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NIB ANNUAL REPORT 2021

Safety Investigation Authority

FINLAND

PREFACE TO THE REPORT

This is the annual report of railway sector of the Safety Investigation Authority, Finland for calendar year 2021.

National investigation ID

From the beginning of year 2012 the identifying of accident investigation reports has been changed.

The new identifier

Accident/incident categories

L - Aviation accidents and incidents
R - Rail accidents and incidents
M - Marine accidents and incidents
Y - Other accidents and incidents
T – Social and healthcare accidents and incidents
P - Exceptional events

Investigation identifier

Each investigation is designated by an identifier that consists of three parts, such as R2012-01.

- The first part refers the accident category (L, R, M, Y, T or P).
- The second part refers to the year of the accident.
- The third part is a sequence number referring to the order of the accident within its accident category in the year in question. “S” in the beginning of the number means that the investigation is a theme investigation (safety study).

The old identifier

Terms used in this report:

Investigation categories	
A-investigation	Major accident
B-investigation	Accident or serious incident
C-investigation	Incident, damage or minor accident
D-investigation	Other incident
S-investigation	Safety study

Investigation identifier:

Each investigation is designated by an identifier that consists of four parts, such as A1/1998R.

The first part refers to the investigation category (A, B, C, D or S).
The second part is a sequence number referring to the order of the accident within its accident category in the year in question.
The third part refers to the year of the accident.
The fourth part indicates the accident category (L, R, M or Y).

E.g. A1/1998R refers to the first major railway accident investigation in 1998.

CONTENTS

1 INTRODUCTION TO THE INVESTIGATION AUTHORITY

1.1 Legal Basis

The Safety Investigation Authority, Finland was founded in 1996 in connection with the Ministry of Justice. The tasks of the Safety Investigation Authority are specified in the relevant national Finnish act (Safety Investigation Act 525/2011, updated 187/2019), and they also include overall directions on the methods and powers implemented in an investigation. In Finland the Safety Investigation Authority is a multimodal investigation authority, which investigates aviation, maritime, rail, other accidents and incidents and social and healthcare accidents and incidents. The Safety Investigation Act also provides for the procedure to be followed in the event of exceptional and very serious events that, while not accident, have threatened or seriously damaged the basic functions of the society.

The current Safety Investigation Act is in harmony with to the Railway Safety Directive.

1.2 Role and Mission

The purpose of safety investigation is to promote general safety and to prevent any new accidents from occurring.

Safety investigation is conducted by the Safety Investigation Authority, Finland (SIAF). Safety investigation examines the course of events related to the accident or incident, their causes and consequences, and the search and rescue actions as well as the actions taken by the authorities. The investigation specifically examines whether safety has adequately been taken into consideration in the activity leading up to the accident and in the planning, manufacture, construction and use of the equipment and structures that caused the accident or incident or at which the accident or incident was directed. The investigation also examines whether the management, supervision and inspection activity has been appropriately arranged and managed. If necessary, the investigation also examines possible defects in the provisions and orders regarding safety and the authorities. The goal of the investigation is to discover factors and background causes contributing to the accident or incident in addition to its immediate cause, which may be found in e.g. the organisation, the instructions or the working methods.

When making the decision on whether to start a safety investigation, the seriousness of the incident and the probability that it will recur is taken into account. An incident or hazard with only minor consequences should be investigated if it causes danger to several people and it is judged that the investigation will generate information that is significant in improving general safety and preventing accidents. The Safety Investigation Authority does not normally investigate incidents that have been caused deliberately or occur as a result of an offence.

The end result of a safety investigation is an investigation report. At the end of the report, there are safety recommendations addressed to the appropriate authorities and other agencies. The safety recommendations summarise the views of investigators on how similar accidents and incidents can be avoided in the future. The Safety Investigation Authority monitors the implementation of recommendations. The purpose of safety investigation is to promote general safety, prevent further accidents and incidents from happening again, and prevent losses caused by accidents.

Safety investigations are not conducted to allocate legal liability. Other authorities and agencies are responsible for that task.

Task of Safety Investigation Authority

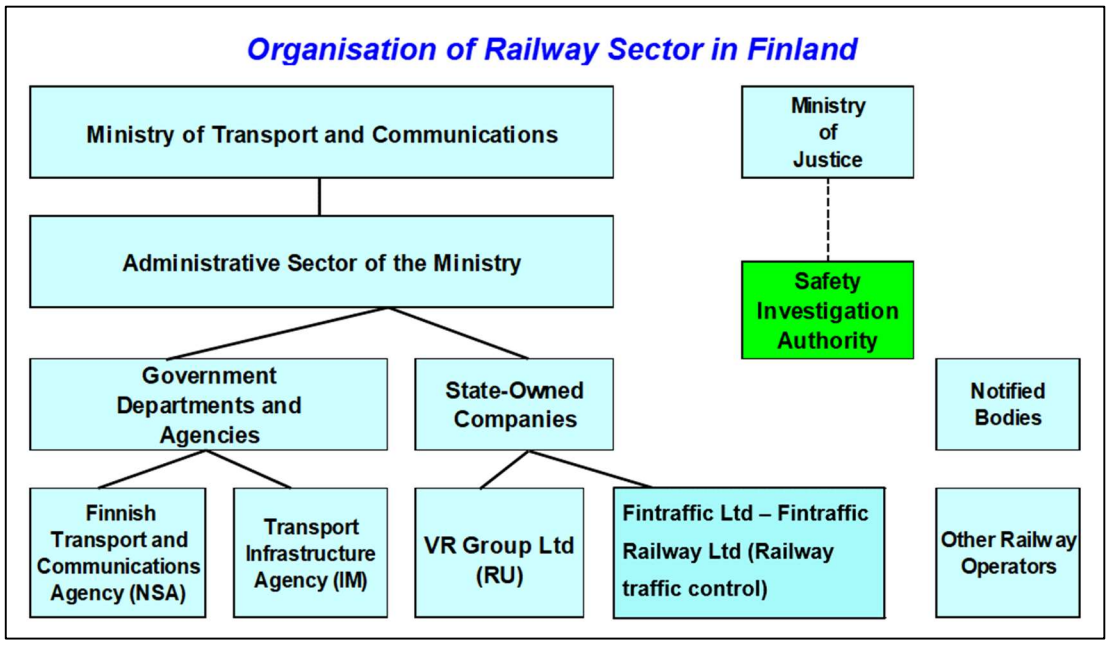
The Safety Investigation Act (525/2011) defines the task and the mandate of the Safety Investigation Authority. The Safety Investigation Act of Finland provides for the types of accidents and incidents investigated by the Safety Investigation Authority and how they are investigated.

The task of the Safety Investigation Authority is to investigate all major accidents and serious incidents regardless of their type, as well as aviation, rail traffic and maritime traffic accidents and incidents.

The Safety Investigation Authority

- ensures the general organisation, planning, guidance, provision of information, and supervision of the safety investigation
- trains persons suitable to be investigators
- maintains readiness to quickly initiate an investigation
- attends international cooperation forum connected with the safety investigation field
- issues safety recommendations and monitors their implementation.

1.3 Organisational flow



2 INVESTIGATION PROCESSES

2.1 Cases to be investigated

Accidents and incidents to be investigated:

- **Rail traffic accident**, which due to fatalities or injuries, the extent of damage incurred to the environment, property or assets, or nature of the accident can be regarded as particularly serious (**major accident**)
- **Serious railway accident** as specified in Article 3 of the Directive (EU) 2016/798 of the European Parliament and of the Council on railway safety
  - **train collision** (with another train, a shunting unit or an object or obstacle within the clearance gauge) or **derailment**, resulting in the death of at least one person or serious injuries to five or more persons, or extensive damage to the rolling stock, the infrastructure or the environment (in excess of EUR 2 million)
  - any other railway accident with similar consequences, which has an obvious impact on railway safety (safety regulation or safety management)
    - level crossing accident, resulting train derailment, or resulting in the death of at least one or serious injuries to five or more members of the train crew or passengers, or if the accident was result of failures within the railway system, or which due to deaths or injuries, the extent of damage incurred to the environment, property or assets, or nature of the accident can be regarded as particularly serious
    - **accident to persons** involving rolling stock in motion at a station or railway yard (personnel, passengers), or in connection with a track maintenance operation (personnel)
    - fire in rolling stock when running between the departure station and the destination (including when stopped at the departure station, the interim and destination stops), and re-marshalling operations
    - other type of accident
- and **any similar accident in private or public rail traffic**
  - metro accident
  - tramway accident.

A serious incident and another accident or incident may be investigated in accordance with the Safety Investigation Act. Also, a joint investigation of several similar accidents or incidents may be conducted in accordance with the Act.

2.2 Institutions involved in investigations

The Safety Investigation Authority, Finland can investigate all rail accidents. Those investigations are independent and thereof reports are public. According to The Rail Transport Act (1302/2018) the Finnish Transport and Communications Agency can investigate those occurrences that SIAF does not investigate. The investigation reports of the latter are not public.

Level crossing accidents

Road accident investigation teams investigate all fatal road and off-road traffic accidents in Finland, including level crossing accidents. Preventing them is crucial from the human perspective in particular, but also from the economic perspective. In addition, the teams investigate on project basis accidents that have caused serious personal injury and property damage to clarify certain specific questions.

The main aim of the investigation is to promote road safety. Accident investigations do not comment on guilt or compensation issues.

Investigation is regulated by legislation on the investigation of road and off-road traffic accidents (Act on the investigation of road and cross-country traffic accidents, 24/2001, since 1.1.2017 Act on the investigation of road and off-road traffic accidents, 1512/2016).

The Finnish Crash Data Institute (OTI) coordinates the work of road accident investigation teams but does not intervene in the independent working of the teams. OTI also takes care of the training of the teams, the use of investigation results, and information services.

There are 20 investigation teams operating in different parts of Finland. They have a total of approximately 300 members. The teams are mainly positioned according to the current regional borders. The teams independently study the reasons for road accidents and make proposals to improve safety. The investigation team members are subject to public liability and a non-disclosure obligation.

The task of road accident investigation teams is to determine the underlying reasons for an accident and to propose the necessary actions to improve traffic safety. The material collected is used in traffic safety work, the work of public authorities, international cooperation and communication. The teams do not investigate guilt or compensation issues related to accidents.

In addition to the above about the investigation of road and off-road accidents, the SIAF can investigate any accident which has taken place in Finland, including road and off-road accidents. When the SIAF has initiated an investigation, any other authority or instance that has initiated a safety investigation shall transfer any investigation material it has complied to the SIAF. Finally, it is worth mentioning that the SIAF has investigated about 80 level crossing accidents and made four safety studies on level crossing accidents.

2.3 Implementation of the Commission implementing Regulation (EU) 2020/572

Investigation reports of the Safety Investigation Authority, Finland are issued following the structure describe in Regulation (EU) 2020/572, as closely as possible and adapted to the type and seriousness of the accident or incident.

Summary, Conclusions and Safety Recommendations are written in a second official European language (in English and in Swedish). These translations are published at the same time as the investigation report.

We send the investigation report in our national language and the translated parts of it in English to the Agency in a digital format immediately after the report has been published (at the latest within 7 days).

How “The structure to follow on the reporting” in the appendix has been followed in our investigation reports and where are the matters of the section in question found from in our reports:

1. Summary

We make the summary of every investigation reports. The matters which have been presented in the appendix have been dealt with in the report. The summary is not section 1st in the report but we publish it separately.

2. The investigation and its context

The matters that have been presented in this section have been dealt with in our investigation report in the section *Preface*, except for point 7 which has been presented in other parts of the report.

3. Description of the occurrence

The matters mentioned in the subsection *(a) The occurrence and background information* are handled as follows:

- Points 1, 2, 4, 5, 7 and 8 have been processed in separate *Data Summary*.
- Point 3 is in subsections *2.1 Environment, systems and equipment* and *2.2 Conditions* of the section *2 Background information*.
- Point 6 is in subsection *2.4 Personnel, organisations and safety management* of the section *2 Background information*.

The matters mentioned in the subsection *(b) The factual description of the events* are handled in section *1 Factual information*.

4. Analysis of the occurrence, where necessary in respect of individual contributing factors

The matters that have been presented in this section have been dealt with in our investigation report in the section *3 Analysis*. In our report the rescue operations also are analysed.

5. Conclusions

The matters that have been presented in this section have been dealt with in our investigation report in the section *4 Conclusions*.

6. Safety recommendations

The matters that have been presented in this section have been dealt with in our investigation report in the section *5 Safety recommendations*.

Table of contents of SIAF's safety investigation reports:

3 INVESTIGATIONS

3.1 Overview of investigations completed in 2021, identifying key trends

Type of accidents investigated	Number of accidents	Number of victims		Damages in € (approximation)	Trends in relation to previous years
		Deaths	Seriously Injured		
Collisions	0				1
Derailments	0				0
Level crossing accidents	1	0	0	over 2 million	0
Other	0				0

3.2 Investigations completed and commenced in 2021

Investigations completed in 2021

Date of occurrence	Title of the investigation (Occurrence type, location)	Legal basis	Completed (date)
14.5.2020	R2020-01 Level crossing accident in Mänttä-Vilppula on 14 May 2020 (ERA FI-6270)	I (2) (a)	14.1.2021

Investigations commenced in 2021

Date of occurrence	Title of the investigation (Occurrence type, location)	Legal basis
5.6.2021	R2021-01 Fire in the Dm12 rail bus between Huutokoski and Siikamäki in Joroinen on 5 June 2021 (ERA FI-10069)	I (2) (a)
3.7.2021	R2021-02 Derailment of a freight train in Vesanka on 3 July 2021 (ERA FI-10083)	I (2) (c)
5.10.2021	R2021-03 Level crossing accident in Kaskinen, 5 October 2021 (ERA FI-10140)	I (2) (c)
2.12.2021	R2021-04 Derailment of a train transferring a metro in Oulunkylä on 2 December 2021 (ERA FI-10162)	I (2) (c)

The Legal Basis for the decision to investigate accident/incident:

I National rules imposed by implementing of the Directive on railway safety
- (1) in light of Article 20, §1
- (2) in light of Article 20, §2
  - (a) the seriousness of the accident or incident
  - (b) it forms part of a series of accidents or incidents relevant to the system as a whole
  - (c) its impact on railway safety on a Community level
  - (d) requests from infrastructure managers, the safety authority or the Member State
- (3) in light of Article 22
  - (§5) cross-border investigation or request to assistance
  - (§6) other reasons than those referred to in Article 20

II Other national rules/regulations (covering possible areas excluded in Article 2, §2 and §3)
- (2) (a) metros
- (2) (b) trams and other light rail systems
- (2) (c) networks that are functionally separate from the rest of the railway system
- (3) (a) privately owned railway infrastructure, including sidings, used by the owner or by an operator for the purpose of their respective freight activities or for the transport of persons for non-commercial purposes, and vehicles used exclusively on such infrastructure
- (3) (b) infrastructure and vehicles reserved for strictly local, historical or tourist use
- (3) (c) light rail infrastructure occasionally used by heavy rail vehicles under the operational conditions of the light rail system, where it is necessary for the purposes of connectivity of those vehicles only

(3) (d) vehicles primarily used on light rail infrastructure but equipped with some heavy rail components necessary to enable transit to be affected on a confined and limited section of heavy rail infrastructure for connectivity purposes only

III Other national rules/regulations not referred to the Safety Directive.

3.3 Safety Studies completed and commenced in 2021

Safety Studies completed in 2021

Date of commission	**Title of the Study** (Occurrence type, location)	**Legal basis**	**Completed** (date)

Safety Studies commenced in 2021

Date of commission	**Title of the Study** (Occurrence type, location)	**Legal basis**
1.7.2021	R2021-S1 Accidents and incidents occurring in urban rail traffic	II (2) (a,b)

3.4 Summaries of investigations completed in 2021

R2020-01 (ERA FI-6270)

Level crossing accident in Mänttä-Vilppula on 14 May 2020

At 11.12 p.m. on Thursday 14 May 2020, a tractor pulling a manure spreader collided with the side of a rail bus on the passive Kulmala level crossing in Mänttä-Vilppula, on the track section between Orivesi and Haapamäki. The rail bus had departed for Haapamäki from Vilppula station on schedule. While approaching the Kulmala level crossing, the train driver noticed a vehicle moving under tree cover on the road to the left of the track. The tractor approaching the level crossing came into view just before the rail bus entered the level crossing. The train driver flashed the rail bus lights at the tractor but did not have time to brake. The speed of the rail bus was 100 km/h when the tractor collided with its left side. The collision ruptured the rail bus's fuel tank and the diesel oil gushing out of the tank ignited immediately. After the collision, the train stopped approximately 300 metres from the level crossing.

The train driver and passengers escaped without injury. The tractor driver suffered minor injuries. The rail bus was badly damaged in the collision and the ensuing fire. The tractor was destroyed beyond repair by the collision. The total costs caused by the accident were estimated at over €2 million. Oil and diesel fuel were spilled into the environment due to the accident. Polluted oily soil was removed from an area of approximately ten square meters between the level crossing and a ditch running next to it. A detrimental element study of the soil revealed no need for further measures or monitoring.

The tractor driver's fatigue, familiarity with the route, blind spots and reflections in the tractor's cabin, and the tractor's features all contributed to the driver not noticing the train or stopping before the level crossing. Road users commonly make mistakes like this at level crossings, especially if the crossing is familiar.

The collision with the rail bus's side started a fire because it damaged the fuel tank, batteries, and switchboard at the same time. The risk of a collision from the side had not been taken into account in the placement and shielding of the rail bus's critical equipment. Neither are such risks addressed in the regulations applying to rolling stock of this type.

The rail bus was evacuated successfully despite the rapid spreading of the fire because the train driver was able to act, there were few passengers, and some light entered the rail bus from the outside. The train driver plays a crucial role in the evacuation of regional trains with no other crew.

Because the rail bus lost power, all the lights went out and its doors could only be opened with the emergency mechanism. The doors' emergency opening instructions are difficult to understand, and the drawings on the instruction decal next to the door do not match the actual shapes of the opening switches and handles. Neither does the decal indicate the location of the handles. A passenger who is not familiar with

rolling stock may not understand the instructions. The passengers will have to open the doors themselves during an evacuation if the train driver is incapacitated or the train has several cars.

There was a delay in determining the accident location, because the train driver did not use the 112 application to make the emergency call. The engine driver described the location of the accident by referring to the location sign, which was an unfamiliar concept to the ERC operator. The Finnish Transport Infrastructure Agency and Emergency Response Centre Administration had not agreed on the use of location signs for locating the scenes of railway accidents.

To improve the safety of rolling stock, the Safety Investigation Authority recommends that:

1. *The European Union Agency for Railways add requirements on protection against side collisions to regulations on diesel trains.*

In addition, the Safety Investigation Authority recommends that the Finnish Transport and Communications Agency (Traficom) ensure the implementation of the following recommendation:

2. *VR Group includes evacuation training in its engine driver training program.*

3. *VR Group replaces the emergency opening instruction decals and ensure the functioning of safety lights on rail buses.*

4. *The Finnish Transport Infrastructure Agency agrees with the Emergency Response Centre Administration on the use of location signs in railway emergency calls.*

3.5 Comment and introduction or background to the investigations

Investigations commenced in 2021 and not followed

Date of occurrence	Title of the investigation (Occurrence type, location)	Legal basis	Reason of non-following or suspension of investigations	Who, why, when (decision)

3.6 Accidents and incidents investigated during last five years (in 2017–2021)

Rail investigations in 2017–2021

Accidents investigated		2017	2018	2019	2020	2021	TOT
Serious accidents (Art 20.1)	Train collision	0	0	0	0	0	**0**
	Train collision with an obstacle	0	1	0	0	0	**1**
	Train derailment	0	0	0	0	0	**0**
	Level crossing accident	1	1	0	1	0	**3**
	Accident to person caused by RS in motion	0	0	0	0	0	**0**
	Fire in rolling stock	0	0	0	0	1	**1**
	Involving dangerous goods[1]	0	1	0	0	0	**1**
Other accidents (Art 20.2) + (Art 22.6)	Train collision	0	0	1	0	0	**1**
	Train collision with an obstacle	0	0	0	0	0	**0**
	Train derailment	0	0	1	0	2	**3**
	Level crossing accident	0	0	0	0	1	**1**
	Accident to person caused by RS in motion	0	0	0	0	0	**0**
	Fire in rolling stock	0	0	0	0	0	**0**
	Involving dangerous goods[1]	1	0	1	0	0	**2**
	Incidents in train traffic	0	0	0	0	0	**0**
	Accidents or incidents in shunting work	2	0	7[2]	6[2]	0	**15**
TOTAL		**4**	**3**	**10**	**7**	**4**	**28**

3.7 Preliminary investigations

The Safety Investigation Authority has conducted in compliance with section 8 of the Safety Investigation Act (525/2011), preliminary investigations. The SIAF has decided on the basis of a preliminary investigation, that the special characteristics of the case do not require a full investigation. The report on the preliminary investigation is sufficient from the point of view of the safety advantage to be obtained. The events leading to the accident and immediate and indirect

[1] Belongs also to another category and is not calculated another time to the total amount.
[2] Cases belong to the theme investigation on shunting work accidents and incidents in railway traffic.

causes of the accident/incident are described briefly in the report on the preliminary investigation.. The reports are published in Finnish and Swedish.

In 2013 we started to publish reports of preliminary investigations on the SIAF web pages. In 2017 we developed a new layout of the report.

During the year 2021 SIAF published one preliminary investigation report of rail occurrence:

- R2021-E1 Level crossing accident and derailment of a locomotive at Kontiomäki 4.6.2021, published 1.7.2021.

During the year 2021 SIAF also started another preliminary investigation of a rail occurrence:

- R2021-E2 Collision between train units during shunting operation at Tampere station on 12 December 2021 (report was published 4.2.2022).

3.8 Fatal level crossing accidents investigated by the road accident investigation teams

In 2021 occurred a total of 22 level crossing accidents, seven of them were fatal. Of the seven fatal accidents, six involved a motor vehicle and one involved a bicyclist.

Eight persons were fatally injured in the accidents, 4 injured seriously and 12 injured slightly. The road accident investigation teams investigated the fatal level crossing accidents. Below are short summaries of these seven fatal accidents.

1. Fatal level crossing accident at Loimaa on 23rd of May 2021

On Sunday 23rd of May 2021 a level crossing accident involving a van and a passenger train occurred on the Alhokedontie unprotected level crossing. The van driver did not notice the oncoming train and drove directly in front of it. Locomotive driver noticed the approaching van and tried to inform driver with locomotive whistle. A few seconds before impact train driver realised that the van is not going to stop and commenced emergency braking. Impact speed was between 40-50 km/h.

Collision was fatal to van driver. The locomotive driver and passengers on the train did not sustain injuries. The van was wrecked completely. Front end of the locomotive sustained minor damage.

The direct cause (*the key event*[3]) was that the van drove into the level crossing while train was approaching. It is possible that the van driver did not see the train because of the angle of the road in relation to the track and the fact that the visibility from van to the direction of the train was limited due to lack of side windows in van's cargo area.

Background risk factors[3]:

- level crossing was not protected.
- The angle of the track made observing the oncoming train difficult.
- Van had no side windows other than in cab doors.

[3] Terms used by the road accident investigation teams.

- Train was travelling at high speed (118km/h).
- There were no level crossing warning signs on the road.

In order to prevent similar accidents, the investigation team made the following improvement *proposals and safety recommendations*[3]:

- Installing level crossing warning signs to the road and STOP-sign to level crossing.
- Equipping level crossing with warning signals or barriers.
- Changing the angle between road and track so that it is ideal 90°.
- Removal of level crossings when possible.

2. Fatal level crossing accident at Pori on 4th of July 2021

On Sunday 4th of July, a level crossing accident involving a motorbike with driver and a passenger, and a freight train occurred on the Karjarannantie level crossing. Level crossing is equipped with warning devices and half barriers.

Motorbike driver drove at high speed and passed several cars that had stopped in front of the level crossing and then drove past the barriers into the level crossing and directly in front of the oncoming train. Motorbike passenger tried to warn driver about the oncoming train, but the driver did not react to warnings.

Collision was fatal to motorbike passenger who did not wear a helmet. Motorbike driver did have a helmet but suffered serious injuries. There were no injuries to locomotive driver. Motorbike was destroyed. Front of the locomotive was damaged slightly in the collision.

The direct cause (*the key event*) was that the motorbike drove into the level crossing past the half barriers while train was approaching.

Background risk factors:

- Motorbike driver was intoxicated and did not have motorbike driving license.
- The angle of the track made observing the oncoming train difficult.
- Motorbike passenger did not wear a helmet.

In order to prevent similar accidents, the investigation team made the following improvement *proposals and safety recommendations*:

- Technical equipment on motor vehicles that would prevent operating them if driver is intoxicated.
- Replacing half barriers with full width barriers that close the road completely.
- Changing the angle between road and track so that it is ideal 90°.
- Removal of level crossings when possible.

3. Fatal level crossing accident at Imatra on 6th of August 2021

On Friday 6th of August, a level crossing accident involving a bicyclist and a shunting locomotive occurred on the Linnankoskenkatu level crossing. Level crossing was equipped with warning devices and half barriers.

A senior citizen was walking with bicycle and walked to the level crossing despite warning sound and lights and right in front of a locomotive approaching level crossing at 30 km/h.

Collision was fatal to bicyclist. Locomotive driver was not injured.

The direct cause (*the key event*) was that bicyclist walked into level crossing while locomotive was approaching.

Background risk factors:

- Bicyclist was a local resident who had crossed the track at this location for several years. He had a habit of crossing the track despite warning devices were active in level crossing.
- Bicyclist had hearing problems. He had a hearing aid, but he did not use it at the time of the accident.
- There was a road work in progress at the level crossing at the time of accident.

In order to prevent similar accidents, the investigation team made the following improvement *proposals and safety recommendations*:

- Education to people about the importance of reacting to warning devices in level crossings.
- Traffic arrangements should be made as clear as possible also during road works.
- Removal of level crossings when possible.

4. Fatal level crossing accident between Raahe and Tuomioja on 8th of August 2021

On Sunday 8th of August 2021, a level crossing accident involving a passenger car and a freight train occurred on the Kuirinmaa unprotected level crossing.

A passenger car with a driver and a passenger was driving on a private road that runs along the track at a distance of 30 meters. Road ended into a T-junction where the car turned right towards the level crossing. When arriving to level crossing, the car passed the STOP-sign but stopped on the tracks. Locomotive driver noticed this about 40 meters before the level crossing and commenced emergency braking. Locomotive hit the passenger side of the car.

Collision was fatal to car passenger. Car driver was seriously injured. Locomotive driver did not sustain injuries. The car was wrecked completely. Front end of the locomotive sustained minor damage.

The direct cause (*the key event*) was that the car drove into the level crossing while train was approaching. Car driver did not notice or reacted incorrectly to the approaching train.

Background risk factors:

- level crossing was not protected.
- Car driver did not stop at the STOP-sign before driving into level crossing.
- Road before level crossing is designed so that it is possible to drive into level crossing without slowing down.
- Sun may have blinded the car driver.

In order to prevent similar accidents, the investigation team made the following improvement *proposals and safety recommendations*:

- Equipping level crossing with warning signals or barriers.
- Removal of level crossings when possible.
- Narrowing the road leading to level crossing and improving the waiting platforms.
- Instructing locomotive drivers to give warning signals if they see traffic near unprotected level crossings.

5. Fatal level crossing accident at Paltamo on 27th of August 2021

On Friday 27th of August 2021, a level crossing accident involving a passenger car and a passenger train occurred on the Lepikko unprotected level crossing.

A passenger car with a driver and a passenger was driving on a private road towards south. Meanwhile a passenger train was travelling west at 120 km/h. Car approached the level crossing slowly but did not stop at the STOP-sign before the level crossing. Train driver noticed that the car is not stopping and noticed that car driver was looking at the opposite direction. Train driver commenced emergency braking about 50-100 m before level crossing. Train hit the left side of the car. Both car driver and passenger were thrown out of the car due to impact.

Collision was fatal to car driver and passenger. The locomotive driver and passengers on the train did not sustain injuries. The car was wrecked completely. Front end of the locomotive sustained damage.

The direct cause (*the key event*) was that the car drove into the level crossing while train was approaching. Car driver did not notice or reacted incorrectly to the approaching train.

Background risk factors:

- Car driver did not stop at the STOP-sign before driving into level crossing.
- Car driver looked only to one direction before driving into level crossing.
- Car driver had health issues that may have affected his abilities to observe other traffic.

In order to prevent similar accidents, the investigation team made the following improvement *proposals and safety recommendations*:

- Improving health monitoring of drivers with noted health issues.
- Assisting systems in cars that control drivers' awareness and driving condition.
- Equipping level crossing with warning signals or barriers.
- Removal of level crossings when possible.
- Instructing locomotive drivers to give warning signals if they see traffic near unprotected level crossings.

6. Fatal level crossing accident at Loimaa on 24th of September 2021

On Friday 24th of September 2021, a level crossing accident involving a passenger car and a passenger train occurred on the Poikkitie level crossing. Level crossing is equipped with warning devices and half barriers.

A passenger car was driving on a private road and approached a level crossing. At the same time a passenger train was approaching the level crossing. Train driver noticed the car approaching the level crossing from right side of the track and stopping before the lowered barriers at the level crossing. Suddenly the car started to manoeuvre around the half barriers and drove into the level crossing. Train driver commenced emergency braking and used both sound and light warning devices to alert car driver. Despite the train's emergency braking, train collided the left side of the car at speed of 90 km/h.

Collision was fatal to car driver. The locomotive driver and passengers on the train did not sustain injuries. The car was wrecked completely. Front end of the locomotive sustained damage.

The direct cause (*the key event*) was that the car drove into the level crossing despite of lowered half barriers while train was approaching. Car driver did not notice the train or possibly estimated that he could make it over the level crossing before the train.

Background risk factors:

- Car driver had health issues that may have affected his abilities to observe other traffic, this could have caused an error estimate that led him to believe that he could make it over the level crossing before the train.

In order to prevent similar accidents, the investigation team made the following improvement *proposals and safety recommendations*:

- Improving health monitoring of drivers with noted health issues.
- Assisting systems in cars that prevent entering level crossing if train is approaching.
- Installing level crossing warning signs on the road.
- Replacing half barriers with full width barriers that close the road completely.
- Removal of level crossings when possible.
- Instructing locomotive drivers to give warning signals if they see traffic near unprotected level crossings.
- Improving the visibility of trains to road users.

7. Fatal level crossing accident at Loimaa on 9th of November 2021

On Tuesday 9th of November 2021, a level crossing accident involving a passenger car and a passenger train occurred on the Alhonkedontie unprotected level crossing.

A passenger car was driving on a private road and approached a level crossing. At the same time a passenger train was approaching the level crossing. Train driver noticed the car approaching the level crossing at speed of 40-50 km/h from left side of the track.

A few seconds before entering level crossing, train driver noticed that the car was not stopping and commenced emergency braking. Due to the short reaction time, the emergency braking had little effect. Train collided the left side of the car at speed of 137 km/h.

Collision was fatal to car driver. The locomotive driver and passengers on the train did not sustain injuries. The car was wrecked completely. Front end of the locomotive sustained damage.

The direct cause (*the key event*) was that the car drove into the level crossing at the same time train was approaching it. Car driver did probably not notice the train.

Background risk factors:

- level crossing was not protected
- The angle of the track made observing the oncoming train difficult.
- Light rain and darkness could have affected car drivers' ability to notice the approaching train.
- Car driver was tired and, in a hurry.
- Train was travelling at high speed
- This level crossing has been classified dangerous many years ago, but no actions have been taken.
- Train's green-white colour scheme is not optimal for visibility to road users.

In order to prevent similar accidents, the investigation team made the following improvement *proposals and safety recommendations*:

- Installing level crossing warning signs to the road and STOP-signs to level crossing.
- Equipping level crossing with warning signals or barriers. Also taking into consideration low-cost warning devices as used on Lahti-Heinola and Toijala-Valkeakoski line sections.
- Changing the angle between road and track so that it is ideal 90°.
- Removal of level crossings when possible.
- Education to people about the dangers of level crossings.
- Educating private road users about their responsibilities about maintaining level crossing conditions.

4 RECOMMENDATIONS

4.1 Short review and presentation of recommendations

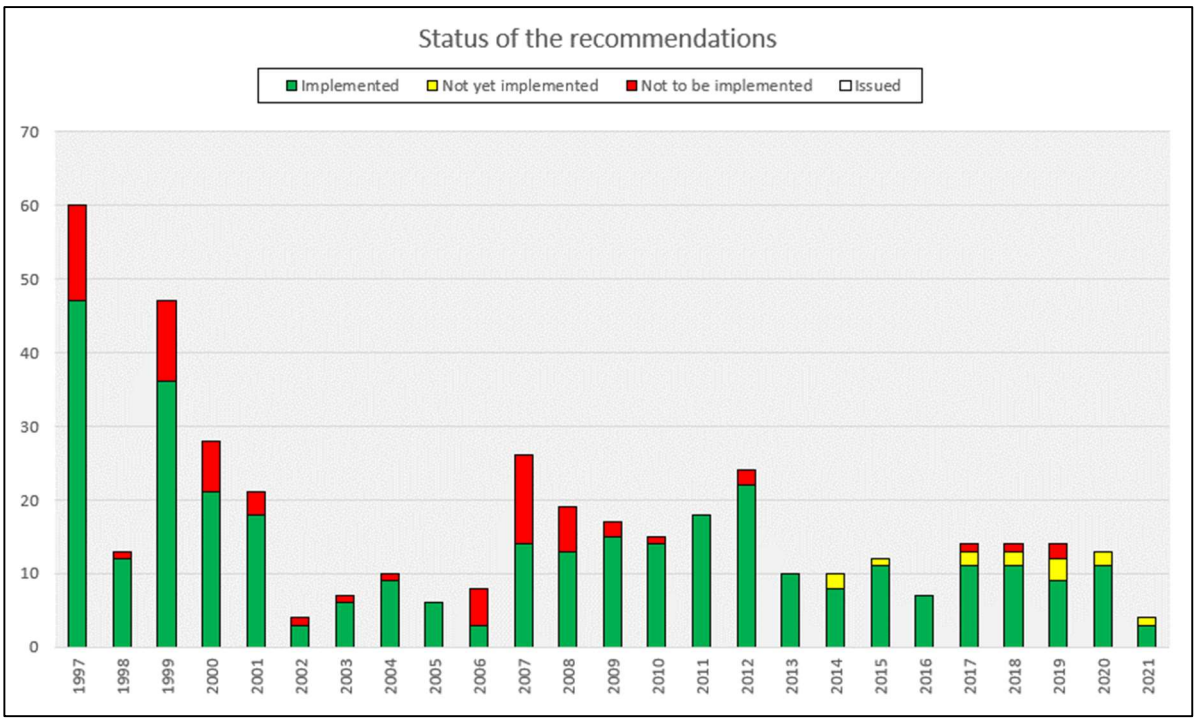
Implementation of recommendations during 2007–2021

Recommendations issued		Recommendation implementation status					
		Implemented		In progress		Not to be implemented	
Year	[No.]	[No.]	[%]	[No.]	[%]	[No.]	[%]
2007	26	14	53,8	0	0,0	12	46,2
2008	19	13	68,4	0	0,0	6	31,6
2009	17	15	88,2	0	0,0	2	11,8
2010	15	14	93,3	0	0,0	1	6,7
2011	18	18	100,0	0	0,0	0	0,0
2012	24	22	91,7	0	0,0	2	8,3
2013	10	10	100,0	0	0,0	0	0,0
2014	10	8	80,0	2	20,0	0	0,0
2015	12	11	91,7	1	8,3	0	0,0
2016	7	7	100,0	0	0,0	0	0,0
2017	14	11	78,6	2	14,3	1	7,1
2018	14	11	78,6	2	14,3	1	7,1
2019	14	9	64,3	3	21,4	2	14,3
2020	13	11	84,6	2	15,4	0	0,0
2021	4	3	75,0	1	25,0	0	0,0
TOTAL	**217**	**177**	**81,6**	**13**	**6,0**	**27**	**12,4**

Changes in implementation statuses of recommendations during 2021 are described in detail in Annex 1.

A total of 421 recommendations were issued from the beginning of 1997 until the end of 2021. According to information available on 24 April 2022, 321 (76.3 %) recommendations were implemented. On 67 (15.9 %) issued recommendations, the SIAF received a reply stating that they would not be implemented.

Since beginning of 2007 until the end of 2021 a total of 217 recommendations have been issued. 177 (81.6 %) have been implemented. On 27 (12.4 %) %) issued recommendations, the SIAF received a reply stating that they would not be implemented and 13 (6.0 %) are under implementation.



4.2 Recommendations 2021

2021-S1 Side collision protection for rolling stock (ERA FI-6270/1)

The regulations do not take the protection of rolling stock equipment against side collisions

into account. The lack of protection increases the risk of fire in diesel trains in particular. Diesel trains typically operate on track sections with a lot of passive level crossings. This means that there is a risk of side collisions.

The Safety Investigation Authority recommends that:

> *The European Union Agency for Railways add requirements on protection against side collisions to regulations on diesel trains. [2021-S1]*

Ready-made modules are used in building trains, which is cost-effective. Usability factors are the primary consideration in the placement of modules, while safety remains secondary. Railway operators are to investigate the possibilities of improving the protection against side collisions of the stock that is already in use.

2021-S2 Evacuation training for engine drivers (ERA FI-6270/2)

The engine driver plays a crucial role in the evacuation of regional trains since the driver is the only crew member on board. A risk assessment was conducted when train crews were cut from rail bus traffic. The risk assessment did not pay sufficient attention to evacuations or identify the

need for additional engine driver training. The basic or supplementary training provided to engine drivers by VR does not include evacuation training or drills.

The Safety Investigation Authority recommends that the Finnish Transport and Communications Agency (Traficom) ensures that:

VR Group includes evacuation training in its engine driver training program. [2021-S2]

2021-S3 Passenger safety on Dm12 rolling stock (ERA FI-6270/3)

If the train driver is incapacitated or the train has more than one car, passengers must be able to exit the train quickly on their own initiative in the event of a fire or other accident. The rail bus's safety lights do not function if the batteries are damaged, and the instructions for opening the doors are difficult to understand.

The Safety Investigation Authority recommends that the Finnish Transport and Communications Agency (Traficom) ensures that:

VR Group replaces the emergency opening instruction decals and ensure the functioning of safety lights on rail buses. [2021-S3]

2021-S4 Use of location signs in the emergency call (ERA FI-6270/4)

A study commissioned by the Finnish Transport Infrastructure Agency on the use of location signs included a risk assessment of their impact on other parties. The impact on the ability of Emergency Response Centres to locate the scenes of accidents was not assessed.

The Safety Investigation Authority recommends that the Finnish Transport and Communications Agency (Traficom) ensures that:

The Finnish Transport Infrastructure Agency agrees with the Emergency Response Centre Administration on the use of location signs in railway emergency calls. [2021-S4]

Changes in implementation statuses of previous recommendations during 2021 and actions taken by the addressees

1. **Recommendation number: R2012-01/S327 (ERA FI-1326 REC-000131)**

Recommendation: The railway yard work instructions should be developed in order to take account of all situations arising from normal work. Safety-critical instructions should be presented as a checklist.
Issued in investigation: R2012-01, Derailment of two freight train wagons in Kouvola railway yard, Finland on 14 January 2012
Previous status: Partly implemented
New Status in 2021: Implemented
Description on implementation:
The Finnish Transport Infrastructure Agency has further refined its guideline on safety rules for train traffic and shunting (Junaliikenteen ja vaihtotyön turvallisuussäännöt, Jt). A risk assessment for railway yards with several operators was realised in 2021. The risk assessment did not identify the Finnish Transport Infrastructure Agency's role in providing special work instructions. Rail operators regularly update their own operating instructions using the same cycle as the Jt guideline of the Finnish Transport Infrastructure Agency.

2. **Recommendation number: R2013-02/S345 (ERA FI-2950 REC-000462)**

Recommendation: The Finnish Transport Agency will ensure that contracts include a separate and sufficient timeframe for planning trackwork and clarifying responsibilities before trackwork is begun.
Issued in investigation: R2013-02, Collision of a freight train with an excavator on the Pännäinen–Kolppi section, Finland, on 7 November 2013 and other occurrences and incidents in 2013
Previous status: Under implementation
New Status in 2021: Implemented
Description on implementation: The Finnish Transport Infrastructure Agency has taken this into account in an update of its procurement instructions. The matter is described in Section UO 8.3.1, Working hours.

3. **Recommendation number: R2013-02/S346 (ERA FI-2950 REC-000463 and ERA FI-5386 REC-000395)**

Recommendation: The Finnish Transport Agency will increase the field monitoring of trackwork safety regulations by allocating appropriate resources for such work.
Issued in investigation: R2013-02, Collision of a freight train with an excavator on the Pännäinen–Kolppi section, Finland, on 7 November 2013 and other occurrences and incidents in 2013
Previous status: Under implementation
New Status in 2021: Partly Implemented
Description on implementation: The Finnish Transport Infrastructure Agency's project manual has been transferred to the maintenance phase. The manual is being regularly updated. The Finnish Transport Infrastructure Agency has also compiled a summary of measures, Kohti turvallisempaa ja sujuvampaa työtä (Towards safer and more fluent working) to ensure a coherent approach to safety. The measures will be promoted within the framework provided by the available resources and decision-making processes.
The Finnish Transport Infrastructure Agency has developed safety coordinator training in a manner that emphasises the role of the coordinator. Furthermore, the processing of human and organisational factors (HOF) has been boosted. Developer consultants have been given instructions on matters such as the use of procurement instructions.

4. **Recommendation number: 2016-S27 (ERA FI-4998 REC-000430)**
Recommendation: The Finnish Transport Agency shall renew the instructions on cable marking and adapt the cable marking request form so that the purchaser must comment on the protective measures to be used in the work.
Issued in investigation: R2016-01, Train collision with a person working on the track in Uimaharju on 3 February 2016
Previous status: Partly implemented
New Status in 2021: Implemented
Description on implementation: The Finnish Transport Infrastructure Agency has renewed the form used for cable survey requests.

5. **Recommendation number: 2017-S9 (ERA FI-5111 REC-000125)**
Recommendation: Infrastructure managers should modernise buffer stops on tracks where shunting work is done related to the transport of dangerous goods.
Issued in investigation: R2016-03 Collision of tank wagons with buffer stop during shunting in Mussalo, Kotka, on 8 July 2016
Previous status: Partly implemented
New Status in 2021: Implemented
Description on implementation: In the case of the state rail network, the Finnish Transport Infrastructure Agency has surveyed rail barriers in VAK railway yards and on VAK tracks, as well as their condition. Most rail barriers in poor condition have been replaced. The work will continue within the limits set by funding. In the case of private tracks, the matter is, as a general rule, taken into account as part of normal railway maintenance.

6. **Recommendation number: 2017-S22 (ERA FI-5157 REC-000172)**
Recommendation: Helsinki City Transport and the safety device supplier should investigate and analyse the requirements relating to the operational safety of the metro railway system thoroughly in order to avoid potential faults being carried across to the next system in the course of the current safety device revision.
Issued in investigation: R2016-04 Collision of metro trains in Itäkeskus, Helsinki, on 27 July 2016
Previous status: Under implementation
New Status in 2021: Partly implemented
Description on implementation: Signaling requirements of the metro system have been taken into account. Development measures are in progress at different levels and with different schedules. The matter is an integral part of the planning tasks included in the project package for increasing the capacity of the metro (METKA), in which special attention is paid to matters such as requirements and risk management.

7. **Recommendation number: 2017-S28 (ERA FI-5158 REC-000187)**
Recommendation: The Finnish Transport Agency should restrict trains running on tracks that are not under technical centralised traffic control.
Issued in investigation: R2016-06 Collision of a freight train with wagons standing on the tracks in the Oulu freight yard on 13 August 2016
Previous status: Partly implemented
New Status in 2021: Not to be implemented
Description on implementation: A recommendation is implemented in a different manner. All tracks used for train service will be equipped with safety devices. For example, all old safety devices at the Oulu railway yard will be replaced, also enabling the future deployment of the ERTMS system. The implementation will take place between 2020 and 2023.

Existing mechanical traffic control and safety devices at the Joensuu railway yard will be replaced with a modern computer-based system while changing the track model and the railway engineering structure to form a functional railway yard that will serve the current traffic. The implementation will take place between 2020 and 2023.
A renovation of the safety devices at the Kuopio railway yard will be completed in the autumn of 2024. At that time, the new safety devices will be commissioned in the entire railway yard, and railway yard traffic control will cease.
Almost all safety devices in Kotka (Kotolahti, Mussalo, Hovinsaari and Kotka station) will be replaced between 2020 and 2023.
Further construction will take place at Kotolahti in Kotka. A track plan for Imatrankoski is underway.

8. Recommendation number: 2018-S1 (ERA FI-5386 REC-000383)
Recommendation: Already at the competitive tendering phase for the project, the Finnish Transport Agency should require each main contractor participating in track projects to have its own safety management system that takes the special characteristics of the companies and work sites into consideration and include monitoring of the realisation of these systems as part of its auditing process.
Issued in investigation: R2017-01 Runaway of a maintenance machine in Ylivieska, Finland, on 28 June 2017
Previous status: Partly implemented
New Status in 2021: Under implementation
Description on implementation: The Finnish Transport Infrastructure Agency will survey the need for and effectiveness of service provider safety management systems in 2022.

9. Recommendation number: 2018-S15 (ERA FI-5532 REC-000399)
Recommendation: Training institutions in the railway sector include simulator training in the training programme for shunting foremen.
Issued in investigation: R2017-02 Collision between shunting unit and wagons standing on the tracks at Kouvola on 21 September 2017
Previous status: Partly implemented
New Status in 2021: Implemented
Description on implementation: Kouvolan Rautatie- ja Aikuiskoulutus Oy (KRAO) has acquired a radio control simulator for training use. The simulator was taken into use on 1 August 2021.

10. Recommendation number: 2018-S19 (ERA FI-5532 REC-000405)
Recommendation: The Emergency Response Centre add numbered emergency service routes for railway yards to its system, and emergency duty officers be instructed to locate the accident site primarily through such routes.
Issued in investigation: R2017-02 Collision between shunting unit and wagons standing on the tracks at Kouvola on 21 September 2017
Previous status: Under implementation
New Status in 2021: Not to be implemented
Description on implementation: The recommendation cannot be implemented as such, because the Emergency Response Centre Agency is unable to add roads to the map. It is hoped that roads could be included in the data of the National Land Survey of Finland as well as Digiroad, in which case they would be transferred to the topographic bases of the emergency response system four times per year. The Emergency Response Centre Agency is not a party guiding the operations of rescue authorities or any other authorities. Instead, the authorities move to sites on their own using their own systems as an aid. Emergency access roads should be taken into account in plans stored in field systems, for example. The field

control system has evolved, and within a few years, vehicles will have better data available to pinpoint the correct location.

11. Recommendation number: 2018-S20 (ERA FI-5479 REC-000407)
Recommendation: The Finnish Defence Forces develop the risk assessment of exercises in order to identify the actual risks and name those which are identified.
Issued in investigation: R2017-03 Level crossing accident which led to four deaths at Raasepori on 26 October 2017
Previous status: Under implementation
New Status in 2021: Partly Implemented
Description on implementation: Part of the development work is already completed and part of it is still ongoing. The Finnish Defence Forces acquired an information system required as a uniform and systematic tool for dynamic risk management in 2020. Commissioning of the system and related training will take place in 2022. Training on risk management materials for occupational and in-service safety (TPT) focuses on providing guidance on carrying out a risk assessment on the activity under consideration in such a manner that risks are identified at the right level in a timely manner and the risk management measures are effective. Content on TPT risk management has been added and specified in the teaching for students aiming at a basic officer's degree (cadets; bachelor's and master's studies in military sciences). TPT risk management training during the continuing education of the personnel of the Finnish Defence Forces has been developed since 2019. The Finnish Defence Forces have realised a programme called Training 2020 (Koulutus 2020), developing the conscription system, service selection, training methods and the training system as a whole. Risk management was selected as one of the programme's special development targets. Reporting to offer a snapshot of the current status to be used in the development of TPT risk management is being continuously developed. For example, reminders on taking the road conditions into account in risk assessments are issued regularly.

12. Recommendation number: 2018-S21 (ERA FI-5479 REC-000408)
Recommendation: The Finnish Transport Agency and the Finnish Transport Safety Agency ensure that resources are allocated to improving the safety of, or removing, the most dangerous level crossings.
Issued in investigation: R2017-03 Level crossing accident which led to four deaths at Raasepori on 26 October 2017
Previous status: Partly implemented
New Status in 2021: Implemented
Description on implementation: The Finnish Transport Infrastructure Agency is implementing a level crossing safety improvement programme that will improve the safety of some 450 level crossings. In addition, the use of more affordable level crossing systems will be developed and extended further.

13. Recommendation number: 2018-S22 (ERA FI-5479 REC-000409)
Recommendation: The Finnish Defence Forces develop seatbelts in cargo space seating modules so that they are easier to use and enhance their monitoring of the use of seatbelts.
Issued in investigation: R2017-03 Level crossing accident which led to four deaths at Raasepori on 26 October 2017
Previous status: Partly implemented
New Status in 2021: Implemented
Description on implementation: The development work has been performed under constant supervision, and changes will be made as necessary. With regard to training and supervision on the use of safety belts, the Finnish Defence Forces specified the instructions, training and supervision on the use of seats in cargo spaces immediately after the accident

(AO10607/1 June 2018). The order obliges to ensure the competence of persons training conscripts and military drivers. The training for conscripts is included in the traffic safety training ("Toiminta puolustusvoimien henkilökuljetuksissa"), and it is realised by the staff. To support the training, a short film on transporting personnel in a military truck ("Henkilökuljetus maastokuorma-autolla") was published. It illustrates the use of safety belts. In 2020, the Finnish Defence Forces specified and clarified the instructions on passenger transport training with an order (AQ24202/30 December 2020), which provided detailed instructions on the content and implementation of the training and further developed the monitoring of the use of seat belts in passenger transport. The above-mentioned guidelines and orders will be further specified and then included in the traffic safety order of the Finnish Defence Forces, which is currently being updated. The Ministry of Defence is currently preparing a new act on military vehicles, and its content and publication date will affect the traffic safety order and its publication date.
To improve the use of seat belts, the Finnish Defence Forces have studied the possibility to further develop the performance of seat belts for seats in cargo spaces with new technical solutions. The Finnish Defence Forces have tested the structural feasibility of the new seat belt type with field tests in several military units. On the basis of the test results and an analysis thereof, the Finnish Defence Forces made a decision (AQ20313/30 November 2020) on the technical solution.

14. Recommendation number: 2019-S42 (ERA FI-5869 REC-000379)
Recommendation: In its track projects, the Finnish Transport and Infrastructure Agency shall prepare a plan and a timetable for the correction of the risks identified at level crossings. It must not be possible to transfer the risks into the future as residual risks.
Issued in investigation: R2018-02 Level crossing accident in Kemijärvi on 12 December 2018
Previous status: Under implementation
New Status in 2021: Implemented
Description on implementation: The Finnish Transport Infrastructure Agency has recognised that requirements memoranda prepared on a track section basis are not sufficient to describe the overall need for removing or improving level crossings, which is why they must be accompanied by track section-specific or sufficiently extensive plans at the planning phase of renovation or development projects.

15. Recommendation number: 2020-S24 (ERA FI-6148 REC-000590)
Recommendation: The Finnish Transport Infrastructure Agency harmonizes the location instructions for the railway network so that location markers are used in addition to the track elements in the voice communications between centralized traffic control and the trackwork supervisor, if necessary.
Issued in investigation: R2019-01 Collision of a freight train with a trackwork machine between Puhos and Kesälahti on 9 December 2019
Previous status: Under implementation
New Status in 2021: Implemented
Description on implementation: Implementation of the RUMA application and the correct procedures were focus areas in 2021. Development of the safety of trackwork (incl. locating models) are part of the continuous improvement and one of the key safety development areas of the Finnish Transport Infrastructure Agency.
In 2021, the Finnish Transport Infrastructure Agency prepared a transfer to electronic communications in the requesting, issuance and closing of trackwork permits. The work was done in connection with an update of the track maintenance safety instructions (Radanpidon turvallisuusohjeet, RUMA) in collaboration with Fintraffic Raide Oy. Fintraffic Raide's RUMA system

is also being developed in many ways in this connection. The use of voice communications in the requesting of trackwork permits is largely being phased out.
Confirming the location of trackwork based on terrain elements in a key issue. It is of utmost importance for the trackwork supervisor and the other persons participating in the work when pinpointing the trackwork and determining the trackwork area.
Fintraffic Raide is developing a feature for the RUMA application to warn the user if their position differs significantly from the trackwork area. The plan is to introduce this and other important features at the beginning of 2023. Furthermore, the Finnish Transport Infrastructure Agency realised a pilot project to enable accurate locating of trackwork in 2021. In addition to the procurement of equipment, accurate pinpointing requires comprehensive development of the geospatial data for the track infrastructure. Furthermore, it has been agreed that in future, the track master data will be stored in the Finnish Transport Infrastructure Agency's RATKO system from where the data will be retrieved to the systems of both the Finnish Transport Infrastructure Agency and Fintraffic to ensure consistency of the track data.

16. Recommendation number: 2020-S28 (ERA FI-6347 REC-000665)
Recommendation: Infrastructure managers improve the lighting of railway yards with modern technology**.**
Issued in investigation: R2019-S1 Theme investigation of shunting accidents and incidents
Previous status: Partly implemented
New Status in 2021: Implemented
Description on implementation: In the state rail network, monitoring to ensure systematic improvement of railway yard lighting systems will be developed. The Finnish Transport Infrastructure Agency has methods to receive feedback on lighting development needs. Lighting systems will be improved in connection with railway yard projects and through separate lighting projects. The Finnish Transport Infrastructure Agency's guidelines on lighting are up to date. In the case of private tracks, the matter is, as a general rule, taken into account as part of normal railway maintenance.

17. Recommendation number: 2020-S29 (ERA FI-6347 REC-000666)
Recommendation: Railway operators improve the lights of locomotives used for shunting with modern technology.
Issued in investigation: R2019-S1 Theme investigation of shunting accidents and incidents
Previous status: Partly implemented
New Status in 2021: Implemented
Description on implementation: The recommendation has been realised by taking into account lighting when acquiring new stock and modifying the old stock. For example, the plan is to equip 30 units from the VR-Group Plc's Dv12 locomotive stock with LED floodlights. The floodlights can also be used during shunting, which will significantly improve the field of vision. Four locomotives will be thus equipped by the end of the year (2022). Some of the Dv12/Dr14 locomotives are also equipped with "port lights" that shine a yellow light sideways. There are similar lights in the entire Sr3 electric locomotive stock and the Dr19 locomotive stock. The locomotives used by Operail Finland Oy are new and have lights enabled by the latest technology. In addition, the Dr21 has lights in the steps, which also improve the safety of working.

18. Recommendation number: 2020-S30 (ERA FI-6347 REC-000667)
Recommendation: The Finnish Transport Infrastructure Agency reviews track signs and ensure their visibility and unambiguity.
Issued in investigation: R2019-S1 Theme investigation of shunting accidents and incidents
Previous status: Under implementation
New Status in 2021: Implemented

Description on implementation: Updated Part 17 of the Finnish Transport Infrastructure Agency's railway engineering guidelines (Ratatekniset ohjeet, RATO) will be published on 1 June 2022, at which time the black-and-white switch signal will be reintroduced. The amendment of the guideline was preceded by testing of the black-and-white signals in Oulu in 2021.

19. Recommendation number: 2020-S31 (ERA FI-6347 REC-000668)
Recommendation: The Finnish Transport and Communications Agency develops its safety deviation information system so that it can be used to follow the processing of deviations. Furthermore, the Finnish Transport and Communications Agency ensures that all operators in the railway industry have functional deviation management processes.
Issued in investigation: R2019-S1 Theme investigation of shunting accidents and incidents
Previous status: Under implementation
New Status in 2021: Partly implemented
Description on implementation: Safety deviation reporting systems are being developed in both the EU and at the national level. Instead, reacting to and monitoring of deviation reports has been discussed in the rail traffic network of human and organisational factors (HOF) and in connection with the safety culture. The development of an actual system is not to be expected in the EU or at the national level in the near future.

20. Recommendation number: 2020-S32 (ERA FI-647 REC-000669)
Recommendation: The Finnish Transport Infrastructure Agency assumes overall responsibility for shunting work instructions in Finland by supplementing the Train Traffic and Shunting Safety Guidelines document in this regard. Operators can only be permitted to have supplementary local guidelines drawn up in cooperation with other operators.
Issued in investigation: R2019-S1 Theme investigation of shunting accidents and incidents
Previous status: Under implementation
New Status in 2021: Implemented
Description on implementation: The Finnish Transport Infrastructure Agency has updated the guideline on safety rules for train traffic and shunting (Junaliikenteen ja vaihtotyön turvallisuussäännöt, Jt; valid as of 1 June 2021). The update also aimed to take into account a recommendation from the Safety Investigation Authority.
The 2021 risk assessment on railway yards with several operators has been completed. The results did not provide any further development measures regarding the guidelines.

21. Recommendation number: 2020-S33 (ERA FI-6347 REC-000670)
Recommendation: The Finnish Transport Infrastructure Agency and railway operators improve the interoperability and usability of their information systems.
Issued in investigation: R2019-S1 Theme investigation of shunting accidents and incidents
Previous status: Under implementation
New Status in 2021: Implemented
Description on implementation: The compatibility of information systems is being continuously developed. In future, track master data will be stored in the Finnish Transport Infrastructure Agency's RATKO system from where the data will be retrieved to the systems of both the Finnish Transport Infrastructure Agency and Fintraffic to ensure consistency of the track data. The SAAGA system and a new capacity controller feature are currently in use at the Helsinki and Ilmala railway yards. A plan on expanding the nationwide railway yard capacity control model is currently being prepared. The plan and the related schedule will be completed by the end of 2022. The plan is to use SAAGA to improve the snapshot of the current status of the railway yards.

22. Recommendation number: 2021-S1 (ERA FI-6270/1)
Recommendation: The European Union Agency for Railways add requirements on protection against side collisions to regulations on diesel trains.
Issued in investigation: R2020-01 Level crossing accident at the Kulmala level crossing in Mänttä-Vilppula on 14 May 2020.
Previous status: Issued
New Status in 2021: Under implementation
Description on implementation: No answer to recommendation received from addressee.

23. Recommendation number: 2021-S2 (ERA FI-6270/2)
Recommendation: VR Group includes evacuation training in its engine driver training program
Issued in investigation: R2020-01 Level crossing accident at the Kulmala level crossing in Mänttä-Vilppula on 14 May 2020
Previous status: Under implementation
New Status in 2021: Implemented
Description on implementation: VR-Group Plc has created an evacuation training programme for Dm12 engineers. It also includes a practical exercise. The training was completed in 2021. Competence was verified as part of the practical training. To support the training, an online course for engineers on evacuation has also been prepared. New emergency procedure cards in three languages have been added to the cabs, and instructions on how to open the doors in case of emergency have been updated. VR passenger service division updated the risk assessment relating to the amended procedures in June 2021.

24. Recommendation number: 2021-S3 (ERA FI-6270/3)
Recommendation: VR Group replaces the emergency opening instruction decals and ensure the functioning of safety lights on rail buses
Issued in investigation: R2020-01 Level crossing accident at the Kulmala level crossing in Mänttä-Vilppula on 14 May 2020
Previous status: Under implementation
New Status in 2021: Implemented
Description on implementation: VR-Group passenger service division has initiated measures to renew the emergency opening instruction stickers on the doors of the Dm12 stock. The new emergency opening instructions were installed in the stock by the end of 2021. Other guide signs in the railbuses were also simultaneously updated.
VR passenger services has also launched measures to explore the technical possibilities to ensure proper functioning of the emergency lights in case of an accident. Engineers are instructed to use a LED head lamp that is included in their personal equipment during evacuation after an accident so that they will have their hands free.

25. Recommendation number: 2021-S4 FI-6270/4)
Recommendation: The Finnish Transport Infrastructure Agency agrees with the Emergency Response Centre Administration on the use of location signs in railway emergency calls
Issued in investigation: R2020-01 Level crossing accident at the Kulmala level crossing in Mänttä-Vilppula on 14 May 2020
Previous status: Under implementation
New Status in 2021: Implemented
Description on implementation: The Finnish Transport Infrastructure Agency has provided the Emergency Response Centre Agency with the location and names of positioning signs, kilometre markers, stops and buildings, as well as updates and revisions to the location and names of level crossings. Currently, track kilometres, level crossings, railway stations and stops are manually maintained in the Emergency Response Centre Agency data system as

"target or location data". During spring 2021, the level crossings in the Emergency Response Centre Agency’s data system were updated to reflect the Finnish Transport Infrastructure Agency’s data. A caller is pinpointed using GPS data provided by the AML (Advanced Mobile Location) technology and the 112 Suomi app, as well as by using traditional emergency positioning. The location is also verified from the caller themselves whenever possible, however. Assignments outside population centres are assigned to the units of the authorities using the coordinate data generated by the system. At present, location signs are not very useful in the pinpointing of emergencies, but they may be useful in some cases.