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THE USE OF THE SINGLE EUROPEAN SKY IN CURRENT MILITARY AND CIVIL AIR TRAFFIC

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Abstract
The aim of the contribution is to define the theoretical background within the operational and economic level of parallel use of the common airspace in Europe. The contribution is divided into 5 parts. The first part deals with the introduction to the Single European Sky. In the second part are presented the general characteristics of the concept, the problems of the functional blocks and the individual phases, through which the SES concept has passed. The third and fourth parts illustrate the cooperation between civilian and military components during the shared use of airspace and the puzzling part deals with the evaluation of the issues discussed.

Keywords
Single European Sky; SES; functional airspace block; FAB; EDA; EUROCONTROL; SESAR; PRISMIL; air traffic control; ATC.

1 INTRODUCTION

Airspace offers a wide range of options for developing and implementing transport not only for the civilian component but also for the military component. Performing military operations, whether direct air fights, exploratory flights, or the transport of military material, are gaining more and more importance. In particular, it contributes to the conflicting situation in which more and more countries, in particular the North Atlantic Organization of NATO, support states occupying the occupation or direct military conflict, whether civil, religious or international, are receiving. The SES project was launched by the European Commission in 1999 and its primary objective was to meet future capacity and security needs through legislation. The development of the project also meant the development of the different areas associated with air traffic control and therefore took a step forward in defining objectives in key areas of safety, network capacity, efficiency and environmental impact. The second part of the program - SES II - contributed to this. Single European or transformed the role of EUROCONTROL, which could become the network manager of the European ATM network. Technologically, the SES project is supported by SESAR, which provides advanced technologies and procedures to modernize and optimize the future European ATM network.

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2 CHARACTERISTICS OF THE SINGLE EUROPEAN SKY PROGRAMME

In response to the dramatic rise in aviation development recorded over the past two decades, the European Commission has approved two parts of the European Single Program or in order to create a legislative framework for the aviation industry in Europe.

The European Air Traffic Management (ATM) system currently processes around 26000 flights a day. Forecasts indicate a doubling of the air traffic level by 2020. In addition to this assumption, European ATM operations, compared to other ATMs in the world, cost about EUR 2-3 billion each year. The SES program is intended to answer the question of how European airspace will be adapted to the increasing air traffic flow in order to reduce costs and improve its performance.

The necessary response came with the initiative to organize airspace into the so- FABs - functional blocks according to traffic flows to replace national borders. Such a project could not be organized without common rules and procedures at European level. Single European or a program built to meet these needs.

2.1 Functional airspace blocks

Although airspace is a common source of air traffic management, ATM is still provided in a less organized way in the European Union, affecting safety, reducing capacity and, above all, increasing costs. The key to improving the capacity and efficiency of increased security and ensuring lower cost of air navigation services is enhanced co-operation and cross-border integration. The establishment of functional airspace blocks will lead to increased cooperation and integration in the provision of air navigation services.

The functional airspace block is defined in the Single European Sky legislative package, in Regulation (EC) No. 1070/2009 amending Council Regulation (EC) No. 549/2004 as an airspace block based on operational requirements and established regardless of frontiers where the provision of air navigation services and related functions is performance-optimized and enhanced by enhanced cooperation between air navigation service providers or, where appropriate, integrated providers. The current reorganization of 67 airspace blocks in Europe (based on state borders) into only 9 functional blocks is the first step towards achieving this.

2.2 Arrangement of airspace

The FAB concept was developed in the first SES legislative package (SES I) as one of the main means of reducing fragmentation of the airspace. The creation of the FAB itself was the second legislative package of SES II, with a view to providing services, in addition to the organization of airspace. The dual aim of the legislative package is to optimize air traffic flows and to increase the efficiency of air traffic services in Europe. SES II sets the final date for the commitment to improve performance by Member States by 4 December 2012. The project is subject to 9 functional blocks, of which two have already been implemented - UK-IRELAND FAB (United Kingdom and Ireland airspace and DENMARK -SWEDEN (airspace of Denmark and Sweden). Below are all 9 proposals received:

- NEFAB (North European FAB): Estonia, Finland, Latvia, Norway;
- Denmark-Sweden: Denmark and Sweden;
- BALTIC FAB: Poland and Lithuania;
- FABEC (FAB Europe Central): France, Germany, Belgium, the Netherlands, Luxembourg and Switzerland;
- FABCE (FAB Central Europe): Czech Republic, Slovak Republic, Austria, Hungary, Croatia, Slovenia and Bosnia and Herzegovina;
- DANUBE: Bulgaria and Romania;
- BLUE MED: Italy, Malta, Greece and Cyprus (as well as Egypt, Tunisia, Albania and Jordan as observers);

- UK-IRELAND FAB: United Kingdom and Ireland;
- SW FAB (South West FAB): Portugal and Spain [1, 2].

2.3 SES I

Since 2004, the European Union has been granted air traffic management powers and the decision-making process has shifted from intergovernmental practice to the EU framework. Its main objective is to reform ATM in Europe with a view to tackling the sustained growth of air transport and operations under the safest, cheapest and most environmentally friendly conditions. This means eliminating the fragmentation of European airspace, reducing delays, increasing the safety of standards and the efficiency of flights in order to reduce the environmental footprint of air transport and reduce the costs associated with the provision of services. Achievements have already been achieved at the operational, technological and institutional levels. Efforts to continue, however, continue to maximize the benefits of the activities initiated under the Single European or European program.

2.4 SES II

The second Single European Sky (SES II) regulatory package was adopted in 2009 and changed the focus of SES from capacity to performance in general. Its main objective is to increase the economic, financial and environmental behaviour of the provision of air navigation services in Europe. The amendments to the SES I regulatory package have in particular introduced a comprehensive EU performance scheme. Redistribute functional airspace blocks (FABs) not only to airspace but to the provision of services in general and to the network administrator to coordinate certain activities at the network level. In addition, it extended the European Aviation Safety Agency (EASA) air traffic management powers, thereby stepping up support for the drafting of technical implementing rules and supervision of Member States from EUROCONTROL to EASA.

2.5 SES II+

The SES II package of 2009 has proven to be a promising contribution to the future of the project, especially as regards the implementation of the performance-oriented economic regulation model. In implementing this approach, important facts have been identified that need to be included in accessibility regulations. In addition, the SES II initiative left some overlapping of legislation, so the same provisions were found in several regulations. In order to implement these updates, the European Commission has proposed an ongoing update of the rules of the Single European Program. The SES II + proposal were submitted in June 2013 and is currently being approved by the European Parliament and the European Council.

2.6 SESAR

The SESAR project is the technological pillar of the Single European Program. Its objective is to improve the performance of ATM by modernizing and harmonizing ATM systems through the definition, development, validation and deployment of innovative ATM technology and operational solutions. These innovative solutions represent the so-called SESAR concept. This concept is defined in the European ATM Master Plan, which also defines the necessary operational changes and the plan for their implementation. The components of the concept will be developed and validated by the Joint Undertaking SESAR JU. Verified basic operational changes are used through joint projects supported by SESAR deployment management and mechanisms. All three processes are part of a virtual life cycle that actively engages stakeholders and the Commission in various forms of partnership [6, 7].

3 THE USE OF AIRSPACE BY CIVIL AND MILITARY AIR TRAFFIC

The Single European Sky concept does not directly apply to military air operations, because defence and security are synergies that remain under the sole responsibility of the state. However, since European transport policy has a direct impact on the organization of airspace, it may also affect access to the airspace of the Single European Sky. As a result, EUROCONTROL's member states must make important decisions on how they intend to align their military forces with the development of the SES. The EUROCONTROL ATM Civilian and Military Coordination Division provide support to Member States in all areas related to the implementation of the Single European Sky (SESIM) and its possible impact on the activities of the Air Force.

3.1 The Master plan of European ATM

The master plan of the European ATM is an approved plan for the modernization of the ATM system and combines the scenarios of its development with the development of the SESAR program. The master plan is a tool for deploying SESAR and provides the basis for timely, coordinated and effective deployment of new technology technologies. It includes plans outlining the main operational and technological changes required by all stakeholders (airspace users, air navigation service providers, airport operators, military component and network manager) in order to achieve the performance set by the SES program [2].

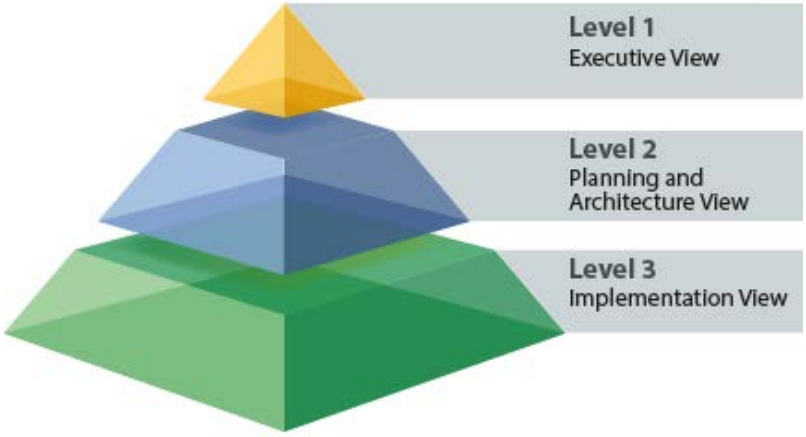

Fig. 1 The pyramid of the introduction of the Master Plan of the European ATM

3.2 Advanced Flexibile Use of Airspace (AFUA)

Targets and business models of airspace requirements vary for both civilian and military airspace users. While civil aviation is developing the program's trajectory with the most cost-effective route, the country's air forces are engaged in the widest possible use of airspace through the FUA program. However, this concept was interpreted differently by different organizations. As a result, the procedures applied by these countries vary considerably, leading to discrepancies affecting the civil-military coordination activity. The AFUA concept, which is a better part of the SESAR deployment process, is expected to provide more flexibility in dynamic airspace management at all phases of flight from initial planning to the flight phase.

The SESAR project, Design 7.5.2, aims to optimize the compromise between civilian and military requirements by defining new types of airspace structures and related reservation processes between the two user communities. It is led by EUROCONTROL with the participation of Aena, DFS, NATS, NORACON and Thales. It defines future airspace structures and aligns design at their European level. These structures will have to be as dynamic as possible, taking into

account the performance of aircraft and weapon systems. The current solid structures - the temporary limited area (TRA), the Temporary Area (TSA), the cross-border area (CBA), should in the future be an exception only for a limited timeframe. There will be developments in line with the three steps of the SESAR Concept Storyboard, starting with a more flexible airspace structure, such as the MVPA and the Dynamic Mobile Area (DMA) geometric area (VMA) from 2020.

Benefits for all airspace users:

The FUA concept is intended to contribute to meeting the SESAR performance targets:

- Providing adequate dedicated airspace at the right place and at the right time while providing accurate information;
- The development of airspace structures from fixed to dynamic aims to reduce transit between aerodrome bases and training areas, help to save fuel and allow for greater flexibility;
- Facilitating cooperation and coordination between armed forces has the role of increasing capacity for the benefit of all airspace users.

4 DESIGN OF THE CONCEPT OF USING THE AIRSPACE IN PARALLEL CIVIL AND MILITARY AIR TRAFFIC

The draft concept of cooperation between civilian and military aviation is based on a combination of programs that are used in the long term in the United States and Germany. The complexity of civilian and military transport in the Central European airspace required enhanced civil and military co-operation. In general, military aviation activities do not allow for inflexible treatment and discrete or segregated management of military transport flows.

4.1 Linking the Overseas and European FUA concept

The concept of flexible use of airspace is based on the safety of fluent operation. The complexity of civilian and military transport remains a permanent challenge.

In addition, the military air force will continue to exist with different airspace and mission requirements, albeit probably in a smaller amount. What has been achieved over the last twenty years through good civil-military cooperation is the basis for the future, and therefore:

a) a very high level of safety;
b) more than doubling the capacity of airspace;
c) a national security guarantee;
d) meeting military requirements even in times of crisis.

The concept of military flexible use of airspace is a follow-up to the comprehensive European ATM Harmonization and Optimization Program to cope with the growing demand for airspace in Europe. General Air Traffic (GAT) and Operational (Air) Air Traffic (OAT) formulate different requirements for the use of airspace. Airspace sketched for military purposes prevents economical and efficient flight routes, and training airspace available to the air force is limited due to existing ATS routes.

Airspace management is conducted at three organizational levels:

(a) Level 1 (Policy and Strategic Planning) - Civilian-military authority at government level, which takes political decisions on airspace structure and issues guidelines on airspace management;

(b) Level 2 (tactical pre-planning) - Planning, coordination and defining the activation of defined airspace and contingent routes on the following day in accordance with current requirements. It is the role of the National Airspace Management Cells (AMC).

c) Level 3 (Tactical Civil and Military Coordination) - This is the operational part implementing the FUA concept in practice in day-to-day operations. The management of ad hoc use of airspace and airspace shall be carried out in close cooperation with the air traffic control unit units

designated for air traffic control and management / support for air traffic control. For example, Deutsche Flugsicherung GmbH (DFS), in cooperation with the Air Traffic Management Tactical Service as well as the Control and reporting Center (CRC), performs this task in Germany [4].

4.2 Special use of airspace (SUA)

The United States, based on the geographical area and political structure, has formally integrated flexible airspace for over 50 years. Air Navy military air services are divided into military requirements into two categories:

1. operations which could be dangerous for an aircraft without participation or activity on the ground; and
2. those that are not.

Naturally dangerous operations are carried out in segregated airspace, which is called special airspace, which is more known in ICAO terminology than FUA, and hence the flexible use of airspace. However, as this is not a civil air traffic operation, the special use of airspace can be referred to as a subset of the FUA. Its basic requirements include:

a) volume/capacity - sufficient airspace to achieve training / testing objectives;
b) distance from operating airports;
c) time - available if needed;
d) Physical characteristics (environmental and safety issues).

Airspace is available for both civilian and military aviation. However, the USA can be characterized as the airspace needed to protect persons and property, to carry out special training, testing or military operations and is available for that purpose. In such cases, civilian crews are instructed not to enter the airspace or are aware of the hazards and have been advised to use their airspace with the utmost caution if they choose to enter such airspace.

Special use of airspace is not a normal operation of flights used for the carriage of persons or goods. Therefore, for the protection of persons and property in the performance of special operations which do not have the status of ordinary civilian flights, temporary flight restrictions (TFRs) are in place to protect persons and property from the temporary danger which, when performing a specific a special task was caused by the presence of aviation technology to that end.

4.3 SUA as a part of MVPA

Model of military areas with variable profiles MVPA was established as a field study in the northern part of Germany (near TRA 206/306) [4]. The airspace was arranged into 15x15 nautical miles (NM) modules that the military units can reserve according to their operational requirements. This is the concept of dynamic or flexible use of airspace [7].

US Authorization Process and Subsequent Operation:

After entering the requirement for the use of airspace in the electronic reservation system, the confirmation is issued, permission to use part of the airspace, preceded by the consultative process of military components with the relevant civilian ACCs. After this process, airspace is assigned to the appropriate purpose that meets the requirements of the military mission and minimizes the impact on civilian air traffic.

All conditional CDRs remain open while running. RLP personnel will maintain a horizontal distance of 5 NM from active modules representing US airspace blocks that create the boundary between this and civilian air traffic. A military user can use MVPA modules to their limit.

Following an inspection in Germany where the MVPA model is used, ESARR 4, which assesses the degree of risk in providing air traffic control services, has shown that MVPA procedures can be safely implemented. This results in the expected benefits for users:

- easier to carry out the tasks of military users;
- Adaptation to changing mission requirements by military users;

- Reduced redirection of flights compared to the fixed TSA / TRA system for civilian users;
- more favourable economic indicators for civil aviation flights.

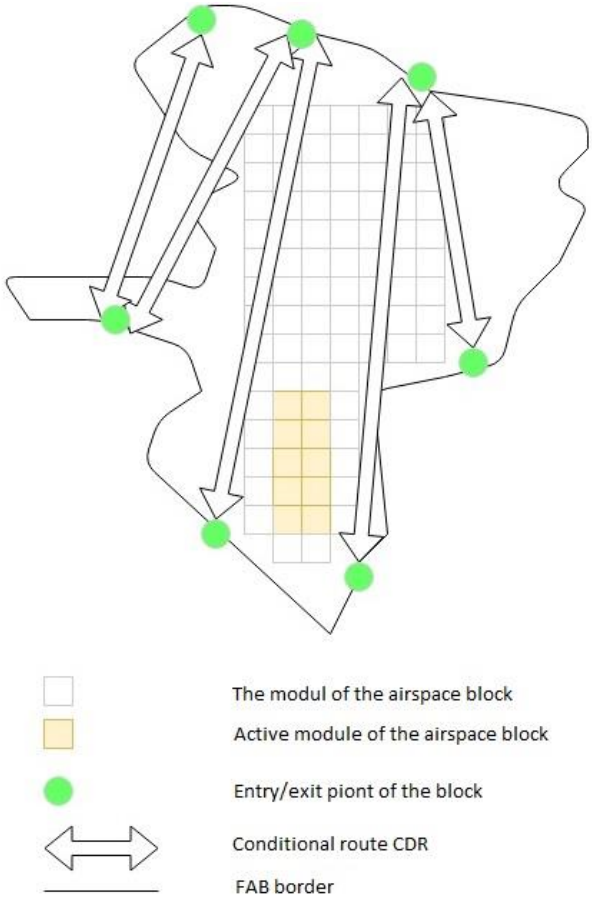

Fig. 2 Dynamic use of airspace

5 CONCLUSION

The idea of a Single European Sky depicting cooperation between the European Union and EUROCONTROL is one of the best practices in Europe that aims to change citizens' lives by increasing airspace capacity, increasing safety and reducing costs. There is a need to continually reinforce the project performance scheme, the focus of which is to achieve the airspace performance targets and to reduce costs, which are two main pillars of success for the whole project. An important fact is the introduction of nine functional airspace blocks.

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