

# **<sup>1</sup>DISASTERS IN TRANSPORT – THE USE OF ACCIDENT INVESTIGATION COMMISSIONS AS A PROACTIVE APPROACH**

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**Keywords:** Accident investigation, safety board, disaster, transport, accident investigation commission

## **Abstract**

Transport disasters and accidents with tragic consequences in aviation, maritime, rail and road traffic during the last few years have raised the issue of the safety of public transport in many countries. In addition, explosions, fires, and other large accidents and near misses in urban areas have contributed to a general feeling of fear and frustration among the public. Such disasters have been reported in detail by the mass media, politicians have called for stronger safety regulations, and police authorities have made investigations to determine if laws have been broken. Moreover, accident investigation commissions have often been asked to identify causes and propose new preventative measures.

Although accident investigation commissions exist in many countries, they do not constitute a homogeneous group. Some common international trends in establishing and organising such commissions at a national level are described and discussed, with emphasis on certain associated characteristics. The general difference between national accident investigation commissions and the safety boards in the transport sector is highlighted.

The preventative role of safety boards has been questioned. In conclusion, some of these critical questions are discussed, and certain prerequisites for a more successful preventative function are summarised.

## **Introduction**

Some transport disasters and several major transport accidents have been widely reported in detail by the mass media in western countries during the last 2-3 years. Both the media and independent accident investigators have questioned the quality of safety management systems in transport enterprises, and the safety effectiveness of specific preventative measures. Despite the general reduction of injury risk associated with the use of public transport within the last decade, many passengers and potential users remain worried and, in general, feel that there are insufficient levels of safety within aviation, maritime and rail transport. Indeed, many people who rely on daily transport for work or leisure choose a private car as a safer means of transport! Public opinion, contrary to all the available evidence, is that the private car is safer than plane, ship or train.

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Norwegian accident statistics indicate that 90% of all fatal accidents in the transport sector in Norway were connected to road traffic (ECON Report 46/2000). This gap between individually perceived risks as opposed to the actuality of the statistically calculated risks represents a dilemma for those seeking to promote public transport.

The use of accident investigation commissions, in some form, is common in connection with public transport accidents. However, they are seldom used for car accidents where the police usually combine the functions of investigating the causes, identifying the guilty person(s) and recommending possible legal prosecution. The paradox is that despite both lower accident risk in public transport and a structured investigation procedure in the case of accidents, many people still doubt the safety of public transport and favour private cars.

### **Public transport, accidents and public confidence**

#### The radical change in transport patterns in developed countries

Looking retrospectively over a long period, the overall pattern of transport of passengers in developed countries has changed radically according to the availability and use of the prevailing transport mode. Historically, over many centuries, transport overland was on foot or by horse, and at sea by ship. In the last century, the tragic sea disasters are exemplified by the Titanic in 1912 (over 1500 dead) and the Estonia in 1994 (852 dead). But most shipping accidents are connected to merchant vessels and fishing boats (excluding the two world wars) and have resulted in considerable loss of life. Technological progress in the 19<sup>th</sup> century led to the introduction of railways as a new and rapid means of transport without a high-risk profile. However, single train accidents resulting in many fatal injuries have highlighted the high-risk potential. Technological development in the 20<sup>th</sup> century led to two other transport means, with different risk profiles: motor vehicles (cars, buses and lorries) and airplanes. Road traffic was characterised by many accidents, on a small scale, but with a growing number of injuries. Conversely, the aviation sector was characterised by few accidents, but on a large scale. Today, most passenger and goods traffic in Western Europe is by road. Road traffic accounted for 79% of all passenger traffic in the 15 EU countries in 1998 (measured by billion passenger km), and 44% of all goods traffic (billion ton km). (See EU White paper 2001, page 24).

Today, the injury pattern reflects the distribution and use of the transport modes, and is partly influenced by systematic safety promotion.

Transport fatalities statistics for Sweden during the 1990's illustrates both the pattern of risk between different transport modes, and the potential for risk reduction (fig. 1). (Aarsbok 2000/2001: Transporter och kommunikationer, Svensk institut för kommunikationsanalys)

Similar patterns can be found in several countries whereby high-risk transport modes are the use of private boats and cars, whilst public transport means have a relatively low risk for fatal accidents. However, for a clearer overall picture of development, a more detailed analysis is required including the number of entities, work transportation trends and other varying factors.

The introduction of the zero vision (no fatalities/ no major injuries) in the different transport modes in many countries has highlighted the necessity of a continuous, holistic safety approach.

Fig.1 Fatalities in selected transport areas in Sweden, 1990 – 1999. Total number.

Year	Leisure boat	Rail*	Aviation	Road
1990	73	2	21	772
1991	80	0	11	745
1992	55	0	17	759
1993	50	0	8	632
1994	46	0	7	589
1995	47	0	14	572
1996	33	0	4	537
1997	38	0	9	541
1998	42	1	4	531
1999	28	1	12	580

Remark: \*Rail fatalities: Source: Swedish National Rail Administration/Swedish Railway Inspection/ NSB BA. Aviation: 75 % of the fatalities in the period 1990-99 occurred in connection with private airplanes, only 25 % with other airplanes.

The risk in transport

Research has shown that, “people have a higher risk valuation when travelling by collective modes of transport like railway than when going by car”. Professional transport companies operate collective modes of transport, and all employees are specifically educated and trained to do their jobs. Serious companies have adopted safety management systems, procedures and routines to ensure safety of operation. Public responsibility and liability should encourage a high level of safety. The risk of injuries varies according to the type of transport mode, and for several reasons. Laws and regulations, certification, auditing regimes

etc, in addition, comprehensively regulate the transport areas. The key question is, if the different acceptances of risks as seen by society, politicians, inspectors and passengers, are concurrent or not? The tolerance of hazards will vary along different dimensions, but as a common phenomena the societal threshold has been lower from decade to decade, with the exception of the high sensation seekers, for whom individual acceptance and practice of high risk activities seems to be tolerated by societies. In the transport field, however, one conclusion could be that there is a need for more defined differentiated risk values, which in turn may raise several ethical and political questions.

Higher personal risk is not only accepted on an individual level when driving a car. Similar acceptance has been found with other activities. For example, leisure time, at home, during sport, on vacation etc. The risk acceptance gap between the collective sphere and private life can be explained by several reasons.

The present level of risk in the transport field is challenged by professor A. R. Hale (EU Proceedings 2001). His point of departure is that “most transport systems have inadequate system models for carrying out effective risk assessment and management”. In his view, “the transport industries lag a decade behind the nuclear and process industries in making such explicit models of safety and risk control, including explicit and auditable safety management systems.” He also argues that “transport systems such as aviation and railways have become ultra-safe without having such explicit models of how they achieve this. They are very vulnerable to the sorts of organisational and technical changes that are flooding over them at present. Without a clear model of who does what and which measures control which scenarios, outsourcing, downsizing, privatisation and decentralisation can remove vital safety functions in the system without us realising it.” (Page 143).

Public confidence

A company’s reputation is vital for success in the market place. The destiny of the worldwide enterprise Arthur Anderson is a good example of the thin edge between success and failure. All high-risk companies, and this includes all public transport companies, rely on public confidence for survival, and this is derived from subjective passenger evaluation of perceived risks. There are several examples from transport during the last 10-15 years of the considerable effect resulting from just one single accident. Many companies have used millions of dollars in trying to rebuild

customers' confidence. The possible environmental disaster arising from the oil spill from the Exxon Valdez (1989) in Alaska and all the following counter measures is but one example.

Another example is the Aasta train accident in Norway on 4 January 2000 in which 19 people were killed. The train operator, NSB BA, carried out a public survey in the spring of 2000, and some of the results were clear:

- A majority held the opinion that it was safer to use private car than train
- Only 21% believed that NSB BA were strictly attentive to safety
- Only 51% believed that air companies were strictly attentive to safety

The survey showed that a majority of people thought car transport by road as far safer than transportation by a professional train operator, indicating a remarkable lack of confidence in the safety commitment of the rail company. Moreover, the survey also indicated distrust in the aviation companies' prioritisation of safety. The train company, NSB BA, needed several months to regain their customers. Similar examples can be found in other transports arenas and with other transport operators.

Accident investigation has a special function in this connection. This role is stated clearly in the Rand Report (1999): "The NTSB's unique role in transportation safety is .... to assure public confidence in the safety of our national transportation systems." (Page 1-2). To fulfil this role, the NTSB must of course meet special prerequisites, and such a function place also a heavy burden on NTSB. Similar multi-modal safety boards, however, characterised by independence, competence and authority, will have the same functions in their countries. The challenge to the Accident Investigation Commissions or Safety Boards is to preserve their integrity and independence in such a situation.

## **The role of accident investigation commissions**

### Some major trends

One major trend is to organise independent accident investigation bodies outside of the traditional organisational structures such as the transport directorate or inspectorate, and within the framework of public authorities. Usually, the responsibility of the investigating body is limited to a special transport mode, such as aviation, maritime or rail accidents.

This trend is further advanced by the European Commission's transport initiatives. In an ambitious programme, "European transport policy for 2010: time to decide" (EU White Paper 2001), several potential proactive measures are identified as intending to reduce the risk of accident in all transport modes. Two examples, of many: (a) the EU will, by 2010, reduce by half the number of 41,000 people currently killed in fatal road accidents on European roads. (b) A EU proposal to create a separate European Maritime Safety Agency. The issue of investigation commissions is dealt with under the safety directives for each transport mode. As one example, the European Commission will propose a new Directive on the regulation of safety and investigation of accidents and incidents on the Community's railways in 2002 (Draft proposal, December 2001). The draft Directive details several proposals, including an obligation on each Member State to create a permanent investigative body that shall be independent, sufficiently resourced, and capable of covering both accidents and incidents. The main aim is to improve railway safety and prevent future accidents and incidents.

On a national level, the tendency is two-sided. This involves both the creation of a sectorial accident investigation commission for each transport mode (if not already in operation), and the building up of institutional bodies and dedicating personnel with the necessary competence to fulfil such functions within major transport companies.

Parallel to this particular sector approach, there is another trend with growing importance in some European countries, the creation of independent multi-modal investigation bodies. One of the conclusions from the 1<sup>st</sup> Annual European Energy and transport conference in Barcelona (October 18 – 19, 2001 – Theme: Prevention the key to transport safety) was that “there is much benefit in the creation of a multi-modal accident investigation authority in each Member State. The multi-modal approach was seen as a positive step to widening knowledge. In particular in the field of the human element – often at the root of the accident – a multi-modal approach offers scope for cross-fertilisation” (Proceedings, page 61). A recent example of such organisational innovation is the new Safety Investigation Board in the Netherlands.

Two models of safety boards are currently in use. Firstly, there is the traditional approach of a multi-modal accident investigation commission for transport as used by the US National Transportation Safety Board (1967), the Transportation Safety Board of Canada (1989), the New Zealand Transport Accident Investigation Commission (1990), and the Netherlands Transport Safety Board (1999). However, the second model is a total, or holistic safety board, covering all major types of accidents, as utilised by the Swedish Board of Accident Investigation (1990) and the Accident Investigation Board of Finland (1990). (see also John A. Stoop 2001)

#### Characteristics by AIC

Modern transport safety boards have developed through different stages and processes. In the paper, “Safety Board Methodology” by Kahan and others, fact-finding investigations are divided into three categories:

1. A reactive event investigation of an accident or incident.
2. A retrospective safety study to attempt to determine the common factors in a series of events.
3. A proactive safety study, in which a board plans a research study that includes primary data collection of events as they occur.

In addition, they summarize the evolution of safety boards by identifying several dimensions, which are dependent of historical conditions and needs:

- Independence
- No fault
- Multi-modality
- A systemic perspective
- Safety studies

Only a few of the present safety boards incorporate all of these elements. The authors also look into the future and advocate new evolutionary steps.

Supporting collateral for these evolutionary viewpoints comes from two of the conclusions emanating from the 1<sup>st</sup> Annual European Energy and Transport conference in Barcelona. Namely, that there “are big differences between transport modes” and, “also in the field of accident investigation it was considered that the oldest transport modes can learn from the practices established in the youngest mode (aviation)”. (Proceedings, page 61).

#### Accident investigation commissions or safety boards?

Historically, there is no straight line. The first, and indeed most important commission was the US National Transportation Safety Board. This safety board was mentioned in 1938 by Adgar S. Gorell, who was president of the Air Transport Association, in connection with the adaptation of the Civil Aeronautics Act of 1938. In a later phase, the concept of accident investigation commissions was widely used in several countries. However, during the last 10 years the focus has again been on safety promotion, and therefore also on safety boards. These two concepts have been used in different historical contexts and have different associations and meanings. While the term

commission is used for numerous different purposes, there are common elements: the historical perspective, the fact-finding mission, and the necessity of a conclusion. The safety board concept is associated with a positive approach, is more future oriented, and has the promotion of real safety as a key element.

### **Safety boards as proactive tools**

#### Some critical questions

Most of the activity in present safety boards around the world is concentrated on investigating actual disasters, accidents or incidents. Using the US NTSB as an example, the Rand Report (1999) focuses on the inherent dilemma that all accident investigation commissions are facing: “The NTSB’s mission is primarily *proactive* – the prevention of transportation accidents – yet the agency accomplishes this mission by being *reactive* in responding to catastrophic events.” (Study overview, page 5). This problem is of crucial importance. However, one argument could be to underline the potential effect in-depth studies and safety recommendations can have on similar risks within the same transport mode or on corresponding risks in the transport system as a whole. The validity of the argument will depend of the real effect of the recommendations i.e. if they are adequate and implemented. Another argument could be to stress the importance of investigating incidents. A critical view would be to examine the extent of incident investigations and the follow-up of such investigations.

Another question concerns the resources, priorities and competence of safety boards. Do they currently have the necessary resources available, including personnel with the necessary competence, to allocate activities connected to proactive tasks? In an organisation with limited resources, a heavy workload, widespread mass media attention, and impatience from politicians and victims to investigate specific accidents, the all-encompassing independent role is more idealistic than the actual reality.

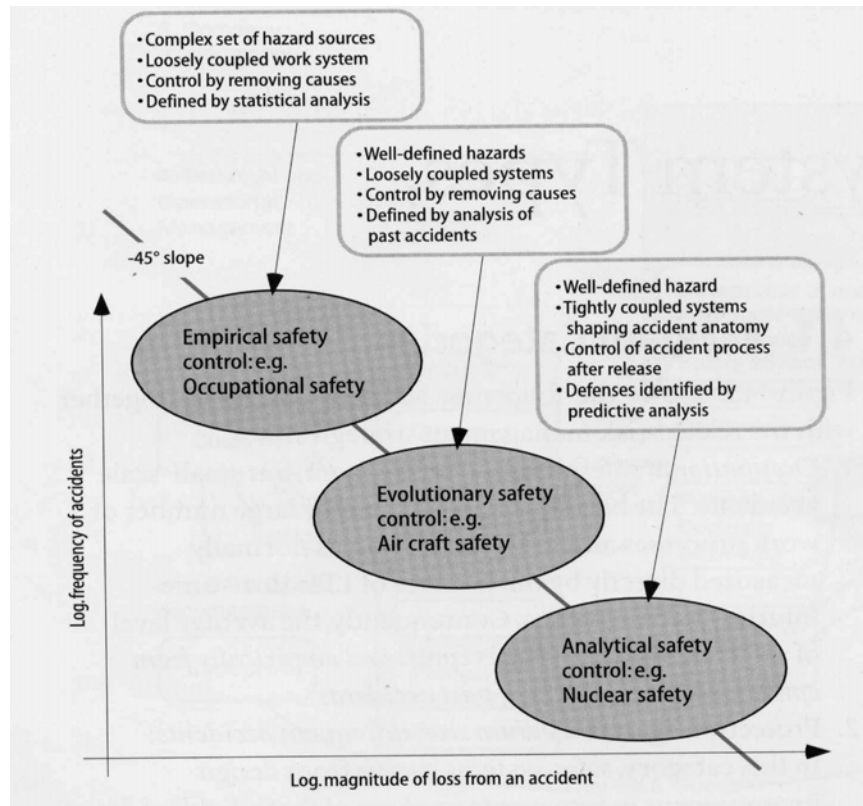
#### Improving the proactive function

One very important task for future safety boards must be to more clearly define the mission. This will then shape the strategic decisions concerning organisational structure and position, resources, suitably qualified personnel, methods, equipment etc.

Such a policy process should ideally focus on both objectives and limitations. This might lead to the conclusion that accident investigation commissions are not the most appropriate method to use in respect of all kind of accidents. It will be essential to identify a set of criteria to define which types of accidents are applicable for proactive aims. Danish researcher Jens Rasmussen has illustrated this point (fig. 2). He combines the frequency of accidents with the magnitude of loss from an accident, leading to the basic features of different hazard categories and the related hazard sources. Different risk management strategies are necessary to deal with these accident categories (Rasmussen/Svedung 2000, page 28). The same will occur with accident investigation commissions; their mission must be defined in more proactive terms to stimulate the development of real safety boards with proactive functions.

Independent investigations should be anchored in law, as proposed by Pieter van Vollenhoven, in 2001 (van Vollenhoven 2001). He argues that every citizen has a right to independent investigations after accidents, and society has a duty to perform them.

Fig. 2. Jens Rasmussen's figure of different hazard categories and hazard sources



Wider and improved application of conclusions, recommendations and proposals should be encouraged, both within the specific transport mode and the relevant transport sector as a whole, both nationally and internationally. Such distribution of knowledge and firm proposals could be the task of an international body, preferably a UN organisation. The usefulness of such a knowledge database will increase over time, since it is reasonable to assume that similarities at the system level, both within the same transport mode and between different transport modes worldwide, will develop towards closer uniformity e.g. human factors, technology, safety management systems etc.

There is a considerable potential for accident research to produce more scientific based knowledge about risks, accidents, prevention and emergency management. Today, the resources used on such research in different countries are remarkably small. Safety boards should be adequately financed to enable the initiation and support of research in areas where more knowledge is needed.

### Concluding remarks

There is an urgent need for improved organisational and methodological approaches when using accident investigation as a method to enhance proactive measures against the threat of future disasters and accidents.

1. The establishment of safety boards should be encouraged, especially in the developing countries, with the help of financial support, systematic use of investigative and preventative competence and experience feedbacks.

2. Safety boards should, at the very least, be multi-modal and independent, cover the whole spectrum of transport modes, or be national safety boards covering all types of major accidents.
3. Safety boards should be designated the necessary resources to recruit key personnel, develop new skills and competence, and initiate research programmes and projects.
4. As a long term aim, to enhance safety promotion, a UN database is needed to incorporate worldwide information on accident and incident statistics, accident investigations, injury causes, exposure statistics, in-depth injury studies, recommendations, research results.

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## Author biography

Sverre Roed-Larsen, educated as a sociologist, is a project manager and has more than twenty years experience of consumer and product safety work for the Norwegian public authorities, in addition to railway safety management for the Norwegian State Railways. He is currently a researcher at the Norwegian Work Research Institute, where he is working on a Ph D dissertation on the use of accident investigation commissions following transport disasters in some European countries during the 1990s, particularly aviation, maritime and railway accidents. He has broad experience from international work, including that with UIC, OECD, EFTA, ECOSA, PROSAFE, and ESReDA.