WMSCI 2019

The 23rd World Multi-Conference on Systemics, Cybernetics and Informatics

July 6 - 9, 2019 – Orlando, Florida, USA

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Volume II

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WMSCI 2019
The 23rd World Multi-Conference on Systemics, Cybernetics and Informatics
Special Track on Risk Management and Cyber-Informatics: RMCI 2019

VOLUME II

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ASSESSMENT OF CRITICAL INFRASTRUCTURE FOR AIR TRANSPORT IN THE CZECH REPUBLIC

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ANNOTATION

The transport system is an integral part of the national economy. The same situation is in the European Union and in the Czech Republic. The specific elements in the transport system are such so rare and difficult to replace. The disruption of element or destruction of it, would have a significant impact in the state as a result of the failure those functions. That includes effects resulting from cross-sector dependencies on other types of infrastructure. On the other hand legislative forgets on the critical infrastructure in the regions and in the smaller administrative units. This short paper describes the situation in the field of air transport critical infrastructure for regions. The paper also briefly shows possible solutions at the legislative level.

Key Words: air transport, critical infrastructure element, legislative

1. INTRODUCTION

Every state has some parts of the national infrastructure that is necessary for the state's needs. These necessary parts of state infrastructure are Critical Infrastructure. It is the same situations in the European Union member states. Moreover, the Czech Republic is the European Union member, too. In the
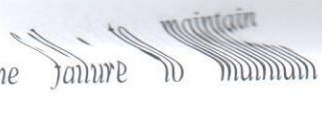
Czech Republic are definite the European *Critical infrastructure elements* and the National Critical Infrastructure elements. The protection of the European and National Critical Infrastructure elements is based on the European Union regulative. The national regulative of the European Union Member state is based on the conditions defined by the European Union. The national and European critical infrastructure is composed of various infrastructures with the transport infrastructure elements. The definition by the European Union is suitable for road transport and railway transport. The definition for the air transport branch is very vague and unsuitable for national needs of member states. By the authors is recommend the determination of critical infrastructure element for air transport on the national and lover authority levels (e.g. regional authorities).

2. CRITICAL INFRASTRUCTURE IN THE EUROPEAN LEGISLATIVE FRAMEWORK

Despite the fact, that critical infrastructure for smaller administrative units (like regions) looks unlogic, the opposite is true. The critical infrastructure in the air transport for smaller administrative units is necessary. The necessity spring from the independence on the linear structures. Thanks to independence on the linear structure, the air transport is suitable for delivering of inaccessible areas. The Inaccessibility could be caused by the crisis situation (e. g. flooding or another natural disaster) or typical feature of the distant region. Like a basic legislative regulation is assessed *"Directive 2008/114/EC"* about identification and designation of European critical infrastructures. The directive sets: *Critical infrastructure: assets or systems essential for the maintenance of vital social functions, health, safety, security, and economic or social wellbeing of people. European critical infrastructure (ECI) is critical infrastructure in EU countries whose disruption or destruction would have a significant impact on at least 2 EU countries (e.g. electricity power plants or oil transmission pipelines).*
„Critical infrastructure" means an asset, system or part thereof located in Member States which is essential for the maintenance of vital societal functions, health, safety, security, economic or social well-being of people, and the disruption or destruction of which would have a significant impact in a Member State as a result of the failure to maintain those functions.

The citation from the European directive is vague. The vague of the European Union regulative should replace the national legislation in the member states. In the Czech Republic is a law about crisis states.

The law about crisis states defines the critical infrastructure element. The criteria for including any element to the group of the critical infrastructure elements are:

- probability, that element could be the target of a terroristic attack
- unacceptable risk
- the uniqueness of element for state
- individual assessment of national authority

All of these features are precisely defined in national legislation. The disadvantage is that the Czech National legislation is regarded on the transport branch only marginally and legislative have the same scale for all infrastructures (transport, information, energy, etc.). Thanks to the same scale for all kind of infrastructure, the major part of air transport features can't fulfil the conditions for adding to the critical infrastructure elements. The conditions are usually fulfilled by the busiest airport in the member state and the national air traffic control. That situation is logic from a specific point of view because in west Europe and in North America is ground transport modes like road and railways high developed. The air transport is suitable for longer distances. During the crisis states is not necessary to carry goods or passengers on the long distances. Moreover, the air transport is independent on ground conditions. The independence on ground conditions is very practical for crisis situations.

3. CRITICAL INFRASTRUCTURE ELEMENTS IN THE AIR TRANSPORT BRANCH IN ACCORDANCE WITH REGIONAL NEEDS

The main goal of the research is focused on the air transport on the smaller administrative units (e. g. regions). In the regions is not sufficient demand for the air transport. Thanks to that low level of air transport demand are not effective for every region to have own airport with expensive equipment for commercial air transport. From a different point of view is the air transport important in the regional scope. The air transport is important in the naturogenic crisis situation occurred (e.g. flooding, earthquake). In the crisis situation could be ground transport network damaged and the air

transport is more resilience than other transport modes, especially ground transport modes.

The critical infrastructure elements for smaller administrative units are not definite in the air transport branch. Thanks to the definition of the critical infrastructure elements on the national level, the critical infrastructure elements in the air transport couldn't be defined. For that case is necessary to change the definition of the crisis infrastructure elements. Thanks to the changed definition of the crisis infrastructure elements could be smaller airports in regions could be included in the crisis infrastructure elements group. Moreover, it is necessary to notice, that the new critical infrastructure elements must be in another subgroup of critical infrastructure elements. It is necessary for recognition of the crisis infrastructure element importance for various subjects (local authority, state authority, etc.).

4.   OPTIMIZATION PROPOSAL

In chapter 3 is described option for extension of the critical infrastructure elements. These new critical infrastructure elements will be designated for the smaller administrative units. These new critical infrastructure elements are called by authors like the regional infrastructure elements. The regional critical infrastructure element needs new parameters for definition. Authors propose definite parameters in the branches:

- probability of destruction definite element and the impact of destruction on the citizens
- the uniqueness for the region (without the possibility of substitution in the neighbour region)
- individual assessment of regional authority

These air transport critical infrastructure elements will be under the supervision of regional authorities. The regional authorities will cooperate on the airport maintenance in the normal states and cover the operation of the airport during the crisis. Cooperation during the normal state ensures the fulfilment of required criteria on the airport features. That airports and air transport facilities will fulfil conditions for the regional crisis infrastructure elements in air transport branch. Thanks to the statute "the regional crisis infrastructure element" will be the airports and the air transport facilities supported at the national level and in the Union level, too.

The aim of the determination of the regional crisis infrastructure elements in the transport is creating conditions for using air transport, during the crisis. For overcome crisis is necessary to be ready. The air transport is suitable mean for ensuring the transport needs of a region without a developed transport infrastructure because ground transport infrastructure could be destroyed.

5.   CONCLUSION

The proposal presented here is based on the project *VH20172019027 Simulation of the rescue during the air traffic accidents*. In the project was found the gap in the air transport critical infrastructure for regional authorities.

The author team will solve the topic further solved. The idea of the regional critical infrastructure element will be developed in anther transport modes and in the air transport branch, too. In the Czech Republic, the regional critical infrastructure is not solved. Just to the fortune, the deficit in the legislation wasn't revealed in the crisis situation, but during the analysis.

6.   REFERENCES

1. Directive 2008/114/EC — identification and designation of European critical infrastructures and assessment of the need to improve their protection

2. SOUŠEK R. *Doprava a krizový management* (Transport and Crisis Management): Pardubice, Czech Republic: Jan Pernera Institute, 2010. ISBN 978-80-86530-64-2

3. ENDRIZALOVÁ E., et al. *Dynamic Mathematical Model of Ground Support Equipment Utilization in Aircraft Technical Handling*. In: Proceedings of 20th International Conference Transport Means 20161. 20th International Conference Transport Means 2016. Juodkrante, 05.10.2016 - 07.10.2016. Kaunas: Kauno technologijos universitetas. 2016, s. 759-762. ISSN 1822-296X

4. ENDRIZALOVÁ E.; NOVÁK M.; KAMENÍKOVÁ I. *Development and Trends in Airlines Business Models*. In: New Trends in Process Control and Production management. London: CRC

Press, 2018. pp. 119-124. ISBN 978-1-138-05885-9.

5. VAGNER J., JENČOVÁ E. *Comparison of Radar Simulator for Air Traffic Control - 2014*. In: Nase More. Vol. 61, no. 1-2 (2013), p. 31-35. - ISSN 0469-6255