Single European Sky and the functional airspace blocks: Will they improve economic efficiency?

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A B S T R A C T

The paper examines the potential economic efficiency of on-going changes in the European air traffic control system. Air navigation services in Europe are undergoing a process of consolidation and technological changes known as the Single European Sky initiative. The ultimate aim is to shift the industry from a paradigm based on national borders, to one where operational efficiency is the goal. One of the key components of the movement toward this is the notion of functional airspace blocks (FABs) whereby blocks of airspace are combined as a precursory to total unification of the system. To study the effects that those changes might have on the economic efficiency of the system, a data envelopment analysis framework is used. Although these FABs are not yet deployed, it is possible to simulate, ceteris paribus, how these different systems would have ranked in terms of economic efficiency by using data for each individual air navigation service provider.

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1. Introduction

Air navigation services (ANS) involve a complex network that handles the movement of aircraft at and around airports and in their movement between those airports. Under the 1944 Chicago Convention, governments have sovereignty over their national air space, and thus each country has traditionally dealt with this issue by having its own air navigation service provider (ANSP) that handles ANS and other related matters such as weather information services and flight planning. This has continually posed challenges of ensuring both the internal efficiency of individual monopoly suppliers of ANS and the external efficiency of ensuring optimal coordination of service between a series of network suppliers.

The economies of scale, scope, and density involved in ANS provision, together with the external economies associated with each unit being a supplier in an interactive network makes not only the provision of optimal services difficult, but also the measurement of exactly what efficiency entails. This contrasts somewhat with the other two main elements in the air transportation supply chain; airlines and airports. Airlines have been the subject of economic deregulation, beginning in the US, for some 35 years, albeit it at various rates and forms in different countries. In general this has enhanced the efficiency of airline operations (Barbot et al., 2008). Airports have also seen changes in many countries with moves to remove them from excessive political control, open up new sources of finance, and to tie airport fees more closely with the costs of airport use (Barbot, 2004). This has involved changes in institutional structures of the facilities, ranging from overall ownership and control, to outsourcing particular elements of service (Barbot, 2012). There have also been considerations to link the operations of airlines and airports to enhance efficiency and encourage long-term stability services (Barbot, 2011).

There has been much less activity regarding the provision of ANS. What has been done has largely been to change the institutional structure under which services are provided, moving away, except in the notable case of the US, from provision by a government department to various forms of corporatized structure, and in the case of the UK, public-private company (Button and McDougall, 2006). Reforming air traffic control is, however, inherently more difficult than deregulation of airlines and airports. The infrastructure in long lived and highly integrated making piece-meal reforms difficult. There is the need for, if not complete standardization, at least the use of a common platform to allow aircraft to be passed smoothly and safely from one control area to another. In contrast, aircraft can vary considerably as can airports, and a wide variety of varying technologies infrastructure can be used in both a competitive and cooperative manner.

Some of these factors lead to a questioning of whether ANS are being provided and used efficiently, and if there are issues, how
could the system be improved. Aircraft, are mobile and if airlines are unhappy with the local infrastructure or are competitively unsuccessful in any market, they can rapidly be deployed elsewhere. While airports are certainly not mobile, there is considerable competition amongst them for business, with large airlines in the US and Europe. While airports are unhappy with the local infrastructure or are competitively unsuccessful in any market, they can rapidly be deployed elsewhere. While airports are certainly not mobile, there is considerable competition amongst them for business, with large airlines in the US and Europe.

1 Gloaszewski (2002) outlines the nature of the US air navigation system and gives a comparative analysis of the interactions between air navigation service providers and airport regulations in the US and Europe.

### Table 1

<table>
<thead>
<tr>
<th></th>
<th>Europe</th>
<th>US</th>
<th>Difference: US vs. Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area (million km²)</td>
<td>11.5</td>
<td>10.4</td>
<td>–10%</td>
</tr>
<tr>
<td>Number of air service navigation providers</td>
<td>38</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Number of air traffic controllers</td>
<td>16,700</td>
<td>14,600</td>
<td>–13%</td>
</tr>
<tr>
<td>Total staff</td>
<td>57,000</td>
<td>35,200</td>
<td>–38%</td>
</tr>
<tr>
<td>Controlled flights (million)</td>
<td>9.5</td>
<td>15.9</td>
<td>+67%</td>
</tr>
<tr>
<td>Share of flights to/from top 34 airports</td>
<td>66%</td>
<td>63%</td>
<td>–5%</td>
</tr>
<tr>
<td>Share of general air traffic</td>
<td>4%</td>
<td>23%</td>
<td>x 5.5</td>
</tr>
<tr>
<td>Flight-hours controlled (million)</td>
<td>13.8</td>
<td>23.4</td>
<td>+70%</td>
</tr>
<tr>
<td>Relative density (flight-hours per km²)</td>
<td>1.2</td>
<td>2.2</td>
<td>x 1.8</td>
</tr>
<tr>
<td>Average length of flight (within respective airspace)</td>
<td>557NM</td>
<td>493NM</td>
<td>–11%</td>
</tr>
<tr>
<td>Number of en-route centers</td>
<td>63</td>
<td>20</td>
<td>–68%</td>
</tr>
<tr>
<td>Number of airports with air traffic control services</td>
<td>&gt;450</td>
<td>~509</td>
<td>+13%</td>
</tr>
<tr>
<td>Number slot controlled airports</td>
<td>&gt;90</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Note: NM is nautical miles.

Source: EUROCONTROL and US Federal Aviation Administration (2012).

3. Single European Sky and the functional airspace blocks

First muted by the European Commission in 1999, the SES has been put into law in 2004. It made ANSs a responsibility of the European Union, instead of its member states individually, and has the main goal of improving the efficiency and the capacity of ANSs in Europe. A number of stipulations were put in place by legislation in both 2004 and 2009, including the creation of the FABs, the Single European Sky ATM Research (SESAR) technological initiative to modernize the ANS system, and the extension of competencies of the European Aviation Safety Agency (EASA) to include air traffic management and air navigation services (European Commission, 2012b).

One of the fundamental aspects of the SES initiative are the FABs, which have the goal of reducing the inefficiencies — in terms of safety, capacity, and cost — that result from the fragmentation of European airspace. FABs are seen as an explicit bottom-up

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2 There is also a wide dispersion in the size of ANSs, with the five largest European ANSs handling 54% of the traffic and incurring 60% of the costs, with the remaining 46% of the traffic being handled by over 30 providers (EUROCONTROL Performance Review Commission, 2012).

3 Implementation involves a number of institutions and initiatives involving: the European upper information region (EUIR), functional airspace blocks (FAB), flexible use of airspace (FUA), National Supervisory Authorities (NSA), certification of ANSs, air traffic controllers licencing, interoperability, SESAME, and extensions to 3rd party countries.

4 The criteria for the creation of FABs are strictly to do with:
  - safety;
  - optimum use of airspace, taking into account air traffic flows;
  - overall added value, including optimum use of technical and human resources, on the basis of cost benefit analyses;
  - ensuring a fluent and flexible transfer of responsibility for air traffic control;
  - ensuring compatibility between upper and lower airspace;
  - complying with regional agreements concluded within ICAO;
  - respecting regional agreements, in particular those involving European third countries.
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