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## IMPLEMENTATION OF LOCAL AND SUB-REGIONAL AIRSPACE MANAGEMENT SUPPORTING SYSTEM IN UKRAINE

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**Abstract.** *The article is devoted to the analysis of possible LARA (local and sub-regional airspace management supporting system) implementation in Ukraine. We tried to define the problems which might occur during the integration of the new system into the flexible use of Ukrainian airspace and what it may result in. Probable allocation of responsibilities among the state aviation bodies was made.*

**Keywords:** advantages of the proposed system over the existing one; Airspace Management; system functionality estimation; system implementation plan.

### 1. Introduction

Nowadays, the science is progressing as never before, especially in aviation sphere. New ideas, inventions and their implementation in air transport field have lead to the need of constant improvement of air traffic management. With the introduction of new weapons system, military activities will require larger volumes of airspace and so will civil ones as demands for air travel and transportation grows significantly. Although contemporary systems and procedures thrive on airspace management, there is still a great need for more dynamic and flexibility in airspace structures as well as in more efficient and transparent decision making process.

The solution on the problems mentioned above was found in LARA, which is a support tool for airspace management. It gives the States a chance to improve the collaboration between military and civil sides of national Air Traffic Management (ATM); the tool enables the military and civil controllers share the information in the most efficient way. The LARA program is EUROCONTROL program that aims at delivering software, technical documents and a deployment service to support airspace management at State and/or Functional Airspace Block's (FAB) level.

LARA, being a supporting system first, supports Flexible Use of Airspace (FUA) and enhanced FUA concepts, allows dynamic centralized and de-centralized Airspace Management (ASM) encompassing the whole state or just a region (FAB, province, oblast, etc.), moreover, cross – border operations become really easy with it. One of the key aspects of LARA is that it has a real-time presentation of the same data to all stations in a link

between airspace users, service providers and airspace managers.

The basic concept of LARA lies in a modular approach where each separate system represents one of three modules in three distinctive areas of ASM, starting from long – term one and up to the real – time coordination of airspace activation. Such a concept helps to guarantee the transparency among the users which is one of the main drivers for them. With the modular approach it becomes possible to connect existing system as a module.

*Module 1 or Airspace Planning* starts from the blur, imprecise picture of the future airspace moving up to the definite, coordinated plan of activities in it. At this stage the basic component is continuous coordination between all planning authorities, which have constant access to all data during the process. For the sake of complete booking process, all manageable and non-manageable areas, CDRs (conditional routes) and Radar Vectoring Areas are bookable.

In general, at this level LARA supports civil-military planning co-ordination, airspace reservation or booking, simulation, analysis, collaborative decision making, cross-border coordination, information promulgation and airspace allocation, mainly based on FAB or national procedures which is very important as the functional blocks are not yet established over Ukraine.

The planning starts with an event calendar which collects the planned exercises or main events foreseen in the year and the next year(s) without knowing exactly the airspace requirements and ends up with tactical changes.

The structure of Module 1 is graphically represented in Fig. 1.

*Event Calendar* is the very beginning of airspace management as it means the collection of main events foreseen in the year or some anniversaries, etc. but without knowing exact airspace requirements for them. It's the first and the basic view of the future airspace. All events, that are to be included at this level, have the priority over the others, being planned later.

*Long-term planning* begins when more planned airspace activities appear with exact plan and requirements for airspace areas:

- large military and civil events, for example: EURO 2012, The Victory Day, etc.; or military exercises.
- GAT (general air traffic) constrains which have the significant impact on military activity (weekends or holidays).

Long-term planning lasts from x years up to 7 days prior to the actual day of airspace usage. Initial coordination (communication) is already possible.

*Short-term planning* (STP) is defined as from day 7 until day 1 or the day before the actual airspace usage. The STP activity focuses on:

- Military booking of airspace coordinated with appropriate services (e.g. Ukraerocentre, Air Defense unit, etc.);

- Civil booking of airspace with expected constrains;
- Assessing the mutual impact of reserved areas and CDRs;
- Creation of Airspace Use Plan (AUP), distribution of it to all network managers and reception of analysis, proposals and alternatives from them.

The main features of this step are the ability to evaluate the impact of booking on other areas and check double booking; all areas are represented as in 3D. Since now online coordination becomes possible so as to be able to challenge the proposal. Such an intensive coordination ensures authorized planning.

*Day planning* is also available for reservation and booking of airspace by military or civil plus the ability to make some changes in previously booked airspace (all last changes are going to be presented in UUP or Updated Airspace Use Plan). The system carefully analyzes and detects possible impact of such reservations and changes and, as it has online coordination, these requests are immediately granted or refused. The time for these activities is limited to x hours before the actual time. It depends on ASM level 1 decision.

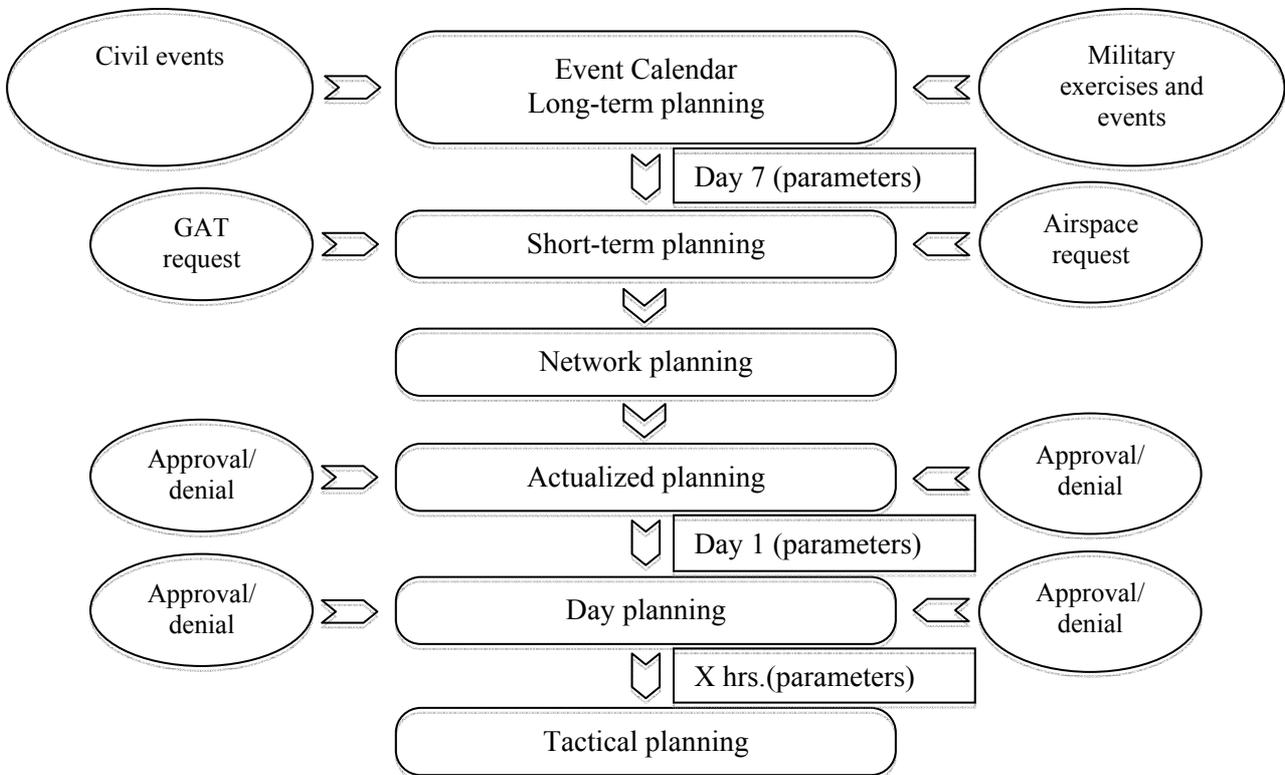


Fig. 1. Structure of Module 1

*Module 2 or Airspace Status* supports short-term cancellation or change of airspace allocation. It supports the actions of air traffic control role by exchanging and enabling the display with actual airspace status ensuring common situational awareness.

When the controlling unit becomes responsible for the management, it is no longer airspace planning but airspace status. This transition is based on a time parameters and is defined by ASM level1. As the controlling unit activates and de-activates the areas, this module supports online coordination for other users and authorities to be aware of what is going on up there.

When it comes to the display, all areas are visible and have their own color according to the status, users and duration [http://www.lara-eu.org].

Any changes shall be acknowledged manually or automatically (Fig. 2).

All airspace management activities held during this stage are recorded and stored.

*Module 3 or Airspace Data Collection* collects and stores all the data from modules 1 and 2 for its further analysis.

All data exchange is stored on a server and can be retrieved for national statistics on the use of

airspace. It is essential for assessment of airspace efficiency, mission effectiveness and flexibility of airspace use. All these data can easily be accessed via an interface. The LARA database supplies the analysis programs with data regarding the following KPI (key performance indicator) aggregations:

- FUA application;
- Adherence to optimum airspace dimensions;
- Utilization of airspace;
- Efficient booking procedures;
- Economic impact on transits;
- Impact of airspace location on training;
- Training in non-segregated areas;
- Release of airspace.

## 2. Evaluation of LARA prospects

Current situation with Civil – Military coordination and Flexible Use of Airspace in Ukraine still makes us wish something better. Really, it wasn't until after 2010 that the Government started to allocate money for military flights and trainings. Now, Ukrainian military pilots fly 2–3 times per week what means the need for airspace is increasing among the users.

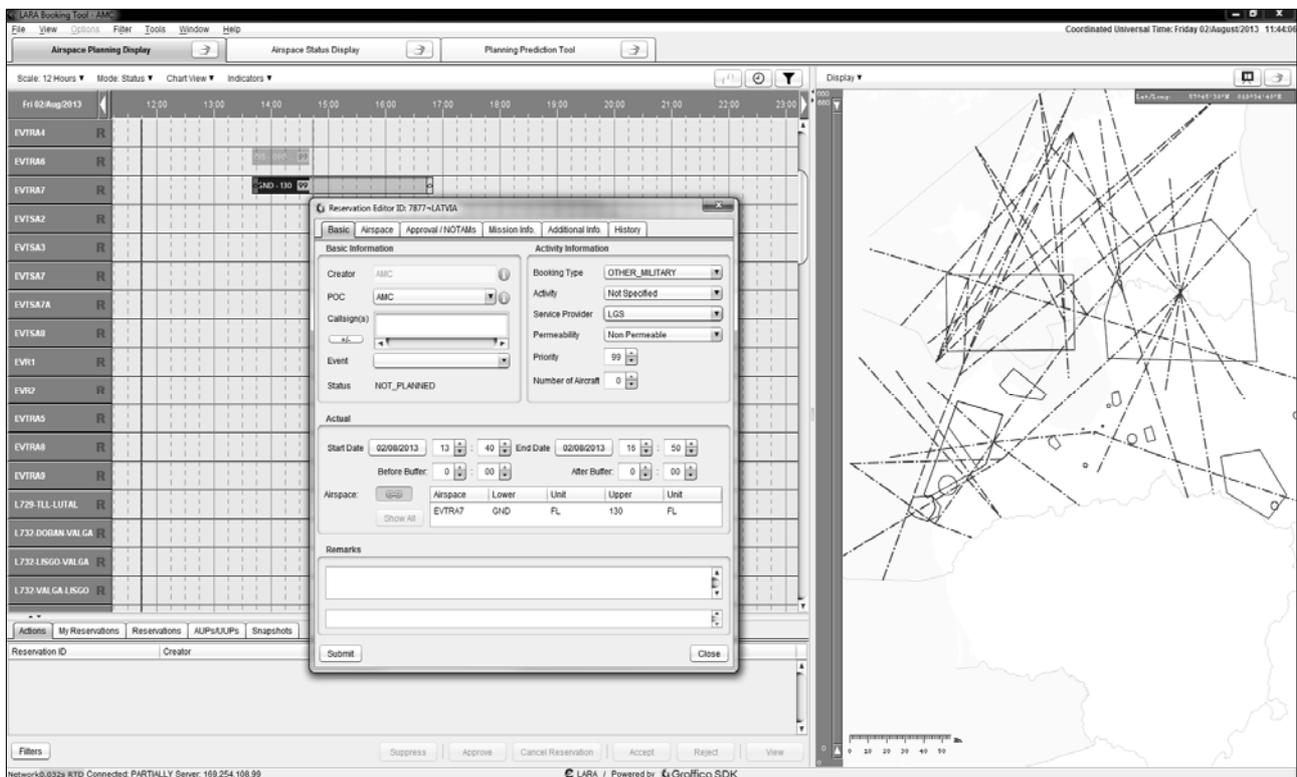


Fig. 2. LARA booking tool

Moreover, the aviation of Ukraine is on the constant slope up as it is a window to Europe. We are handling a lot of transit flights from and to Asia. What it means is that we need to provide the airspace to all those users, mentioned above, and ensure their safe presence within it. But how? For this reason we implemented FUA to allocate the airspace among various kinds of users on their requests. But the reservation of the airspace is done according to complicated procedures and it needs a lot of signatures and stamps. What we need is fast and easy process that doesn't require a lot of time to waste. The only solution, which seems to be really perspective, is LARA implementation in Ukraine. This software package will help us to visualize all procedures and coordinate with all users on the real-time basis. It is really easy because the stakeholders will not have to call, use fax or telegraph. They will have LARA software installed on their computers which will allow them to see what is going on in the airspace on the day of their planning airspace use. What a user will only do is to choose defined volume of airspace, indicate the type of reservation, click OK and wait for conformation from the server (Ukraerocentre). Meanwhile, this portion of reserved airspace will visually be represented in all clusters as the data is shared through the network.

The Fig. 3 represents the way the LARA system is designed and how all way points are connected among each other. So the way the system works is really helpful as it allows the real-time data sharing

not only among the users but also among the clusters which are, for example, neighbouring countries [LARA brochure...2008].

Moreover, the ATS (Air Traffic Service) units, being one of the waypoints, also receive the data what leads to more effective airspace allocation on the day of planning. Currently, the LARA is partially tested by Eurocontrol and is being prepared for implementation in European countries but we are not among them. One of the options which might be the step forward for Ukraine is to ask Eurocontrol the trial version of LARA to see the way it works and evaluate its further prospects in Ukraine.

### 3. Order within the network

*Ukraerocentre* plays a key role in the airspace management process since it has to produce a balanced airspace user plan taking into account civil and military needs. It is a server in the network who will provide:

- the interaction between airspace reservations and CDRs;
- the conformation to the other roles of the last airspace plan;
- the alignment of civil-military airspace requests;
- the analysis and display of network proposals or scenarios through simulations;
- the compilation of all airspace reservations and CDRs to support AUP, UUP, NOTAMs (notification to airmen) and AIP (aeronautical information publication).

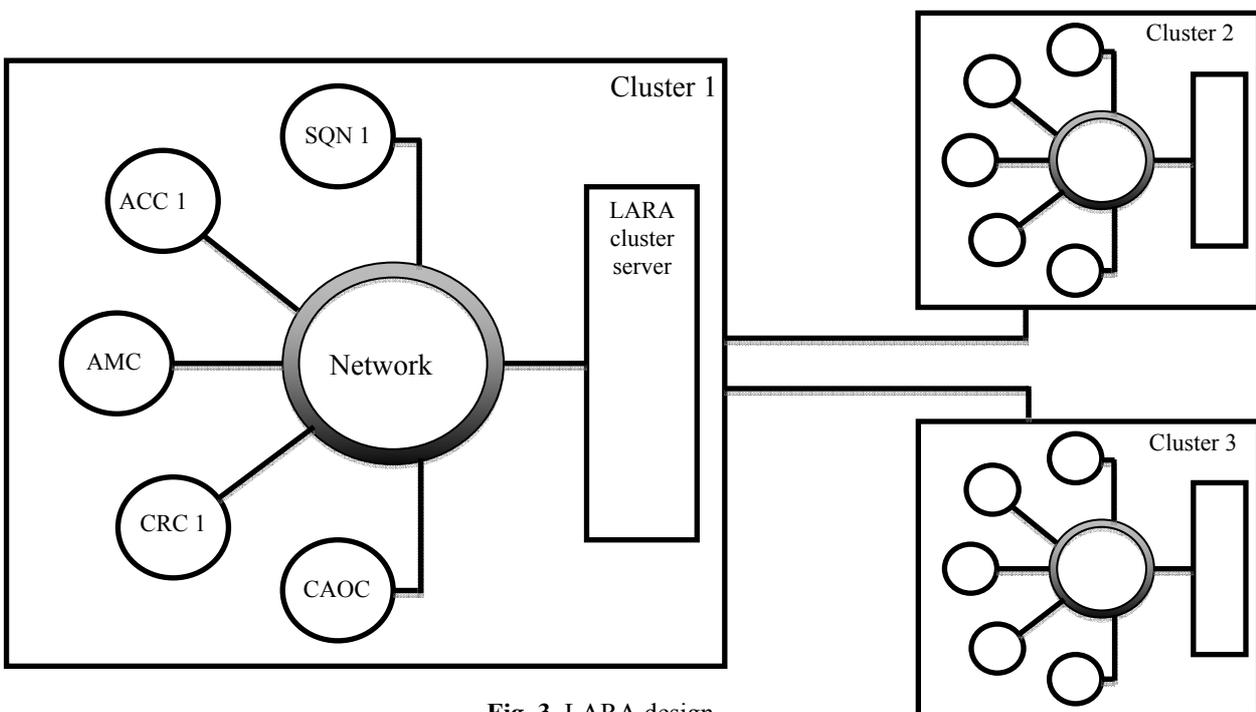


Fig. 3. LARA design

*Military units* need to be able to book airspace for their missions, depending on particular needs in terms of area, level and time. To properly support this activity, an airspace planning system is to take into account the rules and procedures applied in Ukraine. To optimise the use of the airspace, the availability is visible. The system also supports interstate military coordination and enable the planning of Cross-Border Areas (CBA) and Cross-Border Operations (CBO).

*Civil airspace requests* other than the utilisation of the network (e.g. glider championship area, civil aircraft test area) are introduced for processing through Ukraerocentre or other agency concerned. A swift response containing an approval, a change proposal or a denial shall be supported.

#### 4. Airspace Use Plan

LARA supports current Ukrainian airspace management processes - being capable to provide and distribute AUP data and updates (UUP). The AUP data can be generated from within LARA on the basis of all reservation data available for the appropriate time period. It is as well possible to export the AUP data to an ACA File for import into the Network Manager (previously CFMU) Interface for Airspace Managers (CIAM) or into an ADEXP File for import into Air Command and Control System (ACCS) or other legacy systems. LARA can as well import AUPs from CIAM and properly display the CDR availability on the Gantt Chart [LARA brochure...2008].

#### 5. LARA and ATCOs collaboration

The controllers at the civil control areas and upper control areas (ACC/UACs) must be informed continuously about the status of the airspace and will be warned, in a timely manner, of any pending changes to the airspace status.

In addition to all requirements mentioned above, the radar map used by controllers at a civil ACC/UAC shall integrate the current airspace status in a correct, unambiguous and coherent manner. Any pending changes to the airspace status of the various, relevant airspace portions, should be indicated on the radar screen.

The airspace status is permanently available and updated. The data will be correct and at all times available without technical interruptions or delay. The display will present the airspace available to the civil ATCO taking into account the buffers that must be respected.

The ASM system will automatically apply the buffers conform to the applicable agreements and in function of certain parameters e.g. type of activity inside a Temporary Restricted Area (TRA).

#### 6. Estimated benefits

The conceptual description of a local and regional ASM support system and associated specifications concertedly drafted by a majority of stakeholders will assure a harmonised approach. Easier conformity of the systems to the specifications is ensured when basing the work on existing best practices.

It is expected to enable a more dynamic and flexible usage of Ukrainian airspace. Standardised and stored data to be used for civil and military KPIs would provide more transparency between civil - military activities and improve analysis processes and performance assessments [Milestones...2011]. It should help enhance Ukrainian ASM procedures and offer the opportunity to develop regional management.

So, by implementation of LARA system in Ukraine, we will get the following advantages:

- Reduction of workload through automation and airspace management task optimization;
- Enhancement of civil-military ASM coordination at levels 2 and 3;
- Ukrainian ASM planning will become more accurate and easier;
- Harmonised approach to deliver accurate and up-to-date ASM data to international agencies;
- Enable the continuity of cooperative decision-making and coordinated optimization of ASM from the earliest stage of airspace planning until operation time, etc.

Also, we believe that in the future, we'll not even need the AUP or UUP as all data will be represented in a computer.

#### 7. Conclusions

Ukraine is considered to be a country with great prospects especially in aviation. The traffic over Ukraine is constantly increasing and in summer 2012 we happened to come across the real European traffic, which needed the last improvements and updates in aviation. Let's face the truth, we don't have them, but nevertheless, with some problems, we managed to handle that traffic. If it were to continue to be so, we would not manage to provide the safety. For this reason, we had better to be prepared for everything. We don't have to wait until a situation requires something but be ready to face it.

LARA implementation will result in the whole bunch of benefits for Ukrainian airspace management process and in general for flexible use of Ukrainian airspace. We really need it because the operational air traffic is growing and doesn't seem to stop.

Ukraine should not lag behind as it used to. We must be the first!

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Received 1 July 2013.

### **О.Є. Луппо<sup>1</sup>, В.А. Лазоренко<sup>2</sup>, О.О. Пригара<sup>3</sup>. Упровадження місцевої та субрегіональної допоміжної системи організації повітряного простору в Україні**

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Розглянуто структуру та основні принципи організації повітряного простору з використанням місцевої та субрегіональної системи організації повітряного простору. Розроблено детальний план структури даної системи в Україні. Вирішено організаційні питання щодо розподілу обов'язків та прав. Пояснено принципи застосування системи можливими користувачами. Висвітлено прогнозовані переваги даної системи над системою, яка використовується на теперішній час в Україні.

**Ключові слова:** організація повітряного простору; оцінка функціонування системи; переваги пропонованої системи над існуючою; план упровадження системи.

### **О.Е. Луппо<sup>1</sup>, В.А. Лазоренко<sup>2</sup>, А.А. Пригара<sup>3</sup>. Интеграция местной и субрегиональной вспомогательной системы организации воздушного пространства в Украине**

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Рассмотрена структура и основные принципы организации воздушного пространства с использованием местной и субрегиональной вспомогательной системы организации воздушного пространства. Разработан детальный план структуры данной системы на Украине. Решены организационные вопросы, касающиеся распределения обязанностей и прав. Объяснены принципы применения системы возможными пользователями. Определены возможные преимущества данной системы над системой, которая сейчас используется в Украине.

**Ключевые слова:** организация воздушного пространства; оценка функциональности системы; план интеграции системы; преимущества предлагаемой системы над существующей.

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