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Organization of the air transportation in the conditions of a terrorist threat: a problem statement

Despite considerable resources spent on safety and security matters, the process of decision-making remains relevant in unstable conditions of the air transportation system operation. New hybrid challenges and threats indicate the necessity to develop new approaches concerning the issue of vulnerability and resilience of air transportation towards attacks.

It is considered, that air transportation performs a significant role in the global economy and support the development of trade, tourism, political and cultural connections between Governments. According to the ICAO Global Aviation Security Plan, November 2017 [1] data by 2030 it is expected to increase the annual volume of international passenger traffic almost twice as large - up to 6 billion of the passengers and the volume of the cargo transportation by air is expected to increase from 50 million tons to 125 million tons. Considering the contribution of the air transportation to the economy of many countries, an important factor of further development and progress in trade, tourism and other fields of service is the sustainability of aviation operations. The incidents in aviation security area have an obvious impact on passengers and cargo customers, decrease confidence in air transport and corresponding failures in different spheres of the economy.

In accordance with the Analytical report on the Current issues of counteractions against terrorism in the world and in Ukraine [2], Ukraine does not belong to the group of countries with the highest level of the threat of international terrorism today. At the same time, taking into account the ideology and intentions of jihadist movements this tendency might change dramatically. Thus, under conditions of intensify cooperation in the sphere of counteractions against terrorism and enhancing the participation of Ukraine in international anti-terrorist political actions, leaders of certain jihadist organizations can consider our country as a direct object for the attacks. According to the [2], there are several factors that allow us to confirm the possibility of the terrorist threat strengthening in Ukraine, i.e strategic geographical location of Ukraine, difficult political situation in the country, activation of separatist movements, and expansion of the illegal weapon market.

Since 2014 after the occupation of Crimea and the beginning of an anti-terrorist operation in eastern Ukraine the aviation system of our country is in unstable conditions and with a permanent threat of losing the strategic transport nodes, i.e like it has already happened to the international airports in Simferopol and Donetsk. Updated document on the National Security Strategy of Ukraine [3] confirms existence of these problems and the necessity of solving them, ensuring the security of strategic infrastructure facilities.

From 2011 to 2016 the 69 acts of hijacking were registered, followed by 21 human casualties [1]. During this period, as a result of terrorist attacks, 884 people died. In addition to human casualties and destructions during anti-terrorist operations or hijackings the terrorist organizations activities lead to a growing sense of insecurity and unsafety among the population. As the author's good point [4] the financial losses from acts of terrorism include not only the destroyed properties and losses associated with the flight cancellations but indirect losses related to the reduction of foreign investment, tourism, international trade, short-term capital fund flows as well. Although, the assessment of the financial consequences from terrorist attacks is extremely complexed, nevertheless the approximate calculations have shown that losses for Brussels airport after 22 attacks were about 93 million euros [5].

According to the Ukrainian Airlines rules it is recorded that in case of emergency actions that includes military actions, a terrorist acts, an explosion, a revolt or the threat of its occurrence, riots and diversion the airline has the right to cancel or delay the flight without notifying the passenger or cancel a previously confirmed booking. In this case compensation will not be refunded to the passenger [6]. The public than has to solve the problem of further travel alone.

The recent incident at the Kyiv airport was not related to a terrorist threat [7]. But it turned out that even simple inadequate behavior of the passengers in the transit area after passport control procedure could cause flight delays and uncoordinated actions between authorized state bodies and the air transportation market actors. Police, who arrived on the scene, couldn't do anything but watching the fight through the glass and expecting on help from the border guards [8].

The process of air transportation organization even from a technological point of view is complicated and considering necessity of subjects with different forms of ownership and responsibility to be included to the air transportation system management the level of uncertainty of the given system increases substantially. In this regard, the following questions arise:

- 1) What decision has to be made in case of spontaneous incident, i.e. a threat alarm at one of the airports?
- 2) Is the legislative and regulatory framework of the country effective protecting the rights of its citizens?

New hybrid challenges and threats facing our state signify the importance of further improvement of the system of counteractions against terrorism including cooperation with civil organizations (in the case of the aviation system, those are airlines, airports, travel agencies, etc.) and adaptation of operation in unstable conditions.

The general thesis concerning suggestions to counteractions against terrorism is that the governmental system must ensure the continuousness of all subsystems operations in case of unexpected problems caused by a crisis or destructive actions. Notice, that an important role here is the readiness of society to act in the conditions of a terrorist threat. Adequate system response in general, its subsystems and public in the face of increased threat of terrorist attack or as the direct reaction to an already committed acts of terrorism assumes the plan and

methods for rapid mobilization including the recovery of all functions and processes in the system [2, 9].

In the last decade, scientists and practitioners of the aviation area frequently raise the issue of the importance for a deeper analysis of reliability and sustainability of the air transportation system. One of the methods of such analysis, i.e. is the simulation of deliberate attacks on airports (nodes) networks for better understanding of the air transportation management in critical conditions and the probability of assessing potential damage of any airport or airline operating in this certain network.

According to the study [10] определено два подхода к анализу vulnerability and resilience of transport systems two approaches are determined to analyze the vulnerability and resilience of transport systems that are essentially developed separately from each other topological and systemic. Oriol Lordan, Jose M. Sallan, Pep Simo believe, if the topological approach is based on a strict mathematical theory and easy to implement in terms of calculations, and the system one does not have a homogeneous structure and requires a sufficient extensive database that consequently complicates the implementation of the experiments [10]. However, despite this, the systemic approach gives a more complete answer to the questions on the problems caused by the vulnerability and reliability of the transport system, since it involves studying the reaction of demand and supply related to the violations and disruptions in transportation. Such a comprehensive study of the problem requires the application of complex economic and mathematical models.

According to the literature review [11] the issues of methods for assessing the topology and reliability of networks routes of air transportation remains opened and requires further study. In the subsequent study [12] авторами предлагается метод оценки устойчивости of the European airport network (EAN), который заключается в применении понятия the multilayer structure of the EAN (многослойной структуры EAN) authors suggest a method of assessing sustainability of the European airport network (EAN) that applies in the concept of the multilayer structure of the EAN and some concepts of the complex networks theory.

Another way of solving the problem of the air transportation system management in abnormal conditions is the development of predictive risk management. Among the recent academic studies on Predictive Approach for business we can indicate [13] and [14]. As for the aviation industry in the paper [15] the authors conclude that the direction of Predictive risk in aviation area requires further improvement since often developed methods and models of risk assessment is not related to the aviation system in general but only to its certain parts, requires a large volume of information and incoming data can be based on expert prejudices.

Conclusions. The increase of the global demand and supply for air transportation, development of models such as hub and spoke by the airlines and the airports should be provided with the sustainability of air transportation systems to external and internal forcing process. The experience of the last decades shows that the uninterrupted operations of complex systems requires the improvement of decision-making methods for rapid response and the recovery of activity in unstable

conditions at all levels of the system operations. This problem is partly reflected in the ICAO initiative in the security area and formulated as “development of an effective response to disruption of the aviation system created by natural disasters, conflicts or other causes”.

The existence of adequate decision-making methods providing the sustainability of the air transportation system of the state or region will contribute to the sustainability of society in general. For example, the readiness and adoption of adequate solutions for the recovery of air transportation in case of terrorist threats or actions reduces the fear of all participants facing the unknown and the threat according to criteria:

- 1) sense of understanding the situation;
- 2) sense of control the situation;
- 3) sense of the capability of jointly confronting the threat.

The above-mentioned criteria can be formulated with the help of the concepts of the fuzzy sets theory.

It is expected that the improvement of decision-making methods for rapid response and recovery of air transportation in unstable conditions can be done by the synthesis of modern theories methods (i.e, complex networks, fuzzy sets, Predictive risk management) and the principles of sustainability, cooperation and information exchange, culture of aviation security and the development of human capabilities declared at

Выводы. Увеличение глобального спроса и предложения на авиаперевозки, развитие моделей типа hub and spoke авиакомпаниями и аэропортами должно сопровождаться обеспечением устойчивости авиатранспортных систем к внешним и внутренним возмущениям. Опыт последних десятилетий показывает, что бесперебойное функционирование сложных систем требует совершенствования методов принятия решений по оперативному реагированию и восстановлению деятельности в нестабильных условиях на всех уровнях управления системой. Частично данная проблема отражена в инициативе ИКАО в области безопасности и сформулирована как «разработка an effective response to disruption of the aviation system created by natural disasters, conflicts or other causes» [1].

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