

FREE ROUTE AIRSPACE (FRA) IN EUROPE

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Summary: At the present time, there is the effort to replace the established airways for flying by direct lines. This style of operation is called free route airspace concept. On the following pages we will focus on problems and solutions associated with this concept and examples of FRA implementation in Europe.

Key words: free route airspace, functional airspace blocks, air traffic control

INTRODUCTION

Volume of air traffic is growing steadily every year, which implies the need of continuous improvement of European ATM. So it is necessary to increase capacity and efficiency of airspace, but with regard to environment and safety, which should be maintained or improving.

The main way to reduce the environmental impact is to reduce aircraft fuel consumption. Achieving this goal, as quickly and easily, begin at the flight routes. If the aircraft flew directly between two points, it would save an appreciable amount of miles and so tons of fuel. The consequence is, nowadays very popular, reducing CO₂ emissions.

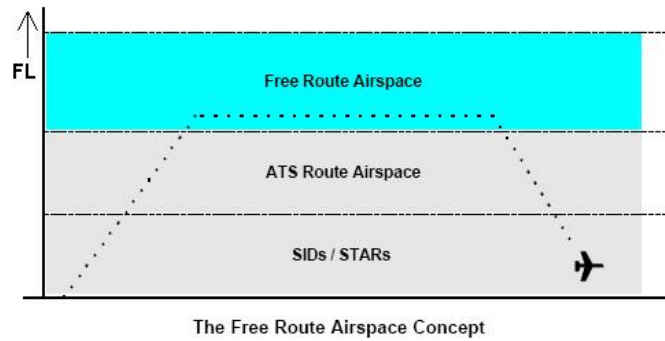
1. SYSTEMS APPROACH

The basis is to realize that the subject of air traffic control is an organization of aircraft movements in airspace, including the methods and practices in managing and securing traffic. Air traffic control is a cybernetic process based on constant exchange of information and interaction between air traffic control units and between them and the controlled aircraft.

2. THE DEFINITION OF FREE ROUTE AIRSPACE

Free route airspace is a specific airspace within which users shall freely plan their routes between an entry point and an exit point without reference to the ATS route network. In this airspace, flights will remain subject to air traffic control. (3)

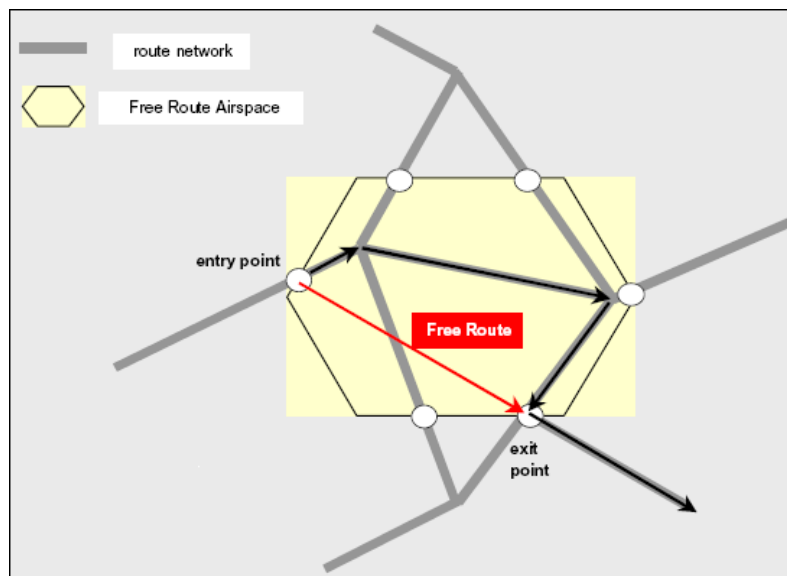
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Source: (4)

Fig. 1 – Position of FRA area

Currently, the defined area is located at the highest levels of airspace above airspace with conventional ATS routes.



Source: (5)

Fig. 2 – route network vs. free route

3. THE MAIN PROBLEMS

As mentioned above, the main benefit is straightening air routes and the consequent reduction in the total flown distance. Another change compared to airways is given information about the airspace, information about the availability of airways are replaced with information about the availability of airspace. For this reasons there are problems that must be resolved before implementation. The main requirements for implementation are on the sides of the operator, ATC and ATFM (in this case mainly CFMU). Given problems are:

- The operator must adapt to a new style of designing flight routes. For the highest fuel economy must the operator plan routes according to the latest information about airspace.
- ATC must have:
 - Flight data processing systems capable, for aircraft flying free routes, to process data in the correct sequence across sectors only with entry and exit

- point of the FRA area, or with intermediate points, which will be determined by the user for the flight.
- Ability to dynamically updating the flight routes between sectors and between the ACC in the event that the flight is diverted from the planned track.
- Systems able to identify and transfer data at all border points of the ACC or the sector.
- New operating procedures for the flight from the airspace with ATS routes to the FRA area and vice versa (descending and climbing).
- Air traffic controllers training for new procedures.
- CFMU must be able to process flight plans containing free routes and to distinguish between different times of day in the event that FRA would be implemented only for part of the day.

Implementation of free route airspace in Europe is not controlled by any mandate. States, air navigation services providers, or functional airspace blocks (FABs) can implement FRA, when they decide for it. By the style of implementation of the FRA in defined airspace is or is not necessary to deal with all issues.

4. ... AND THEIR SOLUTIONS

The adapting of operators to the new airspace organization depends only on them. If they want to fly in FRA area, they must plan routes by the FRA rules. Where the route network is not removed, planning along route network is still allowed. However, it is important to note that operators will be happy to adapt to this change, because for them FRA is the way to save money.

From the perspective of the CFMU corrections runs continuously and in the last years (2009-2011) was CFMU working to improve the systems towards achieving full ability to work with all data for the free route airspace.

Because the implementation of the FRA is not given by any regulation, ATC has the main word for its introduction. That's why there are initiatives to introduce free route airspace in phased approach, e.g. only during the night. Therefore will not be any problems at the beginning of implementing FRA, because at night there is less traffic, sectors can be unified and the overall air traffic controller workload is lower. So in this case it is possible to implement FRA with one requirement, that air traffic controllers will be responsible to monitoring flight paths without the aid of support system.

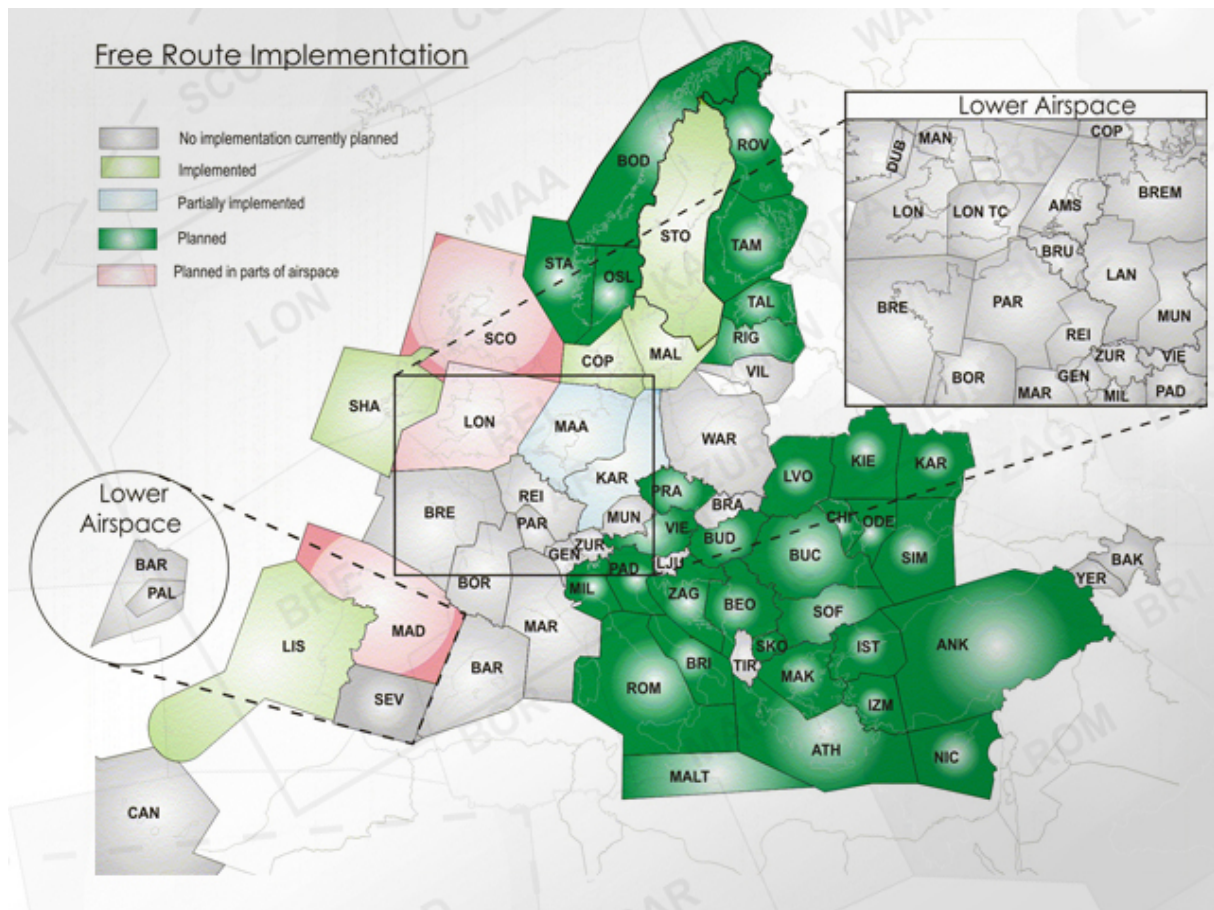
In an effort to implement free route airspace for 24/7 it is necessary to solve all problems related to ATC. In most cases it is necessary to improve the computer system of air traffic control that will be able to monitor the movement of aircraft in the area without airways, which means improving the flight data processing (FDP), and will include support systems such as MONA (monitoring aids - tracking subsystem; checks the deviation from the planned route of flight), MTCDD (medium-term conflict detection - controller may not be able to "see" all the expected conflicts) and CD&R (conflict detection and resolution).

5. IMPLEMENTATION OF THE FRA IN EUROPE

In Europe we can find a lot of initiatives for the implementation of free route airspace. The first states, in which the FRA was implemented, were Sweden, Portugal and Ireland.

Portugal and Ireland have a special status due to the fact that their airspace extends above the Atlantic Ocean, through which leads the transit flight paths Europe - America. The introduction of the FRA is easier due to almost zero climbing / descent to / from the defined FRA area.

Sweden implements the FRA in phases. They divided the airspace by 61° north latitude and first introduced FRA in the north of the country, then south (only whole flights in the FRA, no descent / climb "through the bottom" of the free route airspace). It was followed by implementing of the complete FRA in the northern part of the country and then south. By the end of year 2011 would it be followed by the introduction of the FRA in DK/SE FAB airspace from FL285.



Source: (6)

Fig. 3 – Free route airspace initiatives in Europe

Currently, the implementation of the FRA is planned in the following areas:

- Praha FIR, by the end of 2011, between 22:00 and 04:00
- Finland FIR/UIR, by the end of 2011
- Bucuresti FIR, by the end of 2011, between 22:00 and 04:00
- Beograd FIR, winter 2012/2013, between 23:00 and 05:00

- NEFAB (North European FAB – Denmark, Estonia, Finland, Iceland, Latvia, Norway, Sweden), winter 2014/2015
- Other initiatives: DANUBE FAB (Romania, Bulgaria), Blue Med (Italy, Greece, Cyprus, Malta with associated partners of Albania, Tunisia, Egypt and with observers the Kingdom of Jordan and Lebanon), MUAC (Maastricht Upper Area Control Centre, it includes Belgium, Luxembourg, Nederland and northwest part of Germany; project FRAM – free route airspace Maastricht), Turkey, Ukraine, UK/Ireland FAB, Austria, Croatia, Montenegro, Hungary. (2)

6. FRA AND CZECH AIRSPACE

In the Czech Republic was planned to introduce free route airspace during late March and early April 2011 and only during night hours (22:00 to 04:00). Due to delays in introducing new systems in the CFMU, which will be able to distinguish between day and night operations, the implementation of the FRA in Czech airspace has been moved to the end of 2011. FRA should range from FL165 to FL660. The introduction of free route airspace should save 1000NM per day that corresponds to 6 tons of fuel or 18 tons of CO₂.

Due to the low density of traffic at night and the resulting consolidation of sectors is not necessary to making significant changes in ATC systems, which might prevent the introduction. The introduction of such FRA carries significant limitations. For example the FRA is usable only for transit flights or for flights to / from TMA Praha, or in the FRA area is prohibited to change flight level and true air speed (TAS). Other flights which do not meet these criteria will still need to use ATS routes.



Source: (Jakub Kraus)

Fig. 4 – Planed night FRA in Praha FIR

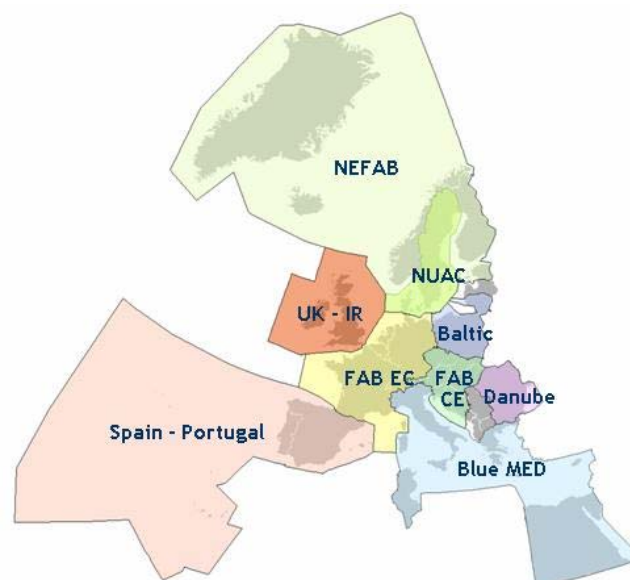
The introduction of free route airspace in Czech Republic for 24 hours a day is much more complex than FRA only at night. Because traffic density is several times higher during the day, the Czech airspace is divided into many sectors (horizontally – sectors north N, south S, east E, west W and vertically up to five layers) and the operation even in these smaller sectors becomes confusing.

The main problem is insufficient ATC system, which cannot cope with the requirements of the FRA (e.g. dynamic FDP to ensure correct ordering of sectors for flights) and does not support functions that are required to use all the benefits of free route airspace. This eliminates the planned replacement of the system which should take place in 2015. Along with it they would be introduced into operation supporting air traffic management tools, such as medium-term conflict detection MTCDD and tracking subsystem MONA. Until the implementation of the FRA take place there is also necessary to carry out training for controllers in a different style of air traffic control.

7. LOOKING AHEAD

The next step in the implementation of free route airspace should be an extension of this space to the whole Central European FAB (FABCE includes states Czech Republic, Austria, Slovakia, Slovenia, Croatia, Hungary, Bosnia and Herzegovina). The same procedure should be practiced throughout Europe, so that the FRA would be introduced in all FABs with united lower flight level of the entire European FRA.

In the distant future, perhaps even the transfer of responsibility for maintaining separation into the cockpit (thanks to the ASAS) and the consequent introduction of the Free Flight concept.



Source: (Eurocontrol PRC)

Fig. 5 – Functional airspace blocks in Europe

CONCLUSION

Free route airspace FRA is currently definitely the right step, which should take the development of air transport. FRA provides complex improvement compared to the airspace with ATS routes either in increased capacity and flexibility of airspace or for operators by increasing their efficiency. Most of this gain the states that have large airspace extending over the Atlantic Ocean, due to transits Europe - America, which are not distorted by any climbing and descending aircrafts from / to airports and has dominant direction of traffic. In areas with higher air traffic density is necessary to introduce support tools for air traffic controllers to fully exploit the possibilities of free route airspace. Thanks to the shortening of routes, FRA also improves the ecological results of air transport.

As it is not specified and ordered how, when and where to implement free route airspace, it is only at the consideration of the State or the region, but logic suggests that the sooner the better and also the larger space the greater savings.

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