***Translation from Bulgarian***

# REPUBLIC OF BULGARIA

# MINISTRY OF TRANSPORT, INFORMATION TECHNOLOGIES AND COMMUNICATIONS

# DIRECTORATE FOR AIRCRAFT, MARITIME AND RAILWAY ACCIDENT INVESTIGATION

# SPECIALIZED UNIT FOR RAILWAY ACCIDENT AND INCIDENT INVESTIGATION

# FINAL REPORT

**on**

**completed technical investigation of a severe railway accident: fire in train No. 2637 Sofia-Kardam at 137+950 km, in the Kunino-Cherven Bryag inter-station section, which occurred around 23:20, on 28.02.2008**



**SEPTEMBER 2009**

By order No. RD-08-79 (dated 29.02.2008) of the Ministry of Transport, Information Technologies and Communications (MTITC), an investigation commission was appointed, chaired by the head of the Specialized Unit for Railway Accident and Incident Investigation (SURAII) from the Directorate for Aircraft, Maritime and Railway Accident Investigation (DAMRAI) of the MTITC. The investigation was completed on 07.08.2009 with the preparation of the Final Report of the Investigation Commission, intended for the Minister of Transport, Information Technologies and Communications.

**І. Findings of the technical investigation:**

On 28.02.2008, train No. 2637, with rolling stock consisting of 9 car units and total weight of 422 t, departed from Sofia station at 21:00. The train was powered by locomotive No. 45-202.9, with engine-driver and assistant engine-driver from the Gorna Oryahovitsa locomotive depot. The transport team servicing the train was from the Sofia Passenger Transport Division (Sofia PTD) and consisted of: a trainmaster and two car attendants. Sleeping-car WL No. 51526080611-9 (the second car in the train composition) was serviced by a Sofia PTD sleeping-car attendant.

During the travel of the train, after Svoge station, the car attendant servicing the first section of the train, crossed several times the couchette-car towards the wagon (the first car in the train composition) and felt strong smell of alcohol around compartments Nos. 4 and 5, in one of which there was a noisy company.

Train No. 2637 departed from Mezdra station at 22:52, and moved without stopping past Roman station and Kunino station. At 23:15, while moving past Kunino station, which is the last station before Cherven Bryag station, the train station officers on duty did not notice any fire or other irregularities in the train composition.

After the departure of the train from Mezdra station, a passenger from the sleeping-car, carrying a bottle of vodka and apparently under the effect of alcohol, came to the couchette-car attendant. Then the sleeping-car attendant came to him to discuss operating issues. At that time, another passenger from the couchette-car who had just bought beer walked towards the middle of the car in order to enter his compartment. Immediately after him came a female passenger who informed the couchette-car attendant that something was burning in a compartment in the middle of the car. The couchette-car attendant and the sleeping-car attendant walked to the middle of the couchette-car (compartments Nos. 5-6) and saw smoke. In view of the closer vicinity of the sleeping-car and conveniently accessible fire extinguisher located in the sleeping-car service compartment (office), the couchette-car attendant took a fire extinguisher from there and took steps to put out the fire. The couchette-car attendant activated the emergency brake located in front of the service compartment door in the sleeping-car, and the train made an emergency halt at 23:23, at 137+950 km, between the warning and entrance traffic signal installations of Cheven Bryag station.

After stopping the train at 23:23, the service personnel in the train took steps to take the passengers out of the burning car, and attempted unsuccessfully to put out the fire using fire extinguishers from the locomotive. At that moment, all front doors of the couchette-car and the sleeping-car as well as the rear left side doors in respect of the direction of the train were opened. At around 23:26, the sleeping-car attendant also opened the rear right side door in respect of the direction of the train. The fire rapidly spread, with a real danger of propagating to the other cars of the train composition. In the period between 23:28 and 23:30, the bodies of the general directorates “Fire Safety and Civil Protection” and “Urgent and Emergency Medical Care” were informed.

Steps were taken to decouple the burning couchette-car from the other rolling stock. In the period between 23:30 and 23:40, the couchette-car attendant unsuccessfully attempted to decouple the couchette-car from the sleeping-car. Another unsuccessful attempt to decouple the sleeping-car, to which the fire had not spread yet, form the couchette-car was made prior to 23:42, this time by the train controller. At 23:42, during the third successful attempt, the couchette-car, the sleeping-car and the wagon were decoupled and moved approx. 50 m away, at a safe distance from the other section of the train composition. At 23:44, the wagon was also decoupled from the already burning sleeping car and couchette-car and pulled out to a safe distance from them. Thus the burning cars were decoupled and moved to a safe distance from the other sections of the train.

At 23:50, the power to the contact system was disconnected, and steps were taken by general directorate “Fire Safety and Civil Protection” to put out the fire which had already spread to the sleeping car as well.

The fire was put out at around 03:30 on 29.02.2008. During this period of time, the passengers were evacuated from the train, the injured persons received medical care and were carried away by ambulances and available vehicles to Cherven Bryag station and the closest hospital.

Following a permission by the investigating authorities, steps were taken to restore the traffic.

After inspection by the investigating authorities, the cars destroyed by the fire were stored under security in a covered area in the Cherven Bryag locomotive depot at 19:00 on 29.02.2008.

The investigation commission and operations group arrived immediately at the scene of the accident; however, until 07.03.2008, the prejudicial investigating authorities did not allow them to inspect the cars destroyed by the fire.

On 08.03.2008 and 11.03.2008 the investigation commission and operations group were allowed to inspect the cars destroyed by the fire. The inspection was carried out in the presence and under the control of the bodies of the Ministry of Interior and the investigation authorities prosecuting the inquiry.

**2. Officers involved in the event.**

The following officers were involved in the accident:

2.1. engine-driver – holding the position of „engine-driver” in „Bulgarian State Railways (BDZ) – Hauling Rolling Stock (locomotives)” EOOD, 41-year-old, male, length of service in the railway company: 19 years and 6 months;

2.2. assistant engine-driver – holding the position of „assistant engine-driver” in „Bulgarian State Railways (BDZ) – Hauling Rolling Stock (locomotives)” EOOD, 24-year-old, male, length of service in the railway company: 3 years and 7 months;

2.3. trainmaster – holding the position of „trainmaster” in „Bulgarian State Railways (BDZ) – Passenger Transport” EOOD, 48-year-old, female, length of service in the railway company: 26 years;

2.4. train controller – holding the position of „train controller” in „Bulgarian State Railways (BDZ) – Passenger Transport” EOOD, 29-year-old, male, length of service in the railway company: 10 years and 5 months;

2.5. train controller in charge of the second half of the train – holding the position of „train controller” in „Bulgarian State Railways (BDZ) – Passenger Transport” EOOD, 51-year-old, female, length of service in the railway company: 6 years and 7 months;

2.6. couchette-car attendant – holding the position of „train controller – sleeping cars” in „Bulgarian State Railways (BDZ) – Passenger Transport” EOOD, servicing the couchette-car, 41-year-old, male, length of service in the railway company: 9 years and 7 months;

2.7. sleeping-car attendant – holding the position of „train controller – sleeping cars” in „Bulgarian State Railways (BDZ) – Passenger Transport” EOOD, servicing the couchette-car, 29-year-old, male, length of service in the railway company: 4 years and 8 months.

,,BDZ” EAD is a licensed state carrier for passenger and freight transport, with three enterprises: „BDZ – Hauling Rolling Stock (locomotives)” EOOD, „BDZ – Passenger Transport” EOOD and „BDZ – Freight Transport” EOOD.

**3. Physical condition of the officers involved in the accident.**

3.1. All officers involved in the accident were given the necessary rest period before commencing work, in accordance with the provisions of the Labour Code and Ordinance No. 50 (dated 28.12.2001) of the Minister of Transport concerning the working time of managers and employees engaged in the transport of passengers and cargo by rail (promulgated in State Gazette, No. 4 of 2002, amendment in State Gazette, No. 46 of 2004, amendment and supplement in State Gazette, No. 99 of 2006).

3.2. All officers involved in the accident had pre-travel (pre-shift) briefing as well as pre-travel medical examination, by which it was found out that they had not used alcohol or drugs, and that they were fit for work.

The above officers had psychological examination certificates which were valid and had not expired yet.

**4. Documents certifying competence and capacity for holding the positions.**

All officers involved in the accident had the required documents for professional qualification and legal capacity for the positions they were holding, and had been furnished with respective orders and certificates.

**5. Actions carried out by the officers prior to the accident.**

Prior to the accident, all officers acted in accordance with the established legal regulations, by-laws and administrative acts regulating the safety during transport by rail.

**6. Circumstances preceding the accident, relating to railway, safety equipment, contact network, rolling stock, etc.**

The railway was in good working order and had no bearing on the railway accident which occurred.

The contact network was in good working order and had no bearing on the railway accident which occurred.

According to the protocols produced, the safety equipment in the two neighbouring stations – Kunino and Cherven Bryag, as well in the inter-station section was in good working order and had no bearing on the railway accident which occurred.

According to the statement of findings produced, the train’s locomotive No. 45-202.9 was in good working order, with technically operative running gear, braking system, lighting and audible signal equipment, and had no bearing on the railway accident which occurred. A protocol on the good working order of the power supply for the electric train heating system and lighting is also available.

According to the statement of findings produced, the cars in the train composition were in good working order, with technically operative running gear, braking system and signal equipment, and had no bearing on the railway accident which occurred.

**7. Observance of the operating procedures and technologies in the National Railway Infrastructure Company (NRIC) prior to and during the accident.**

NRIC is a licensed state-owned company for the repair and maintenance of the railway infrastructure.

No violations of the operating procedures and technologies in the National Railway Infrastructure Company (NRIC) prior to and during the accident have been found, and they had no bearing on the railway accident being investigated.

**8. Observance of the rolling stock service procedures and technologies in the carrier system prior to and during the accident.**

Train No. 2637 had been furnished with the necessary train documentation, train dispatch radio communication system, GSM mobile phones provided by the company, and had the required braking mass.

In the section where the accident occurred, the speed of the train was 100 km/h, while the speed prescribed in the booklet (schedule) was 105 km/h. The speed recording device of the train was in good working order.

According to the findings of the Commission, the last mid-life repair of couchette-car Vs No. 51525940641-8 was carried out on 05.06.2007 in the car-repair plant in the city of Levski. The car was transferred in good technical condition certified by a protocol.

On 13.02.2008, couchette-car Vs No. 51525940641-8 was transferred to Nadezhda Detached Production Unit, Passenger Transport Division – Sofia, where 18 damaged heaters of the electric heating system were replaced.

On 14.02.2008, couchette-car No. 51525940641-8 underwent a 5-hour warm test, but no faults were detected.

The analysis of the collected documents certifying the technical condition of the car and the hearings held with the employees who had carried out the repairs and the tests did not show any violations of the operating procedures and technologies.

**9. Condition of the railway infrastructure and the rolling stock prior to, during and after the accident.**

The railway infrastructure was in good working order prior to the accident.

The rolling stock was in good working order prior to the accident.

After the accident, insignificant damages to the railway infrastructure elements were found.

The accident has not caused any damages to locomotive No. 45-202.*9* and cars: D No. 51529257112-9, A No. 51521940161-6, V No. 51522047184-8, V No. 51522047482-6, V No. 51522047897-5, V No. 51522047902-3 and Vs No. 51525940661-6 from the other sections of the train composition.

The interior equipment of the couchette-car and sleeping-car destroyed by the fire had completely burned out, and all remains were processed during the judicial inquiry procedures.

The running gear and the equipment under the car frames were visibly intact and there were no traces of fire on them.

During the inspection conducted on 08.03.2008, control measurements of the heating and lighting system cabinets situated under the car frame were made.

A statement of findings has been drawn up, and it was found out that the electric fuse of the heating system in Compartment No. 6 had been activated (blown).

The main safety fuses for the electric lighting and heating systems as well as the other fuses in both cabinets installed under the car frame were in good working order.

The remains of the heating units in compartments Nos. 5, 6 and 7 have been examined. The examination of the terminal boxes of the heaters did not show any metal pearl-shaped melt which is typical of short circuit, and this indicates that the short circuit was a secondary effect caused by the fire, and the fire did not start there.

**10. Technical and external factors which have affected or contributed to the accident.**

The investigation of the railway infrastructure did not show any technical deviations from the norms which could affect or contribute to the accident.

The curvature in this section of the railway is characterized by R = 800 m from 137+778 km to 138+007 km, and the elevation is H = 130 mm.

The weather was clear, and there were no obstacles hindering the good visibility of the signals.

**11. Causes of the accident** **(fire occurrence).**

As a result of the examinations of the cars destroyed by the fire, the collected protocols and statements, train and station documents, other documentation relating to the case, experiments carried out, as well as the explanations provided by the personnel involved in the case, including the hearings conducted and the explanations taken from the transport and locomotive teams, **the investigation commission concluded that the cause of the fire was not the general technical condition of the couchette-car, deviations from the normal state of the electric circuits, or illegal actions of the personnel**.

The above position of the investigation commission does not contradict the conclusions of the electrotechnical expert examination of the causes of the fire, assigned to Mr. Pandurski, engineer and Dr. Dragomir Velkov, senior research assistant, engineer-physicist. The cause of the fire was reflected and approved in the indictment under pre-judicial proceedings No. 63 of 2008, according to dockets of the Regional Prosecutor’s Office – city of Pleven (page 47 and page 48), viz.:

“According to the conclusion of the experts involved in this expert examination, the profile of the shield of the heating unit, its structure and the location of the convection openings do not allow any possibility of destruction or ignition of regular luggage, even in case of entirely covered section between the two lower beds in compartment No. 6. **According to the experts, a loose terminal connection of the lighting unit has caused sparking (voltaic arc) in one of the invertors, which is inherent of disconnection of circuits with inductive characteristics, accompanied by intense release of heat, which, being close (19 cm) to the roof structure of the car, acted upon the insulation materials, whose destruction has led to ignition of the flammable air-gas mixture. The explosive ignition has caused pieces of burning substance to be thrown upon the curtains of the window and the hung clothes, which caused the fire in compartment No. 6 of the couchette-car.”**

The indictment does not contain any accusations against officers responsible for the technical condition of the couchette-car, in terms of cause of the fire, which also supports the conclusion of the investigation commission.

**12. Consequences of the accident.**

12.1. Injuries and fatalities.

As a result of the accident, among the passengers of train No. 2637, 9 (nine) persons died and 10 persons were injured; the latter received medical care and were discharged without consequences.

12.2. Material damages.

The following damages and losses have been caused to the rolling stock and the railway infrastructure:

a) sleeping-car WL No. 51526080611-9, property of BDZ EAD – total damages amounting to BGN 52 667,78;

b) couchette-car Vs No. 51525940641-8, property of BDZ EAD – total damages amounting to BGN 38 941,12;

c) the personal luggage of all passengers traveling in the couchette-car and of some of the passengers traveling in the sleeping-car has been destroyed by the fire;

d) the contact network, which is property of NRIC – total damages amounting to BGN 7 107,60

12.3. Traffic interruption:

a) on current railway No. 1 between Kunino station and Cherven Bryag station – from 23:23 on 28.02.2008 till 22:34 on 29.02.2008;

b) on current railway No. 2 between Cherven Bryag station and Kunino station – from 23:23 on 28.02.2008 till 09:00 on 29.02.2008; after 09:00 on 29.02.2008, traffic with speed up to 25 km/h was allowed, and after 17:30, the speed limit prescribed in the booklet (schedule) was applied.

12.4. Train delays caused.

Detoured - 4 trains. Cancelled - 9 trains. Delayed – 2 trains.

**ІІ. Proposals for organizational, technical and other measures for the prevention of this type of accidents.**

1. BDZ EAD should review and update its regulations regarding fire safety, and specify and submit up-to-date measures for operative control of their fulfillment. BDZ EAD should notify in writing the Directorate for Aircraft, Maritime and Railway Accident Investigation (DAMRAI) in the Ministry of Transport, Information Technologies and Communications of the specified measures and their implementation.

2. BDZ EAD should conduct additional training of the staff for practical familiarization with the operation of various types of fire extinguishers.

3. BDZ EAD should ensure permanent availability of the necessary operative anti-fire equipment in the trains, and maintain the electric installations of the rolling stock in good working order.

4. Executive Agency “Railway Administration”, in its capacity of a national agency in charge of safety, based on a thorough analysis of the circumstances relating to the case, should draw up additional proposals for organizational and technical measures to ensure the necessary level of safety, and prescribe them to the railway carriers providing passenger transport services, and provide preventive control for their implementation through General Directorate “Railway inspection” and its regional railway inspection bodies.

**Annexes:** The materials and the statements of findings of the investigation commission have been attached to Case No. 1 and are stored in the archives of the Directorate for Aircraft, Maritime and Railway Accident Investigation.

**Note:** The final reporthas been provided to allpersons involved in the accident (NRIC and BDZ EAD) and to all offices and institutions concerned.

**Chavdar Chavdarov**

***State Inspector***

***in the Directorate for Aircraft, Maritime and Railway Accident Investigation***

**Atanas Kostov**

***Director of the Directorate***

***for Aircraft, Maritime and Railway Accident Investigation in the MTITC***

I, the undersigned Peter Vassilev Vassilev, hereby certify that this is an exact Bulgarian-English translation of the document attached hereto – FINAL REPORT on completed technical investigation of a severe railway accident, dated September 2009. The translation consists of 8 pages.

*Translator: ……………………….*

*Peter Vassilev Vassilev*