Investigation Body for Railway Accidents and Incidents

SUMMARY

Safety Investigation Report

Infrabel agents hit in Morlanwelz, followed by a collision with an SNCB/NMBS-train in Bracquegnies caused by a runaway towed damaged railcar

27 November 2017

November 2018

DOCUMENT VERSION TABLE

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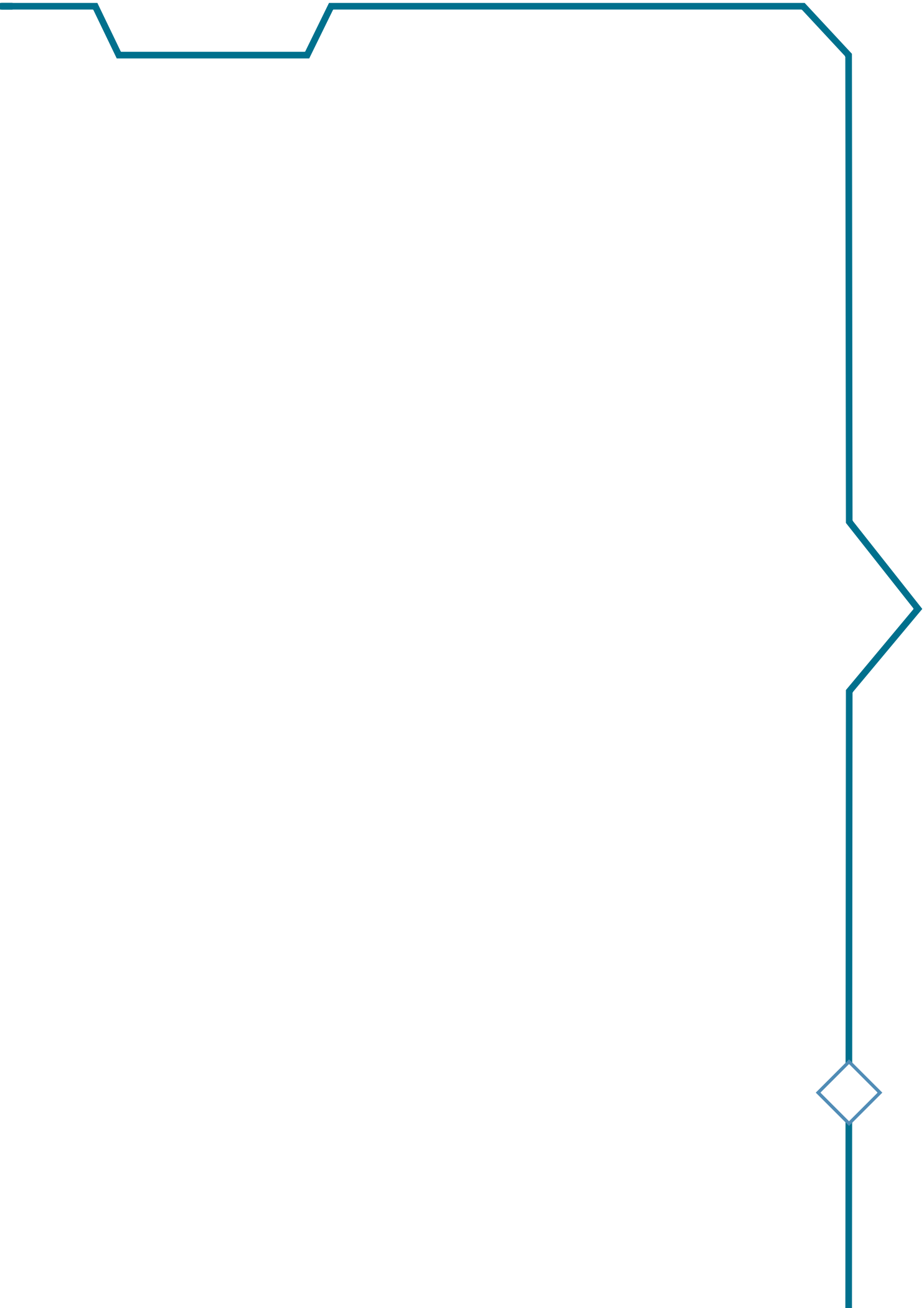
1.0	First version	23/11/2018

Any use of this restricted report with a different aim than of accident prevention - for example in order to attribute liability - individual or collective blaim in particular - would be a complete distortion of the aims of this report, the methods used to assemble it, the selection of facts collected, the nature of questions posed and the ideas organising it, to which the notion of liability is unknown. The conclusions which could be deduced from this would therefore be abusive in the literal sense of the term.
In case of contradiction between certain words and terms, it is necessary to refer to the French version.

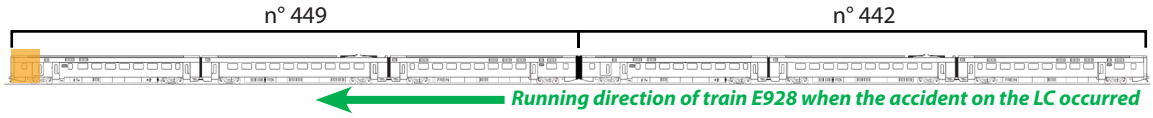


SUMMARY

On Monday the 27th of November, 2017, at around 7:26am, SNCB/NMBS passenger train (E928) hit a road vehicle with no passengers stopped on the level crossing 1 of line 112 at Morlanwelz (kilometre marker 16.841).
The train was travelling on track A, pushed the car over several hundreds of metres and came to a stop some 460 metres further on.

The train included 2 railcars of the AM96 type (n° 449 and n° 442) – these are electric railcars made of three vehicles, easily recognisable by the large pneumatic black rubber diaphragms located at either end of each railcar. Each end of the railcar is fitted with a "Georg-Fischer» (GF) automatic integrated coupling used to mechanically, pneumatically and electrically couple two railcars.

In the aftermath of the collision, a fire started in the road vehicle and spread to the front of the first railcar (n° 449). The passengers on board the train were evacuated to the second railcar (n° 442), at the rear of the train.



Position of the driver's cabin damaged by the fire of the road vehicle.

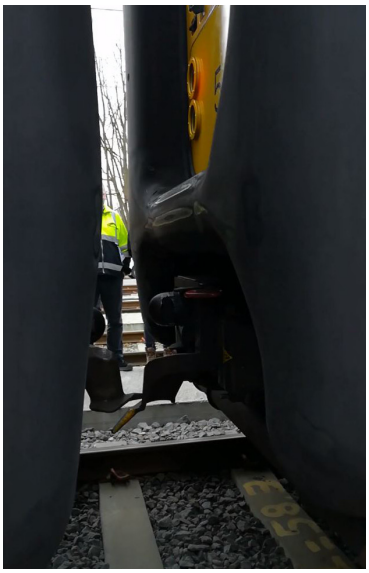
The driver's cabin of the first railcar (n° 449) was badly damaged and various elements of the infrastructure were also damaged by the fire.

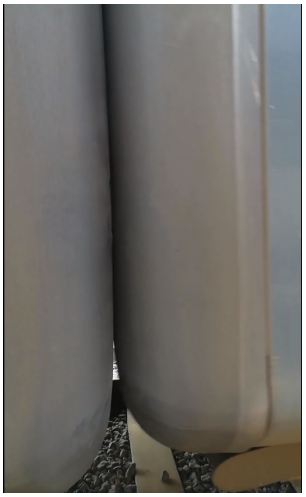
After the intervention of the emergency services, an SNCB/NMBS equipment inspector examined both railcars: the railcar occupying the second position (n° 442) was not damaged and the Equipment Dispatcher decided that it could be retrieved for service: a driver was sent to Morlanwelz to drive it.

However, the fire had caused significant damage to the first railcar (n° 449), and it could not be driven away. Traffic Control called a technical re-railing train to evacuate the railcar to the workshop in Charleroi.

For the purpose of organising and preparing towing operations by the technical train, a first foreman (agent in charge of a re-railing team) was sent in advance to the site of the accident.

A train driver was sent to the site of the accident in order to recuperate the AM442. He tried several times to reset low voltage on the AM442: as the fire caused problems in the AM449's electrical connections, the various power supplying attempts resulted in failure (tripping of the circuit breakers).
Therefore, the automatic procedure to uncouple the two railcars, could not be used.
The manual uncoupling procedure, with a hand crank in the driver's cabin – a procedure of last resort – had to be implemented.





When two of these railcars are coupled, the rubber diaphragms compress against one another, thereby forming a seal. It is a specificity of this type of railcar that allows passengers and staff to pass from one railcar to the other.

The disadvantage of the presence of these rubber diaphragms pressed against one another is that they do not allow access to the manual uncoupling mechanism located on the couplers. Therefore, AM96 railcars feature a manual uncoupling command system in the driver's cabin: it is a hand crank used to transmit the effort to the mechanism through a cable and its sheath.
The applied force to uncouple two railcars is relatively important. The presence of rubber diaphragms pressed against one another generates a mechanical strain in the coupling mechanism: during normal operations, the automatic uncoupling procedure is initiated by opening a solenoid valve to slightly deflate the rubber diaphragms. This is why the procedures require the cranks to be operated simultaneously in both drivers' cabins, to cumulate the forces applied.

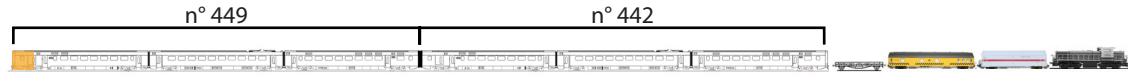
On the day of the accident, a first attempt at manual uncoupling using the crank in the driver's cabin was performed, before repeating the same operation in a synchronised manner in both drivers' cabins.

In normal operating conditions, indicator lights inform on the coupling state of the railcar (coupled/uncoupled). In the absence of electrical voltage powering the railcars after the accident, these indicator lights were non-operational. The driver and the first foreman attempted to confirm this state visually, but the rubber diaphragms forming the connection seal between both railcars did not provide access to the couplers connecting the two railcars. There is no other indicator informing on the coupling state of a railcar.
The uncoupling of the two railcars was not achieved.

In the meantime, the second foreman, in charge of the re-railing team, composed a re-railing team with on-duty members of staff. The technical re-railing train made its way to the site of the accident and arrived at Morlanwelz from the station of La Louvière-Sud, travelling on track B.

Upon arrival of the technical re-railing train at the level of the two railcars, the situation was assessed by the two foremen and the leader Infrabel. As the uncoupling was unsuccessful, the decision was made to evacuate not only the first railcar (n°449) towards the Charleroi workshop, as was initially planned, but to tow instead all of the train E928, consisting of two railcars, towards the Charleroi workshop.

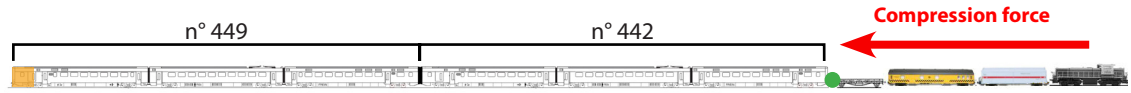
The crane was unhooked from the rest of the re-railing train and remained on track B. A part of the re-railing team, headed by the first foreman, started removing the road vehicle.
The re-railing train, without the crane, travelled to Piéton station and came back to position itself at the rear of the train to be towed on track A.



Damage as a result of the collision and the fire of the road vehicle.

The other part of the re-railing train team, headed by the second foreman, placed the backup coupling between the re-railing train and the second railcar (n° 442).

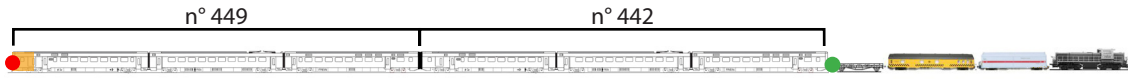
To check the strength of the coupling between both railcars, the staff of the re-railing train asked the driver of the re-railing train to perform a compression test on the train to be towed away. The locomotive of the re-railing train applied force in the reverse direction on both braked railcars. This effort did not cause the two railcars to become uncoupled.



Rescue coupler.
Damage as a result of the collision and the fire of the road vehicle.

The brake pipe of the train E928 (AM449 + AM442) was then supplied with compressed air by the locomotive of the re-railing train through the rescue coupler.

Because of the damage caused during the collision on the level crossing and the subsequent fire of that morning, the coupler in the front of the AM449 was leaking air: the crew of the re-railing train managed to solve this issue by closing the pneumatic valve supplying air to the damaged coupler of the AM449.

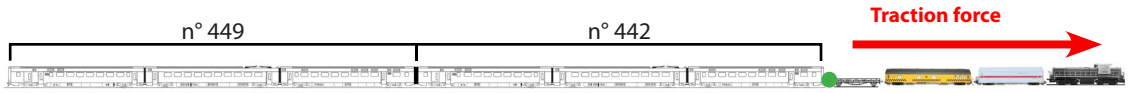


Air leakage at the coupler in the front of the AM449 damaged during the collision with the road vehicle.
Rescue coupler: towing and air supply.
Damage as a result of the collision and the fire of the road vehicle.

Despite a supply of compressed air at 5 bars, the brakes of the damaged railcar (n° 449) could not be released. It was therefore impossible to tow it away.

The crew of the re-railing train then decided to isolate the brakes, the purpose of this operation being to release the brakes and to allow the towed train to move. The consequence of isolating the brakes was that the damaged railcar (n° 449), at the rear of the convoy, was not braked. The damage caused by the morning's accident and subsequent fire made it impossible to couple another vehicle at the rear of the convoy.

The track had to be cleared as quickly as possible.
In order to verify, once more, the strength of the connection between both railcars, additional pull tests were performed by the driver of the re-railing train; the locomotive of the re-railing train applied force in the forward direction on the train to be towed, with shims having been placed under the wheels of the damaged railcar (n° 449).
These tests did not cause the two railcars to become uncoupled.



Under the HLT regulations of the railway undertaking and the Safety regulation for the exploitation of the railway infrastructure of the infrastructure manager, a train is authorised to travel with a non-braked car at the end of the convoy to the closest station with parking facilities, and it was therefore decided that the convoy could be driven to Piéton station, where the parking of the railcars could be organised.

The driver of the re-railing train contacted the signal box to obtain the authorisation to travel to Piéton station. The driver of the re-railing train warned the signal box that he would first stop at the unmanned stopping point of Morlanwelz in order to check the proper state of the train.
Once the authorisation was obtained, at around 6:46pm, the re-railing train started off towards Piéton station. The crane travelled towards Piéton by its own means along track B.

At the unmanned stopping point of Morlanwelz, shortly before 7:00pm, the re-railing train towing the two railcars came to a stop and the crew of the re-railing train checked the state of both towed railcars. At around 7:20pm, the convoy resumed its journey towards Piéton.

However, during the journey towards Piéton, the damaged railcar (n°449) at the rear of the convoy became uncoupled from the other railcar (n°442). The damaged railcar (n°449), with no brakes and travelling on a slope, started rolling back towards Morlanwelz.

On board the locomotive of the re-railing train, there was no sign informing the driver of the uncoupling and release of the damaged railcar (n°449). The re-railing crew was in the re-railing train car preceding the second railcar (n° 442), and could therefore neither see nor realise that the uncoupling had just occurred.

At around 7:50pm, the watchman at level crossing 1 warned the signal box: he had just seen a train run through the level crossing of which he was in charge.
Track A was considered as obstructed and traffic was no longer authorised, with the exception of re-railing trains, for which access is controlled by specific procedures. The foreseen protection principles were implemented by the infrastructure manager; closing the access to the section by closing the signals (red signal) surrounding the section. These protection measures had no effect on the runaway railcar (n°449), which continued on its course and hit workmen working on the tracks some hundreds of metres further down from the level crossing, killing two of them and causing injuries of varying degrees to four others.

The signal box launched a GSM-R alarm to halt all traffic in the area and avoid a collision with another train.
The signal box requested that the ES dispatcher cut the electrical supply to halt the train, but the damaged railcar (n°449) was not powered and continued on its course.

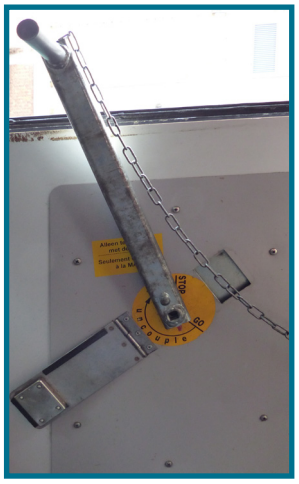
The emergency measures applied by various Infrabel services failed to stop the AM449, which continued towards the station of La Louvière-Sud and then along line 118.

Traffic Control requested:

- the ES dispatcher to restore the electrical voltage;
- the driver of the train E940, located in Bracquegnies, to restart the train.

In Bracquegnies, on line 118, at around 8:00pm, the damaged railcar (n°449) collided with the train E940, injuring at various degrees three passengers and two SNCB/NMBS members of staff.

The front of the first railcar of the AM449, with the traces of the fire, collided with the train E940 in Bracquegnies.



The manual uncoupling procedure is a “last resort” procedure and is not part of the practices generally implemented by drivers who, in most cases, use the automatic procedure.
The investigation highlighted that this last resort procedure is not well-known by drivers and instructors.
Inappropriate use of the crank causes irreversible damage to the sheath of the cable connecting the crank to the manual uncoupling system when a foot is used to apply greater force on the crank.

The damage caused to the cable sheath is only visible during workshop maintenance operations.

Once the “sheath + cable” system is damaged, rotating the crank no longer drives the correct motion of the internal parts of the coupler, bringing them to an intermediary and unstable position.

The risk of inadequate use of the crank was identified by the railway undertaking, but it appears that the measures taken by SNCB/NMBS were not sufficient to bring staff to properly use the manual decoupling procedure.

A sticker next to the crank in the driver’s cabin informs that the crank should only be used manually. This sticker was not sufficient to prevent a foot from being used.
In the driver’s cabin, there is no warning to inform that the operation must be conducted simultaneously in both drivers’ cabins. This procedure is specific to this type of railcar.

Manual decoupling manoeuvres are explained during training, but according to the documents provided to the IB, it seems that practical exercises are not systematically organised.

After the accident in the morning on the level crossing in Morlanwelz, a team of the re-railing train intervened. By convention, this technical train is called a "re-railing train": in Morlanwelz, there was no re-railing to be carried out as the train had not derailed. The car wreck needed to be cleared and the rolling stock removed.

The re-railing train personnel comes from the traction workshop to which the re-railing train is linked. The re-railing teams are proficient in re-railing techniques and have a general knowledge of rolling stock (there is no specialisation based on the type of rolling stock to be re-railed). The re-railing teams combine experienced personnel and new recruits: as they accompany experienced agents, agents who have recently been integrated in the re-railing teams execute increasingly complex tasks, under the supervision of the foreman and experienced agents. The members of the intervening team in Morlanwelz had completed their training plan.
In the case of questions relating to the rolling stock, to which the crew of the technical re-railing train would not directly have the answers, the foreman of the re-railing team can contact a member of the service team (sometimes working according to a three shift schedule) or a "rolling stock" specialist (there is no specifically appointed on-duty specialist).

In the past, the SNCB/NMBS identified a problem with the manual uncoupling system of the AM96: damages were detected to the sheath of the cable connecting the lever of the coupler to the crank. The analysis that was then carried out by the SNCB/NMBS rightly concluded that damage appears when drivers use their foot to apply greater force on the crank.
The risks of improper use of the crank have been identified by the railway undertaking and measures had been taken in the workshop during servicing of the rolling stock. However, it seems that the measures taken by the SNCB/NMBS were insufficient to get the driving personnel to use the crank the procedures:

- practical exercises on the procedure of manually uncoupling AM96 are not systematically integrated in the drivers' training;
- the sticker placed next to the crank in the driver's cabin reminds that the crank must be used manually, but does not mention the simultaneous manoeuvre in both driver's cabins;
- the SNCB/NMBS documentation did not allow to efficiently draw the attention of the driving personnel on the issue.

Based on these elements, the IB recommends that SNCB/NMBS analyses its training procedure so as to raise awareness of staff in terms of the risks identified.

Several cases of runaway railway vehicles are analysed or have already been the subject of a finalised investigation by the IB. Each time, the circumstances are different and the analyses of these different cases allow to detect that the causes reveal both technical aspects and operational, even organisational, aspects.

The risks of a runaway railway vehicle have been analysed, but the measures taken by the railway industry do not appear to be adapted to the present railway situation.
The railway geography, the organisation of the sector, the numerous customisation and modernisation works and the evolution of the rolling stock have brought about important changes with respect to the analyses of the past and it seems right to review these risk analyses, in particular in terms of the elements highlighted in this investigation:

- a train with a non-braked vehicle at the rear of the convoy is authorised to travel to the closest station, although there is no emergency procedure that enables to stop a runaway vehicle for sure should this occur.
- certain measures taken to protect personnel working on the tracks (closing of the signals) do not protect from the risk of being hit by a runaway railway vehicle, whether this vehicle ran away from a "technical train" (re-railing train, work train) travelling by regulation on the obstructed track, or it ran away from a train located at the signals giving access to the obstructed section. In the case of such events of a runaway train, maintaining automatic signals giving access to the obstructed section or track closed does not protect the personnel (of the infrastructure manager and/or of the re-railing train) standing in the tracks.

The IB recommends that the railway undertakings and the infrastructure manager jointly verify the risk analyses and the technical, regulatory and procedural measures to provide an adequate response to the risk of runaway vehicles.

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