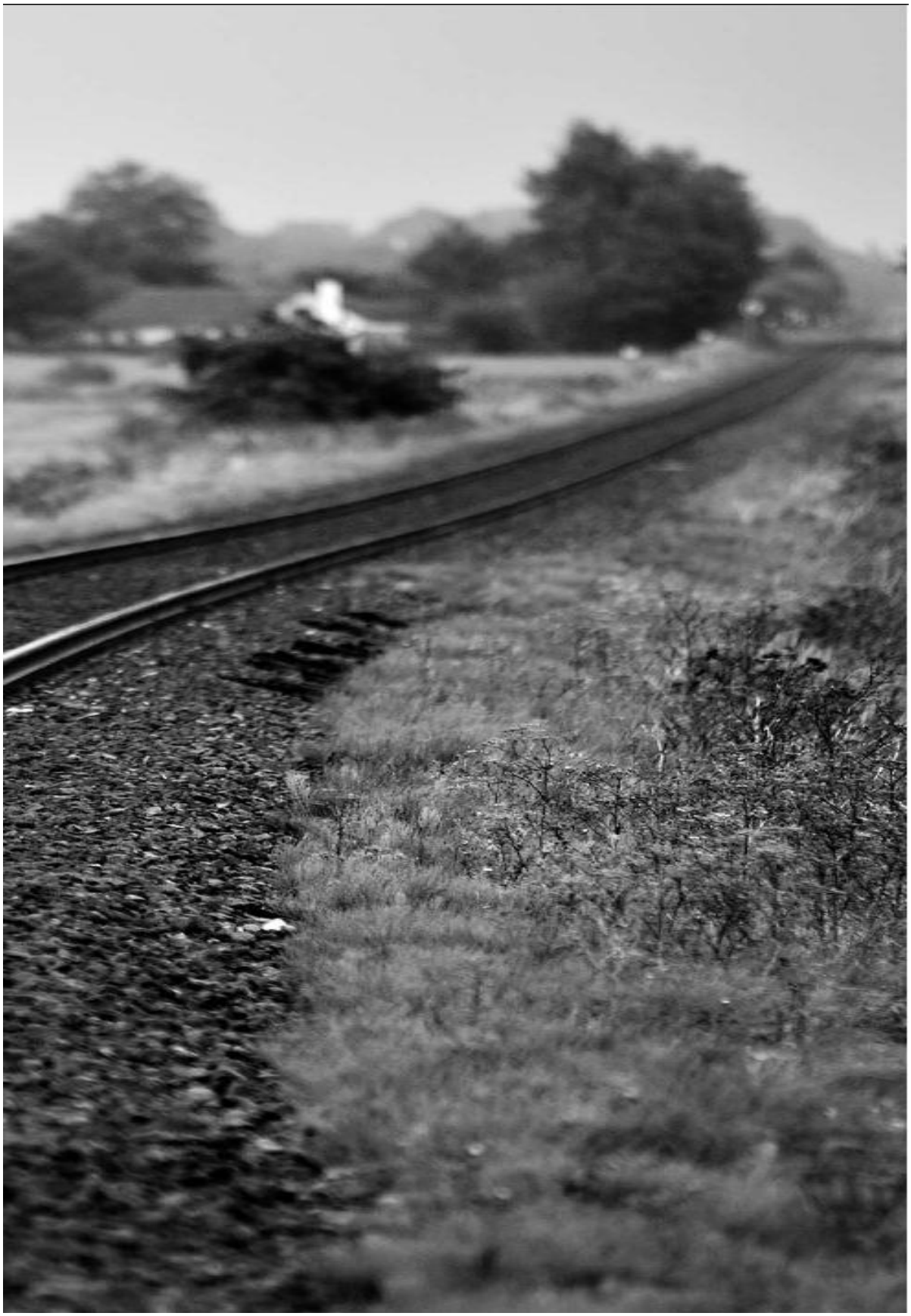
Trafikstyrelsen
for jernbane og færger

National Rail Authority

Railway Safety Report 2006

September 2007



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Summary

The Railway Safety Report is an annual report that gives an account of developments in railway safety and describes significant trends that have an impact on railway safety.

The Railway Safety Report 2006 assesses some of the substantial structural changes made this year to implement the Railway Safety Directive. The Directive came into force under Executive Order No. 38 on the implementation of the Railway Safety Directive, and is of great importance for the railways sector with regard to the sector's organisation, methods and instruments for working with railway safety. Among other things, the Railway Safety Directive sets out a requirement for an annual report from both the National Rail Authority (NRA) and the safety authority, the Danish Accident Investigation Board (AIB), as the investigative unit and every single railway undertaking and infrastructure manager.

The annual report by the safety authority contains a status report on implementation and development within the individual elements of the Railway Safety Directive. Evaluating railway safety legislation, analysing statistical data for the "Safety Indicators", developing safety certification and safety authorisations, and supervision are the central themes of the Railway Safety Report. Through the analyses and evaluations carried out in the Safety Report, it is possible to use these experiences to ensure a continuously high level of safety on Danish railways.

Amendments to legislation and following up NRA tasks

In 2006, international developments have had a great impact on the amendments made to Danish laws and regulations on railway safety. As has been mentioned, the Railway Safety Directive has been implemented and consequently, among other things, two new executive orders have been drafted: one on safety certification for railway undertakings and one on safety authorisation for infrastructure managers.

The Railway Safety Directive (Article 16) states that the NRA, as the safety authority, is directly responsible for safety and must therefore be notified of safety at railway undertakings and infrastructure managers. The powers of the safety authority include issuing permits for bringing into use and checking that the railway is operated and maintained in accordance with relevant requirements, and that rolling stock is duly registered. The safety authority supervises railway undertakings and infrastructure managers, issues updates and revokes safety certificates and safety authorisations, and checks that the requirements are met. At the same time, it is also the duty of the safety authority to monitor, promote, strengthen and develop the safety regulatory framework.

The 2006 amendments to the Executive Order on the duties and powers of the NRA (the Delegation Executive Order) mean that Technical Specifications for Interoperability (TSIs) are implemented for the railway by way of provisions and are issued by the Director of the NRA. The first four TSIs entered into force in 2006, including the very important TSI for train control and signals, which requires that a Danish implementation plan be prepared for introducing the European train control system.

Accidents and incidents

There were three serious railway accidents in 2006, of which the fire in the tunnel under the Great Belt was considered to be the most serious. The accident resulted in injuries to the staff involved, and comprehensive damage to the work vehicle, permanent way and tunnel bore involved. After the accident, operations with the tunnel bore involved were halted for ten days, after an order from the NRA for more detailed documentation about the impact of the damage on safety in the tunnel. It may be noted that there has been an increase in the number of accidents involving fire in 2006, but the NRA feels that there are far fewer accidents overall and that there is no general picture of the reasons for these arising. The other serious accidents in 2006 were, respectively, a derailment and a train collision, both of which occurred in shunting areas at low speed and which did not result in human injury but in extensive material damage.

The total number of accidents in 2006 was 94, which, as a relative number of accidents, equates to 1.17 accidents per million train kilometres. The running five-year average rate demonstrates a falling trend in the number of accidents: from 1.5 accidents per million train kilometres in 2002 to 1.08 in 2006. There is always an annual variation in the distribution between accident types, and this gives a smaller increase in the number of train collisions, accidents at level crossings, fires and other accidents in 2006. Particular attention should be paid to the growth in the number of accidents at railway level crossings. There is a significant increase from six accidents in 2005 to 11 accidents in 2006. This category also includes, among other things, accidents related to current traction equipment and vandalism.

Accidents in which people are struck by trains are the most significant type of accident on the railways, and this is in line with the results from previous years, although it can be seen that there has been a reduction in 2006 in terms of the running five-year average. There has likewise been a reduction in train derailments in comparison with 2005, when the number was rising.

With regard to the trend for the number of incidents that do not result in injuries, it may be noted that there has been an increase in the number of danger signals being passed in 2006, equating to 6.3 incidents per million train kilometres. The industry has made a joint decision to carry out an analysis of the conditions present when danger signals were passed in 2006, and has already implemented some of the proposals that have been made to solve the problems.

Personal injuries

There was a fall in the total number of serious personal injuries in 2006, and the make-up of the running five-year average also demonstrates a falling trend. The 2001 level was 0.4, falling to 0.3 serious personal injuries per million train kilometres in 2006. In total, 24 serious injuries were recorded in 2006 (excluding suicides), and accidents to persons were the cause of 16 of these. There are some cases of passengers and staff being seriously injured in accidents to persons where there is a collision with a train but, on the other hand, two-thirds of these cases are for other reasons, often including trespassers on railway premises. Of the 24 serious personal injuries in 2006, five came under the category of accidents at level crossings, one under fire and two under other accidents.

The risk of being involved in a railway accident is assessed by considering the distribution of serious personal injuries for different groups of people. The risk is low for railway staff, at 0.03 serious accidents per million train kilometres when the five-year running average is considered, and the trend has been stable in recent years. The five-year average for the passenger and level-crossing user groups is 0.05 serious personal injuries per million train km in 2006, in contrast with which the group for other people has about 0.2 serious personal injuries per million train km.

If the trend over a number of years is considered, there has clearly been a fall in the extent of serious personal injuries to passengers and others, but an increase for level-crossing users during the period 2001-2006. The Danish Road Directorate, which is responsible for level crossings, is aware of the problem concerning safety, and has therefore entered into a partnership with the relevant infrastructure managers.

Safety target

The safety target for passengers is set at 1.75 serious personal injuries per million person kilometres. The number fell in 2006 in comparison with the previous year, and the safety target was met, both for 2006 and for the five-year average, the latter being 1.0 serious personal injuries per million passenger kilometres.

The target for staff is 0.7 serious personal injuries per 10 million train kilometres. In 2006, there was an increase in the number of serious injuries to staff in comparison with the previous year. The stated risk in 2006 was 0.5 serious personal injuries per 10 million train kilometres, which is higher than the running five-year average of 0.3 for the period 2001-2006.

The number of serious personal injuries gives rise to socio-economic costs of approx. DKK 331 million for all the injuries that occurred in 2006, including suicides. Excluding suicides, the costs are DKK 165 million, or a cost of approx. DKK 2 million per train kilometre on the railways.

European accident statistics

Denmark maintains a high level of safety in comparison with other European countries. The latest accident statistics, for 2005, show that Denmark has 1.15 accidents per million train kilometres, whereas the average for the EU as a whole is 1.83 accidents per million train kilometres. It should be noted that there are still great differences in the appraisal methods between countries. For example, Denmark reports accidents involving damage of over EUR 10 000, whereas most other countries report damage of over EUR 150 000.

If the number of people killed in railway accidents is considered instead, Denmark has approx. 0.31 people killed per million train kilometres, which is more or less on a par with the countries with which Denmark usually compares itself, and slightly under the EU average of 0.38 per million train kilometres.

The group “other people” constitutes the majority of the total number killed in railway accidents, rather than passengers and staff, who constitute a very small group. Accidents to persons that are caused by rolling stock in motion and accidents at level crossings together account for 95% of all those killed on the railways, which is consistent with the national trend in Denmark.

Certification and supervision

In 2006, the NRA received five applications for certification and re-certification, which resulted in the following railway undertakings being issued with new safety certificates:

– DSB S-tog A/S
– A/S Hads-Ning Jernbane (The Odder Line)
– Railion Danmark A/S
– Vemb-Lemvig-Thyborøn Jernbane A/S
– Hector Rail AB.

The latter is a new railway undertaking which was issued with a safety certificate to provide freight transport and haulage of dangerous goods. No safety certificates were issued to railway infrastructure managers in 2006. At the beginning of 2007, new rules on safety certification and safety authorisation will be brought in, and these will impose specific requirements for an undertaking to use a safety management system to control safety on the railways.

Supervision

The NRA has carried out 33 inspections, of which 21 were scheduled inspections under the 2006 supervision plan, and 12 were not scheduled but were so-called "special inspections", carried out in light of specific circumstances. In relation to the supervision plan, three of the scheduled inspections were postponed to the beginning of 2007. 18 inspections were carried out for railway infrastructure managers, and 15 for railway undertakings, of which five inspections were carried out in connection with certification.

In 2006, the NRA focused on how the undertakings deal with scheduled inspections/maintenance with regard to both rolling stock and infrastructure, and how the undertakings deal with the faults found during inspections and maintenance. In connection with its supervisory activities in 2006, the NRA recorded a total of 2 bans, 19 orders and 47 non-conformities. Most of these related to maintenance/inspections, deficiencies in employee competences, and companies that did not plan and/or carry out adequate internal supervision.

Safety reports

For the first time, railway undertakings and infrastructure managers have had to submit an annual safety report for the area covered by the safety certificate. Many of the reports were not submitted in time, and do not meet the requirements laid down regarding which topics should be addressed.

The NRA feels that safety reports which include assessments of trends and reasons for safety failures as well as an analysis of their own supervision efforts are the most suitable for use in the undertaking's further work to improve railway safety. The NRA will continue to work to provide guidance on the preparation of safety reports, and will, among other things, follow up the year's reports by carrying out inspections of the relevant railway undertakings and infrastructure managers.

Safety indicators

In accordance with the requirements, the annual safety report by the NRA must include an account of developments in the five common safety indicator groups (CSIs): Number of Accidents; Number of Incidents and Dangerous Situations; Consequences of Accidents; Technical Safety (relating to technical safety systems) and Safety Management. These factors are evaluated annually by railway undertakings and infrastructure managers relative to the actual traffic volume, and it is expected that they provide sufficient information for assessing the general level of safety on the railways.

In the areas of "technical safety", "safety management" and "consequences of accidents", it has not been possible to calculate the safety indicators for 2006 as intended. The NRA finds that the necessary data is either not available or the assessment and calculation methods are not developed sufficiently for a usable appraisal to be made. The NRA feels that it may be several years before the recording and calculation methods are well developed enough for it to be possible to carry out precise appraisals. The final definitions of CSIs will be laid down by the European Railway Agency (ERA) in April 2009, and it is therefore inevitable that there will be some uncertainty regarding the reporting in the first few years.

Introduction

The objective of the Railway Safety Report 2006 is to outline developments in safety on the Danish railways.

The Railway Safety Report is an annual report by the NRA, which is the safety authority for the Danish railways sector. The report must give an account of safety conditions on the Danish railways. It is about rendering visible the good, appropriate developments taking place in the Danish railways sector. At the same time, it is important to point out any problem areas that might require particular attention in planning where further efforts are needed in future.

Coverage of safety conditions in previous years has shown that safety is at a high level on Danish railways, both in comparison with other modes of transport and also in relation to railway safety in other Scandinavian countries. The policy objective is that Denmark should maintain this high level of safety.

The railways sector will face a large number of challenges in the years ahead in relation to planned maintenance work and renewed projects on many stretches of track. The report may and should be used to identify trends that could be significant for the safety conditions of railway undertakings and infrastructure managers. New technology might be implemented, or amendments might be made to laws and regulations, organisation, etc., which could have an impact on safety. This knowledge is a prerequisite for railway actors to be able to debate and exchange experience of the conditions that exist for maintaining safety on the railways.

Content and structure of the safety report

In 2006, the "Railway Safety Directive" was transposed into Danish law by Executive Order No. 38 of 23 January 2006. The Railway Safety Directive lays down a requirement that the NRA, as the safety authority for the railways sector, must publish a report each year with information on:

– the development of railway safety, including a complete account at Member State level of the CSIs laid down
– important changes in legislation and regulation concerning railway safety
– the development of safety certification and safety authorisation
– results of and experience relating to the supervision of infrastructure managers and railway undertakings.

The Railway Safety Report 2006 is structured so that it meets the requirements laid down in the executive order. The more detailed recommendations given by the European Railway Agency (ERA) relating to the structure of a safety report have meant that the NRA has chosen to include a number of other important factors in the report. The safety report starts with a general introduction to the railways sector and its actors. It also gives a general description of the Danish railway system and a presentation of the safety authority and its areas of responsibility.

It then gives a comprehensive review of the development of railway safety in 2006, with a description of important initiatives for maintaining and improving safety, including a status report on the technical authorisations awarded by the NRA. There is then a comprehensive analysis of developments in the number of accidents, incidents and personal injuries taking place on Danish railways.

The last part of the report contains three sections on, respectively, amendments to legislation and regulation, certification, and supervision of railway undertakings and infrastructure managers.

The report has comprehensive material in the Annexes, including background data, and the descriptions in the report itself provides an evaluation of the most important trends and analyses the data material.

The NRA chose make the report broader than required by the ERA's recommendations, by providing a general status report for all the activities of the safety authority, so the report also includes the following topics:

– Information on bringing infrastructure and rolling stock into use
– Approval of traffic rules and technical standards
– the development of personal certification and medical certificates

The report is used both nationally and internationally to exchange experiences regarding railway safety. The overall objective of the report is for actors, authorities and the general public to be in a position to follow the development of safety conditions on the railways, in parallel with the opening up of the international market for transport services. The European objective is to achieve full interoperability on the European railway network whilst at the same time maintaining a high level of safety on the railways.

Implementation of the Railway Safety Directive

Due to the sweeping reorganisation process aimed at greater interoperability on the railway network, it has been deemed necessary at European level to introduce risk management at several levels: in undertakings, at national level and at international level. The Railway Safety Directive was therefore drawn up with the intention of establishing standard methods for the evaluation of safety and the comparison of safety levels in different undertakings and countries.

The introduction of the Railway Safety Directive has set in motion some comprehensive work to develop common safety indicators (CSI), common safety methods (CSM) and common safety targets (CST). The first set of definitions for the common safety indicators will be published by the ERA in 2007, while a final decision laying down all the common safety indicators will not be made until 2009. The common safety methods and common safety targets will be laid down in subsequent years.

The ERA's recommendations place particular emphasis on the annual safety report discussing the development of the common safety indicators and the implementation of the elements contained in the Railway Safety Directive.

Common Safety Indicators is a term used for a number of measurable data that give information on safety conditions. The indicators are divided into five groups: Number of Accidents; Number of Incidents and Dangerous Situations; Consequences of Accidents; Technical Safety (relating to technical safety systems) and Safety Management. These are factors which are recorded by railway undertakings and infrastructure managers, and which are appraised annually in relation to the actual traffic volume achieved during the period in question.

Since the definitions of the common safety indicators have not been fully implemented, it will be a number of years before the necessary database is in place, thus providing a reliable basis for comparing the level of safety in the different Member States.

This safety report is an expression of how far we have come in this implementation process: the information on common safety indicators, which themselves constitute the basis for the report, is therefore not fully available today. These circumstances must therefore be borne in mind when considering the safety report.

Likewise, information on the issuing of safety certificates and safety authorisations in accordance with European standards is also irrelevant, since this work will not begin until 2007. Instead, it was decided that the report would present a status report on the implementation of the new rules, together with information on safety certification, cf. the rules in force in this field in 2006.

The safety report serves both as a report on the development of railway safety and as a presentation of the experience gleaned in connection with the implementation of new rules in the field of safety.

Data material

The Railway Safety Report contains analyses of accidents and incidents reported to the NRA's "Incident Database" by railway undertakings and railway infrastructure managers. The database only contains a limited amount of data for private and local railways prior to 2003, but it does contain all data for other railways in the appraisal period on which the report is based – from 1997 to 2006.

The incident database is designed so that, among other things, it is possible to report on the safety indicators mentioned in Executive Order No. 38. Not all railway undertakings and railway infrastructure managers have started recording data in accordance with a common procedure, so the data material is adapted for the structure used. This may give rise to some inaccuracy, but since almost everyone uses different recording methods it is also the only way of being able to perform a total analysis of all the data.

In order to reduce inaccuracies, all data is reviewed in a quality check where all categories of accidents and personal injuries are assessed and any errors are corrected. This year, the focus has particularly been on updating information on personal injuries and suicides in line with information from the national police. This means that corrections may be made to appraisals from previous years, primarily those concerning personal injuries and suicides.

A record is then made of accidents and incidents that have been reported several times by different sources. In this way, it becomes possible to prepare a national statistical summary in which the same accident does not appear several times.

The Railway Safety Report 2006 contains a detailed analysis of personal injuries, accidents and incidents. Relatively small amounts of data are worked with each year, which may give rise to considerable fluctuations in the statistics. Calculations of five-year running averages are therefore used for comparison with the annual statistics.

The Railways Sector in Denmark

This section offers an insight into the reorganisation process that the railways sector in Denmark is going through and a status report on the number of actors, together with a presentation of the NRA as the national safety authority. Finally, it outlines some important facts which describe the structure of railways in Denmark.

Reorganisation of the railways sector

In the period up until the 1990s, DSB handled all train, bus and ferry traffic operations as a state monopoly. By virtue of its administration by the state, DSB had extensive powers to operate, maintain, plan and implement improvements to infrastructure, set timetables and run train, bus and ferry operations itself, on behalf of the state.

At the beginning of the 1990s, the EU proposed to build a more competitive railways sector by opening up the market for international railway transport. The first railway package contains a number of provisions laying down framework conditions for opening up the market in the railways sector under equal, non-discriminatory terms, including opening up the railway infrastructure market of the Member States to international freight transport.

The Railway Inspectorate was established in 1996 as an independent railway authority, and subsequently became the National Railway Agency, separate from DSB, and with responsibility for infrastructure projects and as a railway infrastructure manager.

DSB was turned into an independent public company in 1998 and, in the years following this, it introduced a free market in freight traffic, a free market in passenger traffic and the transfer of private railways to the county councils in 2001. Experience from these developments has highlighted that continued liberalisation presupposes reorganisation of the institutions in the sector, so as to ensure a clear, unequivocal division of, respectively, regulation and production tasks in the sector.

The NRA was established in 2003, with the intention of bringing together all the general authority tasks for the railways sector. The EU's second railway package brought with it the requirement to establish an independent investigation unit and an independent safety authority. The decision was therefore made to abolish the Railway Inspectorate and instead to pass the authority tasks in the area of safety to the NRA, with the responsibility for investigating railway accidents being handed over to the Accident Investigation Board for Civil Aviation and Railways.

The second railway package aims to establish procedures for harmonising safety in the field of railways and to ensure the necessary progress for interoperability on European railways. The focal points of the second railway package are the Railway Safety Directive and the establishment of the European Railway Agency (ERA). The basic function of the ERA is to prepare proposals for more specific implementation of the Safety Directive and the Interoperability Directives, including the Technical Specifications for Interoperability (TSIs).

In Denmark at the end of 2006, there were a total of 12 railway infrastructure managers and 15 railway undertakings with a Danish safety certificate. It is expected that, in the years ahead, foreign undertakings will also have the opportunity to operate within the country's borders.

The National Rail Authority (NRA)

The NRA is the sector authority for public transport, working under the Ministry of Transport and Energy, and deals nationally and internationally with tasks relating to public transport, the transportation of freight by rail and organisation of public tenders for train and ferry transport services. The NRA is responsible for framework provisions, regulation and coordinating traffic among actors in the railways sector.

The NRA's **mission** is to create the right conditions for efficient, attractive, safe and sustainable public transport.

The NRA's **identity** and objective is to be the sector authority for public transport.

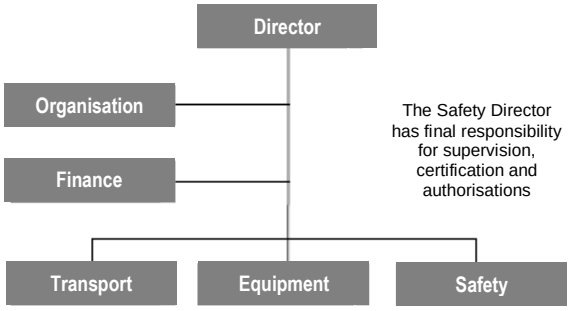
The National Rail Authority:
- creates framework provisions for an integrated public transport system
- advises the Ministry of Transport and Energy on transport policy and strategic topics
- coordinates plans and specific initiatives for improving public transport
- is the State's railway authority for planning, regulation, safety and interoperability
- is the State provider of train and ferry transport services.

The NRA's **vision** is that, through good collaboration at the political level with undertakings and other actors in the industry, the authority will work for cohesion and mobility in public transport with the greatest possible value to society.

See the links between the Ministry of Transport and Energy and other relevant authorities in Annex B.

The NRA has approx. 90 members of staff and is organised into a management group, three technical divisions: equipment, transport and safety, and the administrative functions of finance and organisation, as shown in the Figure below:

Figure 1. Organisation of the NRA



Organisation of the safety authority

The safety division functions as an independent safety authority, cf. the Delegation Executive Order [1], and is managed by a safety director who reports directly to the Ministry of Transport and Energy. With this organisation, the safety director is solely responsible for decisions in matters relating to safety, and this ensures the independence of the safety authority.

In total, 26 members of the NRA's staff are organised under the safety division. The division is split into three groups: Authorisations, Supervision and Certification, and Sector Safety Conditions.

As safety authority for the railways sector, it is the duty of the NRA to generate a coherent profile of the authority and to perform tasks cohesively, fulfilling the political desire for inclusive, balanced management of traffic and financial and safety conditions in the railways sector.

Authorisation
The authorisation group is charged with awarding technical authorisations in line with the safety requirements prescribed by national regulations and international interoperability directives and technical specifications (TSIs).
Authorisations must be awarded objectively and based on risk assessments.

The group awards authorisations in the areas of:
– Type authorisation and permission to bring infrastructure into use
– Type authorisation and permission to bring rolling stock into use
– Type authorisation and permission to bring other technical subsystems into use
– Authorisation of technical standards
– Authorisation of traffic rules.

When applying for authorisation of technical systems, the railway infrastructure manager or railway undertaking is responsible for submitting a safety plan and all relevant documentation demonstrating that the new or changed system meets the given safety requirements. The safety authority has increasingly requested that railway infrastructure managers and railway undertakings involve assessors in authorisation matters. This has benefited both compliance with schedules and decision-making with regards to complex, technical matters.

Technical standards and traffic rules with safety content must be approved by the NRA. It is the sole responsibility of the railway infrastructure manager or railway undertaking to have the standards, rules and guidelines authorised that are necessary for maintaining safety. It has been put to the NRA that it approve these standards and rules with a description of the change or addition made, as well as an assessment of their impact on safety.

Supervision and certification

The group for supervision and certification deals with matters relating to the undertakings' finances, organisation and competence to attend to safety conditions. This is done by authorising the basis for an undertaking's operations, and pursuing the development of railway safety with the aim of being able to take preventive action.

The group is responsible for:
– Permits to operate railway undertakings and infrastructure management
– Medical certificates and engine driver licences
– Authorisation of safety training for staff
– Supervision
– Certification of railway undertakings
– Authorisation of infrastructure managers
– Safety reports
– Following up accidents and incidents.

Railway undertakings and railway infrastructure managers must apply to the NRA for permission to operate their company and obtain a safety certificate or authorisation. The condition for obtaining permission is that the undertaking's financial and insurance status must meet the minimum requirements stipulated by law.

A safety certificate is obtained on the basis of documented adherence to the requirements for the company's safety management system and is renewed every five years, when the undertaking itself applies for a renewed authorisation or re-certification. This applies in the same way to staff who perform safety functions. Staff must always have a valid medical certificate, and engine drivers must also have a licence issued to be able to perform this function.

[1] Executive Order No. 779 of 19 June 2006 on the Duties and Powers of the National Rail Authority.

The NRA carries out inspections to ensure that the legal requirements and other special requirements described in the undertaking's safety certificate are met. The development of railway safety is followed by continuously analysing accidents and incidents, and accident investigations and the annual safety reports from railway undertakings and railway infrastructure managers are also followed up.

Sector Safety Conditions

The group for sector safety conditions is responsible for drafting legislation relating to the development and publication of authority rules. The group is therefore also responsible for coordination and collaboration with the relevant department at the Ministry of Transport and Energy and a number of other authorities in Denmark and abroad.

The group performs the following tasks:
- Prepares authority rules on safety
- Prepares authority rules on interoperability
- Prepares rules for the transport of dangerous goods
- Collaboration with the relevant department at the Ministry of Transport and Energy
- Collaboration with other authorities
- International collaboration among authorities for all rail transport in Denmark
- Regulation reform projects

In the last few years, there have been considerable adjustments to and reform of the legislation (including the legal instruments for administration) in line with the EU's directives for the railways sector. In connection with this, the NRA's areas of competence as the authority are also being extended. Significant parts of the current reorganisation and advances in regulation are resolved in the context of the NRA's work on regulation reform.

Through collaboration both within the EU and at various international conventions and organisations, the authority focuses on areas such as dangerous goods, railway safety, interoperability and transport legislation.

In connection with this, the NRA is represented at the following fora:
- COTIF Convention concerning International Carriage by Rail
- OTIF's RID Committee and Committee of Technical Experts
- The EU's TDG Committee and the UN's ADR/RID Committee (UNECE) in connection with dangerous goods
- Article 21 Committee for railway safety and interoperability.
- The European Railway Agency (ERA) and its working groups
- Other EU fora, including the DERC Committee
- The biannual transport ministers' conference (CEMT)

In order to implement, among other things, the EU's Railway Safety Directive and parts of the Interoperability Directives, the EU has established the ERA institution (the European Railway Agency). It sets out part of the specific framework and guidelines for the European railways sector, including for the National Safety Authorities.

Contact information

More information on the NRA's staff, performance of tasks and the procedures and guidelines it uses can be found at www.trafikstyrelsen.dk.

The railway system in Denmark

What follows is a brief summary of the Danish railway system. It deals with the very structure of the railway and the technology used as one of the elements of fundamental importance for the level of safety. This section provides the basis for understanding the safety conditions and thus also for the evaluation of the development of railway safety later in the report.

The railway system

The total length of track in Denmark is 2 644 km. There are many differences in the different stretches of railway. These stretches, and the trains that run on them, differ with regard to safety, but the stretches are divided into classes of railway. See map of the Danish railway network in Annex A.1.

The railway system is generally divided into the following classes:
- Main lines
- Regional lines
- Local lines
- Private railways (formerly county railways)
- The Suburban Railway
- Copenhagen Metro
- Freight and other lines

The division into classes of railway is done on the basis of the characteristics of individual stretches, particularly their importance for traffic and their physical equipment. Of all the stretches of track in Denmark, 636 km are electrified, and approx. 1 000 km are equipped with train protection equipment (train stop systems). These systems and physical equipment for the stretches of track are most widespread on the main lines, the Suburban Railway network and all of the metro. There are also some regional and local railways, as well as the Hornbæk railway (a private railway), that have a high traffic volume and high speeds, which are equipped with some of these systems in order to make train operation safer and more stable.

There are differences between the classes of railway specified. These concern the design of the railways, the equipment, the composition of traffic on the railways, maximum speed, special procedures, etc. Local and private railways are generally the classes of railway with the lowest traffic volume and speed and the highest distribution of level crossings. There are, however, exceptions for certain private railways.

In 2006, a total of approx. 80.5 million train kilometres were travelled on Danish track. The distribution of transportation is such that there were close to 6 300 million person kilometres, and 4 800 tonnage kilometres for freight transportation (cf. the undertakings' own appraisals). See also the basic railway data in Annex A.2.

Railway Safety 2006

This section offers an overview of important initiatives for maintaining and improving safety, and of the authorisations issued by the NRA in 2006.

Initiatives for maintaining and improving safety

One of the most important factors for railway safety is individual undertakings' understanding of their role, including the necessity of maintaining a high level of safety and continuously laying the foundations for improvements. This requires there to be both a focus on safety from the management side and a culture to support this within the undertaking.

What follows is a description of some of the important initiatives taken within the industry to improve the safety culture, thus also promoting general safety conditions.

Following up maintenance of the rail network

Autumn 2005 was characterised by many speed restrictions on the Copenhagen – Århus line. The basis for these speed restrictions was poorly maintained track with many faults. At the time, the maintenance of the track was far from complying with the standards in force. Instead, the maintenance was, to a large extent, based on habits and estimates.

This led to an order by the NRA to Rail Net Denmark in autumn 2005 to prepare an action plan for changing the safety culture. This action plan was submitted in March 2006, when the first activities in the action plan had already started. The action plan has therefore been in force for most of 2006. The activities in the action plan will end in mid-2007, and according to the plan it is expected that its implementation will be completed in mid-2008.

The objective of the action plan is to lay the foundations for changing Rail Net Denmark's culture from being based on experience to being based on standards. The action plan must indicate which activities need to be instigated to change the culture from being a reactive culture in which the safety management system does not react until safety deviations have a consequence (breakdowns and incidents) to a proactive culture in which everyone in the safety organisation takes responsibility for and ownership of safety in performing their tasks and reacts when it is observed that safety may be threatened in the long term.

The action plan lays a solid foundation for changing the safety culture so as to benefit the development of railway safety.

Improvements to safety messages

During the summer of 2006, there were many acute speed restrictions due to the risk of buckling on "hot" tracks. In connection with this, the focus was on the extent to which safety messages were not passed on correctly to the engine drivers.

It was also noted that, for a while, there was an increase in the number of danger signals passed. The industry therefore made a joint decision to undertake an analysis of possible causes and to clarify possible improvement measures. Several proposals for improvements have already been implemented in the course of 2006, and the report published in March 2007 demonstrated more areas in which more work can be done.

Technical authorisations

The NRA awards safety authorisations for both technical and functional subsystems. These include safety equipment in the infrastructure, rolling stock and the regulations and standards that, together with technical safety, maintain a satisfactory level of safety on Danish railways.

Safety authorisation for technical subsystems

Technical authorisations are often issued in the form of a generic product authorisation for the railway industry in connection with the new development of subsystems. Standardised procedures are used in this authorisation process to assess and calculate reliability, accessibility, ease of maintenance and safety.

The main task for the safety authority is to issue bringing into use permits to railway infrastructure managers or railway undertakings for the implementation of new subsystems. In connection with this, the overall system of which the new subsystem forms part is assessed, including the functional part, which includes the undertaking's procedures and regulations for using the system.

The first "bringing into use" permit is usually conditional upon a test run being carried out within a time-restricted period, after which the final "bringing into use" permit and any type authorisation may be issued.

In 2006, development continued on revised methods and procedures for "bringing into use" permits for railway infrastructure managers and railway undertakings, as well as issuing generic product authorisations to suppliers. As part of this, procedures were adopted for using the European rules for "bringing into use" permits.

Authorisation of subsystems in the infrastructure

In 2006, the NRA awarded major safety authorisations for subsystems in the infrastructure to the following:

- The Ring Line (Ny Ellebjerg station)
- Temporary permit for bringing DICs into use on the Suburban Railway
- Moving remote control of the Hillerød-Snekkersten line (Lille Nord line) from BDK to HL
- New central workshop in Hillerød
- BUES 2000 fully electronic level-crossing equipment
- Section block Gentofte-Lyngby and section block Odense-Svendborg
- Coupling route in Skagen
- Switching system at Hundige and Kastrup
- Remote control equipment for the Lolland Railway.

Authorisation of rolling stock

In 2006, 168 permits for bringing into use were issued, divided between Danish and foreign railway operators (62), entrepreneurs and Danish infrastructure managers (80) and authorisations for vintage trains for Danish and foreign railway clubs (26).

In addition to these, there were 162 permits for test runs, transport and authorisation of modernisation, etc. for all types of rolling stock, including some permits for special transportation of equipment for export, e.g. for resale or repair after an accident.

Moreover, as in previous years, the NRA awarded safety authorisations for approximately 10 reader units, etc. within the freight train sector.

Safety authorisation of undertaking rules

"Undertaking rules" means the standards, rules and regulations of railway infrastructure managers and railway undertakings for the areas of infrastructure, rolling stock, training and transport safety. Railway infrastructure managers and railway undertakings must submit new and revised undertaking rules with greater safety content for authorisation by the NRA. Moreover, applications may be made for dispensations from the undertaking rules.

During the authorisation process for undertaking rules it is assessed whether the level of safety in the new or revised undertaking rules complies with the legal requirements, and whether these rules may have an impact on other rules, standards or regulations. More comprehensive risk assessments are carried out during more complex authorisation processes, where this is deemed necessary. Dispensations from the undertaking rules are assessed in a similar way.

In 2006, the NRA dealt with safety authorisations for the following matters which come under the area of transport rules:

- SODB operating guidelines, used for remote control of the Skagen and Hirtshals Railway (conditional authorisation), the Vestbane Railway and the Lemvig Railway
- Shunting instructions adopted in Rail Net Denmark's Safety Instructions
- Safety instructions for Nordjyske Jernbaner A/S and Hovedstadens Lokalbaner A/S
- Changing from weekly to daily speed restrictions bulletin (Article 53 of Safety Regulations)
- Preliminary Notes to the Service Timetable and Accident Regulations for the Odder Line (HHJ).

In 2006, the NRA had the following broader safety authorisations for technical standards for Rail Net Denmark

- Revised rules for cross-sections for ballasted tracks
- Revised rules for drainage of track areas
- Revised rules on tolerances for control measurements of points and crossings
- Revised rules for broken rails and other rail faults
- Revised rules for rail wear
- Revised rules for the positioning of tracks and platforms in relation to each other
- Revised rules for transmission lines
- Revised rules on loading and calculations for railway bridges and earthworks.

Authorisations of technical standards for DSB:

- Revised rules on tolerances for control measurements of points and crossings.

Accidents and incidents

The most significant accidents in 2006 are analysed on the basis of accident and incident data, together with the consequences of the accidents. This will be compared to the development in the number of accidents at European level.

Developments in railway safety

With the Railway Safety Directive, new definitions for railway accidents and incidents were introduced in 2006. There are also detailed requirements on how the safety authority, railway undertakings and infrastructure managers respectively must report on railway safety. As stated in Executive Order No. 38 on the implementation of the Railway Safety Directive, an appraisal must be carried out for a number of so-called "common safety indicators" or "CSIs". The CSIs are categorised into the following five groups:

- Accidents
- Incidents and dangerous situations
- Consequences of accidents
- Technical safety
- Safety management

It is judged that the five groups of CSIs give sufficient information to be able to assess the general level of safety on the railways. A pivotal element of the safety indicators is considering, for example, the number of accidents divided by the train kilometres travelled for the current year, which gives a truer picture of the current level of safety. The CSIs must also be used to set the quantitative "common safety targets" or "CSTs" for the whole railway system and for parts of the system (e.g. for different classes of railway).

By building a database for reporting accidents and incidents, the NRA has established the basis needed for being able to make this kind of report. The final definitions of CSIs will not be fixed until April 2009, so it is expected that there will be some uncertainty in the data reported in the first few years. In practice, the new safety indicators were not implemented in 2006, so not all the data for this year's report is available.

It is especially difficult to prepare precise breakdowns of costs in connection with accidents, as well as indicators for technical safety and safety management. It is therefore crucial for future work, including by setting railway safety targets, that a solution be found for how these factors should be recorded and reported.

What follows is a review of indicators for accidents, incidents and dangerous situations, as well as the consequences resulting from accidents. Indicators for technical safety have already been described in the introductory chapter on the railway structure and the subject of safety management is discussed later in the chapters on certification and supervision.

Serious accidents

If there is an accident on the railways, an investigation report must be prepared to clarify the reasons for the accident having occurred. The accident investigation is conducted by the Accident and Investigation Board (AIB), the railway undertaking or the infrastructure manager. Railway undertakings and infrastructure managers must document for the NRA that they are acting to prevent accidents from recurring. The NRA can thus ensure that the results of investigation reports are followed up, including the recommendations issued by the AIB on the basis of its investigations.

Significant accidents in 2006

In 2006, there were three accidents on the Danish railway network in the category of "Serious Accidents". The categories of train collisions or derailments are particularly regarded as accidents of a serious nature, but any other similar accidents with obvious consequences for the regulation of railway safety or safety management are also regarded as serious.

In accordance with the definition of serious accidents, any damage should involve the death of at least one person, serious injuries to at least five people or damage to equipment, infrastructure or the environment to the tune of DKK 15 million or more.

Nobody was killed or seriously injured in connection with these three serious accidents, but there were four people with minor injuries and the costs were considerable, estimated to exceed DKK 15 million in each case. The three serious accidents in 2006 were: a collision during shunting at Nykøbing Falster, the derailment of a Suburban Railway train at Køge Bugt and a fire on a trolley in the tunnel under the Great Belt.

Train collision at Nykøbing Falster

The accident occurred on 25 January 2006 at Nykøbing Falster station. Two trains parked on the assembly line there were driven into by a third train shunting in the area.

Four people were slightly injured in the accident, and two locomotives and 15 double-decker wagons were damaged. The material damage to the locomotives and wagons was estimated to be a total of DKK 56 million, but there is no information on damage to the infrastructure.

The AIB has decided not to investigate this incident. DSB, which owns the shunting area, has carried out its own investigation. The accident investigation showed that the head shunter was not in place at the front of the cab of the driving trailer and, among other things, was therefore not able to see that the points were set for running on the wrong track.

Train derailment at Køge Bugt

The derailment of a 4th-generation Suburban Railway train occurred early on the morning of 28 April 2006 at the Køge Bugt Service Centre near Hundige station. After making ready, a Suburban Railway train should have shunted from the service centre to the platforms at Hundige station, but during the approach to the platforms the last four coaches of the train were derailed at a set of points.

Upon the derailment, the train was damaged to an estimated value of DKK 28 million, and there was also significant damage to the permanent way. The follow-up to the incident also showed that no authorisation had been sought for the switching system for the points in connection with setting them up.

The AIB has decided not to investigate this incident, and DSB S-tog, which in this case owns both the equipment and the infrastructure, has carried out its own investigation.

The accident investigation points, among other things, to an operational error in connection with the points underneath the train having been switched while the train was still, so that the rear carriages continued in the wrong direction when the train set off. A safety device had been fitted to prevent untimely switching of the points, but it had been installed incorrectly, and this was a contributing factor to the derailment.

Fire in trolley in the Great Belt tunnel

The accident in the tunnel under the Great Belt occurred on 5 June 2006, when a number of coupled trolleys and railway wagons, pulled in accordance with the provisions on running works vehicles, should have passed the northern tunnel bore. During transit, the rear trolley caught fire, and the works vehicle was stopped approx. 3.1 km before the mouth of the tunnel at Sprogø.

The fire grew stronger and resulted in the rear trolley being completely burnt out, and damage was caused to the trolleys in front, as well as to the permanent way and the tunnel bore. The NRA subsequently issued an order that a number of investigations be carried out regarding the safety conditions of the tunnel bore, and the northern bore was out of action for 10 days. One member of staff was seriously injured in the fire, two sustained minor injuries, and the damage to the tunnel and equipment has not yet been estimated.

The AIB has opened an investigation into the accident, which now shows that the fire originated in the rear trolley, presumably as the result of engine failure. The driver of this vehicle sent a radio message about the fire to the other staff, and the works vehicles were stopped. The staff on the vehicles then attempted to fight the fire with the extinguishers they had with them, but they quickly had to take themselves to safety in the other tunnel bore.

The AIB's investigations into, among other things, the origin and cause of the fire are continuing.

Accidents on the railways

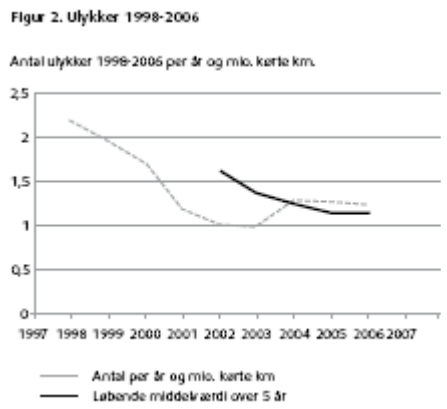
An accident on the railways is defined as having consequences in the form of financial costs or serious personal injuries. In practice, an accident is recorded when it involves serious personal injuries or approx. DKK 50-75 000 in material damage, and no consideration is given to whether the accident involved a loss of working time or delays to transport. This means that the number of recorded accidents is lower than the actual number of accidents. Annex C stipulates the definitions used in Denmark for the time being, as well as the indicators analysed in more detail in the next section.

94 accidents were recorded in 2006, which is on a par with the previous year. There has been an increase in the number of kilometres travelled on the railways in the last ten years, so a stable development in the absolute number of accidents emerges as a reduction, if the relative number of accidents is considered.

The relative number of accidents was 1.17 accidents per million train kilometres in 2006, whereas the average level for the last five years is 1.08 accidents per million train kilometres. The figure below shows the trend for the years 1998-2006. It can be seen that the relative number of accidents was somewhat lower in 2002 and 2003 than in the other years.

Figure 2. Accidents 1998-2006

Number of accidents 1998-2006 per year and per million train km.



Number per year and per million train km
Running average over 5 years

Figure 2. Number of accidents with serious personal injuries and material damage over DKK 75 000 is calculated in relation to kilometres travelled for the year in question. It also shows the running five-year average.

When calculating accidents, rather small quantities of data are involved each year, so it is obvious that the development over a larger number of years should be considered. In the European context, a five-year period is used, but if the calculation is made instead over a ten-year period a more stable development can be seen.

The five-year running average demonstrates a falling trend. There is a fall in the number of accidents from 1.5 accidents per million train kilometres in 2002 to 1.08 in 2006.

It should be noted that the accident statistics for the whole period include cases of suicide or attempted suicide. These cannot be considered as real railway accidents, but must all the same be considered as a significant burden on the railway system, not least for the members of staff involved. For the time being, it has been difficult to prepare a separate assessment of the number of suicides, since the necessary information can seldom be obtained in connection with the accident.

Figure 3 gives a summary of which categories of accident occurred in 2006. A more detailed description of the individual categories, and which types of event belong to each category, can be found in Annex C.1.

Figure 3. Accidents in 2006 divided into accident types

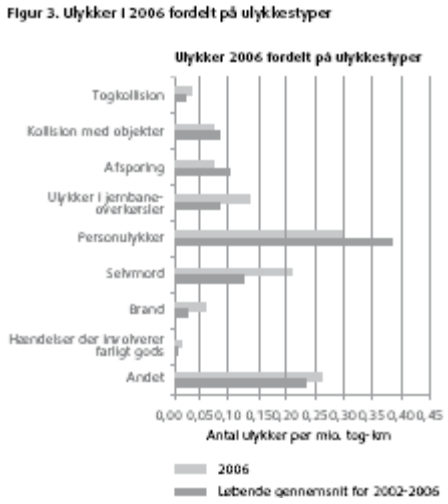


Figure 3. The total number of accidents per million kilometres, and the five-year running average divided into accident types. Definitions of the individual categories of accident can be found in Annex C.1.

Accidents in which people are struck by trains are the most significant type of accident on the railways, which is in line with the results from previous years. On the other hand, there has been a reduction in derailments in relation to 2005, when the number was rising.

At the same time, the distribution of accidents in 2006 shows that, in comparison with previous years, there has been an increase in the number of train collisions, accidents at level crossings, rolling stock fires and in the category for other accidents.

Train collisions are one of the types of accident that are considered to be particularly risky, since some situations will involve considerable injuries. Three train collisions were recorded in 2006, which is a fall in relation to the previous year, but higher than the five-year average. The three train collisions in 2006 all occurred whilst shunting at relatively low speed, and did not result in personal injuries, but in comprehensive material damage.

Particular attention should be paid to the growth in the number of accidents at level crossings. There has been a significant increase; from six accidents in 2005 to 11 accidents in 2006. This type of accident often involves serious injuries, and a small increase can also be seen in the number of serious personal injuries from accidents at level crossings in relation to 2005. In 2006, four people killed and one person seriously injured in accidents at level-crossings were recorded straight away.

The reason for accidents at level crossings is often that road users who use the crossings either overlook or ignore the signs or signals, and therefore drive on in front of a passing train. The accidents can also be due to equipment at level crossings being installed incorrectly.

Accidents at level crossings may also occur when there are technical errors at the crossing, or the train wrongly runs over a crossing for other reasons while traffic is crossing. The Danish Road Directorate, which is responsible for level crossings, has, in collaboration with infrastructure managers, started comprehensive work to improve or close down the most dangerous crossings.

As in 2005, there has been an increase in the number of accidents involving fire in 2006. One case this year, in the tunnel under the Great Belt, turned out to be a serious accident. The relative number of accidents involving fire in 2006 was 0.06 (or five cases), whereas the five-year running average is half of this, so there are grounds for being particularly aware of the increase in this area too.

Fire or smoke formation may occur at many places in a train, although it is often considered to be particularly risky when it starts in the cab or in the engine, where people may be exposed to the smoke. There are also sometimes cases of fires starting in the train coaches themselves, which can be described as a rather serious form of vandalism.

Most of the cases recorded as fire in 2006 were described as hot wheel bearings, and are therefore accidents of a slightly different nature. This type of accident has an impact on the train's ability to run and involves a risk of the train being derailed.

The "other" accident category includes, among other things, accidents related to traction current equipment, with the risk that people or equipment are exposed to voltage. Faults are also observed in rolling stock which are not related to wheels and axles, as well as some faults of different kinds that emerge during train preparation or shunting and which are apparently related to the operation of the rolling stock.

Vandalism is also a frequently occurring incident, and sometimes involves damage to such an extent that it is actually treated as an accident. This comes under the "other" accident category. Vandalism often comprises throwing stones, which involves extensive damage in the form of broken windows and the risk of injury to people on the train. Many cases of things/objects being thrown onto the rails are also seen.

Personal injuries on the railways

In 2006 a total of 75 people in Denmark were injured or killed as the result of an accident or incident. In three accidents, two and three people respectively were injured, including just one who was seriously injured. In 67 cases of accidents and incidents on the railways, one person was injured or killed per accident. There were consequently no accidents in 2006 of disastrous scope resulting in many serious personal injuries at the same time.

As Table 1 shows, suicides account for over half the number of people killed on the railways. Suicide is not viewed as a proper "railway accident", but is recorded as such. The aim of recording suicides is to have a deliberate distinction from other accidents to persons so as to achieve a more reliable statistical assessment. There is a more detailed review of the suicide group later in this section.

There was a total of 24 serious personal injuries in 2006, if suicides and attempted suicides are not counted. There were also 34 minor injuries recorded in connection with accidents and incidents on the railways. It is reckoned that a very large proportion of minor injuries are never reported to railway undertakings and infrastructure managers, and that the number recorded is therefore much lower than the actual number.

The most frequently occurring accidents involving personal injuries are accidents in which people are struck by trains. This type of accident is characterised by passengers being struck by trains when they remain on the platform or fall off the train or off the platform and down onto the tracks. Cases are also often observed where people who are not passengers or members of staff are on railway premises and are struck by a train. In 2006, 16 out of the 24 serious personal injuries occurred during accidents to persons. There is also a very large number of people with minor injuries in this category.

As in previous years, accidents at level crossings are also a significant reason for people being killed or injured. Most often it is level-crossing users who are injured, whereas people on the train are less exposed.

As Table 2 shows, there were five serious personal injuries to level-crossing users in 2006, and there were also four people with minor injuries in the same category.

In 2006, passengers and staff were the most exposed to personal injuries in connection with accidents to persons. One serious injury and two minor injuries were recorded in connection with the fire in the tunnel under the Great Belt, which was the most serious accident in 2006. In addition, there were two serious injuries to staff exposed to voltage from the traction current equipment, and this comes under the "other" accident category.

There were 11 serious injuries in accidents to persons in the "other" group, and as it is this group which includes suicide, the "other" group is on the whole the most exposed group of people.

Development in the number of serious injuries

The following section shows the development in the number of serious accidents to persons over the last ten years, from 1997 to 2006. The appraisal includes the number of people killed and seriously injured, since this gives a relatively good indication of railway safety. The number of minor injuries is not included, because recording these is thought to give a very uncertain picture of safety.

Table 1. Personal injuries in 2006

	Number of accidents	Killed	Seriously injured	Slightly injured
Train collision	9			1
Train derailment	6			
At level crossings	11	4	1	4
Accidents to persons	24	10	6	27
Suicide	17	15	1	1
Fire	5		1	2
Leak/RID	0			
Other	22		2	
Total	94	29	11	35

Table 1. The absolute number of accidents and the distribution of those killed, seriously injured and slightly injured divided into categories of accident

Table 2. Serious personal injuries in 2006, divided into types of people

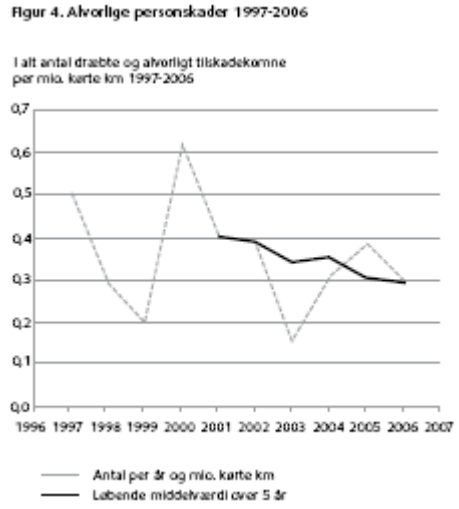
	Level-crossing users		Passengers		Staff		Other	
	Klld	S. injd	Klld	S. injd	Klld	S. injd	Klld	S. injd
Accident Type:								
Train collision								
Collision with object								
Train derailment								
Level-crossings	4	1						
Accidents to persons			0	4	1	0	9	2
Suicide							15	1
Fire						1		
Other						2		

Table 2. Absolute assessment of those killed and seriously injured, divided into level-crossing users, passengers, staff and others. Klld=killed, S. injd=Seriously injured

As mentioned earlier, 24 people with serious injuries were recorded in 2006, which gives a relative value of 0.3 seriously injured people per million train kilometres. This is a lower number than the two previous years, and so it bucks an otherwise negative trend. As can be seen in Figure 4, there was a very low number of serious injuries in 2003, which then increased in 2004 and peaked in 2005.

Figure 4. Serious personal injuries 1997-2006

Total number killed and seriously injured
per million train km 1997-2006



Number per year and per million train km
Running average over 5 years

Figure 4 shows the total number of serious injuries per million train kilometres. The calculation does not include the number of suicides.

The graph of the relative number of serious accidents also shows a high number of serious personal injuries in 2000, caused by, among other things, a serious accident in Kølkær where many people were killed and seriously injured.

At the same time, it can be seen in Figure 4 that the development of the five-year running average demonstrates a falling trend in the relative number of serious injuries. In 2001, the level was 0.4 and it has fallen steadily, although there was a minimal increase in 2004, ending at 0.3 serious injuries per million train kilometres in 2006. It must be noted that the calculation of the five-year running average for 2006 is lower, because data from 2000 are no longer included in the calculation.

What follows is a more detailed account of the development in relation to different groups of people. It shall be assessed whether the safety targets for seriously injured passengers and staff have been met, and what the level of safety is for other groups of people.

Risk to passengers

The risk to passengers is expressed by the number of serious personal injuries in relation to train kilometres, but also in relation to person kilometres. In 2004, a safety target was set for the number of seriously injured passengers. The target was set on the basis of the political motive of maintaining and improving the level of safety on Danish railways compared to the 1996 level.

The target number was calculated on the basis of the average number of human injuries over a ten-year period starting in 1996. The considerable annual fluctuation in the number of human injuries is thus evened out, and gives a truer picture of the level of safety.

The safety target for passengers has been set at 1.75 serious personal injuries per million person kilometres. The graph of the running five-year average shows a significant falling trend in serious personal injuries. It can be seen from the graph that the safety target has been met, both for 2006 and for the five-year average, which is 1.0 serious injuries per million passenger kilometres.

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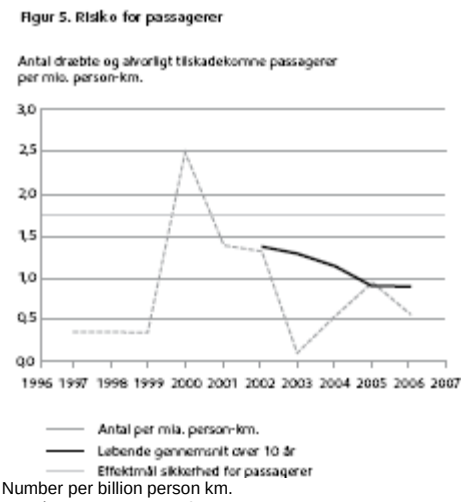
Risk to staff

The number of injuries to staff is generally somewhat lower than for passengers. This is expressed when the development in relation to train kilometres is considered. If the number of injuries is viewed in relation to working hours performed by staff or, for example, person kilometres, another picture is given.

Figure 5. Risk to passengers
Number of passengers killed or seriously injured per million person km.

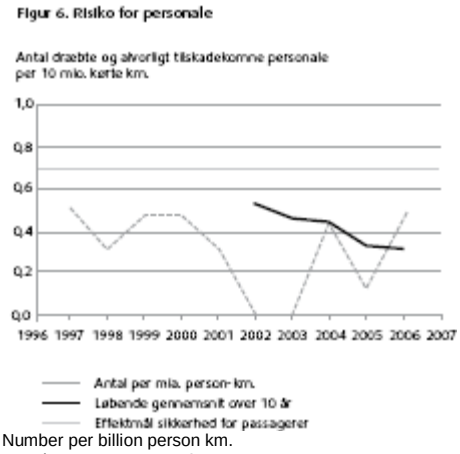


Number per billion person km.
Running average over 10 years
Impact goal for passenger safety

Figure 5. Safety targets are set on the basis of accident data for the period 1986-2006 from Rail Net Denmark. The relative number of personal injuries and the five-year running average are calculated on the basis of the NRA's accident and incident data. Passenger kilometres are compiled by Statistics Denmark, see also Annex A.2.2.

The safety target for staff is, like the target for passengers, set on the basis of a ten-year period starting in 1996. The target is 0.7 serious injuries per 10 million train kilometres.

Figure 6. Risk to staff
Number of staff killed or seriously injured per 10 million train kilometres.



Number per billion person km.
Running average over 10 years
Impact goal for passenger safety

Figure 6. Safety targets are set on the basis of accident data for the period 1986-2006 from Rail Net Denmark. The relative number of personal injuries and the five-year running average are calculated on the basis of the NRA's accident and incident data.

The risk to staff has been somewhat lower over the last ten years than the level set in 1996. The risk is around 0.3 serious injuries per 10 million train kilometres for the five-year average. In 2006, 0.5 serious injuries to staff were recorded, which is an increase on the previous year.

The NRA expects to implement a review of the national safety targets so that greater harmony is achieved with the guidelines in the Railway Safety Directive.

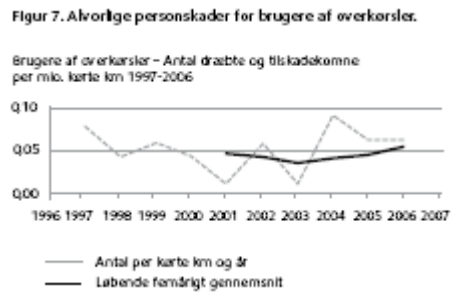
Comparison of risk between several groups of people

The aim is to expand the number of safety targets to also include level-crossing users, trespassers on railway premises and others. This division has not been used to record accidents up to now.

This year, the first attempt was made to prepare a separate assessment of the number of serious personal injuries to level-crossing users. The assessment of the absolute number killed shows an increase in recent years.

A similar increase has been identified in the number of accidents at level-crossings.

Figure 7. Serious personal injuries to level-crossing users.
Level-crossing users – Number killed and injured
per million train km 1997-2006



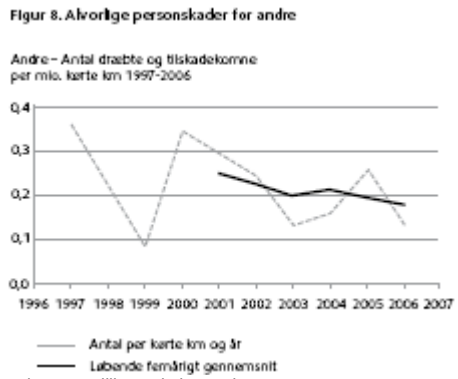
Number per million train km and per year
Running five-year average

Figure 7. The relative number of serious personal injuries to level-crossing users.

In 2006, the number of serious personal injuries is just 0.06 and the five-year running average is 0.05 serious injuries per million train kilometres.

The "other" group actually includes two groups: the group of trespassers on railway premises and "others". The immediate interpretation is that, in most cases, "others" will constitute a very small proportion of the total number of personal injuries, since the group is defined as third parties who have nothing to do with the railways. The assessment is mainly judged to include trespassers on railway premises.

Figure 8. Serious personal injuries to others
Others – Number killed or injured
per million train km 1997-2006



Number per million train km and per year
Running five-year average

Figure 8. The relative number of personal injuries to others and trespassers on railway premises

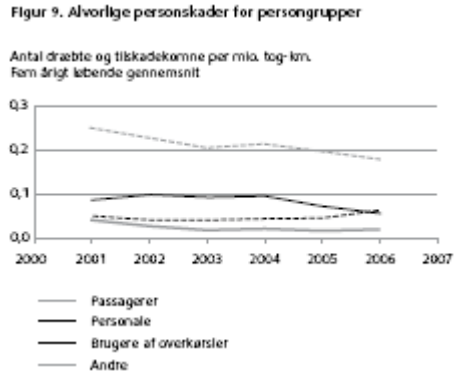
The group of trespassers on railway premises is made up of people who walk along a railway line or cross the tracks, e.g. in order to take a short cut. The number of serious injuries for this group in 2006 was reckoned to be 0.14 serious injuries per million train kilometres, which constitutes almost half of the total number. The five-year running average demonstrates a falling trend from 0.24 serious injuries per million train kilometres in 2001 down to 0.17 in 2006.

It is judged that there may be some cases in this group that should be classified as killed as a result of suicide. In order to reduce the impact of this as much as possible, the existing data was updated for the 2006 assessment, in line with information from the police on the nature of the accident.

If the development of the number of suicides on the railways is considered, an increasing trend can be seen, which, in the absolute figures, accounts for approx. nine serious injuries in 2001 and approx. 14 in the running five-year average for 2006. This more or less equates to the fall that can be seen in the assessment for the "other" group, and it may therefore be the direct cause of the fall, cf. Figure 8.

If an overall assessment of the development is attempted, the number of serious injuries may be considered, divided into all four groups of people. Figure 9 shows the following trends in the five-year running average:

Figure 9. Serious personal injuries to groups of people
Number killed and injured per million train km.
Five-year running average



Passengers
Staff
Level-crossing users
Other

Figure 9 shows the development in the relative number of serious personal injuries divided into groups of people.

The five-year running average for the passenger and level-crossing user groups is 0.05 serious personal injuries per million train km in 2006. In contrast, the group for other people is right up to about 0.2 serious human injuries per million train km. As mentioned earlier, the passengers group had one serious human injury per million passenger kilometres in 2006 and, when converted, this becomes 0.02 serious injuries per million train kilometres.

In absolute figures, this is an average of about six serious injuries to passengers and level-crossing users, in contrast with which approx. 15 injuries are recorded each year in the "other" group, and less than two for staff.

Table 3. Costs of serious personal injuries

	Killed	Seriously injured	Total
Cost per person (DKK)	10 978 185	1 144 660	12 122 844
Total excluding suicide (DKK)	153 694 583	11 446 598	165 141 182
Suicide (DKK)	164 672 768	1 144 660	165 817 428
Total (DKK)	318 367 351	12 591 258	330 958 610

Table 3. Costs of serious personal injuries are calculated on the basis of "List of Key Figures – for use in socio-economic analyses for the transport sector", Ministry of Transport and Energy, 2006.

At the start of this section, we found that there was a level of 0.4 serious personal injuries in 2001, falling steadily to 0.3 serious injuries per million train kilometres in 2006. An overall fall has therefore been identified in the number of injuries. Figure 9 demonstrates that there has been an obvious fall in recent years in the number of serious injuries to passengers and others, but an increase for level-crossing users. The Danish Road Directorate, which is responsible for level crossings, is aware of the safety problem. There seems to have been a more stable development for staff in recent years.

Costs of accidents and personal injuries

Stating costs in connection with accidents is one of the prerequisites for being able to assess the benefits of introducing safety improvements.

For railway undertakings and infrastructure managers, this means assessing the impact accidents have on railway operations. There may be direct costs for repairs or replacements, but there may also be a more indirect loss in the form of delays, loss of earnings, etc. This means that it is sometimes an advantage to invest in improvements, so that savings are made in the long run.

The socio-economic costs include the costs that a railway accident has for society in the form of the work of the police and emergency services, hospitals, pensions, etc. The socio-economic calculations are used in the same way to assess whether it would be more appropriate to make investments.

For 2006, an assessment has been prepared on the socio-economic costs of personal injuries on the railways. This has been carried out on the basis of the set of values prepared in "List of Key Figures – for use in socio-economic analyses for the transport sector", published by the Ministry of Transport and Energy in 2006.

As can be seen in Table 3, the list of key figures sets an estimated value for the costs to society for one serious injury or one person killed.

This gives a total cost of approx. DKK 331 million for all the human injuries that occurred in 2006, including suicides. Excluding suicides, the costs are DKK 165 million, or a cost of approx. DKK 2 million per train kilometre on the railways.

The appraisal of costs in connection with accidents must, in accordance with the requirements of the Railway Safety Directive, contain the following information:

– deaths and injuries
– compensation for loss of or damage to property of passengers, staff or third parties, including damage to the environment
– replacement or repair of damaged rolling stock and railway installations
– delays, disturbances and re-routing of traffic, including extra costs for staff and loss of future revenue.

Additionally, an appraisal must also be carried out of the number of working hours lost by staff and contracting parties as a result of accidents. No methods have yet been laid down for carrying out these appraisals, and in practice some of these situations are not currently assessed by railway undertakings or infrastructure managers.

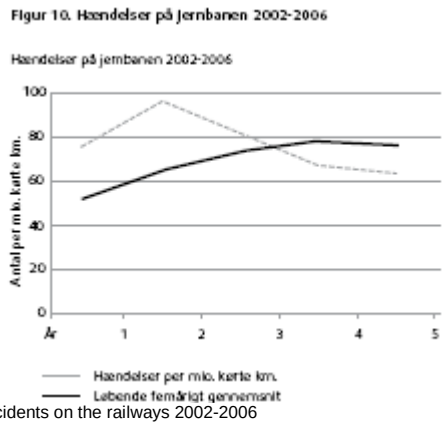
A record will be prepared of the costs associated with the replacement and repair of damaged rolling stock or railway installations. The information that the NRA has received is, however, judged to be too general to be able to constitute a basis for calculating the costs of material damage for 2006.

Incidents on the railways

Incidents on the railways is a term for dangerous situations that do not result in damage or injuries. In appraising this, incidents may involve up to DKK 75 000 in damage and/or minor injuries.

The number of incidents recorded cannot necessarily tell us anything about the level of safety on the railways. The culture or habits that exist at undertakings with regards to the recording of incidents will also have a considerable impact on the number. Therefore, in periods where there is a major focus on this area, there will also be a greater tendency to record less dangerous situations too.

Figure 10. Incidents on the railways 2002-2006

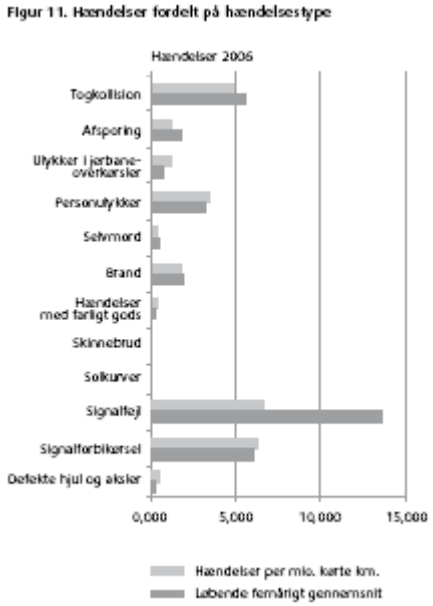


Incidents on the railways 2002-2006
Year 1
Incidents per million train kilometres.
Current five-year average
Number per million train kilometres

Figure 10. The relative number of incidents per million train km.

The number of incidents recorded in 2006 was approx. 62 incidents per million train kilometres, or 4958 as an absolute number. This is a fall compared to the five-year running average, which is approx. 76 incidents per million train kilometres. The slightly fluctuating trend may be an expression of some upheaval having occurred, both in relation to the number of recording undertakings and also in the recording methods used.

Figure 11. Incidents divided into incident type



Incidents 2006
Train collision
Derailment
Accidents at level crossings
Accidents to persons
Suicide
Fire
Incidents
involving dangerous goods
Broken rails
Buckling
Signal errors
Passing danger signals
Defective wheels and axles
Incidents per million train kilometres.
Current five-year average

Figure 11. Summary of the most significant types of incident, comprising in total 2107 incidents out of the 4958 records.

If one looks more closely at the distribution of incidents for different types of incident, one sees a relatively stable development. The diagram below contains the most significant types of incident, and furthermore a number of other incidents and safety irregularities are recorded, constituting a significant proportion of the total number of incidents.

The greatest annual fluctuation may be seen in the signal errors incident type, where the annual figure falls to half in 2006. It is thought that the basis for this is changes in recording methods. This is because signals that incorrectly show “stop” are no longer recorded, since this is not a dangerous situation.

There are also some smaller increases in the categories for passing danger signals, accidents to persons and accidents at level crossings. The two latter categories are significant reasons for many personal injuries and, as mentioned earlier, it is important that the focus is kept on preventing this type of incident and accident. Regarding accidents to persons, more consideration should be given to what can be done to prevent that those who have no business on railway premises being able to access it.

Passing danger signals is a very significant category of incident. This type of incident is often the underlying cause of more serious accidents. Preventive work should therefore be done to reduce the numbers of this type of incident. The increase in the number of danger signals passed has been recognised in the industry for a while and, as mentioned earlier, an investigation was opened in 2006 to clarify causes and possible improvement initiatives in this area.

The categories for broken rails, buckling and defective wheels and axles are completely new categories that have not been implemented properly and which for this reason contain almost no records.

It is worth noting that a fall can be seen in the number of incidents involving fire while there has been a rise in accidents involving fire. This may indicate that it is not a matter of a very stable negative trend, but of some cases that cause the fluctuation in the accident statistics. A decline can also be seen in the categories for train collisions and derailments, which is in line with the development in the number of accidents.

European accident statistics 2005

Statistics on railway accidents are compiled at the common European level in accordance with “Regulation 1192/2003”. The crossover to the new compilation method in 2003 and the introduction of new definitions, cf. the Railway Safety Directive, gives rise to some uncertainty. For example, the definition of an accident in the two pieces of legislation is not identical, and to some extent every Member State still uses its own definitions. The data compiled for 2004 and 2005 is provisional, and will be reviewed in this section. It is, however, important that allowances be made for the uncertainty of the statistical data when the results are considered.

Safety from 2004 to 2005

In 2005, 7023 serious accidents were reported at the common European level, and 3112 people were killed or seriously injured. The figures show an increase in comparison with 2004, with respectively 14% more accidents and 5.4% more victims in 2005.

Large differences can be seen between European countries in the number of railway accidents, even when one considers the relative number in relation to train kilometres.

The countries that have a large area generally also have long stretches of railway, and this naturally has an impact on how many train kilometres are travelled. In 2005, Germany, the United Kingdom, France and Italy recorded the highest number of train km. Hungary, however, had the highest number of accidents, followed by Germany and then Poland. Attention should also be paid to the fact that there are differences in appraisal methods, since, for example, Hungary records accidents with damage over EUR 40 000, whereas the official definition is EUR 150 000. In comparison, Denmark has reported accidents involving damage of over EUR 10 000, but Denmark still has a high level of safety, with 1.15 accidents per million train kilometres in 2005, whereas the average for the whole EU is 1.83 accidents per million train kilometres.

It is reckoned that the best comparison of risks is that based on the number of people killed in railway accidents. Attention should, however, be paid to the fact that several countries, including Denmark, have an uncertain appraisal of the number of suicides, which has some impact on the statistics.

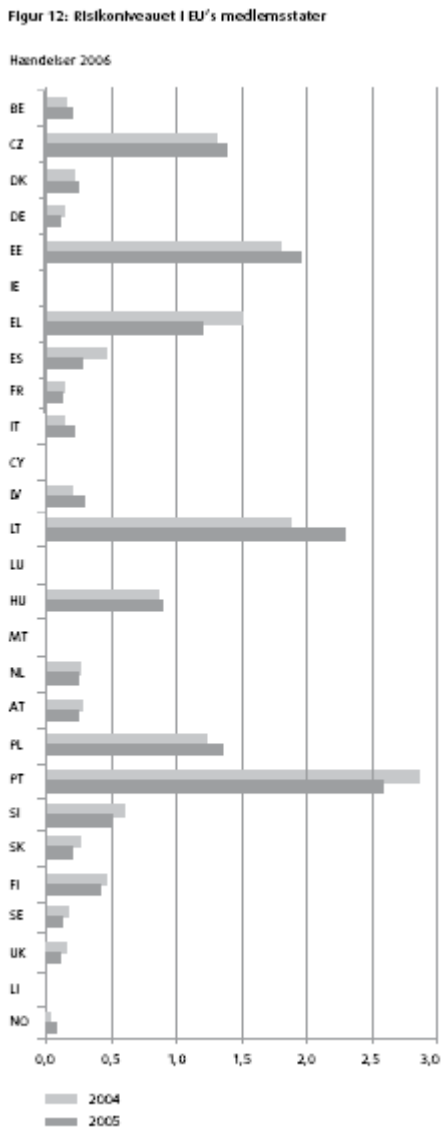
Considering the graph of the relative number killed in different EU countries, it can be seen that only a few countries have over 2.0 killed per million train kilometres. It is important to note that a few accidents with people killed may result in great fluctuations in the statistics, because the data is not very extensive. The figure for Denmark is relatively low, with approx. 0.31 killed per train kilometre, which is more or less on a par with the countries with which we usually compare ourselves, and slightly under the EU's total average of 0.38 killed per train kilometre.

The most common types of accidents that result in people being killed are accidents to persons caused by rolling stock in motion and accidents at level crossings. These two categories of accident together represent 95% of all those killed on the railways, which is consistent with the national trend in Denmark. Accidents of this type rarely result in more than one or two people being injured at a time.

Only a very small proportion of accident victims are actual passengers. Of the 1464 people killed in the whole EU in 2005, only 62 of them were passengers and 43 were members of staff, whereas the group of accident victims that were neither passengers nor members of staff constituted 1359 people out of the total number killed.

Figure 12: Level of risk in the EU Member States

Incidents 2006



Figur 12. Udarbejdet af Eurostat på baggrund af data der er indberettet af hvert enkelt medlemsland

Figure 12. Prepared by Eurostat on the basis of data reported by each of the Member States. Accidents and incidents 2004
2005

Legislation and regulations

This chapter contains a description of the essential changes to international and national laws and regulations relating to railway safety.

Changes in 2006

The year was characterised by a number of directives and provisions from the EU's second railway package being implemented in Danish law. This has led to some pivotal changes to the Danish legal texts, as well as the implementation of new executive orders for regulating safety on the railways, including safety authorisation and safety certification, as well as engine driver licences. The first Technical Specification for Interoperability (TSI) also entered into force.

The important changes are described in more detail below. Annex D gives a brief summary of all the amendments made, as well as the basis for them.

Amendment to the Railways Act

As mentioned in the safety report for 2005, the Railways Act was amended, cf. Act No. 1422 of 21 December 2005, which states, among other things, that the safety authority must publish a report on its activities.

The amendment also means that the Danish Accident Investigation Board for Civil Aviation and Railways (AIB) must publish an account of its investigations, recommendations and corrective measures once a year, by 30 September at the latest. The amendment to the Act entered into force on 1 February 2006.

Implementation of EU Directives

In 2006, two EU directives were implemented in Danish law, relating respectively to railway safety and interoperability, as was an amending Directive on the development of the Community's railways.

The Railway Safety Directive was implemented in Danish law by Executive Order No. 38 of 23 January 2006. The Railway Safety Directive is, among other things, based on the fact that the Commission has found it necessary to establish a common framework for regulating railway safety. The Member States have mainly developed their safety regulations and standards on a national basis that builds on national technical concepts compatible with operations. It has been difficult to overcome the technical obstacles between the countries and to establish international rail transport services.

EU Directive 2004/50/EC was implemented in the area of interoperability, which amends both the High Speed Rail Directive and the Conventional Rail Directive. It appears, among other things, that the scope of the directive is the Trans-European Rail Network (TEN), but this will over time extend to the whole conventional rail network.

Executive Order No. 37 of 23 January 2006 implemented the amending Directive on the development of the Community's railways in Danish law. Among other things, the implementation involves extending access rights to all types of railway freight transport as of 1 January 2007 in harmony with the principles that freedom to supply services will improve the efficiency of railway transport in relation to other modes of transport.

Decrees on safety authorisations and safety certificates

By extension of the implementation of the Railway Safety Directive in Danish law, two new executive orders have been passed (nos. 13 and 14 of 4 January 2007), concerning the issue of safety certificates to railway undertakings and safety authorisations to railway infrastructure managers respectively.

These orders replace the orders of 1999 and 2001 respectively on safety certificates for railway undertakings and railway infrastructure managers.

Under the new orders, undertakings must in future have a safety management system. Safety certificates and safety authorisations are divided into part A and part B, and the safety management system comes under part A. Part B of the safety certificate contains the national requirements. In part B of the safety authorisation, railway infrastructure managers must document that the undertakings have complied with the measures with regard to meeting the other safety requirements laid down in TSIs and in respect of the Railways Act, including authorisation of equipment and certification of staff.

The implementation of the Railway Safety Directive has opened up the possibility that railway undertakings which have obtained a safety certificate in a Member State (certificate part A) should only have to document meeting special national requirements to obtain a safety certificate for running trains in another Member State (certificate part B).

Amendment to the Executive Order on Fees and issue of engine driver licences

Licences for engine drivers were issued in Denmark for the first time in 2006. In connection with this, an executive order was prepared to amend the Executive Order on Fees, and it sets a fee of DKK 290 for issuing such a licence.

Executive Order on the duties and powers of the NRA (the Delegation Executive Order)

The Delegation Executive Order on the duties and powers of the NRA was amended in 2006 in the following areas of importance:

In future, Provisions for Railways (PR) will be issued instead of the former Provisions for Railway Safety (PRS). TSIs, which are set pursuant to Directives in the area of interoperability, will be implemented in Danish law by the PR.

Furthermore, the powers of the Minister for Transport and Energy in Article 26 of the Railways Act, concerning the fulfilment and application of EU legal instruments, shall be exercised by the Director of the NRA with regard to the area of railway safety. The rules shall be laid down as executive orders.

Technical Specifications for Interoperability (TSI)

The TSI-TAF (1) Telematic Applications for Freight entered into force on 18 January 2006. This is a scheme that applies directly to undertakings in the railways sector.

The TSI-NOI (TSI-Støj in Danish) entered into force on 23 June 2006.

The Technical Specifications for Interoperability of the "Train Control and Signals" subsystem entered into Danish law as of 28 September 2006.

The TSI contains provisions on the application of a common train control system, ERTMS – European Rail Traffic Management System, which comprises a train radio system (GSM-R) and a train control system (ETCS).

Safety certificates and safety authorisations

This gives a status report on the rules and procedures used, as well as the certificates and authorisations that were issued in 2006. It also describes special observations concerning the crossover to the new, harmonised rules.

New rules relating to safety certificates and safety authorisations

As mentioned earlier, the Railway Safety Directive was implemented in Danish legislation in 2006. One of the main elements of this Directive is the requirement for railway undertakings and railway infrastructure managers to introduce safety management in connection with them having to have a safety certificate/safety authorisation.

It states in the two new executive orders in this area (nos. 13 and 14 of 4 January 2007) that all railway undertakings must have obtained a safety certificate by the end of 2008, and that all infrastructure managers must have obtained a safety authorisation by the end of 2009.

In 2006, no applications were received from railway undertakings or railway infrastructure managers for certification or authorisation under the new provisions. Moreover, no applications were received for a certificate part B from railway undertakings that have obtained a certificate part A in another Member State.

The NRA has published the expected case-handling times on www.trafikstyrelsen.dk, including times for handling applications for safety certificates and safety authorisations. All case-handling times are in line with the requirements of the Railway Safety Directive.

The legislation and provisions for obtaining safety certificates and safety authorisations, as well as the corresponding guidelines, have also been made available on the NRA's website.

Certification in 2006

The NRA received five applications for certification and re-certification under the current certification rules. This resulted in the following railway undertakings being issued with new safety certificates in 2006:

– DSB S-tog A/S
– A/S Hads-Ning Herreders Jernbane (The Odder Line)
– Railion Danmark A/S
– Vemb-Lemvig-Thyborøn Jernbane A/S
– Hector Rail AB.

No safety certificates were issued to railway infrastructure managers in 2006. Annex E gives an overall summary of safety certification and supervision.

The NRA's observations on the certification inspections carried out are discussed under function supervision later in the report.

The NRA did not receive any complaints from railway undertakings or railway infrastructure managers in 2006 relating to safety certification.

Staff certification

The NRA is responsible for formulating and administering national requirements for the performance of safety-classified functions in the railways sector. The most important activities in 2006 were implementing requirements for engine drivers and work on laying down requirements for certain safety work management functions.

Since the Provisions on Requirements for Engine Drivers, PR No. 2-020.001 entered into force in 2005, there have been identical requirements for all engine drivers in Denmark. In 2006, the NRA has sought to clear up the questions that have arisen in connection with the implementation of the new provisions, in collaboration with the industry, the relevant department of the Ministry of Transport and Energy, the Ministry of Education and relevant educational establishments.

The industry has prepared a common learner driver course to ensure a standard level of competence independent of the undertakings among the practical teachers, and the course has subsequently been approved by the NRA. The NRA has also approved courses on schedule and infrastructure knowledge for engine drivers at the individual railway undertakings.

In future, all engine drivers must be in possession of an engine driver licence to be able to drive a train. The NRA is in charge of authorising engine drivers and issuing engine driver licences. The first issues were delayed for practical reasons, and therefore did not take place until the end of 2006.

Other safety-classified functions

In 2006, the NRA has continued working on the draft authority requirements for safety-classified functions other than engine drivers. The intention is to draft PRs for individual safety-classified functions or collectively for closely related functions. Work has therefore been done on a collective PR for the following functions:
– Guard
– SR supervisor 2
– SR supervisor 2 protection
– SR supervisor 1.

Up to now, these functions have been defined by Rail Net Denmark and approved by the NRA. The future requirements for these functions will, to a large extent, include the current competence requirements, but without requirements that are specific to undertakings. The NRA has worked in close cooperation with Rail Net Denmark, the Transport Training Board of Denmark (TUR), the Ministry of Education and other relevant stakeholders in the sector.

Medical certificates

The NRA issues medical certificates to people who perform safety-classified functions. Today there are around 9500 people who have medical certificates from the NRA for performing safety-classified functions.

In 2006, the NRA issued 2308 medical certificates on the basis of approx. 2500 applications. Six complaints were sent to the Ministry of Transport and Energy, which is judged to be an acceptable number, bearing in mind the number of decisions made. These complaints are all closed.

In collaboration with the Danish Medical Association, the NRA began a critical review of the current medical and doctors' certificates in 2006. This is in order to minimise the number of certificates that have to be returned to doctors on the grounds of incompleteness. In 2005, the NRA had to return 16% of certificates, and this figure has not changed in 2006. It is expected that the proportion of returned certificates will fall when the review of medical and doctors' certificates is finished.

Supervision of railway undertakings and infrastructure managers

This section presents the procedures for the NRA's supervisory activities, as well as inspections carried out during the year. It also describes the results of the inspections carried out and assesses the undertakings' annual safety reports.

Supervision in 2006

The NRA uses three types of supervision to monitor whether undertakings comply with the rules and requirements and whether they have functional technical and management systems to support their handling of all aspects relating to railway safety.

The three types of supervision are:
– Supervision with permits (including insurance)
– Supervision of functions
– Supervision of certification and authorisation

These types of supervision target the main areas of railway safety that the NRA has to monitor as the safety authority. The NRA uses "audit inspection" and "documentation inspection" as forms of supervision, as well as a combination of the two. In 2006, the NRA used approx. three work years for supervisory activities.

Supervision with permits

When issuing permits to undertakings, the NRA must check that a number of conditions, for example of a financial, insurance, legal and organisational nature, are met. It is of fundamental importance that supervision with permits includes a basic check on, for example, whether an operator meets all the requirements for being able to obtain a permit.

The NRA's monitoring with permits is, as a main rule, based on "documentation inspection", where an undertaking submits documentation showing that the relevant conditions are met. The NRA consults relevant authorities (e.g. the Tax Administration and municipalities) and the national police. The NRA then carries out the supervision/inspection on the basis of the documentation available.

The NRA carries out supervision with permits for operating railway undertakings and managing railway infrastructure, including insurance, according to the following strategy:
– Five-yearly inspection with a re-assessment of whether the legal conditions are still met
– Annual insurance follow-up.

In addition, it may be appropriate to carry out special inspections on the basis of the information submitted.

In 2006, the NRA re-assessed two permits for operating railway undertakings. Since both undertakings still met the legal conditions, there were no grounds for further action in respect of these undertakings.

The NRA also received insurance documentation from railway undertakings and railway infrastructure managers in respect of Article 3 of Executive Order No. 1194 of 18 December 2003 on liability insurance for damages in connection with railway undertakings and railway infrastructure management.

Supervision of functions 2006

The aim of supervising functions is to uncover any discrepancies between the authority requirements, the undertaking's documentation for the safety certificate and the undertaking's practices. It is also considered important that, through its supervision, the NRA can participate in supporting individual undertakings in achieving positive development in order to improve railway safety.

Planning of supervision for 2006

In January 2006, the NRA published its annual supervision plan for scheduled inspections of infrastructure managers and railway undertakings. The plan contained a total of 24 inspections, including certification inspections.

The NRA's supervision plan was set out, among other things, on the basis of:
– Experience from inspections carried out
– An analysis of data on railway accidents, safety incidents and railway safety irregularities
– Areas of risk uncovered in connection with railway accidents, e.g. recommendations by AIB
– Areas of risk identified in connection with safety authorisations
– Deadlines for certification and re-certification.

The overall objective of the NRA is to pay regular visits to all railway undertakings and railway infrastructure managers, and to ensure that supervisory activity over a number of years covers as large a proportion of the activities of individual undertakings as possible.

Results from supervision of functions 2006

In 2006, the NRA has focused on how the undertakings deal with scheduled inspections/maintenance with regard to both rolling stock and infrastructure, and how the undertakings deal with the faults found during inspections and maintenance.

The NRA carried out a total of 33 inspections in 2006, of which 12 were "special inspections", i.e. inspections initiated on the basis of a specific event or observation. 15 inspections of railway undertakings and 18 inspections of railway infrastructure managers were carried out. Five of the inspections carried out were judged to require significant

follow-up through new inspections in 2007. Annex E gives an overall summary of certification and inspections carried out in 2005 and 2006.

In relation to the plan published in January 2006, the NRA has failed to carry out three inspections relating to the supervision of functions. These have been set to be carried out in January/February 2007.

The results of supervisory activity in 2006 have confirmed the importance of taking samples or combining audit inspections with proper inspections of the current conditions on the railways. This then gives a more comprehensive overview of the state of railway safety. Examples of inspection supervision are inspections of the transport of dangerous goods and of level crossings.

In connection with its supervisory activities in 2006, the NRA recorded a total of 2 bans, 19 orders and 47 non-conformities.

The distribution of the bans, orders and non-conformities handed out is as follows:

- Maintenance: 18
- Standards, rules, etc.: 5
- Safety incidents: 5
- Contract/purchase of services: 5
- Competence: 11
- Objectives, policies, safety organisation: 6
- RID/dangerous goods: 4
- Supervision: 8
- Administrative errors: 6

Supervision has demonstrated a relatively large number of non-conformities in the focal areas of inspections/maintenance, which indicates that the NRA should maintain its focus in relation to the supervision plan for 2007.

Supervisory activity in 2006 also uncovered the fact that many undertakings do not deal with technical rules and standards, cf. relevant legislation, which prescribes that these must be approved by the NRA. On this basis, therefore, the NRA will in 2007 notify infrastructure managers of the relevant legislation relating to the approval of technical rules and standards, and of the expectation that the undertakings deal with these.

Another subject that caused many non-conformities in 2006 was deficiencies in the competences of members of staff. The NRA may therefore state that, in many cases, staff were used who did not have adequate competences, or these competences could not be documented.

The NRA found in 2006 that many undertakings did not have a plan for internal supervision, and that specific supervision plans were not followed. There were also many companies that did not prepare a supervision plan until immediately before the NRA's inspection visit.

The supervisory activity clarified that the undertakings have different definitions of when an episode should be recorded as a safety incident. The expectation is that a future specification of the definitions used in law and executive orders in the area will support the undertakings in recording in a more standardised way in future.

Annual safety reports by railway undertakings and infrastructure managers

Railway undertakings and railway infrastructure managers should submit a safety report for 2006 by 30 June 2007 at the latest. As stated in the executive orders for this area (nos. 13, 14 and 38), the safety report must contain the following:

a) information on the extent to which all the organisation's safety targets have been met, and the results of safety plans

b) national safety indicators and the common safety indicators to the extent relevant for the organisation in question

c) the results of internal safety reviews

d) comments on errors and deficiencies in railway operations and infrastructure management that may be relevant for the safety authority.

The aim of the safety report is to provide information on, respectively, the activities of railway undertakings and infrastructure managers relating to safety in the area of the railway system that is covered by the safety certificate or safety authorisation. Furthermore, the reporting of accidents/incidents must provide a basis for the undertaking to carry out more work on improving railway safety, including setting targets and areas of focus.

By the submission deadline of 30 June 2007, the NRA had received 18 safety reports from the total of 27 railway infrastructure managers and railway undertakings. The NRA later received a further four safety reports, as well as information from two companies stating that no incidents had occurred in 2006, and little or no transport on the Danish rail network. The last three safety reports are expected after they have finished being edited.

The safety reports have been assessed by the NRA in relation to the fulfilment of the general reporting requirements mentioned above. The general assessment is that there are some deficiencies in relation to the descriptions of internal supervision/safety reviews. Only about half of the reports include a description of the prioritisation of supervisory endeavours in relation to different supervision systems, and very few assess the results of their supervision.

It is a recurrent feature that information on the number of accidents and incidents is not available for the last five years, which may be due to changed appraisal methods. There are still great differences in which categories of accidents and incidents are used, as well as uncertainty when determining the extent of the damage/injury and the causes of the accidents. Comparing and assessing safety indicators and safety targets is thus made more difficult, and it is hard to exchange experiences on this basis. It is expected that the database will be improved with the implementation of the Railway Safety Directive (Executive Order No. 38 of 23 January 2006), which contains the requirements on the reporting of safety indicators, including the preparation of properly standardised appraisal methods.

The NRA feels that 12 of the reports may be said to reasonably meet all four reporting requirements contained within the executive orders in this area. The assessment was based on whether the specific subjects/requirements were discussed, although a certain degree of deficiencies or errors in the submission was also accepted.

Safety reports that include assessments of trends and reasons for safety failures as well as an analysis of their own supervision efforts are the most suitable for use in the undertaking's further work to improve railway safety. Of the safety reports received, two stand out for having used their own accident/incident data for reflective purposes, and for setting new targets for effort.


2133
B

Annex A:

Railway structure

This Annex includes a map of and basic information on Danish railways

Figure A.1. Map of railway lines

Legend
Main line
Regional line
Local line
Private railway
Freight line
Suburban Railway
Ferry routes
Lines in Germany and Sweden
Stations

Table A.2.1. Information on infrastructure managers

Number of infrastructure managers	12
Total railway length length/gauge	2644
Electrified sections/volts	636
Total length of two-way track	942
Km of track with ATC, ATC train stop/Speed check and train stop equipment	1005
Total number of level crossings	1548
Number of train km on total railway length	80 541 000 train km.

Table A.2.1. Appraisal by Statistics Denmark. It is estimated that around half of all level crossings are not equipped with automatic protection.

Table A.2.2. Information on railway undertakings

Number of level crossings	15
Transport type (Freight, ...)	Passengers and Freight
Number of locomotives	183
Number of trains (Transportation of people)	566
Number of coaches in trains	1627
Number of engine drivers *	1792
Number of passengers transported per million passenger km	6274
Amount of freight transported per million tonnage km *	4001
Total number of train kilometres	80 541 000 train km.

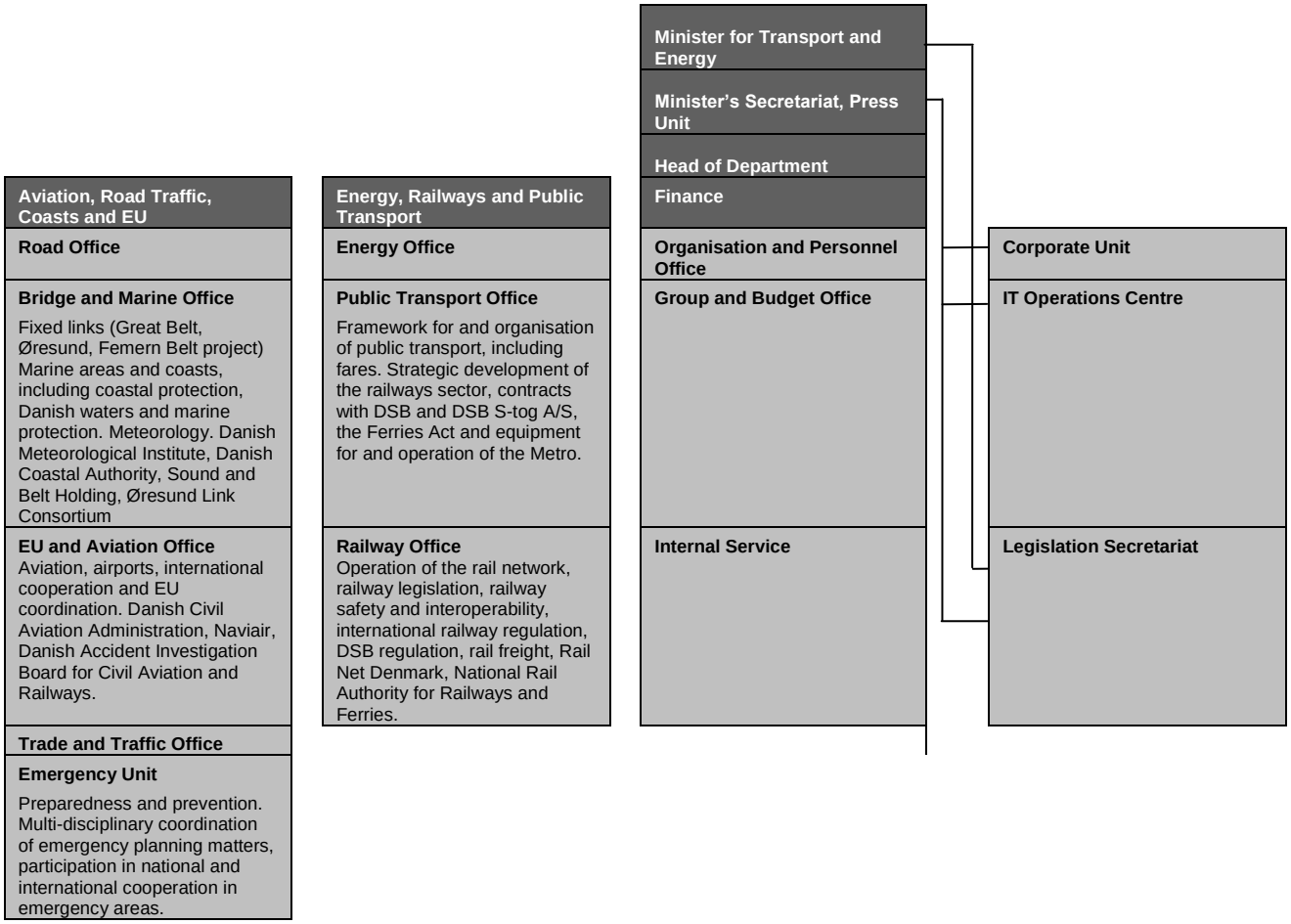
*Table A.2.2. Appraisal by Statistics Denmark. *The NRA's appraisals have been done using the railway undertakings' reports. There are some smaller railway undertakings that do not appear in the appraisal.*

Annex B:

The NRA's relationship with the Ministry of Transport and Energy and with other authorities

The organisation chart shows the positioning of the NRA within the Ministry of Transport and Energy

Ministry of Transport and Energy



Annex C:

National safety indicators

This Annex specifies the definitions used for accidents and incidents, and gives a summary of safety indicators for the number of accidents, incidents and personal injuries

C.1. Definitions of accidents and incidents

Serious accident:

"any train collision or derailment of trains, resulting in the death of at least one person or serious injuries to five or more persons or extensive damage to rolling stock, the infrastructure or the environment, and any other similar accident with an obvious impact on railway safety regulation or the management of safety; "extensive damage" means damage that can immediately be assessed by the investigating body to cost at least EUR 2 million in total." [Railway Safety Directive 2004/49/EC]

Accident:

"an unwanted or unintended sudden event or a specific chain of such events which have harmful consequences; accidents are divided into the following categories: collisions, derailments, level-crossing accidents, accidents to persons caused by rolling stock in motion, fires and others." [Railway Safety Directive 2004/49/EC]

"any accident involving at least one rail vehicle in motion, resulting in at least one killed or seriously injured person, or in significant damage to stock, track, other installations or environment, or extensive disruptions to traffic. Accidents in workshops, warehouses and depots are excluded." [Commission Regulation (EC) No. 1192/2003]

Incident (occurrence):

"any occurrence, other than accident or serious accident, associated with the operation of trains and affecting the safety of operation." [Railway Safety Directive 2004/49/EC]

Person killed:

"any person killed immediately or dying within 30 days as a result of an accident, excluding suicides." [Commission Regulation (EC) No. 1192/2003]

Person seriously injured:

"any person injured who was hospitalised for more than 24 hours as a result of an accident, excluding attempted suicides." [Commission Regulation (EC) No. 1192/2003]

Slightly injured:

"other people who are injured"

Accident categories

- **Train collision:** a frontal or front-end collision between two trains or a sideways collision between one train and a part of another train outside its clearance. Including collision with a train during shunting (also coupling, turning, fly-shunting, hard shunting and collision with moving coaches or wagons).
- **Collision with objects:** collision between a train and obstacles within its clearance. Obstacles may be fixed structures, e.g. buffers, fender stops, bridges, tunnels, or objects that are temporarily on or in the vicinity of the track (excluding level crossings) such as stones, soil, sand, trees, parts from rolling stock, road vehicles and machinery or equipment for track maintenance. Animals are also treated as objects in the railway statistics.
- **Train derailment:** where at least one of the train's wheels is derailed.
- **Accidents at railway level crossings:** accidents at level crossings involving at least rolling stock and a vehicle, other level-crossing users such as pedestrians or objects that are temporarily on or in the vicinity of the track if left there by a level-crossing user (accidents also include footbridges and tractor paths).
- **Accidents to persons caused by rolling stock in motion and the risk of this:** accidents in which one or more people are struck by rolling stock or an object connected to the rolling stock. People falling from the train are included, as well as people struck by loose articles whilst they are conveyed on the train (excluding suicides).
- **Suicide:** an act to deliberately injure oneself resulting in death, as recorded and classified by the competent national authority (suicide is not treated as a railway accident, but is recorded under this category). Attempted suicides are also recorded here: an act to deliberately injure oneself resulting in serious injury, but not in death, as recorded and classified by the competent national authority (definition in relation to Commission Regulation (EC) No. 1192/2003).
- **Fires in rolling stock:** fires or explosions originating in rolling stock (including cargo) whilst in motion between a departure station and a destination, both included, as well as stops along the way and shunting areas. (Exclusively vandalism.)
- **Accidents or incidents involving dangerous goods:** any accident or incident that must be reported in respect of RID/ADR (chapter 1.8.5).
- **Other:** all accidents over and above collision, collision with objects, train derailment, accidents at level crossings, accidents to persons caused by rolling stock in motion, fires in rolling stock and accidents and incidents involving dangerous goods. There may be a collision/derailment of works vehicles used for shunting and maintenance. Objects thrown off the train (e.g. ice or ballast).

Incident categories

All incidents must be reported/recorded. If an incident leads to an accident, it must still be recorded (e.g. as both passing a danger signal and as a collision).

- **Broken rail:** any continuous break that divides the rail into two or more pieces, or a crack formation on the running surface that is more than 50 mm wide and 10 mm deep.
- **Buckling:** faults related to the joints, fixing and geometry of the tracks that give rise to lines being closed or temporary reductions in the permitted speed limit so as to maintain safety.
- **Signal errors that can be attributed to technical conditions:** errors in the signalling system for infrastructure or rolling stock that result in a less restrictive signal than is required.
- **Signal passed at danger** (SPAD): Any situation in which part of the rolling stock continues to move further than is permitted past a signal, also including manual signals. For example, violation of the safety distance envisaged by ATC systems, past a point that is communicated verbally or in writing and envisaged in the rules, or past a stop sign.
- **Defective wheels and axles on rolling stock:** a break affecting the essential parts of the wheel or axle, with the risk of an accident (derailment or collision).
- **Accidents and incidents of an electrical nature** connected to the overhead cable equipment: In addition to accidents to persons, explosions and fires, and the risk of these, must be reported (pursuant to Executive Order No. 177)

Annex C.2.: Current summary of national safety indicators

Table C.2.1 Overall development relating to safety indicators

Indicators	Total in 2006	Total in 2006/million train km	Current five-year average/million train km
Accidents	94	1.17	1.08
Incidents	4958	61.56	75.54
Killed	14	0.17	0.20
Seriously injured	10	0.12	0.13
Costs of serious personal injuries (DKK million)	165	2.0	2.3

General indicators for safety on the railways. Accidents are appraised for situations that give rise to serious injuries or material damage of more than DKK 75 000. The appraisal of people killed or seriously injured does not include suicides or attempted suicides.

Table C.2.2 Indicators for accidents

Accidents	Total in 2006	Total in 2006/million train km	Current five-year average/million train km
Train collision	3	0.04	0.03
Collision with objects	6	0.07	0.08
Derailment	6	0.07	0.10
Accidents at railway level crossings	11	0.14	0.09
Accidents to persons	24	0.23	0.38
Suicide	17	0.21	0.13
Fire	5	0.06	0.01
Accidents involving dangerous goods	1	0.01	0.24

Accidents resulting in material damage of over DKK 75 000 and/or people killed or seriously injured

Table C.2.3 Indicators for personal injuries

Killed	Total in 2006	Total in 2006/million train km	Current five-year average/million train km
Passengers	0	0.00	0.01
Staff	1	0.01	0.01
Railway level-crossing users	4	0.05	0.03
Trespassers on railway premises and Others	9	0.11	0.15

The appraisal of the number of people killed does not include suicides

Table C.2.4 Indicators for people who are seriously injured

Seriously injured	Total in 2006	Total in 2006/million train km	Current five-year average/million train km
Passengers	4	0.05	0.05
Staff	3	0.04	0.02
Railway level-crossing users	1	0.01	0.02
Trespassers on railway premises and Others	2	0.03	0.03

The appraisal of the number of people seriously injured does not include attempted suicides

Table C.2.5 Indicators for incidents

Incidents	Total in 2006	Total in 2006/million train km	Current five-year average/million train km
Incidents	29	0.36	0.46
Collision with objects	361	4.48	5.14
Derailment	90	1.12	1.17
Accidents at railway-level crossings	90	1.12	0.66
Accidents to persons (present)	275	3.41	3.14
Suicide	22	0.27	0.43
Fire	145	1.80	1.90
Incidents involving dangerous goods	20	0.25	0.11
Broken rails	0	0.00	0.02
Buckling	1	0.01	0.01
Signal errors	545	6.77	13.75
Passing danger signals	508	6.31	6.24
Defective wheels and axles	19	0.24	0.10
Other	2851	35.40	43.13

Table C.2.5. Incidents not involving serious injuries and in which any material damage is under DKK 75 000.
The total number of incidents in 2006 was 4 958.

Annex D:

Important changes to legislation and regulations

Table D. Changes to legislation and regulations in 2006

Legislation	Legal instrument	Date of entry into force	New or amending legislation	Remarks
Amendment to the Railways Act	Act No. 1422 of 21 December 2005	1 February 2006	Amending Act	Implementation of various rules in the Railway Safety Directive, including that the safety authority must publish a report on its activities, and that the Danish Accident Investigation Board must publish an account of investigations, recommendations and corrective measures once a year, by 30 September at the latest.
Implementing provisions for interoperability on the Trans-European Rail Network	Executive Order No. 347 of 20 April 2006	29 April 2006		The Executive Order implements Directive 2004/50/EC of the European Parliament and of the Council of 29 April 2004 amending Council Directive 96/48/EC on the interoperability of the trans-European high-speed rail system and Directive 2001/16/EC of the European Parliament and of the Council on the interoperability of the trans-European conventional rail system.
Implementing provisions for the amending Directive for the development of the Community's railways	Executive Order No. 37 of 23 January 2006	1 February 2006		Among other things, the implementation involves extending access rights to all types of railway freight transport as of 1 January 2007 in harmony with the principles that freedom to supply services will improve the efficiency of railway transport in relation to other modes of transport. It will also facilitate the development of sustainable transport between and in Member States, by promoting competition and opening up opportunities for access to new capital and new undertakings.
Implementing provisions for the Railway Safety Directive	Executive Order No. 38 of 23 January 2006	1 February 2006	Implementing order	The Executive Order implements the Railway Safety Directive, 2004/49/EC of 29 April 2004
Rules relating to railway safety				
Safety authorisation of infrastructure managers	Executive Order No. 13 of 4 January 2006	15 January 2007	New Executive Order	Adaptation to the Railway Safety Directive and supplement to the Implementing Order and the Railway Safety Directive
Safety certificate for railway undertakings	Executive Order No. 14 of 4 January 2006	15 January 2007 See above	New Executive Order	Adaptation to the Railway Safety Directive and supplement to the Implementing Order and the Railway Safety Directive
Engine driver licence and fees	Executive Order No. 1191 of 29 January 2006	9 December 2006	Amending Executive Order	Licences for engine drivers have been issued for the first time and, in connection with this, a fee for the licence has been set by an amending order

Table D. The summary shows whether the amendment to the Act or regulation has been implemented with reference to the relevant legal instrument, as well as
a brief remark on the content of the amendment.

Annex E:

Certification and Supervision

Summary

Table E.1.1. Supervision and certification 2005 and 2006 at railway undertakings

Railway undertaking	2005		2006	
	Supervision	Certification	Supervision	Certification
Danish Jernbane Aps		X	X	
Lokalbanen A/S	X			
Norddeutsche Eisenbahngesellschaft Niebüll GmbH (NEG)			X	
Nord-Ostsee-Bahn GmbH				
RAG Bahn und Hafen Gmbh				
Vestsjællands Lokalbaner A/S (WZLR)	X			
Nordjyske Jernbaner A/S	X		X	
Arriva Tog A/S	X		X	
DSB S-tog A/S	X		X	X
Hads-Ning Herreders Jernbane A/S (The Odder Line)	X			X
DSB		X	X	
A/S Lollandsbanen	X	X	X	
Railion Danmark A/S			X	X
Vemb-Lemvig-Thyborøn Jernbane A/S (Lemvig Line)			X	X
Metro Service A/S	X		X	
Hector Rail			X	X

Table E.1.1. The cross does not express the number of inspections carried out. When implementing certification, a certification inspection is carried out. Inspection of Vestsjællands Lokalbaner was postponed until 2007

Table E.1.2. Supervision and certification 2005 and 2006 at railway infrastructure managers

	2005		2006	
Railway infrastructure manager	Supervision	Certification	Supervision	Certification
Rail Net Denmark	X		X	
Øresund Link Consortium	X		X	
Vestsjællands Lokalbaner A/S (VL)				
Nordjyske Jernbaner A/S			X	
Arriva Tog A/S (Vestbanen Railway)			X	
DSB S-Tog A/S			X	
A/S Hads-Ning Herreders Jernbane (The Odder Line)			X	
DSB			X	
Lollandsbanen			X	
Hovedstadens Lokalbane A/S				
Vemb-Lemvig-Thyborøn Jernbane A/S (Lemvig Line)	X		X	
Metro Service A/S	X		X	

Table E.1.2. The cross does not express the number of inspections carried out. For example, more supervision inspections were carried out in respect of Rail Net Denmark's safety certificate as a railway infrastructure manager. All safety certificates for railway infrastructure managers were last issued in 2003 or 2004 and are therefore valid until 2008 or 2009. The scheduled supervision of Vestsjællands Lokalbaner and an inspection of Rail Net Denmark have been postponed until 2007

The Railway Safety Report 2006 is an account of the level of safety on Danish railways, and reviews the development of accidents and incidents. It assesses whether national safety targets have been met, and the risk of people being injured as a result of accidents on the railways.

The Safety Report contains an account for 2006 regarding the development of technical authorisations, certification and supervision for railway undertakings and infrastructure managers. It contains a description of the important changes to legislation on railway safety and interoperability.

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Photographs: Klaus Holsting
Graphic design: Punktum Design MDD
Printing: K Larsen and Son

ISBN 87-91726-21-2