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The quality and efficiency of the use of the air traffic controlled airspace

This article proposes to consider contemporary possibilities and directions for managing the efficiency and quality of the use of controlled airspace for the needs of civil aviation and the society using its services.

The state-controlled airspace is a three-dimensional portion of the atmosphere that is above the territory of the state, including its territorial waters. In order to provide air navigation, the state allocates the airspace of defined dimensions, as a portion of the common airspace, in which services and control is transferred to the competence of the national Air Traffic Control (ATC) service which organizes positive executive control over aircraft flying in that airspace and ensures the quality and efficiency of the use of airspace for flights, including variety of areas and zones.

In this context, airspace is, on the one hand, the general resource of biological survival of man, and on the other, it is a sphere of both state and private production activity.

Until recently, the technical progress and the inevitability of the conflict between general and private interests have led the civilized world to the need to adopt a number of international and bilateral agreements on the division of airspace within the currently defined limits for its use by States in their own interests with the observance of internationally agreed norms of preservation of the environment and population safety.

Hence, there are many entities that may be as users of airspace, but none of them can assume that it is the only manager of it.

At the same time, the desire of a particular business entity to maximize the benefits of using airspace was due, from the outset, to the need to impose restrictions on the amount of damage from the effects of human production in this part of nature.

From now on, each state takes care of the condition of airspace, and at the same time it is interested in benefiting from its full use, and above all, in aeronautics.

As noted, modern aviation activities have a expressive international significance. In addition, it envisages the achievement of high economic productivity and safety of flights, the quality and regularity of air travel, environmental cleanliness, and the availability of air transport for clients.

The probability to perform flights in the controlled airspace is determined by the presence and level of its qualitative characteristics and depends on which level of internal organization it corresponds to.

It is understood that natural and artificially provoked phenomena, the degree of organization of production processes are the primary features of the

airspace, affecting the ability to perform flights and on the capacity of the flight zone.

At the same time, the factors that adversely affect or, on the contrary, positively justify the expediency of using a particular flight zone, relate to the regularity, safety, meteorology, the existence of crisis natural and artificial phenomena such as thunderstorm, turbulence, wind gusts, squalls, excessively low air temperature, heavy precipitation, fog, atmospheric pollution, fighting, and so on.

Lack of information on the objective state of the atmosphere, the backwardness of traffic control systems in the zone, poor organization of flights, the availability of weapons testing areas, insufficient dimensions of the allocated airspace and excessive traffic, all of which limit the ability to conduct safe flights and capacity of zones.

The foregoing clearly indicates to the interested state structures the need for active cooperation with international organizations and aviation advanced countries with a view to introducing advanced scientific and technological achievements in their territories in the field of aviation activity and air navigation, in particular.

For example, it is known that the existing possibility of sharing airspace at high altitudes of flights is the current direction of aeronautics developments. It was this positive factor and the practice of "sharing" that encouraged world aviation organizations to continue to find contractual ways to implement a promising idea of the "common sky", which would serve as a platform for radical increase in the efficiency of operation of aircraft and air routes, by eliminating the unnecessary restrictions that mankind set in the beginning of the era intensive development of aviation, given its exclusive qualities, which ensured not only aggressive competition in the transport market, but also technological breakthrough development of individual states.

Therefore, the current comparatively balanced condition of the countries' provision, their inexhaustible needs for air travel and the obvious opportunities for further enhancement of efficiency and security in each particular region, initiates the community of these countries and their administration to more efficient shared use of the airspace they are subordinated to.

It has been argued analytically that European airspace to be used by civil aviation as a single will have a range of overall achievements and will contribute to improving relations between states and the ecological condition of the environment.

With this in mind, ICAO and EUROCONTROL policies in the area of the integration of flight systems and air traffic management currently contribute to the creation and use of a single European air traffic.

Ukraine, as an active entity of international civil aviation, also attaches great importance to the completeness of the use of controlled airspace and to the growth of the air transportations rates.

Ukraine's airspace is used in the interests of the entire population of the country, its industry, energy, transport infrastructure, agriculture, defense, and so on. Aviation is the essential and efficient operator of this airspace.

The geographical location of our state, its political, social and economic status, are characterized as favorable for commercial transportation by air transport, which contributes to the normal coexistence of society and the state.

Transportation is carried out both within the whole state and on international routes. Since air transport services are used by all sectors of the national economy, the provision of these needs requires the availability of competitive aircrafts, specially equipped air routes and airspaces, significant human and energy resources, and financing to the industry.

In addition, the operation of air transport takes for a rule the achieving of effective levels of social, industrial and economic effects by all links of aviation activities. In this sense, the effectiveness of air transport is its performance, which is estimated by a number of additional indicators concerning both the satisfaction of the expected customer needs and the progress of the industry, of course, along with the productivity, quality and safety of the work performed.

Hence, the conclusion is the following: the overall assessment of transport efficiency is a process that requires the simultaneous application of a number of criteria that, from different points of view, should evaluate the various qualities of the air transport operation process.

The meaning of such an assessment is to maximize the target functions of civil aviation, which will lead to both individual and global solutions that will expand and ensure the maximum efficiency and quality of air transport in the airspace of Ukraine and beyond.

The above points to the following group criteria for the efficiency of air transport:

1. Social. It is a productivity of transportation, where quality is a key benchmark for each product or service provided during the execution of the work. First of all, it is about improving internal production processes aimed at ensuring the regularity of flights, the convenience of their schedule and comfort, the commercial availability of travel from all regions and for all segments of the population with the application of loyal levels of tariffs and a sufficient number of seats for passenger traffic and volumes for cargo transportation. At the same time, flight safety is important for anyone who produces and uses civil aviation products whose departments must have no alternative to conduct safe operation of aircraft, while providing satisfactory conditions for the involved categories of workers.
2. Production. These are, first of all, the volume of transportation, the completeness and organization of airspace use, the modernity of aircraft, sufficient human and material resources.
3. Economical. This is the income/expenditure ratio, the main characteristics of which are the cost of aircraft, the demand for transportation, the promotion of job organization, characterized by a high level of education and the elaborated working ethics of behavior. These and other costs are used to create a product that is economical and efficient for customers, while minimizing negative impacts on the population and the environment, thereby increasing the revenue side of air travel.

The listed generalized criteria are interrelated and interdependent.

On the other hand, the development of society implies the development of air transport, which it uses in its state, and requires a systemic upgrade of all types of aircraft engineering, transport infrastructure, production and information technology.

When developing the necessary vehicles and systems, the technologies of their work should from the very beginning seek a high level of efficiency of both the transport itself and its components. That is why the process of using transport requires systematic management of its efficiency in order to ensure the ultimate level of positive performance and quality of performed functions.

Analysts point out that the modern aviation transport industry in Ukraine is in the midst of many technical, economic and social problems. Existing efficiency of domestic air transport depends on many factors and requires an increase.

In particular, the international Air Traffic Management (ATM) system plays an important role in advancing and optimizing this process, whose effective use, along with other systems, enables the operation of air transport, even in difficult conditions, in accordance with the requirements of regularity, economy, safety and protection of ecology.

It is a question of the fact that the performance of the given functions by air transport consists in the transportation of passengers and goods while ensuring the main requirement: the provision of quality services.

The efficiency and quality of the ATM system can be determined by its direct impact on the volume of transportation or receipt of financial profits of airlines that are consumers of air navigation services.

In particular, improving the ATM helps to save flight time, to increase the frequency of flights which positively affects the volume of commercial traffic. The airspace is used for a certain time and space graph.

Therefore, the most optimal use of airspace and flows of aircrafts is provided by the dispatching department on the basis of improved technology and procedures for laying routes, developing maneuvering schemes, waiting zones, etc.

In Western Europe, airspace is already lacking to intensify flights. It is expected that such a problem will eventually arise in the face of Ukraine, and so this should stimulate us to find ways to more rational use of Ukrainian airspace.

In this context, it should be noted that increasing the efficiency of airspace can be achieved after developing a methodology for assessing its level and the methodology for forecasting its indicators.

The most relevant criteria for the effectiveness of airspace use are:

- The portion of airspace allocated by the state to perform flights by civil aircrafts, its spatial dimensions and the time schedule of use.
- The rate of use by airlines of specific areas and routes in the allocated space.
- The rate of satisfaction of the needs of aviation transport to carry out the necessary types of transportation in a specific airspace zone.
- The volumes of transportations in the controlled zones and on their routes.
- The level of income from transportation in a particular controlled airspace zone.

- The tariffs for air navigation charges for using a controlled airspace zone.
- The condition of the state flight safety in general, and on the routes in a controlled airspace zone, in particular.
- The complexity of air traffic on routes.
- The capacity of the organized airspace of a specific controlled zone.
- The operational costs for providing flights in a specific area of the organized airspace.
- The probability of service of aircraft at a specific time and in a specific zone, taking into account the level of compliance of the organized airspace with requirements to it.
- The dependence of the above criteria on the meteorological situation in the controlled zones.

It should be taken into account that the complete use of airspace is directly consistent with the demand for aviation works, and the intensity of flights depends, among other things, on the economic development of the state, political, civilizational and cultural achievements of its population.

On the other hand, the capacity of airspace zones can be intensified by the technological development of the ATM system and the professionalism of the performers.

For this purpose, the "Regulations on the Use of Airspace" and "The Program for Developing the State Airspace Use System" have been developed and approved in Ukraine. These documents relate to the organization, performance and control over the use of airspace by the civil aviation, defense department and meteorological authorities, aircraft industry, aviation of special operations, space agency, specialized educational institutions, etc.

In addition, improving the efficiency of the ATM system is achieved by developing its organization with the involvement of scientists, highly skilled personnel, improvement of software and hardware, technological tools for air traffic, advanced information and meteorological forecasting. The support of the ATM system at the state level and the urgent introduction of advanced international systems in the management of the efficiency of airspace and air transport use have a particular importance.

In general, the modern Air Traffic Management system (ATM) provides for the following activities:

- The organization of special zone for managing flights in the airspace, laying flight routes, developing rules, procedures and technologies related to the flight operations and the work of ground-based air traffic controllers.
- The organization of the aircrafts flow during flights planning in order to ensure uniform use of airspace, elimination of incidents and disasters that may arise in case of overloading of these zones, routes and air traffic controllers.
- The operational control of air traffic in the control zones, which provides for continuous monitoring of flight operations, air navigation information

support for aircraft crews and, if necessary, correction of flight paths of planes that are simultaneously within the control zones.

Need to consider that the ATM system operates within a single state, but the conditions for the joint use of the "Single European Sky" (SES) are being created to improve international flights and use of new air traffic management principles. This requires the availability of a global ATM system for the entire SES.

Creation of the unified conditions for the sharing of European space will have a positive effect on the efficiency of air transport activities for the whole community as well as individual member states.

When designing and using ATM systems, it is also necessary to take into account the requirements for them, which include the receipt of basic indicators: functional, tactical, operational and other.

In addition, when using systems, it is necessary to periodically check the actual condition of their operation and compliance with established standards. To do this, the criteria for the effectiveness of ATM systems should be clearly formulated and a methodology for their assessment should be developed.

When considering the effectiveness of these systems, it is necessary to take into account aspects of the use of resources, the most important of which is the air traffic controlled airspace allocated to flights. This resource is used not only within the borders of one state, but also on an international scale. Its characteristics are spatial dimensions, indicators of the chemical composition of the atmosphere, meteorological data. Some elements of the atmosphere are variable during the flight, so the air quality and weather conditions also have a significant effect on the aircraft's movement process.

In recent years, the methodology for implementing the basic principles of air navigation, including the use of controlled airspace, has changed significantly. Modern approaches to the use of airspace are being developed and implemented, air traffic management procedures, technological issues of traffic flow organization and traffic flow capacity served by ground-based air traffic controllers are changed accordingly. New conceptual projects of modernization and improvement of aeronautical systems are introduced.

For example, in order to implement the adopted ICAO "Global Air Traffic Management Operational Concept", the "Single European Sky" project, as outlined above, was created during the development of the European program "EATMP Air Navigation System Safety Assessment Methodology". To implement this project, a Research Program aimed at organizing air traffic in the single European airspace (SESAR) and the creation of Functional Airspace Blocks (FABs) were established. According to the plan, it is expected to create nine European international functional blocks for controlled airspace.

According to experts, their implementation will allow to increase the productivity of transportation, increase the safety of flights, reduce the average length of delayed vessels for departure, reduce operator costs, and minimize the amount of harmful emissions.

At this time, the engaged aeronautical administrations of the states conduct organizational and advisory activities on the establishment of an effective operating scheme for the functioning of FABs-blocks and determine their profitability.

It seems that the ultimate goal of these measures will be to combine the technological, regulatory, legal and economic aspects of the modernization of the airspace management systems.

For its part, the functionaries of Ukraine's ATM actively consider all initiatives of European programs in order to coordinate their actions on the harmonization of the national ATM system.

In the first place, it is urgently necessary to consider the development of special operational provisions that would satisfy the high level of the safety of the flights in the air navigation services. These operational provisions are in line with the Dynamic Management of the European Airspace Network (DMEAN), which involves the use of the network principles for the construction of the air traffic controlled airspace, creating the conditions for its flexible use, and the formation of the stable and non-conflicting air traffic flows.

References

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