AUTOMATED SYSTEMS FOR SOLVING THE FLEXIBLE USE OF AIRSPACE

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The article examines the issue of flexible use of airspace, consists of a description of the FUA concept, flexible use of airspace structures, followed by a section of the differences between the LARA and LETVIS in the system support and necessary equipment for possible use of systems, functional use in operation, assessment of cooperation between users, the approval process and the important factors that the user interface. The main objective is to compare systems and LARA LETVIS a proposal to optimize the chosen system.

Keywords: concept, flexible use of space, requirement, collaboration, system, user, LETVIS, LARA

1 INTRODUCTION

Air transport is presented as one of the so-called "junior" forms of transport but its history dates since 1903 and this year is considered as the official start. Air transport belongs to comprehensive, fastest growing and going forward transport of all kinds. Great importance has been reached thanks to the offered comfort and high speed provided to its customers.

In the form we know it today, air traffic is the unthinkable part of everyone's life. Protecting and ensuring the safety in the air transport are two important factors in the process of assessing security risks. Its complexity lies not only in its technical implementation, but especially in its legislation. Each user of the airspace must follow certain rules and regulations. Those regulations can prevent many dangerous situations, aviation accidents and non-conformities. Creating some specific standards and procedures to be followed in the air traffic in the air and on the ground, have begun precisely for this reason. Today, at a time when security breathing down on the back of efficiency and economy, particularly in this place, is the concept of flexible use of airspace very actual, because it allows users to align their requirements for different levels of space and time.

2 GENERAL INFORMATION

Despite the gradual encroachment of the European Union and increasing the travel opportunities between countries without border checks, the border airspace still exists. Exactly for this reason, the European Commission has adopted measures to manage air traffic in order to create the single European sky. The aim was to unite airspace, create an effective and safe airspace without borders and improve cooperation and coordination of all airspace users. The Commission proposed in the Regulation of the organization and management of airspace, in order to establish unique flight information region by merging national areas in one part of the airspace in which air traffic services will be provided under the same rules and procedures. The current organization of airspace is based on sharing borders of airspace, which are solid, mainly static. It is common practice to annul portions of airspace on a permanent or semi-permanent basis for military action. Moreover, the organization of airspace is inflexible and leads to an inefficient use of available resources of airspace. The concept of desegregation the airspace includes dynamic and flexible use of airspace, within the state. Systems for the flexible use of airspace were created to facilitate and automate the process of identifying time constraints and availability of airspace, subsequent entry requirements for the use of airspace, scale of operations, and communication between the various entities affecting the whole of the approval process requirements.

The current concept of the flexible use of airspace enables more efficient implementation of individual flights and aerial missions, during the world crisis it is a very important parameter which can help the managerial level of the decision making to the overall reduction of costs for individual activities, more flexible use of aircraft and thereby achieving better economic, also operational indicators.

First of all, it was necessary to establish the requirements of flexible use of airspace. An important role in this process was presented by cooperation between military and civilian users. The concept defines management requirements and three levels of the airspace management. Based on these requirements, there have been established systems which broadly follow the concept of the flexible use of airspace. Systems have been developed to summarize the requirements of individual entrants to air traffic. This article focuses on two systems LARA, which is the product of the Eurocontrol and the other analyzed system is LETVIS, developed by Czech company ALES.

The aim of the article is to define the concept of the flexible use of airspace, the use of flexible structures, analyze the operation and user interface of individual systems, considering the use of primary users and mainly to propose optimizations for one of the chosen systems, which will lead to better, easier and more efficient use of the system, simplifying the process of learning the functions of the system and to present the interest in a full use of all the offered functions.

Flexible use of airspace FUA

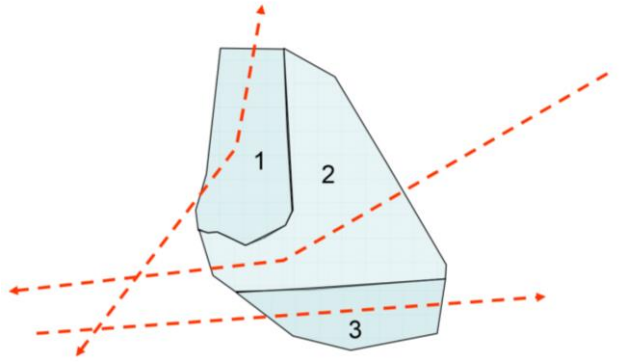
The FUA is the concept, under which airspace should not be designated as either purely civil or military airspace, but should rather be considered as an entity, which should meet the requirements of all users, in order to the provide and show it in the most possible extend for

all the participants. Coordination between civil and military authorities shall be organized on:

• strategic level, ASM Level 1: definition and review of the national airspace policy and organization, setting predetermined airspace structures,

• pre-tactical level of the airspace management, ASM Level 2: day-to-day allocation of airspace according to the user's requirements,

• tactical level of the airspace management, ASM Level 3: real-time use of airspace, allowing the safe separation of civil and military aircraft, through established agreements and practices in order to increase safety and airspace capacity and to improve the efficiency and flexibility of aircraft operations.



Picture – Flexible use of airspace for three users

Flexible use of the airspace structures

States should establish the National High Level Airspace Policy Body. Generally, member states which have both civil and military authorities responsible or involved in the airspace management, National High Level Airspace Policy Body has to be a joint civilian-military body. National High Level Airspace Policy Body ensures the effective implementation and application of the FUA concept at every level. The strategic objectives of the National High Level Airspace Policy Body might include maintaining and actively striving to improve the safe and efficient management of airspace and infrastructure , the application of fair and effective regulation of the organization and airspace management, building trust, respect and reliability in the airspace between regulators and all other holders through consultation, cooperation, maintaining and improving service levels through effective planning, monitoring key processes, activities at a high level, permitting the use of airspace for all user groups, harmonization of procedures for airspace management with neighbouring countries, carrying out regular checks on the compliance with the FUA concept at every level.

National High Level Airspace Policy Body provides at all three levels of ASM framework for effective coordination between ATS, ASM and ATFM which includes coordination agreement, defining clear and unambiguous operating procedures, ASM levels two and three, identifying or creating the organization of the National Airspace cells, AMC for daily allocation and also the declaration of the flexible airspace structures.

The administrations of the airspace have to control and ensure that all reservations and restrictions of airspace may be subject of the ASM and moreover are temporary. Another function is to ensure that the rules are set for early activation and release of restricted airspace for actual use, the procedures for coordination and interaction have been developed on the release and prolonged activation of restricted airspace, or any of the restricted time frame and appropriate the preparation process of written agreements between the parties.

National High Level Airspace Policy Body establishes and communicates the structure of the Eurocontrol, or where the specification is used as the means of compliance with EC Regulation no. 2150/2005 FU, the European Commission, organizations and contact points responsible for carrying out tasks for the strategic ASM Level 1.

Member States shall provide an annual report of the Eurocontrol Agency and where this specification is used as a means in accordance with EC no. 2150/2005 FUA, information on the European Commission on the application of the flexible use of airspace, shall determine the appropriate bodies to conduct inspections, surveys and safety audits of the FUA application. The annual report must include:

- a general description of the national organization and responsibilities at ASM Level 1, Level 2 and ASM Level 3, the concept of flexible use of airspace,
- evaluate the functioning of agreements, procedures and supporting systems established at the strategic, pre-tactical and tactical levels of airspace management, this evaluation must be done with regard to the safety, airspace capacity, efficiency and flexibility of aircraft operations of all users,
- problems in the implementation of this regulation, the measures adopted and the need for change,
- the outcome of national inspections, wide surveys and safety audits,
- cooperation among the member states in the management of airspace, especially in the creation, management of the cross-border airspace and cross-border activities.

Systematic differences between the system LARA and the system LETVIS

When analyzing the system LARA, there came to the finding, that its use is set by the condition of the computer software devices, while its application is possible in many operating systems normally available to users, such as Windows, Unix, Mac. LARA system is programmed in the language Javascript, which means several advantages. One of them is less burdening the server implementation of various activities (e.g. display the date and time, change the position of the browser

window, and recognize the browser). LARA focuses on the creation of low-cost and highly flexible solutions according to the requirements of all civilian and military partners at the national level or at the level of FAB.

In the case of LETVIS, its use significantly narrowed the opportunity to work only on Solaris. Solaris is a proprietary system, but even though it provides many components in the form of "open source", that is freely available, it is not widespread among users . Trend of the 21st century in the information technology is generally focused on adjusting software and applications into a form that it is the most attractive and user friendly. Precisely for this reason, we propose an extension of the programming LETVIS also versions for other operating systems such as in the case of LARA – e.g. Windows, Unix or Mac.

Outputs display

LARA is in this direction more flexible and provides the user's interface with possibility of displaying the different areas. This feature is convenient thanks to transparent display of the data with outlets arranged in tables, graphs or diagrams.

LETVIS uses a simpler presentation of outputs through two views:

- tablets (planned spaces),
- map (GIS planned spaces and AIP data).

Space planning

When analyzing this functionality, there were found some substantial differences between systems. LARA uses the reservation editor for space allocations, which requirements are summarized in the platform and use a single form. For the LETVIS system are utilized various forms and thus increases the demands on the detailed examination of all parameters and based on them, the user must execute the decision to use the specific form.

In case it is necessary to use the allocation of group space and communication within the space allocation, the system LARA provides such an option thanks to the singular application. This option is completely absent in the case of the second system LETVIS.

The cluster communication is also needed, which turns LARA to a leading position with direct communication between LARA systems within the allocation of cross-border-areas. LETVIS allows communication only via AFTN (i.e. text messages, ADEXP) within a single area, the cross-border-areas is not supported.

For allocation of the space LARA system generates so called NOTAM, where in case of LETVIS, this process is reversed - generating applications from NOTAM.

One of the pros of LARA is the possibility of extended personalization of users and assigning additional information, such as e-mail or phone number. LETVIS does not contain this possibility, even though its complementary programming is not difficult.

In the area of AUP/UUP is interesting LARA AUP import and displaying CDR by easy Gantt chart. Some FDP systems are ready to offer - in interface, and use appropriate statistics FDP in optimizing space planning. LETVIS either of these options does not display or operate.

Other applications systems

Certain similarity in two systems is shown in the instrument "The house keeping tool" (LARA). Although systems use it by different sources, in case of LETVIS analogy there is the tool DBAdmin. Basic sources are CFMU database for LARA, for LETVIS is provided a base from ARINC files.

LARA has also very sophisticated and developed management of users and their roles. This functionality is provided by unique users based on examining the master data and ease of identification. LETVIS offers a similar solution through the application of SMC and DBAdmin.
Based on the differences, which are described in individual subsections, it is came to believe that the overall system environment, intuitive working variability of applications, a wide range of functions and evaluating outcomes through transparent display, it is more acceptable and user friendly in the system LARA.

The proposed changes

As described above, in more ways LARA system offers more advanced solutions for the flexible use of airspace. But despite this fact, there is seen a great potential in the system LETVIS and it could be reached by recommended transformation of the system, which would be implemented in three phases: the first phase called "The Improvement", phase two as "The Innovation" and last third phase called "The Simplification".

In the first phase of transformation, LETVIS system could achieve very significant competitive advantage thanks to the innovations and further development of the user's interface, communication with other users and archiving requirements and records. This would become simpler and attractive to a wide range of users.

In the second phase - The Innovation, there is proposed a change which is inspired by recent developments on the IT market. High-performance smart phones and tablets are now widely available to the public. It is suggested to create software or applications for operating systems Android and iOS. Users should be aware of this possibility, thanks to easily connect to their user accounts. Real time access would be allowed by this option, and extended viewing history sanctuaries could be implemented on a given user account, there could be seen history of reserved requirements, and requirements for the selected occupation airspace in future time.

As a further advantage of this application, it is presented more efficiently process in planning and

training requirements to use the airspace outside of the office, but anywhere during the day using your phone or tablet. The user should be within his account the possibility of pre-treatment requirements drawn up using the form in the application, then this information would be imported to the server. Upon arrival to the computer in the office, user would have to check pre-treated requirements and final one dispatch to the server.

The entire application environment would be acceptable user friendly and would offer the intuitive controls. Thanks to the first phase of transformation would be an additional application also communication between different users, also provided in real time.

In the third phase – The Simplification, there are proposed changes to its entire user's interface, which has been completely restructured and would means the intuitive single application, bringing a lot of new users and popularity. This progress would have been a significant factor in the length of the training process of the new users who should take care of the request. It is needed to create a new server that could save individual reservations, which could be research and therefore would be offered the possibility of correction of the time and requirements. Additional functionality is to create interface that would allow other users to have also the possibility of tracking historical demands for the use of airspace and the possibility of their application to the new application.

Still emerging air traffic and racket development of the information technology allow almost continuous cost of reduction on the actual flight and air traffic, while increasing safety, efficiency, smoothness, speed and alignment of individual missions in the air. The most important factor in management is the correct alignment of the components into a functioning unit with minimum labour variations, which could jeopardize the entire system, in worse cases, their result in a crisis situation means in the aviation often a threat to human life and major property damage.

After carefully studying the available resources and in-depth analysis of systems LARA and LETVIS, could be said that the system LARA in a momentary phase treats better and provides the better uses of worldwide favorite operating systems Windows, Linux and also MAC last two decades, for all users. LARA allows real-time view availability and time required occupancy premises, which uses very clear Gantt charts. LETVIS system uses a simpler presentation of outputs. In the process of planning various areas, differences were found both systems, the LARA uses a comprehensive reservation editor, thus there is formed a uniform requirement. LETVIS system provides the user a choice of the form for the processing of your request, thereby increasing fragmentation and opacity, between different types of forms. The future would certainly be worth consideration to unify the system for greater clarity and more efficient processing requirements. LETVIS lags behind in communication between individual users to use only the AFTN, LARA provides the possibility of direct communication between the clusters.

Despite the recent lead of LARA, second mentioned system would gain a significant position on the market with three extensive and revolutionary steps (The Improvement, The innovation, The Simplification) and could catch a momentary loss and begin to dictate the pace and new trends in systems of flexible use of airspace. Among the most serious steps, could be considered creating of a mobile application that would provide user comfort while allowing the immediate login to their account and check the availability and requirements for the space that could be prepare via a new application for occupancy of a particular airspace block. Further substantial progress would be overall simplification of the working environment, which would be a significant step forward in the process of getting to know and learning new users to do their best and work in the system and manage their requirements. The third, equally important step, would be to turn the concept towards to a better system availability and greater flexibility with respect to operating systems which would be used in the LETVIS system.

3 CONCLUSION

The concept of flexible use of airspace is a step forward in the cooperation and efficiency of individual flights and air missions. As automobile traffic, the air traffic has also rules that must be followed very strictly.

Systems that were created on the basis of this specification are primarily designed to assist airspace users. Information technologies provide a constant acceleration of the communication and decision-making efficiency towards to the improvements managing regulations on the ground and in the air.

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