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**AIRCRAFT, MARITIME AND RAILWAY ACCIDENT INVESTIGATION
UNIT DIRECTORATE**

(AMRAIUD)

FINAL REPORT

from

**Technical investigation of a serious railway accident – collision of passenger
train No 10113 with a motor vehicle - "Scania" truck with "Fliegl" semitrailer at
railway level-crossing on km 101+227 in Belovo-Septemvri interstation on
07.05.2014**



June 2014

APPROVE:

TO

DANAIL PAPAHOV

MINISTER OF TRANSPORT,

INFORMATION TECHNOLOGY AND COMMUNICATIONS

FINAL REPORT

Subject: *Technical investigation of a serious railway accident – collision of passenger train No 10113, running along Sofia – Plovdiv direction with a motor vehicle ("Scania" truck with registration number PB 4810 KB with "Fliegl" semitrailer with registration number PB 1876 EH) on 07.05.2014 at 04:35 p.m. at railway level-crossing on km 101+227 along Belovo – Septemvri interstation within the condition of a regularly activated automatic level-crossing signalling (ALCS).*

DEAR MR. PAPAHOV,

With your Order no RD-08-228/13.05.2014 is appointed the Commission for technical investigation of serious rail accident with the task to analyse the facts and circumstances and establish the reasons under which the accident has occurred and to prepare the final report of the technical investigation performed.

In the course of the investigation, the Commission performed several inspections on the accident site, analysed the report presented by the Task Force and required additional materials and documents to it in order to clarify the facts and circumstances accompanying the accident.

1. Ascertained facts and circumstances within the investigation process.

On 07.05.2014 passenger train (PT) No 10113 departed from Sofia station. The train was serviced by electrical multiple unit railcar (EMU) No 30029.3/30030.1, with engine driver and a train crew – train-master and train conductor. The train was running on schedule as per the Train operation timetable (TOT) in Sofia-Plovdiv direction.

At 04:30 p.m. PT No 10113 departed from Belovo station towards Septemvri station with a regular exit signal and normally functioning signalling equipment in both the stations as well as in the interstation section. The train was running with a speed accordingly to the Timetable book and regular indications of the passage semaphores along Belovo – Septemvri interstation on track No 1. Approaching the level crossing on km 101+227 equipped with automatic level-crossing signalling (ALCS), the train was running with a speed of 82 km/h. After receiving visibility of the level-crossing semaphore, the engine driver ascertained that the semaphore was not illuminated, which was an indication that the ALCS is in order, regularly activated and the train could pass safely through the

level-crossing. Before the semaphore, which was installed at a 1000 m distance from the railway level-crossing the engine driver gave a sound signal „Attention“ activating the locomotive whistle. When neared at approximately 600 meter distance, he noticed a lorry, which was approaching the level crossing and continued to send sound signals „Attention“, but saw that nevertheless the lorry was entering the danger zone of the level-crossing. The engine driver undertook immediate stopping with the train brake at a distance of 114 m. before the level-crossing, but due to the short braking distance and despite the required braking train mass assured, it became impossible to avoid the collision between the EMU and the automobile, which happened at 04:35 p.m. with the train speed of 62 km/h. At the time the accident occurred there was a good visibility of the railway level crossing. The automatic level-crossing signalling was regularly activated with the main traffic lights flashing in red and the repeater traffic lights at the factory exit flashing in yellow, accompanied with sound alarm. The truck driver disregarded the explicit verbal warning made to him by the factory guard about activated lights and sound alarm of the ALCS for a train coming along the track. Despite the warning, the driver did not think and undertook unlawful passage through the railway level-crossing.

As a result of the impact, the truck was dragged about 50 meters along the track until the final stop of the train and the EMU derailed with both the wheel sets of the front bogie in the direction of the movement.

When the collision between the passenger train and the truck happened, the freight (metal axes with dimensions 2000 x 120 mm, each weighing 160 kg, loaded to the truck) was scattered. Two of the axes penetrated into both sides of the train through the side panoramic windows and wounded five of the passengers who were seating in the first coach No 30030.1 of the multiple unit. The truck driver was also injured.

All relevant departments were informed immediately about the accident following the established procedure. The train crew provided first medical aid to the injured passengers and helped to get them off the train. The more seriously injured passengers were transported to a hospital in the town of Pazardzhik, where they received specialized medical care. Later on one of the passengers accommodated in the hospital died.

Representatives of the state investigative bodies arrived at the spot and after performing the initial investigation actions and coordination of an authorization from the investigating officer, the Commission for technical investigation carried out inspections of the multiple unit and the level-crossing equipment and facilities, by which a statement of findings on the ALVS condition was prepared.

In the course of the investigation there were found missing signs at the railway level-crossing on km 101+227 - sign A 35 (Balise) from the main road side and sign B 2 (Stop! Give way to these driving on the road with priority!) from the town of Septemvri side of the road.

At 08:35 p.m. and after agreement on the completion of the pre-trial investigation and technical investigation inspections, a permission was given for starting the emergency rehabilitation works for removing the truck and the trailer from track No 1, opening of train operation gauge on track No 2 and for lifting the derailed bogie on the rail track.

The derailed bogie of the EMU was uploaded on the track at 11:30 p.m., and the train was pulled back to Belovo station with diesel locomotive No 06127.5.

In result of the collision of PT No 10113 with the truck with reg no PB 4810 KB and due to the necessity of emergency rehabilitation works execution, the movement of trains along Belovo-Septemvri interstation on track No 1 and No 2 was interrupted at 04:35 p.m. and recovered on track No 2 at 10:43 p. m., and on track No 1 at 05:25 a.m. on 08.05.2014 with a speed limitation of 15 km/h.

2. Officials involved in the case.

2.1 Locomotive crew:

2.1.1. „Engine driver, locomotive” of Electrical multiple unit train car No 30029.3/30030.1 from Sofia locomotive depot, „BDZ – Passenger Service” Ltd. - 30 years of work experience;

2.2. Train crew:

2.2.1., “Train - master” from Plovdiv Passenger Services Division (PPSD), „BDZ – Passenger Service” Ltd. - 32 years of work experience;

2.2.2., “Train conductor” from Plovdiv PPSD, „BDZ – Passenger Service” Ltd. - 5 years of work experience;

2.3. Station officers:

2.3.1. „Traffic manager” Septemvri station – officer at Train operation and station activity management Division (TOSAMD) – Plovdiv SE National Railway Infrastructure Company (SE NRIC) - 7 years of work experience;

2.3.2., “Traffic manager” Belovo station – officer at Plovdiv TOSAMD – SE NRIC - 30 years of work experience;

2.4. Other officers

2.4.1., “Technician-mechanic railway technique/signalling technique (RT/ST)” – Signalling and Telecommunications Division (STD), Plovdiv S and T Section, SE NRIC - 20 years of work experience;

2.4.2., “Technician-mechanic RT/ST” – STD, Plovdiv S and T Section, SE NRIC - 21 years of work experience

3. Physical condition of the officials involved in the accident.

The necessary duration of rest before commencement of work was provided to all officials involved in the accident accordingly to the requirements of the Labour code and Ordinance No. 50 of 12.28.2001 on the working time of the managerial and executive personnel, involved in the provision of passenger and freight rail transport (promulgated, SG. 4 of 2002, as amended SG. 46 of 2004, amended and integrated, SG. 99 of 2006).

Pre-travel (pre-shift) instruction was given to all the officials involved in the accident and they declared being alerted, rested and that had not had alcohol and other drugs.

The officials involved in the accident possessed valid certificates of psychological examination.

4. Documents certifying work qualification and assignment to the work position.

All the officials, involved in the accident, possessed the necessary work and professional qualifications for the respective work position and a testament for its occupation.

5. Activities of the officials before and during the accident.

Immediately prior and during the accident all the service staff acted in accordance with the established regulations and internal rules, which regulate the safety of rail transport.

6. Circumstances, preceding the accident in terms of the rail track, signalling equipment, catenary, rolling stock etc.

Meteorological weather data with an influence over the visibility of signals:

- air temperature +18 °C;
- in the daylight hours;
- Good visibility.

Whether the train acceptance plan was respected: irrelevant.

Rail track: regular.

Profile, geometry and track layout: straight section with 3,2 ‰ inclination towards Septemvri station.

Station and interstation safety appliance type and its condition before the accident:

- at Belovo station route-relay interlocking (RRI);
- at Septemvri station computer-dispatching interlocking (CDI);
- at Belovo-Septemvri interstation along track No 1 and No 2 - automatic block system (ABS) with passage signals – in good working order;
- Level-crossing semaphore – in good working order;
- Road traffic lights and audible signalling at the railway level-crossing – in good working order and functioning.

Level-crossing equipment: **the level-crossing was equipped with an Automatic level-crossing signalling (ALCS).**

Catenary: in good working order - irrelevant to the railway accident occurred.

Train composing station: Sofia.

Communication technique and telecommunications interfaces: technically in order.

Rolling stock:

The electrical multiple unit railcar No 30029.3/30030.1 was technically in order, with running gear, braking system, light and sound signalling equipment corresponding to the technical standards and requirements, which is evident from the records in the respective diaries presented in the Task Force report.

Coaches – 3 coaches, 8 axles, 114 tonnes.

7. Fulfilment of the working procedures and technologies within the system of the SE National Railway Infrastructure Company before and during the accident.

The working procedures and technologies before and during the accident at Train Operation and Station Activity Management Division – Plovdiv, which is a part of the SE NRIC structure, were complied with and unrelated to the accident as evidenced by the Task Force report and by the materials and further questioning the staff and witnesses involved in the accident by the investigation commission on-site.

8. Compliance with the procedures and technologies for rolling stock service within the railway undertaking system before and during the accident.

The passenger train No 10113 was secured with the braking mass required and was provided with the necessary train documents. The locomotive and train crews were provided with business mobile phones.

In the examination of the technical documentation, there were not ascertained and recorded any violations of existing regulations on electrical multiple unit motorcars repair and maintenance as well as of the organisation, procedures and technologies of the repair activities, related to the accident.

9. Railway infrastructure and rolling stock status before, during and after the accident.

The railway infrastructure and rolling stock were in a good working order before the accident.

As a result from the accident several damages to the track, catenary, signalling and telecommunications equipment and power supply were found, which are described in point 10.

The electrical multiple unit railcar No 30029.3/30030.1 was in a good working order before the accident. The damages to the train, which resulted from the accident, are described in point 10.

10. Consequences from the accident.

10.1. Fatalities – 1 passenger;

10.2. Seriously injured – 4 passengers and the motor vehicle driver;

10.3. Failures and damages to the railway rolling stock:

10.3.1. Electrical multiple unit motorcar No 30029.3/30030.1:

The Electrical multiple unit No 30029.3/30030.1 is a property of „BDZ – Passenger Service” Ltd., Sofia, Locomotive Depot. During the inspection there were found damages to:

- Cabin module;
- Lower front fairing;
- Lower side fairings – set;
- Medium side fairings – set;
- plough;
- 3 D survey and body repair;
- Large front windshield;
- Small front windshield;
- Glassing high floor area – 5 pieces;
- Glassing short floor area – 2 pieces;
- Triangle windshield engine driver cabin – 2 pieces;
- Door window – 2 pieces;
- Scharffenberger coupler;
- Decorative veneer salon – 5 pieces;
- Wheel-slide protection sensors – 3 pieces;
- Sand box;
- Typhon and horn;
- Sand installation pipes – set;
- Pipes for main compressor- set;
- Pipes for braking equipment cabin – set;
- Restoring resistance;
- Longitudinal damper;
- Rail cleaner;
- Corps reducer;
- Wheel set motor bogie – 2 pieces;
- Box earthen – 2 pieces;
- Protection covering wheel set – 3 pieces;
- Display panel;
- Interface Compaq I/O;
- Traction rectifier – repair;
- cleaning mechanism for front windshield;
- nozzle external supply;
- carriage;
- Filter grid TD – 2 pieces.

The damages caused to the EMU amounted to 799 857, 16 BGN without VAT.

10.4. Faults and damages to the rail infrastructure:

10.4.1. Railway track and structures.

- Rail type S 49, 25 meters – 1 piece;
- Wooden sleepers from the crossing wooden floor – 2 pieces;
- Fastening sets within the crossing wooden floor area – 35 pieces;
- Road sign B2 – 1 piece;
- Road sign A 34.2 – 2 pieces;

The damages caused to the railway track and structures amounted to 7 131, 65 BGN without VAT.

10.4.2. Signalling and telecommunications equipment, radio interfaces, power supply.

- Right highway traffic light;
- Repeater of right highway traffic light;
- Coil transformer on track No 1 and No 2 - 4 pieces;
- Transformer boxes for Quantity electrical train power on track No 1 and No 2, Septemvri station – 2 pieces;
- Crossing semaphore (grounded) on track No 1 Septemvri side – 1 piece.

The damages caused to the signalling and telecommunications equipment, radio interfaces and power supply amounted to 6 359, 95 BGN without VAT.

10.4.3. Catenary

- Torn carrying cable and damaged contact wire between poles No 935 and No 937;
- Broken polymeric PIN insulator of pole No 237 – 1 piece;
- Broken polymeric insulators for disconnector of pole No 937 – 2 pieces;
- Torn unit droppers – 20 pieces;
- Torn spring dropper;
- Broken wire clamp of pole No 285;
- Torn conductor of pole No 275 compensating device;
- Torn clamp of the compensating device conductor;
- distorted conducting straps - 2 pieces;
- torn feeder of DC-3 between poles No 935 and No 937;
- broken steel lattice poles type BMX – 2 pieces;
- broken steel lattice poles type BAO;
- broken console M – 5;
- torn individual earthings – 5 pieces;
- torn gauge frame of the crossing;
- deformed sign B 16;
- Damaged transformer post.

The damages caused to the catenary amounted to 11 973 BGN without VAT.

10.5. Interruption of the movement:

Due to the collision between PT No 10113 and truck with number plate No PB 4810 KB, the train movement along Belovo-Septemvri interstation on track No 1 and No 2 was interrupted from 04:35 p.m. The movement on track No 2 was restored at 22:43 p.m. on 07.05.2014 with a speed of 15 km/h in the crossing area, and on track No1 at 05:25 a.m. on 08.05.2014 under the same conditions.

10.6. Caused train delay:

10.6.1. Delayed trains:

- Train No 493 – 07.05.2014 - „BDZ PS“ Ltd. - 127 min;
- Train No 8641 – 07.05.2014 - „BDZ PS“ Ltd. - 106 min;
- Train No 1626 – 07.05.2014 - „BDZ PS“ Ltd. - 75 min;
- Train No 10116 – 07.05.2014 - „BDZ PS“ Ltd. - 157 min;
- Train No 10195 – 07.05.2014 - „BDZ PS“ Ltd. - 21 min;
- Train No 10243 – 07.05.2014 - „BDZ PS“ Ltd. - 47 min;
- Train No 16221 – 07.05.2014 - „BDZ PS“ Ltd. - 143 min;
- Train No 493 – 07.05.2014 - „BDZ PS“ Ltd. - 127 min;
- Train No 16222 – 07.05.2014 - „BDZ PS“ Ltd. - 113 min;
- Train No 18207 – 07.05.2014 - „BDZ PS“ Ltd. - 5 min;
- Train No 18208 – 07.05.2014 - „BDZ PS“ Ltd. - 7 min;
- Train No 30115 – 07.05.2014 - „BDZ PS“ Ltd. - 15 min;
- Train No 8612 – 07.05.2014 - „BDZ PS“ Ltd. - 45 min;
- Train No 10196 – 07.05.2014 - „BDZ PS“ Ltd. - 50 min;
- Train No 10125 – 07.05.2014 - „BDZ PS“ Ltd. - 127 min;
- Train No 10127 – 07.05.2014 - „BDZ PS“ Ltd. - 17 min;
- Train No 10234 – 07.05.2014 - „BDZ PS“ Ltd. - 60 min;
- Train No 10392 – 07.05.2014 - „BDZ PS“ Ltd. - 80 min;
- Train No 3620 – 08.05.2014 - „BDZ PS“ Ltd. - 15 min;

10.6.2. Additionally appointed trains:

- Train No 1695 - 07.05.2014 – from Pazardzhik to Plovdiv - „BDZ PS“ Ltd.;
- Train No 10195 - 07.05.2014 - from Pazardzhik to Plovdiv - „BDZ PS“ Ltd.;
- Train No 10391 - 07.05.2014 – from Stm to Pl. - „BDZ PS“ Ltd.;
- Train No 10998 - 07.05.2014 – from Plovdiv to Sp. - „BDZ PS“ Ltd.;
- Train No 18991 - 07.05.2014 – from Sp. to Pl. - „BDZ PS“ Ltd.;
- Train No 10390 - 07.05.2014 – from Pl. to Sp. - „BDZ PS“ Ltd.;
- TCR No 10392 - 07.05.2014 – from Bl. to Sf. - „BDZ PS“ Ltd.;
- Train No 15991 - 07.05.2014 – from Vk to Bl. - „BDZ PS“ Ltd.;

10.6.3. Deviated trains:

- Train No 8612 – 07.05.2014 – from Pr. to Kv-Kz - „BDZ PS“ Ltd.;
- Train No 493 – 07.05.2014 – from Pr. to Kz-Kv - „BDZ PS“ Ltd.;
- Train No 8641 – 07.05.2014 - from Pr. to Kz-Kv - „BDZ PS“ Ltd.;
- Train No 40770 – 07.05.2014 - from Pr. to Kv-Kz - „BDZ PS“ Ltd.;

10.6.4. Non used capacity:

- Train No 1625 – from Bl. to Sp. - „BDZ PS“ Ltd. – 9,9 km;
- Train No 8602 – from Sp. to Sf. - „BDZ PS“ Ltd. – 102,8 km;
- Train No 10115 – from Bl. to Sp. - „BDZ PS“ Ltd. – 9,9 km;
- Train No 10116 – from Sp. to Sf. - „BDZ PS“ Ltd. – 102,8 km;
- Train No 1626 – from Sp. to Sf. - „BDZ PS“ Ltd. – 102,8 km;
- Train No 10113 – from Bl. to Sp. - „BDZ PS“ Ltd. – 9, 9 km;

10.6.5. Costs incurred due to derailment of train No. 10530:

10.6.5.1 Sofia PSD, „BDZ – Passenger Service“ Ltd. – 7 982, 54 BGN without VAT.

10.6.5.2 Plovdiv PSD, „BDZ – Passenger Service“ Ltd. – 431, 79 BGN without VAT

10.7. Movement of rehabilitation means:

10.7.1. Rehabilitation train: no.

10.7.2. Other rehabilitation means:

At 05:45 p.m. on 07.05.2014 specialized vehicle „UNIMOG“ of NRIC's property departed from Plovdiv station and arrived at 06:45 p. m. on the accident site to lift the derailed EMU coach.

11. Analysis of the causes, which led to the railway accident.

In result of the inspections and measurements made additionally on the spot and from materials required from the Task force, it was found that the collision between PT No 10113, running along Belovo-Septemvri interstation on track No 1 and the motor vehicle (truck with number plate PB 4810 KB) occurred at 04:35 p.m. at the railway track crossing on km 101+227 under the condition of regularly activated automatic level crossing signalling (ALCS).

The serious railway accident investigated happened in straight and flat section with 3,2 0/00 of track slope with very good visibility on both sides. This assures a spatial horizon to drivers of motor vehicles before crossing the double track railway line, which for 300 m is parallel with the fence of the “Wagon-repair plant 99” PLC. The exit portal for motor vehicles of the plant is located in parallel to the rail track and situated at a distance of less than 10 m from the level crossing.

While driving towards the exit portal of the plant the driver of the motor vehicle had the possibility to see the one sectioned traffic lights repeater activated illuminating with flashing yellow light (meaning „Attention“ accordingly to article 56, paragraph 3 of Ordinance No 4/27.03.1997 for the railway level-crossings) simultaneously with the double section road traffic light signalling with flashing red lights, which indicated impending passing of a rail transport vehicle. The motor vehicle driver also had the possibility to hear the audible signal „Attention“, which was given several times with the locomotive whistle of the oncoming multiple unit railcar, as well as to comply with the verbal warning of the guard at the entrance of the “Wagon-repair plant 99” PLC, who warned him of the light and sound alarm triggered warning of the approaching train.

It was ascertained in the course of the investigation that there were missing road signs at the railway level crossing on km 101+227 – sign A 35 (Balise) from the main road side and sign B 2 (Stop! Give way to the driving on the priority road!) from the town of Septemvri side of the road. The facts described could be reviewed as factors „favouring“ the railway accident, if the case was of a motor vehicle driver passing this route through the level crossing for the first time and was not aware of the road situation. In this specific case, however, should be taken into account the oral explanations of the Executive Director of the factory and of the guards that the driver visited the factory and passed across the level-crossings with the truck many times, so that he was well familiar with the peculiarities of the level-crossing pass.

12. Causes of the accident.

In result of the inspections made on the site of the serious railway accident and after getting acquainted with the report of the task force, the protocols, the results of planned reviews, protocols for carried out measurements and samples made and with other technical documentation and after making analysis, the Commission of inquiry decided that:

The immediate technical cause of the serious railway accident occurred on 07.05.2014 is the unlawful crossing of a motor vehicle (lorry "Scania" with reg no PB 4810 KB) over the railway crossing at km 101+227 within Belovo-Septemvri interstation in regularly activated automatic

level crossing signalling (ALCS) indicating the imminent passing of PT No 0113 moving on schedule in Sofia-Plovdiv direction.

The motor vehicle driver did not stop obligatorily in front of the traffic lights repeater on the factory territory, which was with activated flashing yellow light and sound signalization and took crossing through the level crossing at his own risk and responsibility without being convinced that no train was approaching the level crossing and the passage was safe.

Infringed were:

1. Road traffic Act – Section XII „Railway level-crossing“, art. art. 51 - 53;
2. Rules for the Law on the Road Traffic application – Chapter seventeenth „Level-crossing pass“ – art. art. 106 – 114;
3. Ordinance № 4 of 27 March 1997 for the railway level-crossings, art. 8.

13. Recommendations and suggestions for preventing events against other similar accidents.

In order to prevent other accidents of similar nature and on the grounds of art. 115m, paragraph 2 of the Law on Rail Transport, with the approved report No 14 – 001130/17.06.2014 and letter No. 10-22-772/24.06.2014 of the Minister of Transport, Information Technology and Communications a safety recommendation was given to involved parties for implementation.

With reference to the requirements of art. 94, par. 3 of Ordinance 59 dated 5.12.2006 on the management of railway safety of the Minister of Transport, Information Technology and Communications the responsible bodies shall notify in writing the AMRAIUD Directorate at MTITC on the appropriate actions undertaken for the implementation of the recommendation.

Appendix: 1. Photos – 8.

Chairman:

..... (Boycho Skrobanski)
*Director for the Aircraft, Maritime and Railway Accident
Investigation Unit Directorate, at MTITC*

Members:

1. (Boyko Stoilov)
Chief Inspector at AMRAIUD, MTITC

2. (Dimitar Iotov)
Inspector at AMRAIUD, MTITC