Mechanics Transport Communications
Academic journal

ISSN 1312-3823
issue 3, 2007
article № 0136
http://www.mtc-aj.com

RISKS IN OPERATION OF TRANSPORT PROCESSES

Ladislav ŠIMÁK,
Ladislav.Simak@fsi.uniza.sk

Prof., eng., PhD, .Faculty of Special Engineering, University of Žilina in Žilina,
1st May Street Nr. 32, 010 26 Žilina,
SLOVAK REPUBLIC

Abstract: *Transport security is one of the conditions of complex society development. Risk management includes the measures that are necessary to be introduced to ensure the transport security. Submitted paper deals with classification of the risks that can result in crisis events in transport and their analysis, too.*

Key words*: security, transport, risk, risks analyses, crisis events in transport.*

INTRODUCTION

Since year 1999 the Faculty of Special Engineering of the Žilina University has been solving a lot of research projects aimed at the problems of transport organization in crisis situations. From the original model, so called Integrated Transport System, we have come to the system of so called Crisis Transport Support. At present we are dealing in detail with technology of individual types of transport whereby the accent is put on the railway transport eventually on the urban mass transportation. The important part of these projects presents solution of the problems of increasing the transport security including risk analysis and realizing preventive measures to prevent crisis events.

Security of society including the transport is a part and one of the basic conditions of positive future development of the human society. These mentioned problems are based on stable international relations but its complex and system understanding require research of all parts of societal, political, economic, natural, technical and technological environments including transport. At present security includes defence against external threat, protection against natural disasters and industrial accidents as well as achieving required level of internal security in a state and its regions.

In the process of achieving required security level the emphasis is put on the abilities of security system to counter a broad range of non-military threats threatening the state, its inhabitants and material resources as well as the nature and that can cause crisis events. The security phenomenon of the present days are not only natural disasters and industrial accidents but in recent years also the international terrorism in all its destructive forms. Transport, because of its specific attributes, became the target and also the tool of the terrorists. They threaten transport process, transport objects and equipments since they form the space of great people concentration and they are also hardly renewable resources from the time, technological and economic point of view. Terrorists also use means of transport to perform the most different form of terrorist attacks.

Transportation and transport infrastructure of the Slovak Republic cannot also avoid the negative impacts of the possible crisis events. Ministry of Transport, Posts and Telecommunication of the Slovak Republic, as the central body of the state administration in the field of transport but also in the field of post and telecommunication services, has to give adequate attention to preparedness for solving the crisis

events in transport that can be the consequences of natural disasters, industrial and ecological accidents, terrorist attacks, organized crime, large migration waves or information systems violation. From the general view, corresponding preparedness for solution of crisis events is the task of public administration and it has this task - to protect the lives and property of inhabitants and the state as a whole- established in the Slovak Republic Constitution. The Slovak Republic is preparing new model of security system that responds to changed security situation in the world, new risks and threats and also respects new situation after the Slovak Republic accession to the European Union and NATO.

1. RISKS AND THEIR CLASSIFICATION

Risk is most often defined as the danger of failure, unsuccess, loss or damage and always connected with specific event. Risk is quantitative and qualitative expression of hazard, degree or margin of hazard. It is probability of a negative event occurrence and its consequences. Because none of human activities is absolutely secure, certain risk rate, called acceptable risk, is permitted. The residual risk presents the fact that in the process of designing, production and operation of technical equipments the certain risk rate cannot be completely eliminated [2].

Social processes, nature, technical equipments and technological processes include minimum events that are realized in conditions of certainty. The bulk of events have uncertain character and their result is connected with certain risk. Risks are caused by the man and his activities, technique and technological processes, nature and its inscrutability. Generally the risks can be classified to two basic groups:

- atropogenic risks:
  - risks emerging from society,
  - risks emerging from technique,
  - combined risks,
- risks independent on human activity:
  - natural risks:
    - tectonic,
    - telluric,
    - topological,
    - meteorological,
  - risks emerging from cosmos.

Transport defined as a move of means of transport on transport roads or function of means of transport that move something or somebody around is connected with a lot of risks that endanger performance of a contract of carriage between carrier and customer. Structure and character of the risks affecting the transport are very varied which results from the nature of the transport, transport business and transport processes. The most important specialty of transport is the movement of people and goods from one place to another that are the sources of external risks. These risks are usually independent on the carrier's will that can only minimally eliminate them. On the other hand there are many risks in transport that are connected with form of transport, its character and quality of technological processes organization. Transport business is also affected by risks that are specific for any type of business.

Above mentioned risks cannot be expressly allocated and sharply separated. They are blending together, connecting and increasing what can result in synergic effects or so called "domino effect". Risk analysis in transport and specifically in individual forms of transport is complex process that presents multicriterion probability function of breaking continuity of transport process and also performance of transportation plan.

Transport and the transferring processes became necessary for human development and increasing the standard of living. They are exposed to the same risks as any of human activities. On the other hand many risks in transport and transferring processes are multiplied because the internal and external conditions inclosing transport are much complicated than e.g. in manufacturing processes.

It is indicated by many facts that include:

- distance carried (extent in kilometres and thousands of kilometres):
  - differences in internal and external conditions in the place of consigner and consignee,
  - time factor (transport distance),
  - changes in transport conditions during transport (transit across other countries, change of type of transport, …),
  - weather influence,
- character of transport:
  - personal,

  - freight,
  - transport of dangerous goods,
- transport technology (split according to form of transport and character of transport).

Risks, influencing transport business and transport processes, can be derived from risks currently affecting society, human activities, material values, living environment and also the human life and health. These risks include:

- risks of non-military character:
  - risks from development in the world and foreign policy of the Slovak Republic,
  - risks of the home policy of the SR including political risks,
  - social risks,
  - risks of demographic development,
  - economic risks,
  - technical and technological risks,
  - information risks,
  - risks of energy and raw material shortness,
  - risks of shortage of basic necessaries of life,
  - health risks,
  - risks of national, race, religious, ideological and cultural intolerance,
  - risks resulting from criminality growth,
  - risks from deterioration of natural environment,
  - risks of natural disasters occurrence,…
- risks of military conflict occurrence,
- combined risks.

It is evident that the risks are generally very varied. They are existing in all spheres of human activities and natural environment. The sources of risks and risks factors that can cause crises events are also varied.

At present there is no generally binding or internal legal rule that would define kinds of risks and enable their analysis and evaluation. If we want to perform this task there are many variants and different views of evaluation. In the first place risks in transport can be classified as:

- risks of transport business,
- risks of transport technologies,
- risks of transport infrastructure,
- risks resulting from transport character [5].

Decisive source of risks in transport is just the man. He can be in various positions in relation to transport. He can be:

- transport operator,
- participant in transportation processes,
- a man wilfully endangering transport and transportation process,
- a man outside transport and transportation process who can danger it through his activities realized in consequence of emergency event [5].

2. RISK ANALYSIS IN TRANSPORT

Risks analysis and their quantitative evaluation are integral part of transport enterprises management and the competent bodies of state administration. This process cannot be successfully realized without perfect knowledge of transport processes and their technology, transport requirements and transport environment. Risk quantification requires complex database that completely describes transport, allows carrying out sequence of generalizations and assess the probabilities of crisis events occurrence. Generally we can say that at present there are only minimum presuppositions of military conflict at our territory but the probability of transport accidents and their seriousness are increasing. For this reason it is necessary to carry out preventive measures to prevent crisis events in transport and prepare conditions for minimizing the impacts of occurring crisis events.

On the other hand it is necessary to respect the particularities of respective types of transport. Railway transport is one of the most used types of transport in the field of personal and freight transport. It is ground type of rail transport that is characterized by the range of specific properties but also the risks threatening transport security and transportation plan. The basic risks in railway transport include: risks of traction vehicles and railway carriages reliability, risks of technical conditions of railways and track lead, risks resulting from technology of railway transport, risks connected with type of transported goods, risks of failure of communication and error protection equipments, risks of failure of information and communication systems, risks of terrorist attacks and risks of military conflict occurrence.

Road transport is now the most used type of individual and public transport. Unlike the rail transport it is relatively independent on traffic road which means advantage in term of its availability but on the other hand it increases the

risk of accidents. The basic risks in road transport include: risks of automobile technology reliability, risks of insufficient technical conditions of roads and highways, risks resulting from technology of automobile transport, risks connected with type of transported goods, risks of terrorist attacks and risks of military conflict occurrence.

Air transport is progressive type of transport for large and middle distances. It is connected with quantity of specific risks that are in connection with use of air corridor. The basic risks in air transport include: risks of aeronautical techniques reliability, risks of air-navigation systems reliability, risks resulting from technology of air transport, risks connected with type of transported goods, risks of threat to air transport due to extreme climate conditions, risks of terrorist attacks and risks of military conflict occurrence.

Water transport is influenced by the risks that are connected with specialities of water transport and also the risks that are typical for all types of transport. They include: risks of vessels reliability, risks of water road conditions, risks resulting from operating objects and equipments on water road, risks from technology of water transport, risks connected with type of transported goods, risks of failure of information and communication systems, risks of terrorist attacks and risks of military conflict occurrence.

Crisis events in transport, initiated by impulses outside transport system, cause events that require special measures for ensuring transport services (extensive emergency situations or crisis states, state of emergency, state of exception, state of war or war). Transport operates in special regime and according to the state administration bodies' decision it is instructed by crisis plans. Crisis events in transport, due to impulses within transport system, result in transport accidents, design failures, technological accidents and failure of information systems. The basic sources and initiators of these crisis events can be:

- man (as operator of means of transport and information carrier),
- means of transport (its technical condition),
- transport road (technical condition, carriage ability),
- transport technology,
- transport information (delayed, bad content, incomplete),
- combination of these factors [5].

Transport system is like other systems influenced by its environment. Impulses resulting in crisis events can act from the transport system environment as well as its inside. For transport system is specific that crisis events within this system can result in crisis state of other objects and systems. It is valid also vice-versa, crisis event in non-transport systems can cause crisis within functional transport system.

The negative crisis events in transport result in disturbing means of transport operation, transport systems, damage or destruction of transport roads and transport buildings. This results in endangered human lives and health, material values or living environment. Relevant degree of crisis event in transport can be characterized:

- **Accident state** in transport occurs after crisis event of smaller extent (e.g. after current transport accident). Its extent significantly disturbs traffic continuity or requires acceptation of special operating measures (e.g. it can be caused by unfavourable atmospheric effects, ecological aspects etc.),
- **Crash state** in transport results in crisis event of great extent (e.g. bulk transport crash, crash during transport of dangerous goods, etc.). This crash results in breaking transport road. For the normal traffic recovery, forces and means for service and recovery of the traffic route in cooperation with forces and means of integrated rescue system are sufficient.
- **Crisis state** in transport is caused by crisis events of great extent (e.g. natural disasters – floods, earthquakes …). Function of the transport is disturbed in certain region or in the territory of the whole country. Recovery of traffic route is not possible without special forces and means and resources given in the crisis plans (e.g. subjects of economic mobilization of the transport, posts and telecommunication branch and other branches) [1].

CONCLUSION

Crisis events in transport result in disturbing transport operation, transportation process, function of means of transport and transport infrastructure. Their solution requires

employment of rescue eventually maintenance services and in the last resort also special forces, means and resources formed in accordance with special legal regulations. While the accident states can be solved only with minimal traffic restrictions, crash states require implementation of special regime during removal of accident impacts. Crisis state in transport cannot be solved by standard practices and means therefore it is necessary in accordance with Act. No.227/04 Col. on State Security during Time of War, Time of War State, Time of Emergency State and Time of Exception State to declare relative degree of crisis state and solve the transport situation within it.

LITERATURE

[1] PAVLÍČEK, F. et al : *Teoretické zásady řešení krízových situací v dopravě*, GA ČR č.103/97/137, DF JP UP, Pardubice, 1999

[2] SMEJKAL, V., RAIS, K.: Řízení rizik, GRADA PUBLISHUNG, a.s., Praha, 2003

[3] ŠIMÁK, L. et al : *Doprava v krízových situáciách*. FŠI ŽU, Žilina, 1999, 211 s., ISBN 80-88829-53-4

[4] ŠIMÁK, L.: *Krízový manažment vo verejnej správe*, FŠI ŽU, Žilina, 2001, 244 s., ISBN 80-88829-13-5

[5] Záverečná správa z výskumnej úloh: *Dopravné zabezpečenie mimoriadnych udalostí a vytváranie systému krízového manažmentu v rezorte MDPT SR*, FŠI ŽU, 2003, 240 s.

[6] Záverečná správa z výskumnej úlohy: *Model krízového riadenia na úrovni MDPT SR*, FŠI ŽU, 2004, 111 s.

[7] Právne normy SR na úseku krízového riadenia

This paper was supported by Slovak Research and Development Agency through financial support No. APVV SK-BUL-01506 and VEGA No. 1/4624/07 and KEGA Agency Project number 3/4055/06.

РИСКЪТ В ТРАНСПОРТНИТЕ ПРОЦЕСИ

Ладислав Шимак.
Ladislav.Simak@fsi.uniza.sk

Проф. д-р инж., *Факултет за специално инженерство Университет в Жилина, 1st May Street Nr. 32, 010 26 Жилина,*
Словакия

Резюме: *Сигурността на транспорта е едно от условията за комплексното социално развитие. Мениджмънта на риска включва мерки, които е необходимо да се въведат, за да осигурят транспортната сигурност. Докладът разглежда класификацията на риска, който може да доведе до кризисни явления в транспорта, както и техния анализ.*

Ключови думи*: сигурност, транспорт, риск, анализ на риска, кризисни явления в транспорта.*