Main Components of Modern Transport Safety

Summary: The subject of this article concerns safety in transport in the context of broadly understood contemporary challenges. The study characterizes the impact of transport on individual types of safety. Ecological, personal and economic security were selected for the analysis. The purpose of this article is to attempt to synthetically address the issue of safety in transport while taking into account several selected areas of this safety. Selected types of security will be considered: ecological, personal, and economic. It is the transport that presents new challenges that will affect the level of safety in the future. Today, the most important thing for the environment is to secure all parts of the infrastructure, both point and line, so that the movement process takes place without any irregularities that could result in damage to health and even loss of human life.

Keywords: transport, ecological security, personal security, economic security.

Główne elementy nowoczesnego bezpieczeństwa transportu

Streszczenie: Tematyka niniejszego artykułu dotyczy bezpieczeństwa w transporcie w kontekście szeroko ujmowanych wyzwań współczesności. W opracowaniu dokonano charakterystyki wpływu transportu na poszczególne rodzaje bezpieczeństwa. Do analizy wybrano bezpieczeństwo ekologiczne, personalne i ekonomiczne. Celem tego artykułu jest próba syntetycznego rozwiązania problemu bezpieczeństwa w transporcie, z uwzględnieniem kilku wybranych obszarów tego bezpieczeństwa. Uwzględnione zostaną wybrane rodzaje bezpieczeństwa: ekologiczne, osobiste i ekonomiczne. To właśnie przed transportem stawiane są nowe wyzwania, które będą w przyszłości wpływać na poziom bezpieczeństwa. Dziś najważniejsze dla otoczenia jest zabezpieczenie wszelkich części infrastruktury zarówno punktowej jak i liniowej tak, aby proces przemieszczania odbywał się bez jakichkolwiek nieprawidłowości które w konsekwencji mogły by doprowadzić do uszczerbku zdrowia a nawet utraty życia ludzkiego.
Introduction

The modern world is comparable to a global village. The distances between individual places of the globe have shortened, and above all, the time to overcome them. One of the features of modern man is his mobility. Mobility is a complex issue identified with the socio-technical system, whose important element, besides infrastructure and transport technology, are people and their behavior (Margherita, Secundo, Passiante, 2012, pp. 1–14).

Mobility is at the root of the development of modern transport. Briefly speaking, transport involves moving goods, people or information in space and time. According to D. Kiperska-Moroń and S. Krzyżaniak (2009), „the concept of transport is ambiguous and can mean:

- a set of activities related to the movement of persons and material goods by appropriate means (process approach),
- a branch of the economy comprising all measures and activities related to the movement of persons and goods (industry approach),
- field of knowledge dealing with various phenomena related to the movement of persons with material goods (scientific approach)”.

S. Krawczyk assumes that “transport is the movement of goods, persons or information in space and time. Activities related to transport make up the transport process. The transport process is a strictly defined sequence of activities, as a result of which the goods move from the sender to the recipient. The transport system consists of three elements: means of transport, transport infrastructure and a system for managing the movement of means of transport conducting goods or persons” (Krawczyk, 2011, p. 43).

The transport process takes place in the transport system. This system consists of three elements: means of transport, transport infrastructure (point and line) and a system for managing the movement of transport means transporting people or goods. Individual transport branches can work together to accomplish the task of transporting goods or people. Transport, along with the economic development of regions, is a factor intensifying development.
Ecological Safety in Transport

Ecological security is a continuous and continuous process that aims to achieve the desired ecological state, without interference, securing the healthy and peaceful existence of all members of the ecosystem. It is a kind of national security that includes processes that are to ensure that the natural environment is maintained undisturbed (Pietraś, 1996, pp. 47–222).

In this context, the key is a natural balance, i.e., a state in which there is a balance in a given area in the interaction of man, components of living nature and the set of habitat conditions created by components of inanimate nature.

The effects of civilization development make economic doctrine assuming the satisfaction of the needs of present generations gaining popularity while respecting the opportunities for future development.

The consequence of this approach to the relationship between nature and human activity is sustainable development, i.e., socio-economic development in which the process of integrating political, economic and social activities takes place, maintaining natural balance and durability of basic natural processes, in order to guarantee the possibility of satisfying the basic needs of individual communities or citizens of both the modern generation and future generations.

Following the concept of sustainable development, the term sustainable transport appeared in the literature on the subject, otherwise known as environmentally sustainable transport or the sustainable transport system, which due to small differences are treated as synonyms (Bartniczak, 2013, pp. 155–163). The basic features of sustainable transport include primarily (Brzustewicz, 2013, pp. 85–96):

- striving to meet mobility needs,
- care for human health and the quality of the environment,
- effective use of available resources,
- taking action to improve the quality of life of residents,
- affordability and supporting the competitiveness of the economy.

The area of sustainable transport in the European Union describes a total of 12 indicators (Table 1). They study, among others, the safety of transport activities in the aspect of their impact on the environment.
Table 1. European Union sustainable transport indicators.

<table>
<thead>
<tr>
<th>Leading indicator</th>
<th>Operational indicators</th>
<th>Explanatory indicators</th>
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<tbody>
<tr>
<td>Energy consumption in transport in relation to GDP (x1)</td>
<td>Transport and mobility</td>
<td>-freight transport volume in relation to GDP (x6)</td>
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<td></td>
<td>Division of transport tasks:</td>
<td>-volume of passenger transport in relation to GDP (x7)</td>
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<td>-in freight transport (x2)</td>
<td>-energy consumption in transport depending on the type of transport (x8)</td>
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<td>-in passenger transport (x3)</td>
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<td>Impact of transport</td>
<td>-greenhouse gas emissions associated with transport (x4)</td>
<td>-average CO₂ emissions per 1 km mileage for new passenger cars (x9)</td>
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<td></td>
<td>-number of road fatalities (x5)</td>
<td>-emissions of nitrogen oxides by means of transport (x10)</td>
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<td>Contextual indicator</td>
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<td>-emissions of particulate matter by means of transport (x11)</td>
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<td></td>
<td>-prices in passenger transport (x12)</td>
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Source: Sustainable Development Indicators.

Ecological safety in transport is, therefore, an important determinant of customer attractiveness for a given type of transport. The newly outlined electromobility trend is to be the answer to the problem of smog, which is faced by, among others, Poland.

**Personal Security in Transport**

Another type of security is personal security. In the case of an entity’s sense of security structure, indicate the basic premises on the basis of which the entity
assesses its level of security. The sense of no threat in the individual dimension is based on subjective criteria. These criteria are expressed by four basic premises in the form of (Urbanek, 2013, p. 45):

- assessment declared by the unit in relation to its predispositions, possibilities, and opportunities,
- the entity’s perception of a certain level of information about the situation,
- feeling the degree of belonging a given unit to a specific group or community,
- the level of understanding of events, processes, and consequences arising in relation to a given individual.

Modern man uses transport for many purposes: to get to the place of work, study or destination where he intends to spend his free time. We owe the development of mass tourism to the progress in the field of transport and the increase in the amount of free time.

J. Merski (2002) indicates that contemporary tourism functions include:

- socio-educational function (participation in tourism creates the possibility of contacts between people, cooperation, learning about art, culture, shapes patriotism, provides entertainment, etc.),
- health and recreation function (tourism and active physical recreation in free time, which serve the proper biological development of the individual and the efficiency of his body, cause regeneration of strength, etc.),
- economic and financial function (tourism is a branch of the economy based on the organization and offering of services to meet the needs of tourists, which directly affects the development of regions where tourism is organized and causes an increase in national income and the inflow of foreign exchange).

Safety in transport in terms of personal safety can be described in two ways. On the one hand, it is about travel safety, i.e., the reliability of means of transport and the safety of their use. On the other hand, the experience of recent years has shown that the means of transport in the hands of terrorists can be directed against innocent people.

As for the first of the aspects outlined above, transport safety results from the assessment by a given unit of a specific transport company. The multitude and variety of needs reported on the part of users force specific transport providers to be flexible and to adjust their offer.

Currently, “the transport market is a consumer market, i.e., it is characterized
by excess supply over demand” (Bentkowska-Senator, Kordel, Waśkiewicz, 2012, p. 17). With such high competition in both the internal and community market, the consumer freely chooses the service provider, which actively contributes to improving the quality of service provision. When deciding on the choice of means of passenger transport, price and quality are considered first and foremost as the basic value attributes for the passenger, however, the additional elements of this value, such as information, availability or experience, help in making decisions (Figure 1). They also affect the client’s sense of security.

Figure 1. Customer value elements.

The most important elements of customer value in the context of passenger transport include the attributes of the transport service being purchased (mainly quality, price and delivery time), the image of the transport company, where
experience in providing services and the level of user confidence in the brand are important, as well as openness to customer relations (including consulting and providing detailed information). The primary purpose of ensuring safety in transport is to prevent accidents but also to investigate failures that have occurred during the operation of a given means of transport. Security threats can be caused by various factors, such as:

- lack of competence,
- non-compliance with technical procedures,
- broadly understood human factor (including terrorism),
- defective components of the means of transport.

In general, factors affecting transport safety include (Bednarz, 2010, pp. 31–41):

- transport environment infrastructure specific to each type of transport,
- the reliability of the technique specific to each type of transport,
- traffic organization for specific types of transport,
- predisposition, training, health condition of crews of a given means of transport,
- atmospheric and climatic conditions.

The choice of the entity offering the passenger transport service is often dictated by how the entity is assessed in terms of travel safety.

The second of these aspects is terrorism and the use of a means of transport against its intended use. Terrorism is a special type of asymmetric war that is becoming a growing threat to international security. It consists of four main elements (Pillar, 2001, pp. 13–14):

- goals, mostly non-military, such as people from the world of politics, officials or even innocent bystanders,
- conspiracy regardless of whether the perpetrator is a member of a secret organization or is secretly financed by specific states,
- motivation or political, religious or economic matter,
- premeditation, the decision of the perpetrator to intend to commit an act of terror or instill fear in others.

To prevent the use of means of transport against innocent people and against their intended use, a number of procedures have been introduced. The most known are those used in air transport.

Regulation of the European Union Commission specifying the measures used to ensure universal aviation safety standards (Commission Regulation, 2010).
Pursuant to the content of the mentioned regulation, the following principles should be noted regarding the issue of direct passenger control:

1. Before starting the check, the passenger is obliged to remove his coat or jacket - this type of clothing is treated as hand luggage.
2. Appropriate control is carried out using two methods, namely: metal detection gates or manual control.
3. In the case of manual control, the person carrying out the task is to determine whether the passenger does not have prohibited items - so it is necessary to use appropriate methods of control.
4. In the case of control carried out by means of a metal detector, it is necessary to remove the cause of the alarm recorded by the device.
5. In terms of checking the passenger's ability to transport metal objects, it is possible to use a hand-held metal detector. Such a control measure cannot; however, be considered as a substitute for manual control or gate control methods, as it is a complementary method.
6. If the operator cannot verify the actual state of affairs regarding the passenger, further inspection is required. In order to carry it out, it is planned to carry out further control activities while prohibiting passengers from entering restricted areas.

A separate issue in ensuring an adequate level of air traffic safety is part of baggage control. Prohibited items include:

- toiletries and medicines (aerosols and razors that are prohibited in cabin transport),
- firearms, pointed weapons, used in martial arts – prohibited in cabin transport,
- lithium-ion batteries, oxygen concentrators (prohibited in registered transport).

Similar detailed systems of procedures guaranteeing safety in transport can be distinguished for other types. All these activities are aimed at minimizing the risk of using means of transport as instruments of terror.

**Economic Security in Transport**

The last type of security in the aspect of transport discussed in this article is economic security. This is a relatively balanced state of functioning of the national economic system, in which imbalances are maintained in acceptable and
designated principles of social coexistence and organizational and legal norms, as well as the state of proper use of internal development factors. Economic security guarantees the functioning of the state. Modern wars take place on an economic plane, not on the battlefield. Threats to economic security include: economic discrimination, economic crime, emergence of tax havens, money laundering, speculation on the international financial market, payment problems of states, returns to the economic policy of mercantilism and protectionism, problems with public debt, budget deficit, decrease in investment, shadow economy or low spending on research.

Terrorist attacks can also destabilize the economy. Considering only the dynamics of the development of the aviation industry, clients’ loss of confidence in travel safety using aircraft could result in another economic collapse. The assumption of a long-term trend in the use of air services may be reversed if the events of September 11, 2001, are repeated. Terrorist attacks using hijacked aircraft have forced action to improve safety. The dramatic events of 2001 reduced passenger confidence, which translated into a drastic drop in demand for air transport. To reduce these economic losses and rebuild trust in aircraft as a safe means of transport, safety standards have been raised so that the air transport regains passenger confidence.

Summary

Today, transport is the essential element of the economy, which is why the most important thing is to build an appropriate model to secure its individual types in such a way as to transport as many people and goods as possible.

Safety in transport should be treated as one of the critical areas of the modern world because transport is a very dynamically developing branch of the economy. Since it relates to many areas of life, ensuring safety in transport becomes a key issue for its safety.

The article presents selected security planes and their reference to the issue of transport safety. This synthetic outline highlights the complexity of these issues. Safety in transport affects safety in different angles, conditioning each other like a system of connected vessels. Therefore, security, in general, will only be guaranteed if transport safety is assured.

In addition, transport is today facing many dangers that may arise from many threats in the area of both point and line infrastructure. The transport operation
security system should be integrated between individual units in such a way that its individual operations can be observed on designated sections of road movement in space and time.

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