



Air traffic management in the South East European countries. Current situation and prospects

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Abstract

This paper deals with the Air Traffic Management (ATM) situation in the South East Europe (SEE) countries. The current status indicates that the SEE air space users require increased capacity, higher flexibility and improved cost efficiency. On the other hand, some of these countries were in a war situation a few years ago, and now they are seeking a regional cooperation to ensure regional stability and prosperity towards their integration to the European Union.

The paper starts with a description of the cooperation schemes, already in operation in the area. Then the attempt to converge the ATM of the region towards the EU Single European Sky is investigated. The FAB (Functional Airspace Block Approach), a European Union (EU) initiative, applied in the SEE is presented in detail.

In the continuation, the paper reports on the definition phase of the SEE FAB initiative, which is to provide a well founded basis for the reorganisation of the SEE air space into FAB's.

It is concluded that the FAB solution stemming from the EU Single European Sky policy is feasible, highly beneficial and necessary for the SEE region development.

Keywords: Air transport; Air traffic management; Single European sky; Functional airspace blocks; South East European countries.

1. Current situation and challenges

Air Traffic forecasts indicate that the SEE (South East European) region, as elsewhere in Europe, does face a continued challenge in meeting the needs of the airspace users and the Air Navigation Service Providers (ANSPs) in the mid-to long term, unless fundamental changes are implemented in the fragmented airspaces and ATM (Air Traffic Management).

The airspace users require increased capacity, higher flexibility and improved cost efficiency which can only be achieved by a more integrated regional ATM system (see EUROCONTROL SES, Regulatory Framework, 2004).

Consequently, the SEE States should use a coherent approach in their plans, within the context of the overall development of European airspace, for developing the future

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airspace structure and route network and that the approach is based on jointly accepted traffic forecasts.

Considering the different legislation of the participating States, the ECAA agreement (see ECAA, 2006) with SES provisions appears as the appropriate legal instrument to create a legal framework for enhanced and consolidated Air Traffic Management cooperation in the SEE region.

The challenge for the SEE region is in developing an adequate, common regulatory framework. This challenge is for many of the participating States to get the sufficient number of skilled human resources. Therefore, high priority should be given to the development of certified human resources required for regulatory authorities and service provision.

The provision of air navigation services must be provided by Air Traffic Controllers Officers (ATCOs) (see ESARR3, 2003) operating under standardised rules, regulations and procedures. This will necessitate a harmonisation in ATCOs working practices to all Air Traffic Control Centres (ACCs) within the region through a coordinated and standardised approach to training and licencing.

The current cooperation between some SEE States should be used as a major foundation stone for the establishment of an enhanced regional cooperation.

2. The EU cooperation schemes for the Balkans

Fostering regional cooperation is a key element in EU transport policy for the Balkans as, firstly, it opens the way for regional stability and prosperity. Secondly, it acts as a vehicle for rapprochement and, in the long term, for the integration of these countries into EU “acquis communautaire”.

The cooperation initiative schemes operating in the region, in conjunction with the institutional mechanism of the EU Stability and Association Process, and the S.E. Europe Stability Pact, are best equipped for acting as catalysts to reinforce regional cohesion.

The principal inter-state regional cooperation initiatives in the area of South-Eastern Europe are:

- i. the South East European Cooperation Process (SEEC). The SEEC constitutes an indigenous cooperation format that stems exclusively from the countries of S.E. Europe. Albania, FYROM, Serbia, Montenegro, Bulgaria, Romania, Turkey, Bosnia-Herzegovina, Croatia and Greece, all participate in the SEEC. Since October 2004 Moldova has participated in the SEEC, having been granted observer status. The SEEC was revived in 1996, pursuant to a Bulgarian and Greek initiative (MFA meeting in Sofia, 6-7.07.96), which led to the Crete Summit, (3-4.11.1997).
- ii. the Stability Pact, SE Europe (SPSEE). The Stability Pact was established in Cologne in June 1999, and adopted by the Heads of State and Government in Sarajevo on 30 July 1999. The pact stemmed from an older French proposal, which at the end of the Kosovo war was once more put forward by Germany, with the support of the US. The aim was to create a zone of stability around F.R. of Yugoslavia as well as a means to coordinate the allocation of economic development aid to the countries of South Eastern Europe. The participating

- countries were divided into beneficiaries or recipients (Albania, FYROM, Bulgaria, Romania, Bosnia & Herzegovina and, since 2001, Moldova) and facilitators or donors. The Stability Pact aimed to stabilise S. E. Europe through programmes of a regional nature that have been established for this purpose.
- iii. the South East Europe Cooperation Initiative (SECI). SECI comprises a consultation framework for addressing economic and environmental problems with a regional dimension. The role of SECI was to complement and strengthen existing regional initiatives and actions for transferring know-how, realising private investment and harmonising the trade legislation and policies of the countries in the region. The SECI Initiative cooperates closely with the UN Economic Commission for Europe (UNECE) and the Organisation for Security and Cooperation in Europe (OSCE). The following countries are SECI members: Greece, Albania, FYROM, Serbia and Montenegro, Bulgaria, Romania, Turkey, Bosnia-Herzegovina, Croatia, Slovenia, Hungary and Moldova. The following countries are SECI partners: US, Italy, Austria, Switzerland, Liechtenstein and the Czech Republic.
 - iv. the Adriatic - Ionian Initiative (AII) The AII comprises a forum for debate and cooperation between its member states (Greece, Italy, Albania, Croatia, Bosnia Herzegovina, Serbia & Montenegro) in the following sectors: economy and tourism; sustainable development and environmental protection; education and culture; combating organised crime.

The AII was instituted at the Conference on Development and Security in the Adriatic and the Ionian (Ancona, 19 & 20 May 2000), which led to the Ancona Declaration that acts more or less as the Initiatives charter.

The different regional cooperation schemes in the Balkan area, except from a general political effect, have also specific objectives to achieve, especially in the fields of institutional reforms, finance, communication and transport. It should be remembered that the EU has gone through extensive planning exercises resulting in transeuropean networks (TEN) for the European Union and the accession countries. It comes out of these exercises that there is a need for further planning in the region of SEE. It is evident that any development of a regional nature has to take full account of links with neighbouring countries, both EU Member States and candidate countries and the paneuropean policies currently under implementation. In particular for the transport sector, the results of the work undertaken in the framework of the Transport Infrastructure Needs Assessment (TINA) process will be considered as a given for the development of infrastructure in these candidate countries of the region. One of the very first targets set by EU in the area of air transport is the de-fragmentation of air traffic according to the existing EU regulations, and this certainly applies for the SEE region.

Taken under consideration the above mentioned initiatives for regional cooperation in the South Eastern Europe (SEE) it is evident that an attempt to re-organise the Air Traffic Management (ATM) of the region is at least an interesting and challenging exercise.

3. Air Traffic Management(ATM) situation in the EU member states

3.1 Background

In the late 1990s, the high levels of European air traffic growth, combined with the liberalisation of the air transport industry within the EU raised concerns on the ability of the Air Traffic Management (ATM) sector to meet the projected capacity requirements, needed to support increasing air traffic demand. There has been a sharp rise in delays to aircrafts.

This had major repercussions for users and placed a substantial financial burden on airlines. Delays cost to airlines in Europe a substantial amount of money, between €1.3 and €1.9 billion per year (Van Houtte B., 2004). These delays are due to a combination of factors: insufficient capacity of the air traffic control system, adverse weather, problems of airports infrastructure or problems within airline operations.

It has been estimated that air traffic will grow by 4% a year over the next 15 years, leading to a nearby doubling of figures by 2020 (see EUROCONTROL/CFMU Reports).

In response to the challenges outlined above, the European Commission published a Communication Mandate on the creation of the Single European Sky which concluded that: irrespective of the legal and economic structure of air navigation service providers, there is a need to establish an adequate overall European regulatory framework. This will ensure that services meet the necessary levels of safety, interoperability and performance, particularly if they are to continue being provided on a monopolistic basis.

Clearly, a thorough structural reform and development of the necessary regulatory framework in Pan European level would require high-level political support and the development of the necessary political and legislative control mechanisms in order to proceed towards a Single European Sky.

3.2 The High Level Group

With the support of the European Council, the European Commission constituted in 1999, a High Level Group (HLG), bringing together civilian and military representatives of Community Member States, together with representatives of Norway and Switzerland, in order to:

- Define the modalities of functioning of the Single European Sky within conditions of efficient delivery of services and with respect to public service obligations, responsibilities and safety objectives for the benefit of civil and military users;
- Examine the technical issues, implementation decisions and restructuring measures to be considered at national or European level in order to achieve such a reorganisation of routes, airspace structures and their operational usage;
- Propose harmonisation of national systems along a coherent Community approach implying central decision making processes and solidarity mechanisms, and Indicate how the Community framework can be supported by the use of the EUROCONTROL organisation in the implementation of its conclusions.

The HLG developed a final report in 2000 with the objective of undertaking a genuine reform of air traffic management. Primarily, this involved adopting a more coherent organisational role at the Community level, while at the same time accommodating expected traffic growth with more efficient use and organisation of airspace.

The HLG concluded that the main deficiencies that ATM was facing were the following:

- i. Air traffic is growing and will continue to grow in the future .Unprecedented delays can only be resolved by effective measures at European level ATM in Europe is fragmented, and this results in an inefficient use of available capacity;
- ii. The current system is not able to keep pace with demand;
- iii. There is a shortfall of qualified controllers;
- iv. EUROCONTROL does not at present have the necessary decision-making process and enforcement powers to ensure rapid improvement of the situation.

The HLG finally suggested a reform process to:

- Reinforce mechanisms to optimise the performance of European ATM as a whole;
- Establish a ‘European’ airspace as a single continuum, managed for overall system efficiency , ensuring sufficient access to airspace for both civil and military purposes, while respecting national security and defence requirements for the use of airspace;
- Develop a coherent ATM system design across Europe;
- Establish high-level rules at the European level for safety and system performance;
- Establish strong and independent regulators and develop a process that ensures implementation backed up by effective enforcement;
- Be consistent with the international framework and comply with the basic requirements of the EU Treaty.

3.3 The Single European Sky

The Single European Sky is a tool to re-organise airspace and ATM system, according to HLG findings, at a European rather than at a local level. The Single European Sky is essentially a regulatory initiative. It brings to the existing traditional engineering inspired and consensus-driven approach that prevails in the ATM industry a set of clear rules that define the rights but also the responsibilities of the different actors.

The main principles of the Single Sky legislation are:

- to reduce fragmentation between States, Civil and military ATM organisations;
- to introduce new technology at a Pan- European level;
- to improve Synergies between EU and Eurocontrol.

The four EC regulations which consist the founder stones for the Single European Sky are:

- Regulation (EC) No 549/2004 of the European Parliament and of the Council of 10 March 2004 **laying down the framework for the creation of the single European sky** (the framework Regulation);
- Regulation (EC) No 550/2004 of the European Parliament and of the Council of

- 10 March 2004 on **the provision of air navigation services in the single European sky** (the service provision Regulation);
- Regulation (EC) No 551/2004 of the European Parliament and of the Council of 10 March 2004 on **the organisation and use of the airspace in the single European sky** (the airspace Regulation);
 - Regulation (EC) No 552/2004 of the European Parliament and of the Council of 10 March 2004 on **the interoperability of the European Air Traffic Management network** (the interoperability Regulation).

The Regulations provide for the development by the European Commission of more detailed implementing rules, with the assistance of EUROCONTROL and the assistance of the Single Sky Committee.

As a result, in the field of the organisation and management of the European airspace, an effort would be made to move from the traditional national approach, to a more integrated European perspective.

Clearly Member States retain responsibility for their airspace under the Chicago Convention (ICAO, 1944), but nothing prevents them from exercising this responsibility collectively under the EU umbrella and from agreeing uniform rules.

This implies the definition of a harmonised classification of airspace with a reduced number of airspace categories, together with harmonised rules on airways and sector design.

The latter will make the whole process of airspace design and management much more straightforward and open it to the creation of cross-border airspace structures.

As a more seamless airspace is being developed, this should be recognised by the establishment of the single European Upper Information Region and by the preparation of comprehensive aeronautical information to be managed and made accessible centrally.

It has long been acknowledged, technically speaking, that national boundaries are not necessarily the optimal basis for optimal air traffic management architecture.

4. The FAB methodology

The Single Sky legislation obliged Member States to analyse the way in which air traffic is managed over their territories in the light of a number of technical criteria, and to organise the provision of the relevant services on the basis of optimised zones which are called “Functional Airspace Blocks” (FAB).

Since Airspace is a common resource, the key to a more rational organisation of airspace is an integration across borders through functional airspace blocks (FABs) in order to improve capacity, enhance security and lower costs of air traffic services. These FABs should be based on operational requirements rather than existing national borders. This means that for the purpose of optimizing ATM in Europe, national boundaries will become less relevant than operational parameters such as traffic flows and cost-benefit analysis; and that there is a scope for greater efficiency and integration, thereby also reducing a number of safety hazards.

Over time it is expected to record the creation of a number of cross-border functional airspace blocks, drawing on the experience of Maastricht, NUAC and CEATS.

The establishment of functional airspace blocks is considered as a “bottom up” process, driven by the Member States concerned and by their service providers. They know best where there are opportunities for operational improvements.

There is no intention to direct this process towards a specific result, but technical and financial support is to make sure that all opportunities are being pursued diligently and that a forum for discussion is provided, if difficulties arise between States. It is also fair to say that we are putting a lot of faith in the ability and willingness of States and industry to come up with good proposals is being put.

The airspace regulation (Regulation (EC) No 551/2004); foresees in its article 5, that FABs shall respect the following criteria:

- (a) be supported by a safety case;
- (b) enable optimum use of airspace, taking into account air traffic flows;
- (c) be justified by their overall added value, including optimal use of technical and human resources, on the basis of cost-benefit analyses;
- (d) ensure a fluent and flexible transfer of responsibility for air traffic control between air traffic service units;
- (e) ensure compatibility between the configurations of upper and lower airspace;
- (f) comply with conditions stemming from regional agreements concluded within the ICAO, and
- (g) respect regional agreements in existence on the date of entry into force of this Regulation, in particular those involving European third countries.

FABs will only be established following consultation with all interested parties, including other Member States and the Commission. Whilst mutual agreement between the Member States concerned is fundamental to the establishment and running of a FAB, in the event of any dispute, parties may ask the Single Sky Committee for advice. Up to now, based on the strong political willingness of European Commission to implement SES, numerous initiatives have started to be examined by different states according to the bottom up approach .

In this procedure, a number of critical issues will be examined in a case by case procedure. A feasibility study for each initiative will support the decision making of the participating States. Up to now the starting point for all economic evaluations is the current ATM fragmentation cost. All on going initiatives intend to reduce this cost, but it remains to each feasibility study to prove how much ,where and when this cost will be reduced.

5. The SEE FABA initiative

At the European Councils in Lisbon and Feira in the first half of 2000, it was confirmed that the Stabilisation and Association Process is the centrepiece of the Unions’ policy towards the region and that the countries concerned are potential candidates for membership in the European Union (Matsoukis, E. and Poulimenakos, S. 2001)

In the Thessaloniki Summit in June 2003, the EU reiterated its unequivocal support to the European perspective of the Western Balkan countries and to prepare them for integration into European structures and ultimately for membership into the European Union.

In 2005 the Western Balkan countries, along with Bulgaria, Romania and the United Nations Interim Administration Mission in Kosovo (herewith referred to as UNMIK) agreed to create with the European Union, a European Common Aviation Area (ECAA) and thereby accepted to align their national aviation legislation to the complete set of EU legislation in the area of Civil Aviation .

The Air Traffic Management (ATM) part of the ECAA agreement extends the Single European Sky (SES) Regulations to the contracting parties. With regard to the airspace it shall be reconfigured into Functional Airspace Blocks (FABs) with a view to achieving maximum capacity and efficiency of the ATM system while maintaining a high level of safety.

On 1st April, 2005 the Directors General of Civil Aviation of Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Romania, Serbia and Montenegro, The Former Yugoslav Republic of Macedonia and UNMIK (“the Directors General”) decided to examine opportunities with a view to implementing the Functional Airspace Block Approach (FABA) in South East Europe in consistency with the rest of European Air Traffic Management network. Consequently, a Working Group was created to support this task: the South East Europe Functional Airspace Block Approach Working Group (see EUROCONTROL SEE FABA Final Report, 2006).

In February 2006 the report of this Working Group, “The Opportunities for the Application of the Functional Airspace Block Approach in South East Europe”, was presented to the Directors General of Civil Aviation of the SEE-FABA States. In accordance with the conclusions and recommendations of this report, the Directors General approved the commencement of the Definition Phase (SEE FABA Initiative).

The SEE FABA States have also stressed the possibility to extend the participation on an equal basis in the Definition Phase to other States of the Region that express interest and commitment to be part of the FAB approach.

During the working process representatives from the European Transport Workers’ Federation (ETF) and from Civil Air Navigation Services Organisation (CANSO) were consulted on appropriate subjects in the light of their role as social dialogue partners for the European Commission. The authors of this paper participated in the SEE FABA Working Group.

The Working Group identified a number of key issues from the EUROCONTROL report that need to be addressed and studied more thoroughly in a Definition Phase of SEE FABA. These major areas of interest are: operational, technical, military, legal/institutional/ organizational, economic/financial and social.

The regional concept embedded in the implementation of FAB(s) supports:

- i. A regional approach to the airspace solving some of the restrictions put on the airspace structure due to national considerations. The FAB(s) will – on a regional basis – ensure that the airspace structure follows the traffic flows and meets the airspace users’ requirements;
- ii. The development and implementation of common operational concepts and procedures creating a harmonised operational environment and harmonised safety management in the region covered by the FAB(s);
- iii. The planning, deployment and operation of a CNS/ATM infrastructure from a regional perspective, based on common functionality requirements and harmonised (or integrated) operational procedures in the ATM system;
- iv. The enhancement of capacities through seamless operation within flexible use of the airspace;

- v. Practical use of the existing infrastructure in the region and of the ongoing initiatives.

The SEE FAB approach should be based on operational requirements. With an Operationally Driven Approach, an optimal ATS Route Network can be structured with the SEE Region from which the Sector Families can be identified and grouped appropriately into a number of potential FAB scenarios on the basis of which the economical, social, military, institutional and other elements need to be considered.

Although the SES Regulation called for FAB(s) to be established above FL 285 (28.500 feet), this should not be seen as a limiting boundary. The totality of the airspace should be considered to ensure that not only are the benefits extended to all areas but also that an arbitrary division level does not then become another artificial boundary (see also Willis, P., Matsoukis, E. and Poulimenakos, S. 2001).

In order to identify the best suitable scenario for the SEE region, the operational requirements should be developed with the active participation of all SEE FABA States and taking into account neighbouring FAB(s) and cooperation with neighbouring States.

The institutional aspects related to the establishment of the FAB(s) are very complex and must be addressed very early in the establishment of the FAB(s). Basically, the SEE FAB(s) institutional model(s) will then have to be developed and agreed during the Definition Phase (2006-2009).

The economic and charging mechanism related to the establishment of the FAB(s) touches upon the State sovereignty (fiscal regime) and economic interest of participating ANSPs and the air space users while it should support the operational improvements created by the FAB(s). Therefore, the economic model will have to be developed and agreed during the Definition Phase.

The harmonisation and integration process will mainly be driven by common Operational Concepts to be developed before actual activities are performed. At the same time, it will be important to safeguard the present investments in CNS/ATM infrastructure in order to reduce the cost base of providing Air Traffic Services (ATS).

Some planning and implementation activities will also be initiated, such as:

- Development of a common harmonised and integrated CNS/ATM infrastructure to support the provision of ANS;
- Identification of other areas where a common approach should entail early benefits.

As an example the implementation of regional ground-to-ground backbone network is an area that was recommended by the SEE FABA WG as a candidate for early implementation. Implementing a regional harmonised and integrated approach towards safety supporting the implementation of FAB(s) in the region should provide considerable benefits to the airspace users and to the organisations regardless of the chosen institutional framework for the future provision of services by reducing the existing fragmentation in the ATM environment.

Social dialogue in FAB environment shall be more “international minded” with the main goal to foster cooperation instead of competition. Therefore, it is of the highest importance to initiate coordinated bottom up social dialogue at national, at regional and at European level.

Human resource planning and training are important supporting elements of FAB(s). Clear and visible short term benefits can be gained in these areas if training programmes are targeted towards FAB(s) implementation and at the same time promoting the best ATM practices and sharing scarce instructor resources. The training focus on FAB(s)

will bring a very much needed fresh input to the current ATC training and it will also pave the way for more harmonized ATCO performance matched with appropriate social benefits.

6. The proposed strategy for implementation-the definition phase (2006-2009)

The main objective of the SEE-FABA Definition Phase is to deliver all the relevant implementation proposals in order to provide by March 2009 the SEE-FABA States with a well founded basis for the reorganisation of their airspace into FAB(s), in line with the strategic objectives identified by the SEE FABA WG and detailed in the previous paragraph.

The Definition Phase will consider the operational, technical, legal and institutional requirements for the development of Functional Airspace Block Proposals and apply the FAB Key Issues in order to make implementation proposals for the establishment of Functional Airspace Blocks within the airspace of the SEE-FABA States.

To ensure coherency and harmonisation, the Definition Phase will take into consideration Regional and pan-European developments. In order to identify the best suitable scenario for the SEE region, the operational requirements shall be developed with the active participation of all SEE FABA States and taking into account neighbouring FAB(s) and cooperation with neighbouring States, and will fully associate all the relevant actors concerned. In that process, the cooperative approach will not interfere with questions of national sovereignty, in conformity with the principles applied to the Single European Sky, and will let full responsibility to the States for the endorsement of any agreement.

In line with the Chicago Convention, the obligations pertaining to each individual State will be taken into account when establishing FAB(s) as they will have to be addressed in the State level FAB Agreement (or at lower level) to clearly identify the rules applicable to the FAB airspace.

The SEE FAB approach will be based on operational requirements regardless of existing boundaries, which are the primary criteria of a FAB. Therefore the operationally driven concept should be based on the delineation of Air Traffic Control Sector Families based on the air traffic flow complexity which will then be put together in FAB(s) based on secondary criteria such as economic, legal, institutional, and technical.

The key objectives that will be considered during the definition process should be:

- i. The identification of domains for which early benefits can be obtained and propose implementation solutions;
- ii. The development of operationally driven FAB scenarios;
- iii. The address of the FAB Key Issues and the development of solutions for application within the region;
- iv. The conduct of a Business Case;
- v. The conduct of a Safety Case;
- vi. The development of SEE-FABA implementation scenarios with a proposal of a preferred option;
- vii. The development of a SEE-FABA Implementation Plan;

- viii. The Definition Phase of the SEE-FABA project shall be based on the most suitable working arrangements combining the political and financial support of the European Commission and the Stability Pact for South Eastern Europe with the technical expertise of EUROCONTROL under the governance of the SEE-FABA States.

The implementation should be based on:

- A step-by-step process that will combine an operationally driven development period with political decision milestones. The implementation should be composed of a Definition Phase and an Implementation Phase;
- Initiation of projects leading to enhanced cooperation in the SEE region;
- An evolutionary and incremental process for the transition from the existing situation to the establishment of FAB(s);
- Practical use of ongoing regional initiatives combined with a pan-European perspective;
- National skills and competencies.

The following initiatives would provide clear benefits for all parties on short and mid-term:

- By initiating the process of setting up a Common Interconnected Regional Network (CIRN);
- By harmonising of ATC procedures and ATCO operational training;
- By developing the cooperation between the National Regulatory Authorities.

The key factor for success of such a project can only be guaranteed if all the relevant actors of the ATM domain are fully involved in the various works to be conducted. In this regard, the SEE FABA definition phase will ensure participation of the following stakeholders:

- SEE-FABA States: Albania, Bosnia & Herzegovina, Bulgaria, Croatia, Romania, Serbia, Montenegro, The Former Yugoslav Republic of Macedonia and UNMIK
- SEE-FABA Supporting States: Greece and Italy;
- SEE-FABA Supporting Institutions: European Commission – Directorate General for Transport and Energy (TREN) Stability Pact, EUROCONTROL, North Atlantic Treaty Organisation (NATO), International Civil Aviation Organisation (ICAO);
- National Authorities (civil and military);
- Air Navigation Service Providers (civil and military);
- Airspace Users (civil and military);
- Airports (see Matsoukis, E. and Poulimenakos, S. 1999);
- Social Partners and Industrial Representatives;
- Airspace User Organisations (such as IATA, IACA, ERA, EBAA and IAOPA);
- Social Partners;
- Other interested and ready to commit States;

7. What is at stake/benefits-costs of the European ATM/CNS system due to fragmentation

Given the lack of consistent and complete data at national level, this work intends to provide only a way to make a first estimate of the orders of magnitude. Up to now, we can only talk about the cost of fragmentation to the existing ATM Organization and the strong political will of EU and air space users to rationalize it through the SES. Actual financial data and benefits for each of the future FAB Initiatives will be part of a case-by-case feasibility and business study.

The results of this work comes from the Performance Review Committee/EUROCONTROL Study “The Impact of Fragmentation in European ATM/CNS” prepared by Helios Economics and Policy Services (April 2006).

The adverse impact of fragmentation in the European Air Traffic Management and Communications, Navigation and Surveillance (ATM/CNS) system has long been a concern of all stakeholders. The recent Single European Sky legislation is intended to have a major impact on fragmentation; in particular it will foster airspace rationalization and restructuring, consolidation of facilities, and harmonization of systems and procedures.

“Fragmentation” in the ATM system is defined as referring to the division of air navigation service provision into smaller decision-making or operational units than would result from considerations of optimum scale. In Europe, this has mainly arisen from the organization of ANS at the state level.

However, fragmentation also arises through smaller than optimal operational units within national ANSPs. These units may have become sub-optimal, for example, as changes in the technology of service provision have raised the optimum size of a centre upwards.

In the current European ATM system, there are 69 ACCs, of which 47 operate with 10 sectors or fewer at maximum configuration. In Europe, the average centre operates 9 sectors at maximum configuration; the average US centre 37 sectors. Furthermore, the FAA is currently examining the possibility of further consolidation among its existing 21 centres.

The first step in assessing the costs of fragmentation in the European ATM system were to understand what the costs of that system were and how they arose.

Two major resources are required to run an ATM/CNS system: the capital assets, and the staff, with associated non-staff operating costs.

This work is using all available resources to estimate the order of magnitude both of the total costs of the existing system in each of these categories, and how those total costs arose in terms of the areas of focus of the study: ACCs and ATM systems; CNS, and associated support.

The task of assessing the total costs of the system and how these were divided up in this way was a surprisingly difficult one. ACE data, CRCO data and ANSPs’ Annual Reports gave an incomplete picture, particularly concerning how costs and asset values were split between ACCs and ATM systems, CNS and support. We estimated costs based on physical infrastructure and industry estimates of unit capital replacement and operating costs, with validation against Annual Reports (EUROCONTROL, 2006, The Impact of Fragmentation etc).

We assessed the capital replacement costs for the enroute European ATM/CNS system as some €10 billion (2003 data), as shown in the first column of Table 2 below; annual operating costs amounted to some €3500m.

Total annual costs (around €4340m) were obtained by annualising the capital costs over eleven years (a typical ratio for ANSPs between asset acquisition costs and the sum of depreciation and finance costs).

Table 1: Costs for European enroute ATM/CNS (2003 data).

	<i>Capital replacement costs</i>	<i>Annual operating costs</i>	<i>Total annual costs</i>	
COM	€560 m	€60 m	€110 m	2.5%
NAV	€230 m	€10 m	€30 m	0.7%
SUR	€3,000 m	€210 m	€500 m	11.5%
ACCs & ATM systems	€4,900 m	€2,100 m	€2,500 m	57.6%
Associated support	€1,000 m	€1,100m	€1,200 m	27.7%
Total	€9,690 m	€3,480 m	€4,340 m	100%

It is evident that the costs of NAV and, to a lesser extent, COM, are rather small compared with other aspects of the system. The costs of fragmentation in these areas are therefore likely to be small compared with those in SUR and ATM operations. As a consequence, efforts in trying to identify the adverse impact of fragmentation were concentrated on the latter areas.

The major areas where fragmentation was expected to have an adverse impact are summarised in Table 2 , along with the associated order of magnitudes of costs:

Table 2: Summary of fragmentation costs.

	<i>Cause of fragmentation</i>	<i>Annualised costs</i>	<i>% of cost of fragmentation</i>
Common issues	Piecemeal procurement (mainly ATM systems)	€30m-€70m	14%
	Sub-optimal scale in maintenance and in-service development (mainly CNS)	€10m-€15m	
	Fragmented planning	€60m-€120m	
ACCs	Economies of scale in ACCs (operating costs)	€370m-€460m	53%
	Economies of scale in ACCs (capital cost)	€105m-€140m	
	Constrained sector design (flight efficiency benefits)	€50m-€100m	
ATM systems	Lack of common systems (operating costs)	€150m-€215m	23%
	Lack of common systems (capital costs)	€30m-€90m	
	Increased coordination at interfaces	€10m-€20m	
CNS	Optimum location of en-route nav aids	€3m-€7m	4%
infrastructure	Overprovision of secondary radar	€15m-€60 m	
Associated support	Economies of scale in training, administrative costs and R&D	€40m-€100m	6%
	Total costs of fragmentation	€880m-€1400m	100%

The overall order of magnitude of the costs of fragmentation in the European enroute ATM/CNS system was estimated at some €880m - €1,400m. Although there is inevitably some uncertainty around such estimates, this is undoubtedly a significant amount; it represents around 20-30% of the annual en-route costs (see Table 2).

The main components of the cost of fragmentation are (1) many ACCs are below the optimum economic size, (2) duplication of bespoke ATM systems (including piecemeal procurement and sub-optimal scale in maintenance and in service development), and (3) duplication of associated support (training, administration, and R&D).

A number of other issues were identified as important but were not associated with. Fragmentation costs arising from sub-optimal ACC size could arise both through the economies of scale in the centres themselves, and through lost flight-efficiency as airspace and route design is organised in a fragmented way.

The typical size of a European ACC is much smaller than those in the US, as shown in Figure 1. In the current European ATM system, there are 69 ACCs, of which 47 operate with 10 sectors or fewer at maximum configuration. In Europe, the average centre operates 9 sectors at maximum configuration; the average US centre 37 sectors. Furthermore, the FAA is currently examining the possibility of consolidation among its existing 21 centres.

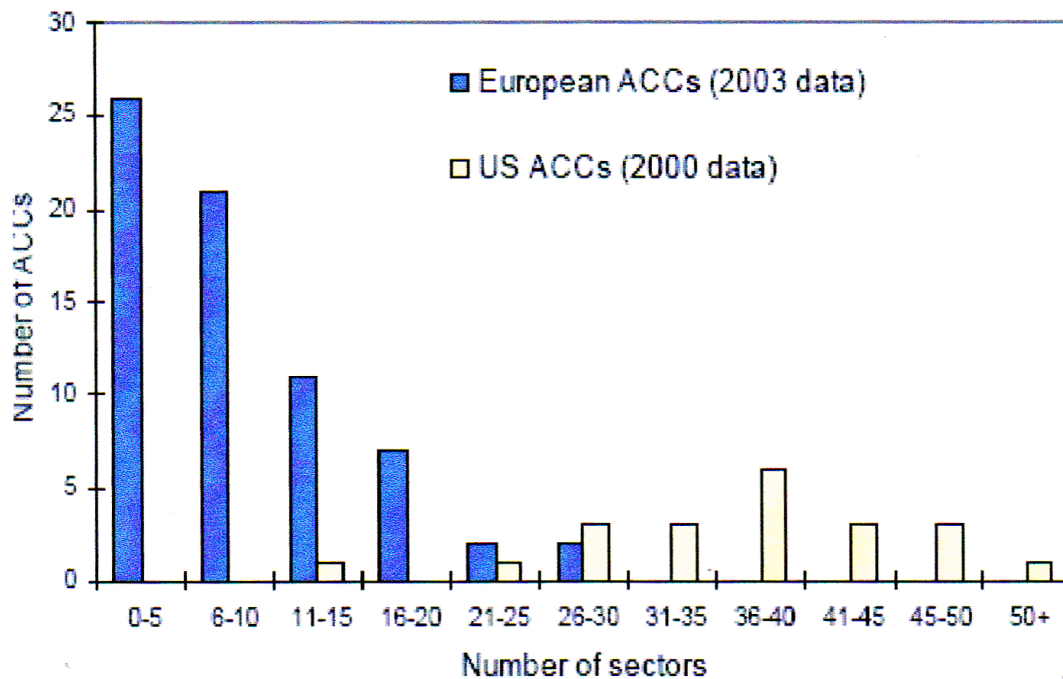


Figure 1: Centre sizes in Europe and the US.

Recent consolidation exercises in the UK and Germany have produced or will produce ACCs that can accommodate 50-60 sectors, making them comparable with the scale of the larger US ACCs. There is a general view that consolidation to scales greater than this may not necessarily lead to further economies of scale – difficulties in coordination and in providing contingency backup may start to outweigh fixed cost savings.

Consequently, in order to estimate the cost savings associated with economies of scale in ACCs in a defragmented system, the costs of current ACCs, estimated according to our assumptions concerning which were fixed and which variable, were compared to the costs estimated for a system in which ACCs operate with around 25 sectors at maximum configuration. This figure is well short of the maximum scale currently operating in Europe. However, such larger scales may only be practically feasible in the densest regions; 25 sectors is a conservative assumption for a non-fragmented system in a FAB environment, operating under SES regulations.

It is important to note that these savings, while associated with ACC fragmentation, do not necessarily require ACCs to be consolidated to achieve them. They could be achieved, for example, by collaborative route and sector design, as should be achieved in a Functional Airspace Block (FAB).

8. ATM systems

An important cost of fragmentation could arise from each centre having different software from others. If a number of ACCs use common ATM systems (identical or very similar systems), further economies can be made on the software element of those systems. Clearly, the lack of such common systems becomes less of a problem as the number of centres is reduced, and therefore cannot be treated in isolation from the costs arising from fragmentation of centres.

The cost arising from this fragmentation was estimated as €5m-€15m capital costs per centre, and €2.2m-€3.2m a year operating costs per centre.

This cost could be applied either to the existing number of centres, or to the number of centres in a defragmented system, as shown in Figure 4.

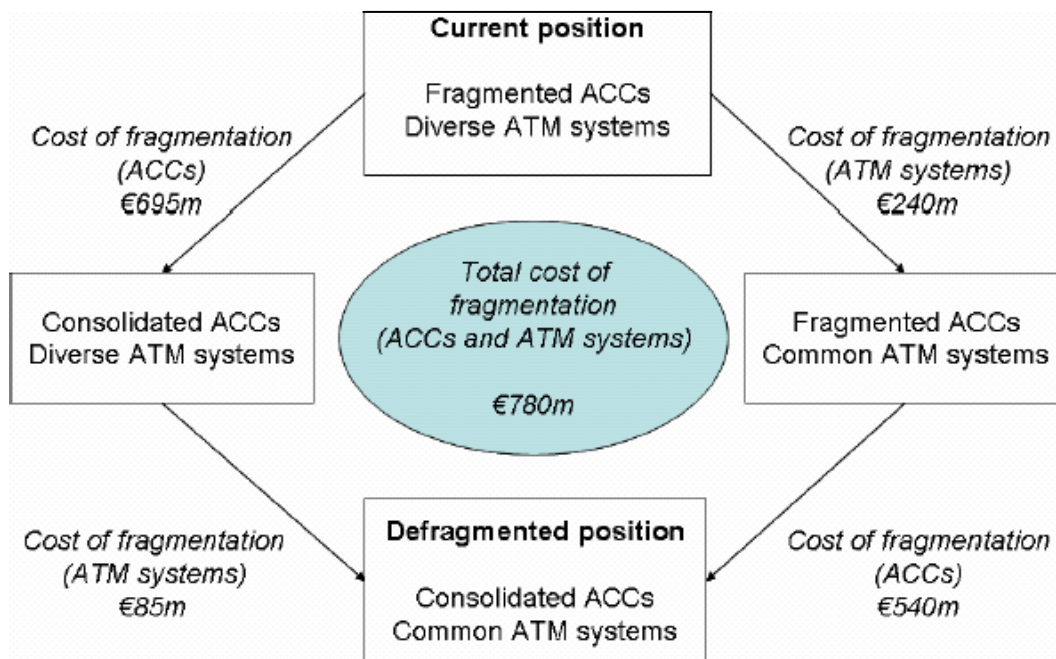


Figure 2: Fragmentation costs of ACCs and ATM systems.

The total cost of fragmentation in ACCs and ATM systems taken together is €780m a year (for clarity, the midpoint of the ranges is shown). This results from reduction of the costs of purchasing and developing the systems, and from the reduction of the number of centres. The top left of the diagram shows the costs of fragmentation obtained by considering ACC consolidation without convergent ATM systems (€695m). This is the figure obtained from the arguments in the previous paragraphs .

The costs of retaining diverse ATM systems in this smaller number of ACCs is relatively small (€85m). However, we considered it clearer to apply the costs of fragmentation in ATM systems to the existing number of ACCs, as in the top right of the figure; a move towards common systems is likely to happen on shorter timescales and with lower transition costs than consolidation of centres. This assigns higher cost to fragmentation of ATM systems (€240m) and a correspondingly lower amount (€540m) to fragmentation of ACCs.

This is an area of fragmentation where costs could rise substantially if no action is taken, because of new requirements for certification of ATM systems. Although a number of initiatives to reduce fragmentation in this area are being undertaken, there is a feeling amongst stakeholders that more needs to be done.

An additional benefit of common systems would be improved coordination at interfaces between centres. The PRU US-Europe study identified inter-centre coordination as possible reason for lower ATCO productivity in Europe. There is higher workload for hand-over in European centres than US centres. In a nonfragmented system, with increased interoperability, the inter-centre coordination time required was assumed to be half that required at present.

9. Conclusion

The coming years will require a sustained effort to improve safety, increase capacity and enhance the efficiency of the European ATM system by reducing fragmentation.

Fragmentation of European en-route ATM/CNS carries a high cost – around €900m - €1,400m annually, perhaps 20-30% of annual European ATM costs; the main causes of this cost were the fragmentation of ACCs, and of ATM systems; other important costs of fragmentation resulted from fragmented planning, piecemeal procurement, and duplication of support activities.

The Single European Sky provides the tools to meet that challenge in a Paneuropean perspective. The EC provides a strong political will to implement the Single European Sky, both to member states and accession states, by using among others the FAB approach for ATM organisation.

This paper demonstrated how the FAB approach stemming from the EU Single European Sky Regulations could also be beneficial, and that the definition and implementation of SEE FAB(s) should be considered necessary for the SEE region.

There are both operational and institutional benefits:

- The operationally driven concept could be based on the delineation of air traffic control sector families based on the air traffic flows complexity and bringing them together, rationalising the airspace organisation and management in the area. Fragmentation of ACCs also has an impact through constrained sector design. Sector design is currently constrained by national and, to a lesser extent, ACC

boundaries. A defragmented system would allow improved sector design by removing the constraints of national boundaries. This would allow improved routing through the defragmented airspace and hence greater flight efficiency.

- The costs of procurement of ATM/CNS systems could be reduced by procurement specifications common across ANSPs and the reduced need for adaptation of systems to bespoke designs, as systems become interoperable.
- A highly fragmented ATM/CNS system, where there are many different types of equipment at several locations, requires more maintenance and development staff than a limited number of equipment types.
- The Communications/ Navigation/Surveillance systems harmonisation and possible integration process will mainly be driven by common operational concepts while safeguarding the present investments in CNS/ATM infrastructure in order to increase the cost base providing services. The implementation of regional ground-to-ground backbone network called Common Interconnected Regional Network (CIRN project) is recommended as a candidate for early implementation.
- Fragmentation costs arising from sub-optimal ACC size could arise both through the economies of scale in the centres themselves, and through lost flight-efficiency as airspace and route design is organized in a fragmented way.

The institutional aspects related to the establishment of the FAB(s) are very complex and must be addressed very early in the establishment of the FAB(s).

Regarding unit charges, a more stepwise approach is expected: first a transitional phase with different national unit rates and then a single unit rate after 3/5 years or in accordance to the incoming EC Charging Scheme Regulation.

Implementing a regional harmonised and integrated approach towards safety supporting the implementation of FAB(s) in the region provides benefits regardless of the chosen institutional framework for the future provision of services. Discussing the safety issues the SEE FABA could initiate an initial project concerning the establishment of cooperation between NSAs in the region.

In this context, conditions for improvement would include:

- rapid progress in the reform process at the national and regional level;
- introduction of new market mechanisms;
- modern operating practices and sound infrastructure financing and management;
- strengthening of institutions through improved legislative and regulatory frameworks;
- restructuring of the sectors;
- introduction of new technologies;
- development, within a regional framework, of a sound investment programme based on the co-operation among the countries of the region and with the Member States and Candidate Countries of the European Union.

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Abbreviations and Acronyms

ACC=Area Control Centres
AII=Adriatic - Ionian Initiative
ANSPs=Air Navigation Service Providers
ATM=Air Traffic Management
ATM/CNS=Air Traffic Management and Communications, Navigation and Surveillance
ATCOs=Air Traffic Controllers Officers
CANSO=Civil Air Navigation Services Organisation
CEATS=Central European Air Traffic Services
CRCO=Central Route Charging Office
EBAA=European Business Aviation Association
ECAA=European Common Aviation Area
ERA=European Regions Airline Association
ETF=European Transport Workers’ Federation
EU=European Union
FAA=Federal Aviation Administration
FABA=Functional Airspace Block Approach
FAB=Functional Airspace Blocks
HLG=High Level Group

ICAO=International Civil Aviation Organisation
IATA=International Air Transport Association
IACA=International Air Carrier Association
IAOPA=International Council of Aircraft Owner and Pilot Association
NATO=North Atlantic Treaty Organisation
NUAC= Nordic Upper Area Control Centre
OSCE=Organisation for Security and Cooperation in Europe
SECI=South East Europe Cooperation Initiative
SEE=South East European
SEEC=South East European Cooperation Process
SES=Single European Sky
SPSEE=Stability Pact of the South East Europe
TEN=TransEuropean Networks
TINA=Transport Infrastructure Needs Assessment
TREN=European Commission – Directorate General for Transport and Energy
UN=United Nations
UNECE=UN Economic Commission for Europe
UNMIK=United Nations Interim Administration Mission in Kosovo