driver of the train 87222-1 communicated through RTF that the locomotive was suspended by one axle on the switch 12 moment when he realized what had happened;
- the train 7032 had to be received at the line IIC, this being with platform for the passengers, the line IC being occupied with the train 871 shunted 6:20 a.m., waiting the sending to the railway station Mogosoaia after the shunt of the train 7032;
- the shunt in the railway station of the train 7032 had to be urgent because at the input signal on the line 700 from the railway station Bucharest North (signal XM) was waiting the train 7039 which had to be sent towards the railway station Mogosoaia after the release of the isolated section 1AD by the train 871;
- under these circumstances the train 871 was re-shunted towards the connection Pajura by pushing to the path signal XBP based on the shunt signal for shunting of the train 7032 line IC 7:34 a.m. The train 871 was re-shunted at the signal XBP at 7:20 a.m.;
- for the sending of the train 7032 towards the railway station Bucharest North was shunted the train 7039 at the line IIC at 7:10 and re-shunted at IC in order to be sent to the railway station Mogosoaia ;
- the train 871 was sent to the railway station Mogosoaia based on free way from the line IC at 8:15a.m. and the train 7039 was sent towards the railway station Mogosoaia at 7:52a.m.

The needles inspector on duty at the block section 6 of the flag station Pajura on the $6^{th}/7^{th}$ of January 2011, stated as follows:
- at 5:56 a.m., with number 18 he received from the IDM Provider written provision to check on spot the isolated sections IIC, 4-12, 024 in order to receive and send the train 87222-1 in the station register;
- he received provision to prepare the running order to approve the running conditions for the train 87222-1;
- he prepared the running order and he went at the driver of the train to give over the running order, communicating this to the IDM provider;
- after completion of these operations he received provision to check the isolated sections 4-12, IIC for the arrival of the train 7032 at the line IIC;
- going on spot to perform the provisions received he was notified through the station RTF by the IDM to check the switch 12 because it was showing problems;
- when he arrived he found that the DHC 392 was stopped in the area of the switch 12;
- he saw the driver getting down from the locomotive and during conversation he found that the locomotive was suspended, derailed by one axle;
- he announced the IDM provider through RTF about this;
- he came back to the station to report in written what had found on spot to the IDM provider;

• further until the giving over of the movement office he performed the duty tasks provided by the IDM provider and also the other provided tasks.

The locomotive driver who drove the train 87222-1 (the locomotive DHC 81-0392-1 isolated), on the 6th/7th of January 2011 (employee of SNTFM "CFR Marfa" SA – Bucharest Triaj Depot), stated as follows:
• he was notified by the IDM in the railway station CFR Bucharest South around 5:00 a.m. to go to Chitila to perform a shunting;
• at the Connection Pajura he was stopped at the input signal at 6:05 a.m.;
• at 6:10 a.m. he received command with the calling signal;
• at 6:15 a.m. he received running order where was mentioned that he passes by the signal X2 on position of stop;
• at 6:16 a.m. he drove the locomotive and near the signal X2 he acted the button DO (provided overcome);
• passing by the switch he heard an abnormal noise under the locomotive and he took actions to stop;
• he mentioned that the switch was attacked to the top on position on direct;
• he insured the locomotive against moving, he went down and found that the axle no. 1 was suspended on the checkrail (axle 4 in the running direction);
• he announced by phone the IDM from the railway station Pajura and the superior authorities.

The head of shunting on duty on the 6th/7th of January 2011, stated as follows:
• IDM from the railway station CFR Bucharest South around 5.00 a.m. announced him he had to go to the railway station Chitila to perform a shunt at a freight train;
• at the Connection Pajura they were stopped to be notified by running order, after leaving from the railway station he passed by the output signal on stop, based on the notification made by the IDM;
• passing by the switch which was on the position on direct, he heard an abnormal noise under the locomotive and he announced the locomotive driver to take actions to stop the locomotive and after insuring it he remained on the locomotive, the driver going besides it where he found that the last axle was on the checkrail and suspended.

The wagons shuntman on duty on the 6th/7th of January 2011, stated as follows
• around 5:00 a.m. he received provision to perform shunt in a freight train;
• at the connection they were stopped to be notified by running order;
• after leaving the railway station he passed by the output signal on the position on stop, at the first axle he heard an abnormal noise under the locomotive;
• the driver and the head of shunting took actions to stop; after insuring the locomotive, the driver went besides the locomotive where he found the derailment by the last axle of the locomotive.

B.5.2. Safety management system
In carrying out its responsibilities and duties, the manager of the public railway infrastructure – National Railway Company "CFR" SA and the railway undertaking the National Company of Freight Railway Transport "CFR Marfa" SA had implemented their own safety management system.

B.5.3. Norms and regulations. Sources and references for the investigation
In the investigation of the railway accident one took into account the following:
• 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.
• job descriptions of the employees involved in the accident;
• Technical plan of operation of H.M.Pajura;
• Instruction for handling the installation CE of the flag station Pajura;

- photos taken immediately after the occurrence of the accident by the members of the investigation commission;
- minute of reading the speedometer band of the locomotive DHC no. 81-0392-1;
- the board records of the locomotive, provided by the responsible with its maintenance;
- questioning of the staff involved in the control of the railway traffic, of the locomotive and train staff involved in the occurrence of the accident and also of other witnesses;
- minutes concluded after the findings performed at the locomotive involved in the accident;
- the roadmap of the train locomotive;
- documents of transport of the train;
- movement records from the flag station Pajura.

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

H.M.Pajura is equipped with electronic centralizing installation type ESTW L90RO –Alcatel.
On the date of the occurrence of the accident, the path circuits 024, 4-12, IIC were showing "busy" on the monitor.

B.5.4.2. Data found on the lines

The railway accident occurred on the switch no. 12 from the flag station Pajura switch type 65, with radius of 300 m, tangent 1/9, left deviation, flexible needles;
The railway accident occurred on an area where the maximum running speed of the trains from that rank provided in the service book is of 80 km/h.

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

The locomotive DHC 8000392-3 had the installation "INDUSI" in operation and sealed, the safety and vigilance installation (DSV) in operation and not sealed, the installation of speedometer sealed. The speed of the locomotive DHC 8000392-3 on the switch no. 12 at the moment of the derailment was of 19 km/h.

B.6. Analysis and conclusions

From the material evidences and the parts provided in the investigation file resulted the following:
- the path circuits 4-12, IIC were out of operation due to non-identified persons stealing transformers from the common picket from the relay end on the 19th of December 2010, according to the records in the telegram no. 10/20.12.2010 delivered from the district CE Bucharest North;
- the path circuit 024 out of operation from the 19th of December 19.12.2010 due to stealing by non-identified persons of the transformer from the relay picket according to the records in the telegram no. 10/20.12.2010 delivered from the district CE Bucharest North;
- on the 30th of December 2010, when the staff of the district CE Bucharest North went to the flag station Pajura to restore into operation the isolated sections 024, 4-12 and IIC was found the missing of the common picket supplying the isolated sections 4-12, IIC.

Under these circumstances, according to the art.34 "Handling of the switch with the isolated section busy" of the *Instruction for handling the installation CE of the flag station Pajura*, when the IDM notices that an isolated section of switch shows busy on the monitor and on spot is free, will act according to the Art. 10 to be able to handle the switch with the help of the forced handling command. Before handling, IDM has to be convinced on spot, personally or by an authorized agent, that the isolated section of the switch is free and there is no risk that a train in movement occupies the switch during shunting.
The handling of the switches with the isolated section occupied id performed on the own risk of the IDM because a series of conditions of traffic safety are eliminated and replaced through the mentioned obligations.
The handling of the switch no. 12 on the position corresponding to the input path of the passenger train no. 7032, without waiting for the report on the check of the release of the output path performed for the train no. 87222-1 is based on a human error.

B.7. Causes of the accident

B.7.1. Direct cause

The derailment of the last axle of the locomotive DHC 81-0392-1 (running isolated as train no. 87222-1) occurred as consequence of the handling of the switch no. 12 from the position "+" corresponding to the output path performed for the train no. 87222-1, on the position "-" corresponding to the input path of the passenger train no. 7032, with the switch section busy on spot.

The operation activity of the installation of electronic centralizing type ESTW L90RO from the flag station Pajura under the circumstances of some failures occurred as consequence of removing several components (transform type L) from the installation, leads to the display on the monitor associated to the installation of the information regarding the condition of "busy" of the isolated sections 024, 4-12, IIC, irrespective of the real condition of "free" existing on spot, situation in which the handling of the switch was allowed only after receiving the written confirmation on the check of the release of the output path performed for the train no. 87222-1 (the isolated locomotive DHC 81-0392-1).

B.7.2. Underlying causes
None.

B.7.3. Root cause

None.

C. Safety recommendations

None.

This Investigation Report will be sent to the manager of the public railway infrastructure the National Railway Company "CFR" S.A, to SNTFM "CFR Marfa" SA and to the Romanian Railway Safety Authority.

Investigation commission:

Bobe Cristian - main investigator _____

Stoian Eduard – member_____

Cociuban Nicolae – member _____

Mitică Virgil – member _____

Ciolacu Tudor – member _____