

**Study on benchmarking for
best practices in Air Traffic
Management in European Union
candidate States**

Part 1: general report

Document information

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1 Introduction

1.1 Background

- 1.1.1 Since 1999 the European Commission has been developing a policy and regulatory framework to improve the European air traffic management (ATM) industry. In 2000, the European Commission set up a High Level Group to advise on reforming the ATM sector. Following this and a number of in-depth studies, the European Commission drafted four proposals to create a Single European Sky¹. During 2002 these proposals have been debated by the European Parliament and Council. The Commission's objective is for the regulations to be adopted in 2003 and to implement the Single Sky concept by the end of 2004.
- 1.1.2 Over the same period, accession negotiations between the European Union and candidate States continue, with ten States aiming to join the Union in 2004.
- 1.1.3 The enlargement of the European Union and the development of the Single European Sky led the Commission to consider the status of air traffic management (ATM) in the candidate States, and how they might adapt to the draft regulations.
- 1.1.4 Consequently, the Commission engaged the Solar Alliance consortium² to study the status, performance and development of ATM in the candidate European Union States. The main purpose of the study has been to 'benchmark' ATM practices and performances in the candidate States. Its findings are intended to provide a basis for integrating the candidate countries into the on-going discussions as part of the development of the Single Sky. The main objectives of the study have been:
- to benchmark key practices and identify key indicators of performance, so as to identify any areas of improvement;
 - to give insight into the development of ATM in the candidate States, in order to guide institutional decisions and remaining investments;
 - to develop scenarios of the possible evolution of ATM in the candidate States over the next fifteen to twenty years;
 - to recommend national and regional approaches to ATM and assess their impact on the EU enlargement process, as well as investments;
 - to assess the value and methodology of benchmarking and best practice for candidate states' ATM systems.
- 1.1.5 The study has also covered benchmarking of 'framework conditions', to compare the effects of the draft Single Sky regulatory framework. Early on in the study, we agreed to reappportion effort on the benchmarking, away from the development of scenarios. This has enabled a more detailed examination of ATM in the

¹ These are draft framework regulations on: (1) the creation of the Single European Sky; (2) the provision of Air Navigation Services; (3) the organisation and use of the airspace; and (4) the interoperability of the European Air Traffic Management network.

² The study was led by Helios Technology and included Vibrant, Avantic Systems and Integra Consult.

candidate States, without compromising a high level appreciation of ATM development in the next fifteen years.

- 1.1.6 The scope of the study has been the provision and regulation of ATM in the thirteen candidate European Union States. All States have been taking part in negotiations with the EU except Turkey, although preparations are under way to support its eventual entry.
- 1.1.7 To join the EU, membership requires candidate countries to adopt the policies and rules of the EU, the 'acquis' and ensure its implementation and enforcement. The accession negotiations are structured into 31 chapters to cover the different areas of the 'acquis'. The other twelve candidate States are at different stages of the negotiations, as shown in Figure 1-1³. Most have target dates of 2004 to join the EU, whilst Romania and Bulgaria have set 2007 as a target.

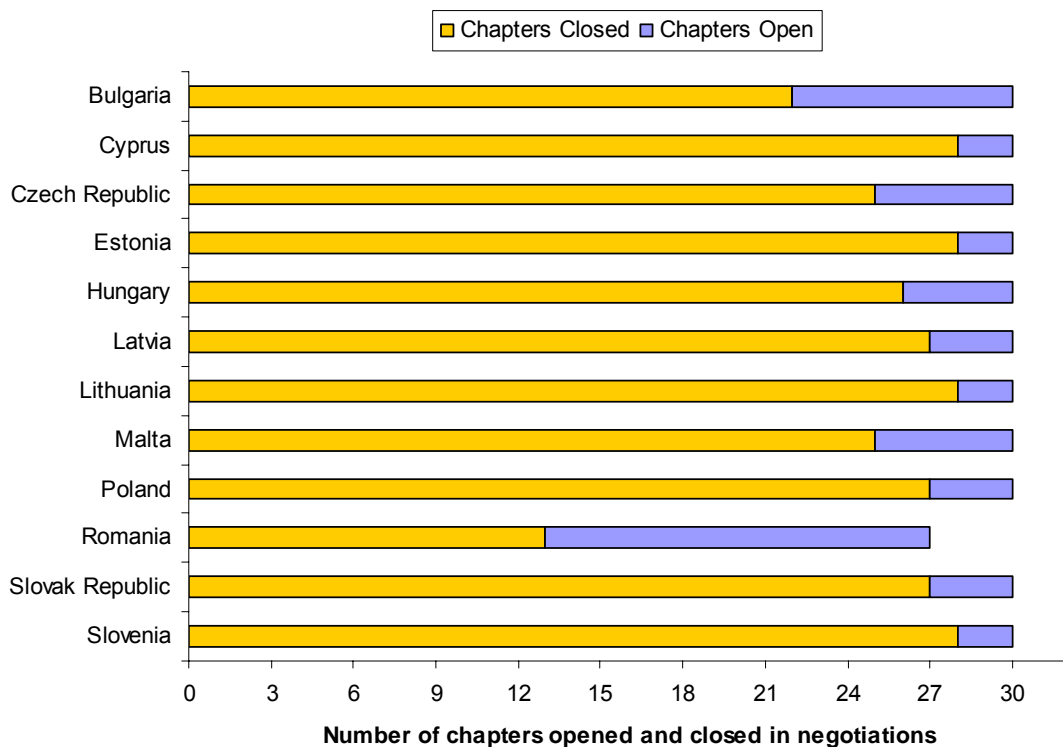


Figure 1-1: States' progress towards accession

- 1.1.8 The timing of States' accession is such that the Single Sky regulations will constitute new *acquis communautaire*, and become relevant legislation for them. It will therefore be important for candidate States to be able to adapt to the new regulatory framework for ATM.

³ Strategy paper and report of the European Commission on the progress towards accession by each of the candidate countries, COM(2002) 700 final, 9 October 2002.

1.2 Links to the parallel study

1.2.1 In conjunction with this work, a parallel study⁴ has been carried out on benchmarking for best practices in European Union States. The aims of the parallel study are:

- to establish the basis for a comprehensive benchmarking of ATM, covering the Community area and third countries (Australia, Canada, New Zealand, South Africa and United States);
- to identify best practices and explain the processes behind good or excellent performances;
- to explore the use of benchmarking as a tool for improving processes in ATM both at the regulatory and service provision level.

1.2.2 The findings of the parallel study will be used to support the on-going assessments of the Performance Review Commission. Ultimately the study will identify indicators for disclosure and use in legislation to support both the permanent exercise of performance review and economic regulation.

1.3 Approach

1.3.1 The approach taken in this study has been to gain a highly detailed knowledge of ATM in each candidate State across a number of specific domains. The domains were: institutional factors; the regulatory framework; economics and performance; safety; management, ATC operations and systems; and human resources. The overall approach taken is shown in Figure 1-2. There were essentially six phases to the study:

1.3.2 *Early data collection using existing sources.* A detailed framework of the essential aspects of ATM provision was developed as a template for collecting data. This was then populated using existing sources such as the EATMP Local Convergence and Implementation Plans, Eurocontrol reports, as well as discussions with air navigation service providers and Eurocontrol Support to States experts. This formed the basis of a dossier on ATM for each State.

1.3.3 *Development of a benchmark specification.* This drew on previous work on performance management from the Performance Review Commission, CANSO and the study team. A number of meetings were held with Eurocontrol to gain further ideas, particularly with military and training experts.

1.3.4 *Consultation with States on a regional basis.* The study was presented to States at a series of regional meetings. These meetings covered the Single European Sky, regional cooperation and a detailed discussion of the benchmark specification. The meetings highlighted a number of issues concerning the enlargement process and the future evolution of ATM.

1.3.5 *Data gathering.* The benchmark specification was updated following comments from States. A cross check with the questions asked by the parallel benchmarking study was also made to ensure that most of the same ground was being covered. The benchmark specification was then synthesised with the 'country dossiers', which were subsequently sent to States for completion. The

⁴ Reference TREN/F2/28-2001 concerning a study on benchmarking for best practices in Air Traffic Management (European Community).

study team also encouraged States to complete their responses to the Eurocontrol Performance Review Commission’s exercise on ‘Information Disclosure’.

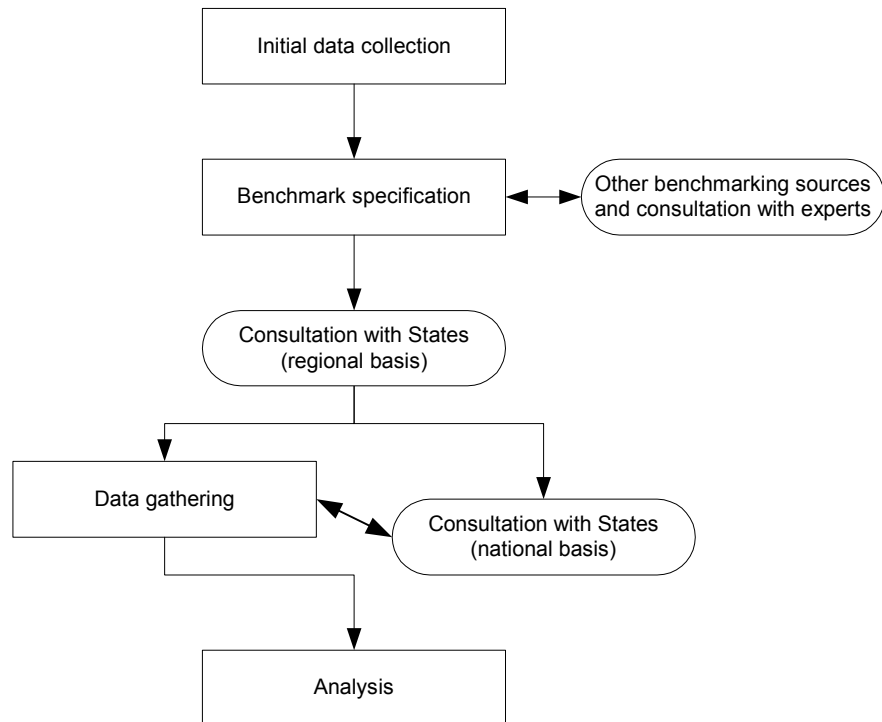


Figure 1-2: Approach to the study

- 1.3.6 *Consultation with States on a national basis.* The data gathering was completed through visits to each State, which also provided the opportunity to meet with a wider group of stakeholders. Following the visits, a short position paper was written, highlighting development issues and scenarios for comment by each State.
- 1.3.7 *Benchmark analysis.* The analysis was undertaken by the study teams’ experts according to their domain speciality. A final part of the analysis was to assess correlations and linkages between the benchmarks. As well as providing comparisons and highlighting development issues, we have made an assessment of ‘best practice’.
- 1.3.8 Note that in many cases what may be considered best practice in one organisation may be inappropriate in another. However, we have identified what is likely to be best practice where:
- it accords with a consensus of current expert opinion;
 - there is a likely link between the practice and good performance;
 - in our opinion, there are clear merits in the practice.
- 1.3.9 In several cases we have been unable to find evidence for what would appear to be best practice. For example, for controller recruitment, more sophisticated

selection methods might be expected to yield higher training success rates. Yet, there is insufficient evidence from the candidate States to confirm this.

1.4 Accuracy of information

1.4.1 Participants gave comments on the study reports from November 2002 to January 2003 and the study team gratefully acknowledges their time. Eleven of the thirteen ANSPs had particular comments or corrections to the data. Data on Poland mainly reflects the institutional structure up to 17 November 2002, at which point the new aviation law came into force.

1.5 Document structure

1.5.1 This report is structured as follows:

- Section 2 gives a consolidated overview of ATM in the candidate States, including an overview of environmental factors and institutional structures.
- Section 3 examines traffic forecasts and ATM investments, looking forward to developments in the next 15 years.
- Section 4 presents a high level view of the status of ATM in the candidate States.
- Section 5 presents scenarios for development of ATM in the candidate States.
- Section 6 considers the likely impact of the Single Sky regulations on EU enlargement.
- Section 7 presents high level findings from the benchmarking exercise.
- Section 8 presents our conclusions, including recommendations for key performance indicators and actions by the Commission to improve the safety and efficiency of air traffic control.
- Annex A contains one page 'fact sheets' on ATM in each State.
- Part 2 of this report is separately bound to maintain confidentiality for the study participants. It includes the detailed results and analysis of the benchmarking.

2 Consolidated overview of ATM in the candidate States

2.1 Introduction

2.1.1 This section gives a consolidated overview of the status quo of ATM operations and regulation in the European Union candidate States. The first part is scene setting, in the context of States' accession to the European Union and major statistics. The following sections then address the main domains of analysis covered in the study, namely: institutional, economic, safety, human resources, and operations. These sections deal with high level data only, as more detailed analysis is covered by the benchmarking.

2.1.2 The sources of data are mainly from the States themselves, Eurocontrol and the European Commission. Data from some European Union States has been included to enable the reader to compare the scale of operations. There are a few missing data, however we have endeavoured to obtain data for the year 2001 as a minimum so that comparisons can be made.

2.1.3 The thirteen candidate States currently involved in the enlargement process are shown in Figure 2-1. The figure also compares population statistics and national GDP per capita. Table 1 gives some supporting data⁵.

	Area (sq km)	Population (millions)	GDP per capita
Bulgaria	110,910	7.9	€1,900
Cyprus	9,250 ⁶	0.8	€15,100
Czech Republic	78,866	10.2	€6,200
Estonia	45,226	1.4	€4,500
Hungary	93,030	10.2	€5,700
Latvia	64,589	2.4	€3,600
Lithuania	65,300	3.5	€3,800
Malta	316	0.4	€10,300
Poland	312,685	38.6	€5,100
Romania	237,500	22.4	€2,000
Slovakia	48,845	5.4	€4,200
Slovenia	20,253	2.0	€10,500
Turkey	780,580	68.6	€2,400

Table 1: General country information, year 2001

The candidate States are very disparate in their characteristics, ranging from a small island with less than half a million inhabitants to a country comparable in area and population to Europe's largest, and with a range of income of more

⁵ Regular reports on States' progress towards accession, European Commission, COM(2002) 700 final.

⁶ Of which 3,355 are in the area under control of the Turkish Republic of Northern Cyprus.

than a factor of two. Although Malta, Cyprus and Slovenia have the highest GDP per capita of the candidate States, they are still less than half the Euro-zone average of around €25,000⁷.

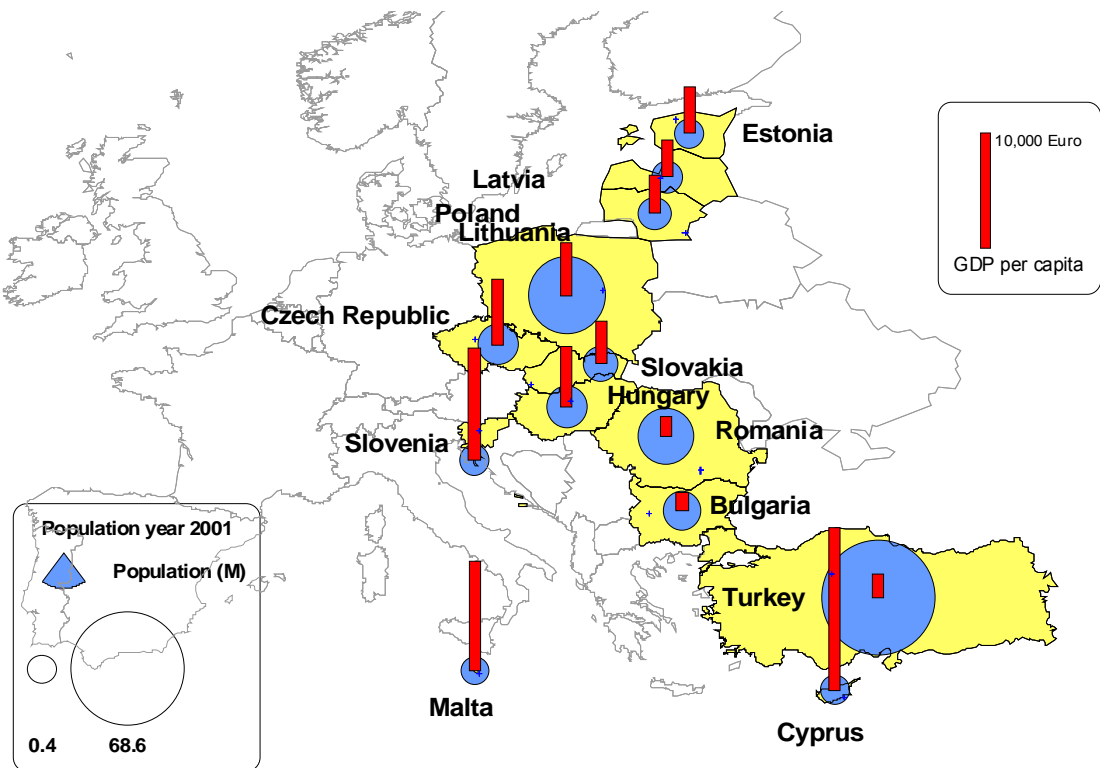


Figure 2-1: Candidate States, showing population and GDP per capita

- 2.1.4 The candidate States are developing at a high rate of growth compared to the European Union, as shown in Figure 2-2. This growth can be compared to that in the UK, France and Germany over the same period.
- 2.1.5 Typically there is a strong link between GDP and air transport growth. However, the high proportion of over-flights in most candidate States make this relationship more complex. Traffic forecasts are discussed later, in conjunction with delays and capacity planning.
- 2.1.6 The scale of air transport movements in candidate States is illustrated in Figure 2-3, which compares the combined IFR flights of all candidate States with Spain, the UK, France and Germany⁸.
- 2.1.7 The combined en-route costs of candidate States can be approximated as €600M for 1 Billion IFR flight km, giving an average cost per km of €0.6. The European (CRCO) average for 2001 has been estimated by the Performance Review Unit as €0.75 for 6.3 Billion IFR km⁹.

⁷ Year 2000, OECD main economic indicators, August 2002.

⁸ Source: Eurocontrol CRCO reporting tables.

⁹ PRC Performance Review Report 5, Chapter 5 'Cost effectiveness', p 47, May 2002.

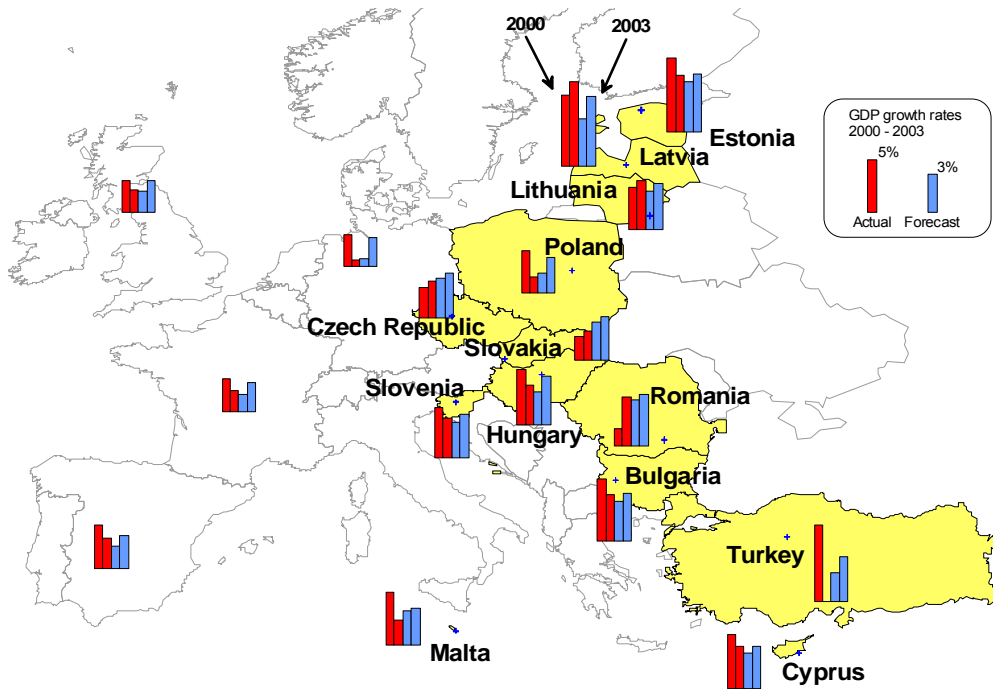


Figure 2-2: GDP growth in candidate States

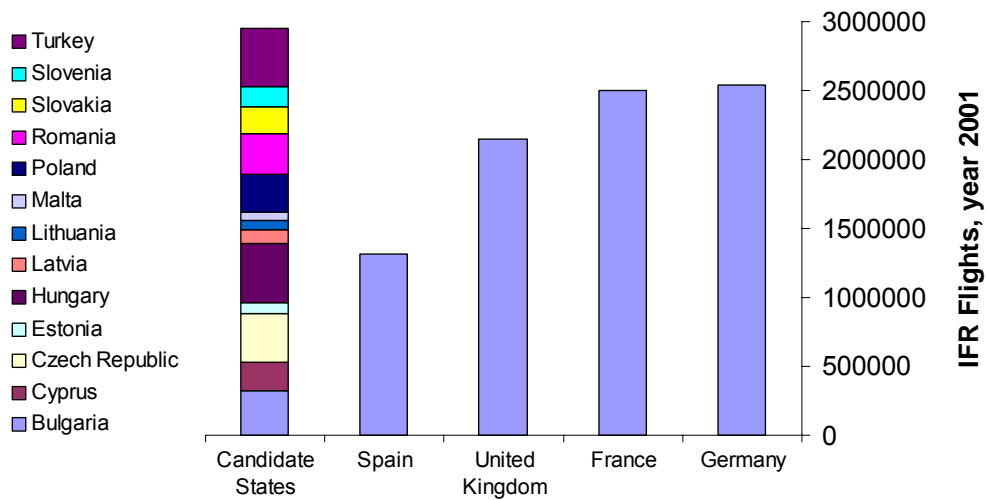


Figure 2-3: Comparison of candidate States' IFR flights with Spain, the UK, France and Germany

2.1.8 The composition of IFR flights is different to that in most European Union countries, with typically a large proportion of over-flights, as shown in Figure 2-4. It might be expected that the lower complexity of flights would lead to lower unit costs than in EU States, but no correlation has been demonstrated through our detailed benchmarking.

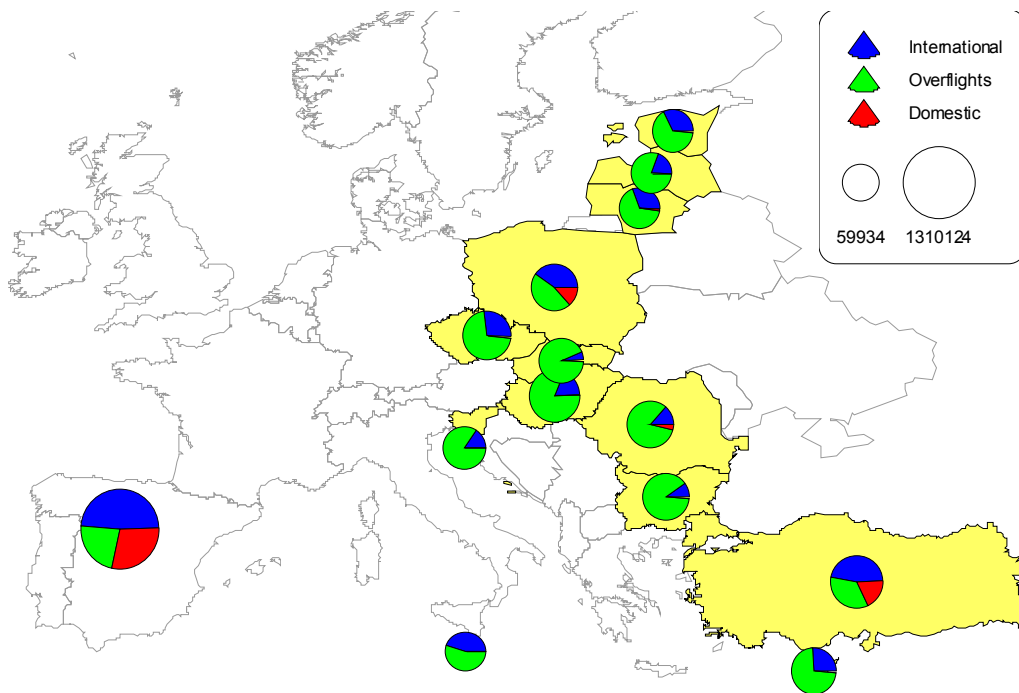


Figure 2-4: Composition of IFR flights

- 2.1.9 In Figure 2-4 the size of the circle indicates the total number of flights and the division of the circles the composition, in terms of domestic, international and over-flights. A comparison is made with Spain, which quite clearly has a different composition to the candidate States with its substantial domestic and international market.
- 2.1.10 In most of the candidate States, the majority of IFR flights are over-flights. This reflects these States' importance in providing a 'gate-way' between western and central Europe to other continents.
- 2.1.11 Generally, the number of domestic flights is very low. Domestic flights only make a significant contribution in the countries with the largest area: Turkey, Poland and Romania. The relationship between area and domestic activity is shown in Figure 2-5. The figure indicates a threshold size for domestic activity.

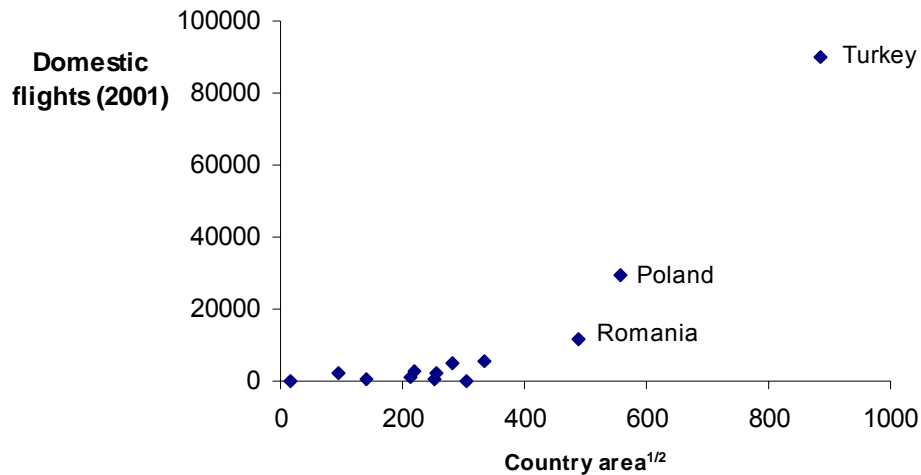


Figure 2-5: Domestic flights and country area¹⁰

- 2.1.12 Further understanding of the domestic and international traffic can be seen from the geographical distribution of the main airports in each State. To determine the main airports in each State we have analysed a sample of traffic¹¹ and show in Figure 2-6 all those airports that have more than 5% of traffic. There are many airports in each State as shown in table 2, however it can be seen that traffic is generally concentrated into a few main airports.
- 2.1.13 The passenger numbers and aircraft movements for the larger of these airports are shown in Figure 2-7. Examination of the passenger numbers and aircraft movements indicates the relative sizes of airports between the candidate States¹². In terms of aircraft movements, three airports are ranked in the top 50 European Airports: Istanbul (23rd), Prague (47th) and Warsaw (49th). In terms of passengers, these airports are ranked 19th, 45th and 54th respectively¹³.

¹⁰ The figure is plotted using the square root of country area.

¹¹ Source: Eurocontrol CFMU, May 30 – 3 June 2001.

¹² Source: Airports Council International, year 2000 figures.

¹³ Also in terms of passenger movements, two other airports rank in the top 50: Antalya (37th), Larnaca (50th).

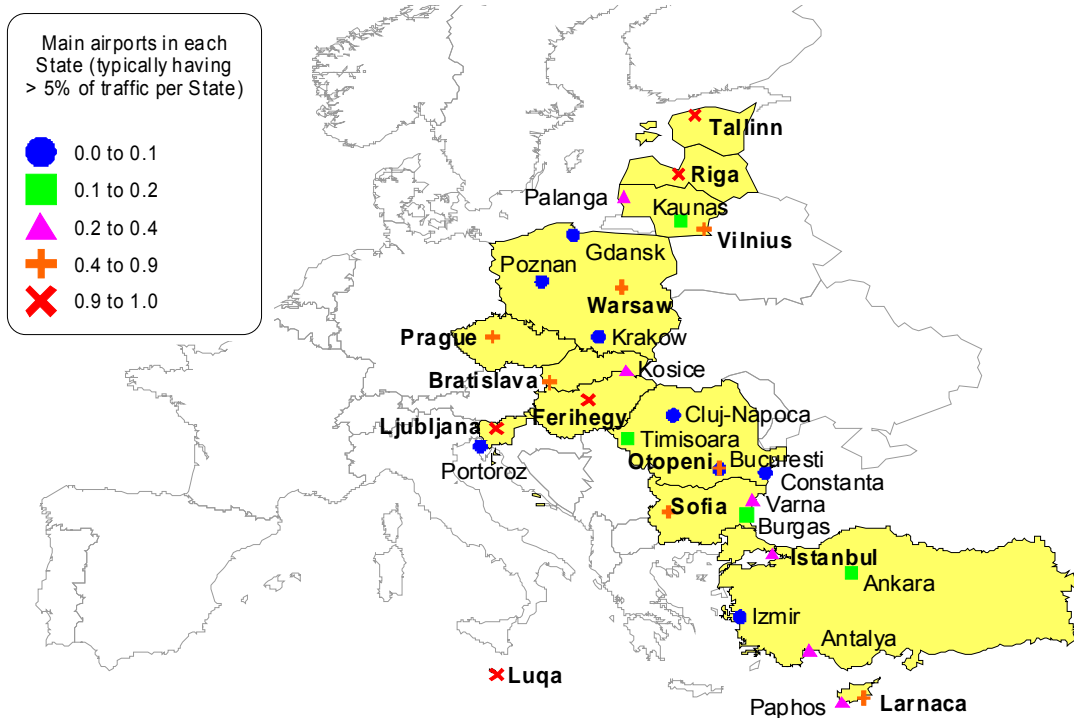


Figure 2-6: Main airports in each State based on proportion of aircraft movements

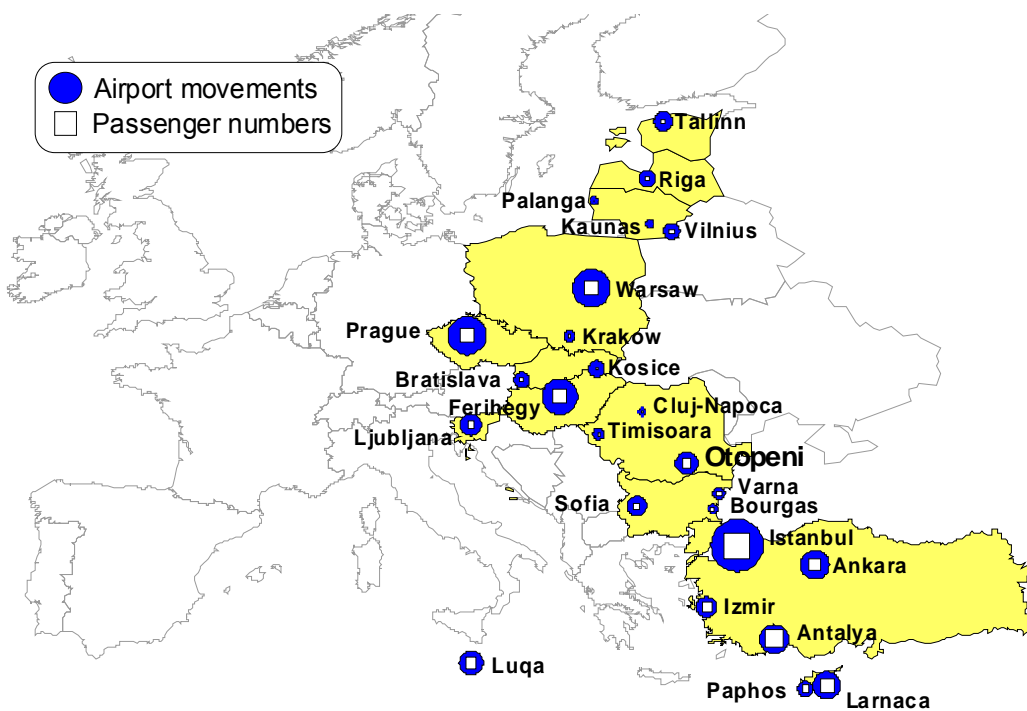


Figure 2-7: Passenger numbers and aircraft movements

- 2.1.14 Another useful indicator to categorise airports by is their coordination status¹⁴. IATA defines three levels of coordination: non-coordinated, schedules facilitated and fully coordinated. Slots are only defined for fully coordinated airports, where for certain periods demand exceeds capacity. At schedules facilitated airports demand is close to capacity for certain periods and a formal but voluntary coordination is in place. As expected, the larger airports shown in Figure 2-7 are coordinated: Prague, Izmir, Istanbul, Antalya and Ankara. Several of the Polish airports (see Figure 2-6 also) are 'schedules facilitated': Warsaw, Poznan, Krakow, Katowice, and Gdansk. Budapest, Larnaca and Ljubjana also come under this category.
- 2.1.15 It is interesting to note the number of smaller Polish airports that are schedules facilitated, whilst several larger airports such as Luqa and Otopeni are not.
- 2.1.16 The main traffic flows affecting the candidate States are shown in Figure 2-8. This is taken from the year 2000 and shows flows greater than 50,000 movements. It does not reflect the south east traffic flow over Bulgaria, which is now their largest flow, but is otherwise representative for 2001. The figure again illustrates how these States act as a gateway to other continents. Also of interest is the potential for competition for traffic between States. For some routes, particularly over the Baltic States, airlines can trade off planned route and ANS charges to optimise their flights, either to time or cost objectives. These States have reported that this market pressure is a key factor in setting their route charges. There is however the potential for unfair competition. For example, Tunisia charges a flat-rate fee for flights, which can mean that the lowest cost route is to fly a longer distance avoiding Malta FIR.



Figure 2-8: Main traffic flows affecting candidate States

- 2.1.17 Although the effect of these market forces may encourage lower ATM prices, there is an obvious drawback for the environment, resulting from the increased fuel burn.
- 2.1.18 The 'gate-way' notion also indicates a range of transition issues for States' air traffic management, such as:

¹⁴ IATA Worldwide Scheduling Guidelines, 6th Edition, Effective 1 July 2002

- the transition between procedural and radar controlled airspace, for example Turkey and its Asian neighbours;
- the transition from RVSM to non RVSM airspace, for example between the Slovakia and Ukraine;
- changing between measurement units, eg from altitude reporting in feet to metres, for example between the Baltic States and Russia.

2.1.19 Such transitions generally create additional controller workload, for example in increasing the spacing between aircraft before hand-over. They have been dealt with in the benchmarking by assuming they add somewhat to the complexity of the operations.

2.2 Institutional aspects

2.2.1 Table 2 lists the main ATM organisations within each State. Government departments are not listed, although for all candidate States these are currently the main policy making bodies. From November 2002 Poland will be an exception as the DGCA and regulator will be combined into the new Civil Aviation Authority, outside of the Ministry.

2.2.2 A variety of models for the institutional framework exist. In most, but not all, candidate States, the air navigation service provider is distinct organisationally from the regulatory and policy-making bodies of government. Civil aviation 'authorities' are generally distinct from 'administrations' through their higher level of rule making and involvement in policy formation. Romania and Slovakia both have civil aviation authorities, but the latter does not appear to be sufficiently staffed to do much ATM rule making.

Air Navigation Services Provider	Civil aviation authority / administration
Air Traffic Services Authority of Bulgaria	Civil Aviation Administration
Department of Civil Aviation, Cyprus	
Řízení Letového Provozu (ANS) of the Czech Republic	Civil Aviation Department
Lennuliiklusteeninduse AS (Estonian Air Navigation Services)	Civil Aviation Administration
HungaroControl	General Directorate of Civil Aviation
Latvijas Gaisa Satiksme (LGS)	Civil Aviation Administration
Oro Navigacija, Lithuania	Civil Aviation Administration
MATS Ltd - Malta Air Traffic Services Ltd	Department of Civil Aviation
PATA - Polish Air Traffic Agency	General Inspectorate of Civil Aviation
ROMATSA - Romanian Air Traffic Services Administration	Romanian Civil Aeronautical Authority
Civil Aviation Authority (CAA) of the Republic of Slovenia	
Letové Prevádzkové Služby (LPS) - Air Navigation Services of the Slovak Republic	Civil Aviation Authority
Devlet Hava Meydanlari Isletmesi (DHMI)	DGCA

Table 2: Main ATM organisations in each State

- 2.2.3 The functional separation of regulation and service provision is one of the requirements of the draft single sky regulations¹⁵. The table also shows that the ATM safety regulator is separate for most candidate States. In Slovenia there is a functional separation between the Air Navigation Services Department and the Safety and Aviation Standards Department. There is some degree of functional separation in Turkey, with safety regulatory tasks being shared between DHMI and the DGCA. There is no ATM regulator in Cyprus. We understand that Slovenia is planning an organisational separation of its service provision and regulation departments.
- 2.2.4 Aside from the functional separation of regulation and service provision, the single sky draft regulations make no proposals for the legal status of service providers. However, there has been a trend towards increasing autonomy from government, as evidenced by the recent changes in Latvia, Estonia and Malta.
- 2.2.5 The PRC has classified the legal status of ANSPs into ‘government department’, ‘State enterprise’, and ‘corporatised’. The latter follows the CANSO definition: ‘...a *corporatised* body is one that exists outside of the Government Civil Service, and has certain commercial freedoms to act in the provision of services.’
- 2.2.6 Many ‘corporatised’ entities according to this definition are still ‘State agencies’ with significant influence on key strategic or operational matters being dictated by government. This study has therefore sought a finer distinction, in the following categories:
- part of a government department; that is, not organisationally separated from policy-making and regulation;
 - a separate State agency; that is, organisationally separate from policy-making;
 - a company operating under a special statute of its own;
 - a joint-stock company operating under normal company law, but 100% owned by the government.
 - a joint stock company owned wholly or partially by private interests.
- 2.2.7 A geographical view of the status of ANSPs is shown in Figure 2-9. There are only three joint-stock companies, all of which are 100% owned by government. The majority of ANSPs are agencies or State owned enterprises, some with unique statutes, whilst some are under statutes applying to state owned enterprises in other industries. For example, ROMATSA is one of 15 organisations under a special statute for state owned enterprises. None of the organisations have any degree of private ownership.

¹⁵ Part I Article 3 (1) of COM (2001) 564 final, ‘Regulation of the European Parliament and of the council on the provision of Air Navigation in the Single European Sky Brussels, 10 October 2001.

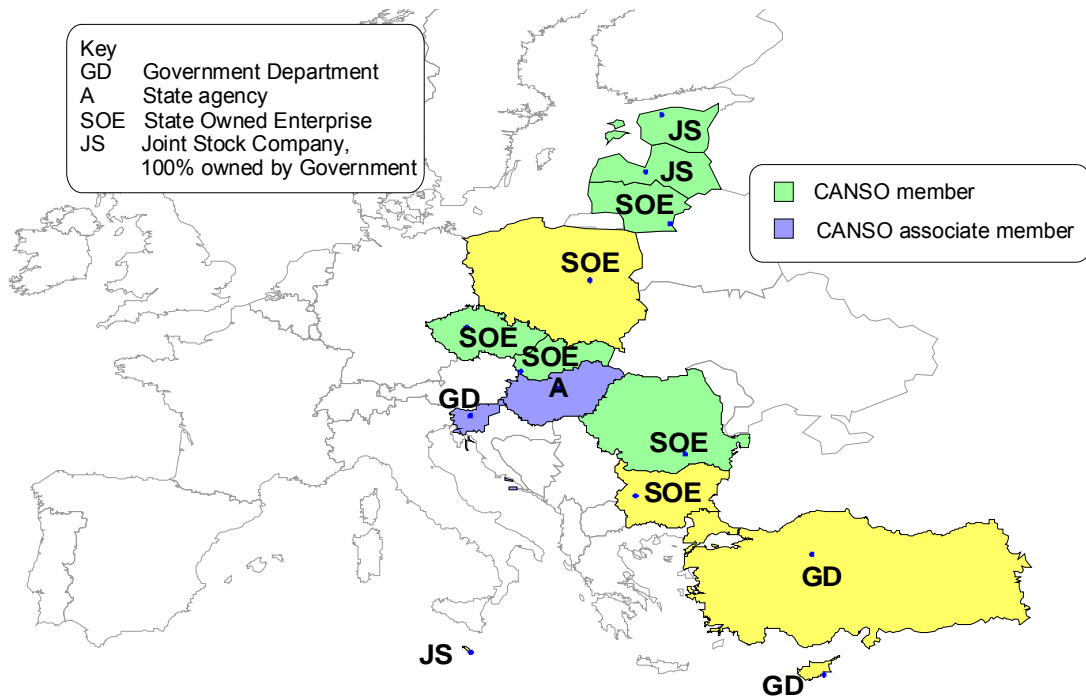


Figure 2-9: Legal status of ANSPs

- 2.2.8 Also shown in the figure is whether ANSPs are members or associates of CANSO, indicating to some extent their outlook on increasing commercial autonomy and separation of regulation from service provision.
- 2.2.9 The various entities in each State are shown in more detail in the following series of diagrams, schematically illustrating the position of service provider, regulator and government ministry. Associated providers of core services are shown as well as major delegations of control to other service providers. The greyed areas represent co-located organisations, but do not imply organisational dependence.
- 2.2.10 We have also found that in the candidate States, the majority of regulatory activities relate to safety regulation (rule making, oversight and enforcement). Economic regulation mainly pertains to approving national prices and is undertaken by the ministries in all candidate States. There are no instances of separately identifiable airspace regulation. Most often this is a shared function between aviation regulators, service providers, the military and government ministries.

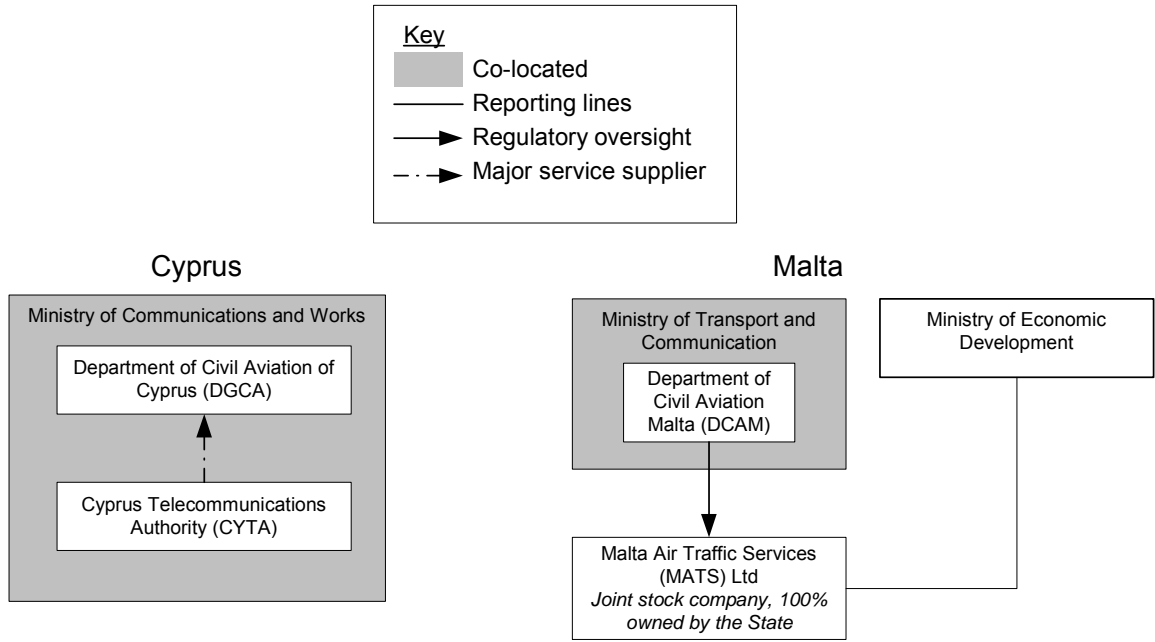


Figure 2-10: Institutional relationships in Malta and Cyprus

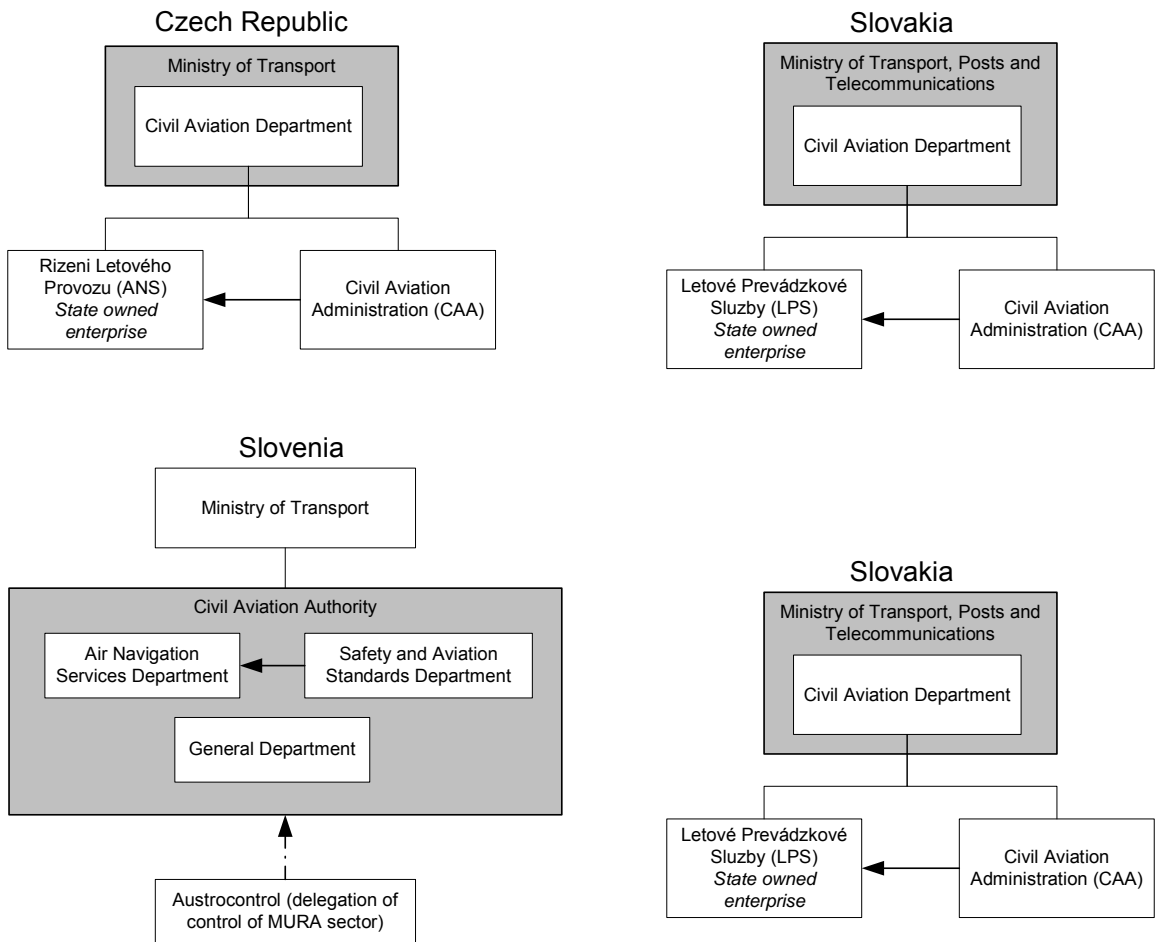


Figure 2-11: Institutional relationships in 'CEATS' States

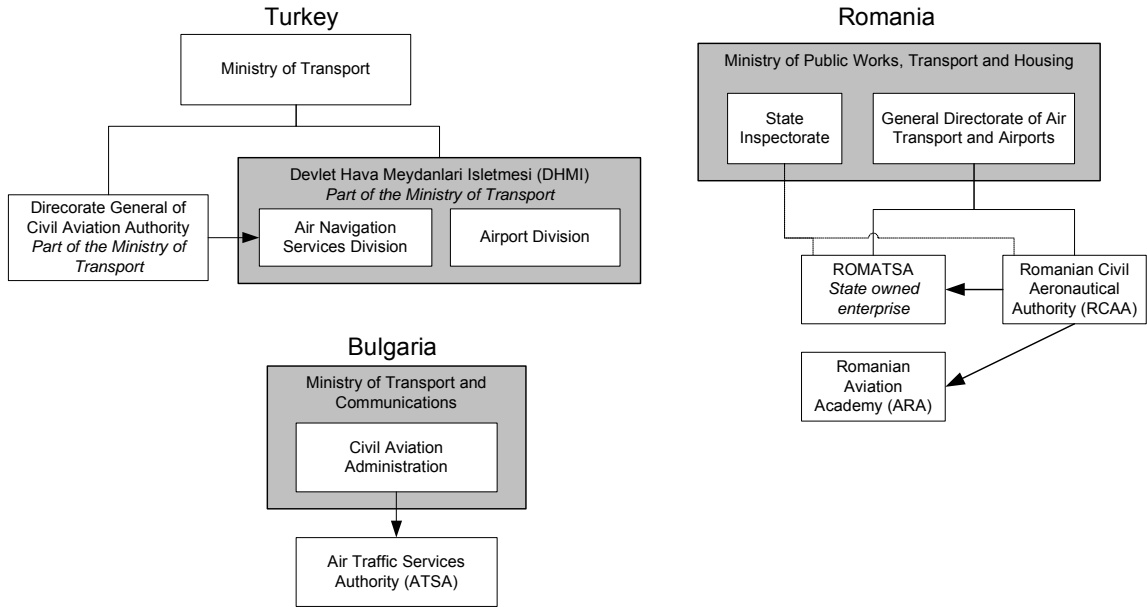


Figure 2-12: Institutional relationships in Turkey, Romania and Bulgaria

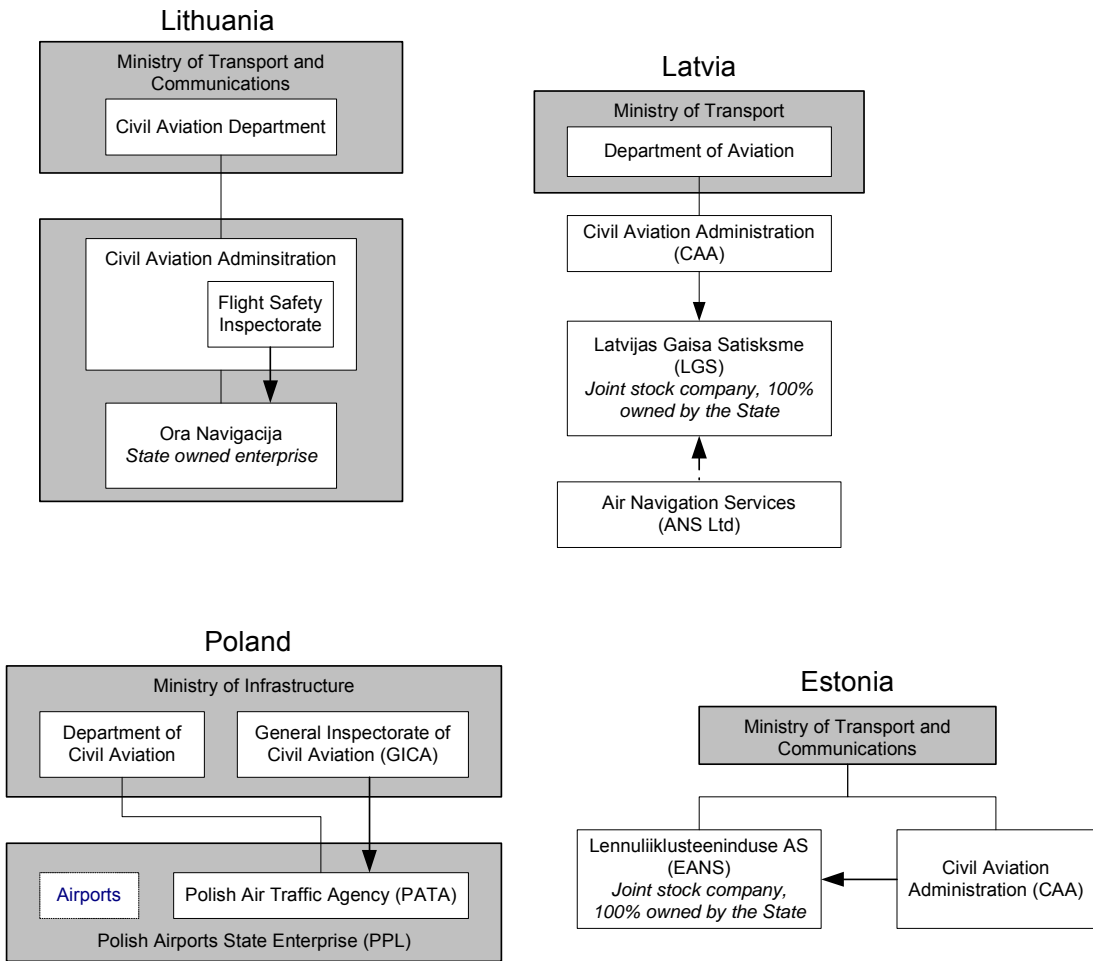


Figure 2-13: Institutional relationships in Poland and the Baltic States

2.2.11 A final point of interest for institutional aspects are the main international organisations joined by the candidate States. The table below summarises memberships of key organisations.

Country	JAA	CFMU	CRCO	Eurocontrol	CEATS	NATO	CANSO
Bulgaria	C	✓	✓	✓		C	
Cyprus	✓	✓	✓	✓			
Czech Republic	✓	✓	✓	✓	✓	✓	✓
Estonia	C	✓				C	✓
Hungary	✓	✓	✓	✓	✓	✓	A
Latvia	✓					C	✓
Lithuania						C	✓
Malta	✓	✓	✓	✓			
Poland	✓	✓				✓	
Romania	✓	✓	✓	✓		C	✓
Slovakia	✓	✓	✓	✓	✓	C	✓
Slovenia	✓	✓	✓	✓	✓	C	A
Turkey	✓	✓	✓	✓		✓	

C: Candidate A: Associate

Table 3: Membership of key international organisations

2.3 Economic and performance aspects

2.3.1 Many of the economic aspects of interest to this study are addressed by the Performance Review Commission's work, particularly the year 2001 information disclosure exercise. As this work is far from complete, and may not be completed by all countries during the study time frame, this section concentrates on high level economic indicators. Detailed analysis of the PRC information disclosure data is covered by the confidential benchmarking report (S013D052 Part 2).

2.3.2 Figure 2-14 shows the national costs per IFR flight km. The PRU prefer this indicator to the route charges unit rate, since it is independent of aircraft size and the previous year's cost recovery. The information in the figure is limited for the Baltic States and Poland, which are not part of the CRCO. The 2001 value Poland is an estimate, since total IFR flight km have not been reported.

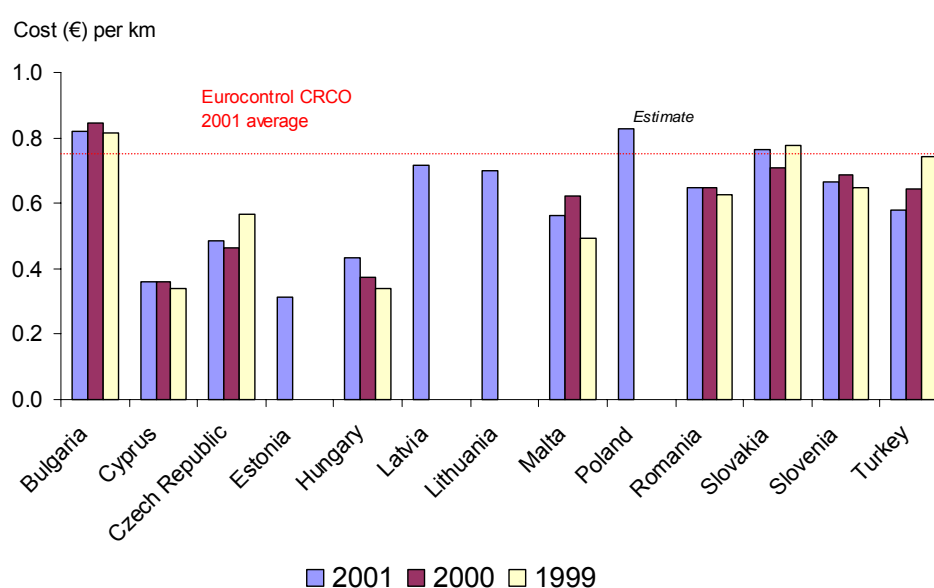


Figure 2-14: Comparison of national costs per IFR flight km

2.3.3 Aside from Bulgaria, Poland and Slovakia, the candidate States are below the European average cost per IFR km for 2001. There is no agreed notion of the target level of en-route charge, although the US compares favourably at around €0.4 per km. This large difference between the US and Europe is currently the subject of more detailed investigation by the PRC, although traffic complexity and social costs are believed to be important factors.

2.3.4 Most States, by virtue of the Eurocontrol central route charges system, charge users in the same way. Poland is of interest however, for two reasons:

- Domestic and international traffic are charged different unit rates, for 2001 this was \$33 and \$63 respectively. The charges also use great circle distance rather than from the last flight plan filed.
- VFR traffic is charged a navigation fee. Users either pay a fixed fee per flight or an annual fee for unlimited flights.

2.3.5 The unit costs may also be compared to levels of performance, of which a key indicator is the average delay per flight, as shown in Figure 2-15. Only Poland, the Czech Republic and Cyprus have noticeable delay figures, with most States having no delays.

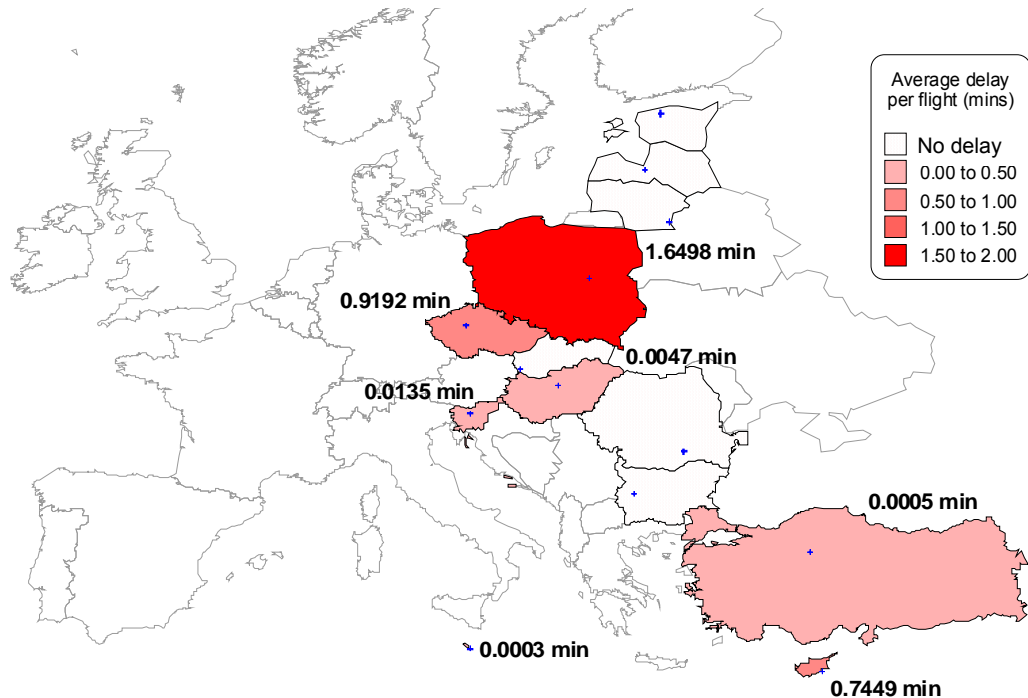


Figure 2-15: Average delay per flight (Source Eurocontrol CODA, 2001 figures)

2.3.6 The delays in Poland were a significant increase on the previous year; it was the only country to have an increase in average delay of more than one minute. One of the causes of this increase was an unexpected 10% increase in traffic in summer 2001. The Czech Republic and Poland had the largest percentage increases of traffic across Europe. A key factor for flow restrictions in Cyprus is the Greece-Cyprus traffic flow, one of the most dense traffic flows with more than 50,000 flights per year.

2.3.7 The PRC has determined the optimum cost of capacity to be set at an average delay per flight figure of 1 minute. This implies that there is generally over-capacity in the candidate States, which is confirmed by the sector capacity figures discussed later.

2.4 Safety aspects

- 2.4.1 High level safety statistics are difficult to obtain, due to the concerns of some organisations that the figures should be kept confidential. Although the Safety Regulation Commission reports some aggregated data, it is not believed to be complete or wholly reliable¹⁶. Accident information is generally widely reported, but due to the low frequency of occurrence it is not useful in statistical analyses and judging trends. IATA collects and analyses data from its members but also does not publicly report these.
- 2.4.2 The Performance Review Commission raised concerns about the lack of safety indicators in its 2001 annual report, PRR5. The lack of transparency at a European level is of concern given that safety is universally acknowledged as the prime objective of air traffic service providers. There seems to be a clear public interest argument for open reporting of safety data, which already occurs in several States.
- 2.4.3 Open reporting of safety data is not without its difficulties. Not all incidents are reported internally to States, which would make comparisons between States meaningless. A significant factor in reporting of safety occurrences is whether a 'no-blame' culture exists and there have been concerns that the legal position of controllers within some States acts against a no-blame safety culture. The PRU has therefore recently undertaken a survey of non-punitive occurrence reporting.
- 2.4.4 In the course of this study, we found that several States openly report statistics of high severity occurrences. This question was not included in the scope of our benchmarking but on reflection is important. We would recommend that future benchmarking exercises address the open reporting of high severity occurrence statistics. This may encourage greater transparency in ATM safety.

2.5 Human resources

- 2.5.1 Few of the candidate States have reported any particular problems in recruitment. Given the high salaries of controllers, with respect to average salaries in most States, there is sufficient demand to attract the top candidates. However, some States such as Turkey do not have complete control over recruitment, where it is a centralised civil service function.

2.6 Operational aspects

Capacity

- 2.6.1 As shown earlier, the average flight delays are not significant in the candidate States, with the possible exceptions of Cyprus and Poland. The low delays are a result of there being either sufficient or excess capacity as shown in the following figure. If the PRC optimum delay of 1 minute were applicable, it would suggest that over-supply of capacity is leading to unnecessary high costs in the candidate States. The issues of productive and allocative efficiency are dealt with by the detailed benchmarking.

¹⁶ PRC Performance Review Report 5, Chapter 3 'Safety', pp 23 – 30, May 2002

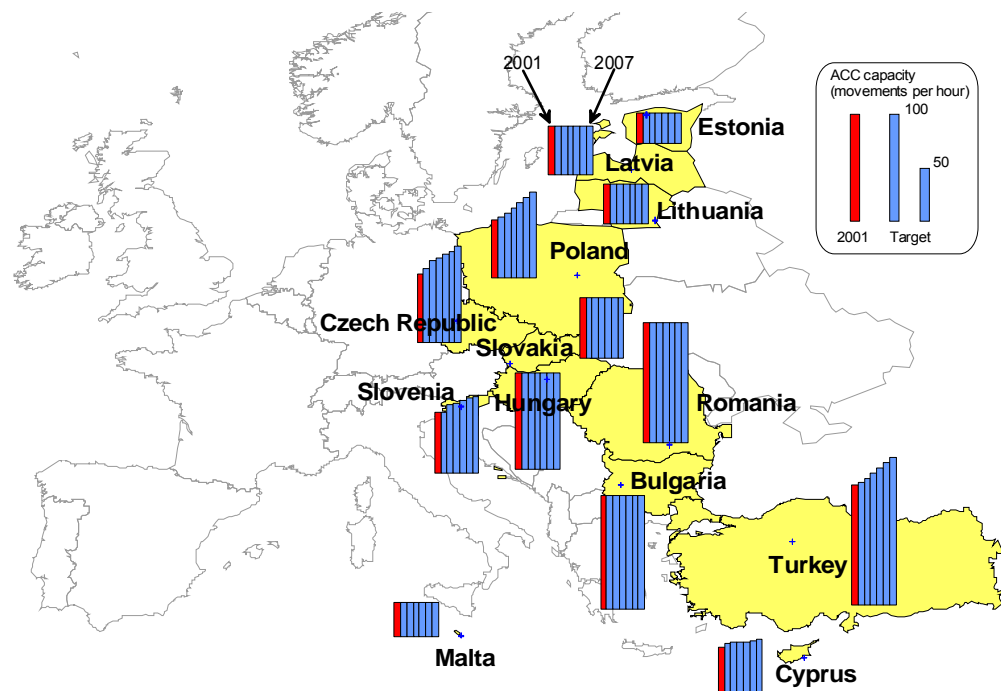


Figure 2-16: Current and projected capacity to 2007

2.6.2 It is also useful to question how current capacity is assessed and how the targets are set. ANSPs tend to use the Eurocontrol methodology, their own simulations or calculations, or simply expert judgement of peak time sector capacity. Usually ANSPs use a combination of these methods. In some cases measures of capacity include that of standby, simulator or training suites; where they are available and configured to handle live traffic. The approaches differ and we have found them to generally be appropriate to ANSPs need. There may be no need to assess capacity to a high degree of accuracy where there is clearly ample capacity for the medium term.

2.6.3 The targets shown in the figure have been calculated by Eurocontrol using the FAP methodology, which accounts for the ARN 4 route network. Some of the figures shown are not so much targets as indications to maintain the current capacity, where it is sufficient for the following years.

Airspace classification

2.6.4 All of the candidate States except Turkey and Poland have airspace classifications consistent with ICAO classifications.

2.6.5 Turkish airspace is currently divided into two categories; controlled and non-controlled. Controlled airspace consists of airways, terminal manoeuvring areas and control zones ('CTR's). Conformance with ICAO is planned but requires negotiations with the military, which are expected to start in September 2002. A two stage process is planned, firstly to classify the upper airspace above FL195, secondly to classify FL195 and below.

2.6.6 Polish airspace is split into civil and military areas. The civil airspace is fully compliant with ICAO classifications, whereas the military airspace is unclassified.

Civil-military

2.6.7 The implementation of the flexible use of airspace concept is very relevant to this study given that it forms part of the draft Single Sky regulations. Whilst most States claim to have adopted the concept, the detail of implementation varies widely and does not necessarily follow the Flexible Use of Airspace handbook. However, there are generally good reasons for this:

- in most candidate States the military use of exercise areas, and hence its demand for airspace, is very low;
- many of the military training areas are away from major civilian traffic flows and there is no need for conditional routes.

2.6.8 Membership of NATO will have some impact on military requirements for new members, however the main changes foreseen amongst the candidate States are¹⁷:

- Hungary, which joined NATO in 1999, has started a 20 year integration programme. Although it plans to conduct advanced flying training at the NATO flying school in Canada, it may continue basic flying training in Hungary. It also plans to reduce operational bases from six to three plus two relief airfields. The planned size of the airforce is for two fighter/bomber, one transport and four helicopter squadrons. Hungary currently has a mixture of Soviet-built aircraft including one MiG 29 fighter wing and Aero Vodochody L39ZO Trainer/Light Attack aircraft. It has determined a need for 40 fighters and has signed a 12-year lease for 14 Saab/BAE Systems Gripen, of which the first delivery is due in 2004 (the 14 MIG 29's will be phased out in 2005). Due to the current airspace structure, each Gripen mission will last approximately 45 minutes and is estimated to operate about 100 hrs per year, which is half of the NATO average.
- The Czech Republic, which also joined NATO in 1999, has an inventory of mainly Soviet-built aircraft of which many have been retired in recent years. Only four MIG 21s have NATO standard communications equipment. All Sukhoi Su-22M Fitter and MiG 23 'Floggers' are presently grounded and are likely to remain so. The military plan to purchase 24 Saab/ BAe Systems Gripen, with a first delivery in 2004. They have also ordered 72 light attack/trainer L159s but now only 38 are expected to enter service.
- Poland is also understood to be currently competing for new fighter aircraft, potentially the Eurofighter Typhoon, Dassault Mirage or the Saab/BAe Systems JAS-39 Gripen.

2.6.9 Although most States have separate civil and military air traffic control, there is a fair degree of coordination, common systems and sharing of data. Some States, such as Bulgaria and Romania, will increase the integration of civil and military units following the implementation of their new ACC centres.

¹⁷ Various public sources, including Flight International.

Systems

The consolidation of the ACC supplier industry in recent years has led to fairly common ACC systems in the candidate States, as shown in Table 4.

	Supplier	Model
Bulgaria	AMS ¹⁸	
Malta	AMS	
Romania	AMS	
Turkey	AMS	
Poland	Northrop Grumman	AMS 2000Plus
Latvia	Si ATM	ATRACC
Slovenia	Siemens Plessey	
Cyprus	Thales	Aircat 200
Czech Republic	Thales	Eurocat 2000
Estonia	Thales	Eurocat 2000
Hungary	Thales	Eurocat 2000
Lithuania	Thales	Eurocat 200
Slovakia	Thales	Eurocat 2000

Table 4: ACC systems

¹⁸ AMS are the supplier for the new ACC, the system being replaced is the Thales Eurocat 200 in Sofia and the Raytheon TrackView 220 in Varna.

3 Forecast and investment assessment

3.1 Traffic forecasts

3.1.1 A summary of traffic forecasts is shown in Figure 3-1 and Table 5. The figure shows the low to high range of forecasts, averaged over the eight year period 2002 – 2009. The States have been grouped according to an analysis of the underlying forecasts, which is discussed later.

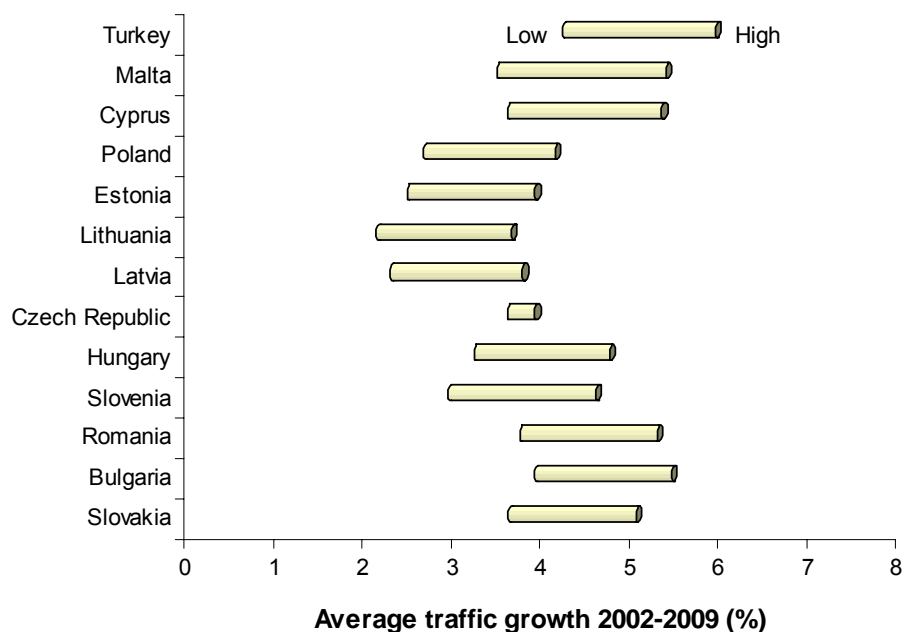


Figure 3-1: Average annual forecast traffic growth range (Eurocontrol STATFOR, February 2002)

Country	Low (%)	High (%)	Base (%)
Turkey	4.2	5.9	5.1
Malta	3.5	5.4	4.4
Cyprus	3.6	5.3	4.5
Poland	2.7	4.1	3.5
Estonia	2.5	3.9	3.2
Lithuania	2.1	3.6	2.8
Latvia	2.3	3.8	3.0
Czech Republic	3.6	3.9	3.6
Hungary	3.2	4.7	3.9
Slovenia	2.9	4.6	3.8
Romania	3.7	5.3	5.1
Bulgaria	3.9	5.4	4.6
Slovakia	3.6	5.0	4.4

Table 5: Average forecast traffic growth 2002 – 2009 (STATFOR)

- 3.1.2 According to STATFOR, the effects of 11 September are manifested in a two year shift in demand from previous forecasts. The Baltic States and Poland show the lowest average growth over the period, where demand is strongly influenced by long haul over-flying traffic. The high growth in Turkey, Malta and Cyprus is influenced by growth in tourism. To understand these forecasts, we have analysed the dominant traffic flows for each country. These traffic flows are the underlying forecasts presented by Eurocontrol's STATFOR. We find that States may essentially be classed into four groups, as follows:

Group 1: Czech Rep, Estonia, Hungary, Latvia, Lithuania, Poland, Slovenia

- 3.1.3 For all these States, the significant traffic flows, defined as more than 10% of the total traffic, are: short haul (North and East Europe) and other over-flights. Poland is a little different, both in having a larger component of north east traffic (26%) and also in having a significant domestic component. The southern-most States of this group, Slovenia and Hungary, have the smallest short haul (North and East Europe) component of this group, with the majority being over-flights. In this way, they resemble somewhat the states in group 2.

Group 2: Bulgaria, Romania, Slovakia

- 3.1.4 For all three States, the overwhelming majority of the flights are over-flights. Of the three, only Romania has a non-negligible domestic component of the traffic (around 4% - 5%).

- 3.1.5 For Bulgaria, international arrivals and departures form 13% of the total but are the main contributor to the traffic growth in 2002 (a 20% increase compared to 2001 figures). ATSA expect this growth to be more moderate but for the proportion of arrivals and departure traffic to increase in future.

Group 3: Cyprus and Malta

- 3.1.6 Cyprus and Malta have very similar flows. As well as over-flights, short haul flights to all parts of Europe also contribute significantly to the total traffic, with the contribution being greatest for Malta. For both States, the most significant short haul component is flights to/from Western Europe.

Group 4: Turkey

- 3.1.7 Turkey is similar to Malta and Cyprus in having significant short haul flows in all three directions. However, unlike the two group 3 States, the main short haul flow is North and East Europe. Turkey is also unique in having a large and growing domestic flight component.

General comments

- 3.1.8 It is interesting to note that States in the same group exhibit similar overall growth in traffic over the period 2002 – 2009. This can also be seen by the average annual traffic growth, shown again in the following figure according to the groups discussed above.

- 3.1.9 By analysing which flows contribute most to the total traffic increase, we can make some further general comments:

- For all States, apart from Turkey and Malta, the majority of the traffic increase for the years 2002 – 2009 is due to over-flights.

- Only in Turkey, Poland, and Romania is there a non-negligible (more than 5%) contribution from domestic traffic to the overall traffic increase. Out of all the States, Turkey has by far the largest contribution from domestic traffic to the total traffic increase, being responsible for 33% of the total increase in traffic.
- For all States the contribution to the traffic increase from long haul traffic is negligible.
- Apart from Slovakia, all the states receive a non-negligible (more than 5%) contribution to the traffic growth from short haul traffic to North and East Europe. There is a major contribution (more than 20% of total traffic increase) for Estonia, Lithuania, Malta, Poland and Turkey. There is a moderate contribution (between 10 and 20%) for Cyprus, the Czech Republic, and Latvia.
- Malta receives a major contribution (38%) to the total traffic increase from short haul Mediterranean traffic. Cyprus and the Czech republic have a moderate contribution (between 10 and 20%).
- Malta, Cyprus, Turkey, Poland and the Czech Republic receive a non-negligible (more than 5%) contribution to the total traffic increase from short haul flights to Western Europe.

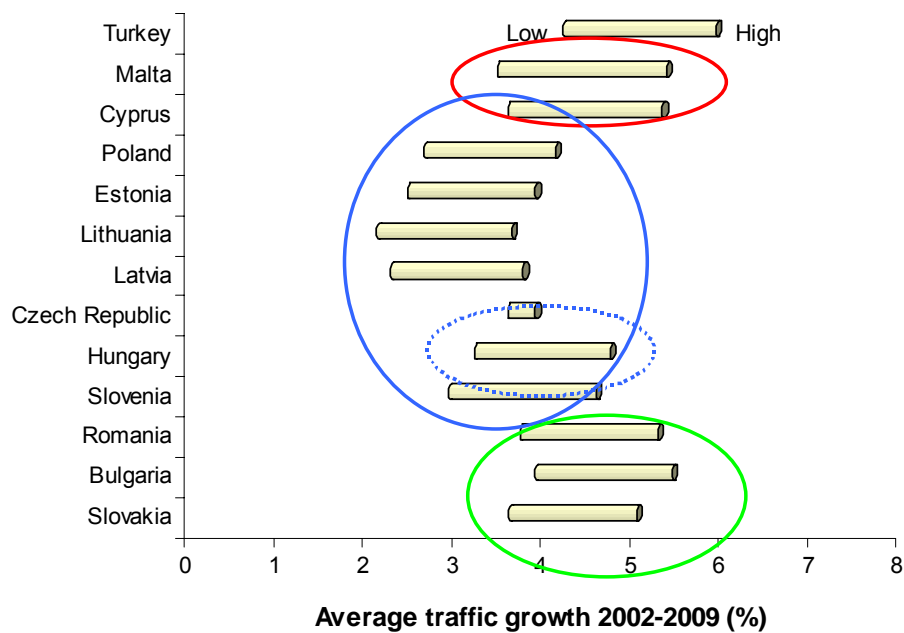


Figure 3-2: States grouped by forecast traffic growth characteristics (STATFOR)

3.2 Investment overview

- 3.2.1 There has been significant investment activity in the candidate States in the last few years, as indicated by Table 6, showing EIB loans for ATM projects since 1987. (Note that EIB loans are typically for 50% or less of the project costs.)
- 3.2.2 Of particular note is that ATM projects are typically subject to procurement problems resulting in delays and cost-over-runs. Our knowledge of problems in EU ATM procurement supports this view. Recent EU examples of significantly delayed procurements are the UK's NERC, Germany's Langen centre and the Maastricht UAC. The EIB's view is that this is not a particular problem with candidate States, but is a general problem for ATM procurements.
- 3.2.3 The EIB has judged the past performance of investments in several of the candidate States in terms of project and cost overruns. It cites Malta, Bulgaria, Romania, Slovakia and Cyprus as having cost overruns of up to 30% and/or delays of up to 6 years. This study has not included a review of project performance, although we have requested relevant information from States. From some of the histories of major ACC projects, the common causes of delay are changes to requirements and suppliers being unable to meet requirements. Industry consolidation has also had an impact.

Country	Loan details	EIB loan (€M)	Supplier	Contract year
Hungary	CNS, ACC and APP equipment, building, training	20	Siemens, Alenia	92
Malta	Radars, Radiobeacons, ACC and APP equipment, building, MET equipment, training	6	Alenia	93
Bulgaria	CNS, ACC and APP equipment, building, power supply, airfield lighting, MET equipment	60	Alenia	93 - 00
Romania	CNS, ACC and APP equipment, buildings, MET equipment, training	40	Alenia	94
Slovakia	CNS, ACC and APP equipment, building, power supply	15	Thomson	94
Estonia	CNS, ACC and APP equipment, building, training (original loan \$20M but only \$8M used)	8	Various	94
Cyprus	Radars, ACC and APP equipment, building, SAR equipment, training	12	Various	96

Table 6: EIB loans for ATM in the accession States since 1987

- 3.2.4 We would recommend that a study of major ATM procurements be carried out so that lessons can be learned for future procurements. This is pertinent to smaller States, who may have difficulties in maintaining technical and project management competencies, as well as larger States, who are faced with increasingly complex systems.

- 3.2.5 There are only two particular examples of regional planning and investment: the Baltic ATSO Network and, on a much larger scale, CEATS:

Baltic ATSO Network (BAN)

- 3.2.6 This project aims to provide ground digital communication, initially among the three Baltic States and Sweden and later with Finland. The BAN's scope includes exchange of data (radar, AFTN, OLDI, AIS, MET etc) and voice (ground/ground and ground/air/ground). The objectives of the BAN project are to
- increase the quality of Air Navigation Services in the Baltic area and thereby flight safety;
 - share aeronautical information between service providers;
 - reduce implementation and running costs of international communication;
 - comply with Eurocontrol ECIP objectives.

CEATS

- 3.2.7 By 2010, there are plans to delegate the control of the upper airspace of eight States¹⁹ into a new international organisation, Central European Air Traffic Services (CEATS). CEATS will be part of the Eurocontrol Agency, along the same lines as Maastricht UACC.
- 3.2.8 As part of CEATS, the Czech Republic, Slovakia, Slovenia and Hungary have strategic plans covering the period up to 2015/20. However, some States have indicated problems with uncertainties in the detailed CEATS planning, which have led to difficulties in States' non-CEATS planning.
- 3.2.9 The present schedule for the CEATS UAC is that it becomes operational by 2007, but will in 2007 only be partly operational (Initial Operations). In 2010 the CEATS UAC will be fully operational taking over the responsibility of the Upper Airspace.

3.3 Requirement for longer term investments

- 3.3.1 One of the aims of this study has been to consider the longer term investment requirements of States. The drivers for this are typically capacity shortfall, equipment obsolescence / unreliability, standardisation requirements, safety improvement, European harmonisation and customer requirements. However, we have focused on capacity and equipment age as the main drivers, given the modernisation of systems in most of the States in recent years.
- 3.3.2 To do this we have extrapolated the available medium term traffic forecast data and estimated the impact of this growth on peak sector demand. The demand has been simply estimated from a 3 day sample of traffic from June 2001, and the peak hour has been taken as the reference demand for that year. This is an approximation, as some countries will have higher traffic during July and August²⁰. However, it seems sufficient to make an initial analysis. The following figure shows when the peak demand exceeds the established ACC capacity

¹⁹ Austria, Bosnia-Herzegovina, Croatia, Czech Republic, Hungary, Italy, Slovakia and Slovenia

²⁰ Bulgaria ATSA have commented that their peak traffic is in August, and is some 15% higher than the June figures.

targets. These capacity targets have been taken from the ECIP 2001 status report.

- 3.3.3 The following figure shows that the Czech Republic and Poland have short term capacity problems, which tallies with their higher delay figures. Of particular interest is that seven States are unlikely to exceed their capacity within the next 15 years. Cyprus already has plans to modernise its ACC and these should account for the likely capacity shortfall by 2006.
- 3.3.4 The Czech Republic has plans to upgrade its ACC prior to CEATS operations, which appears sensible given the likely shortfall by 2007. An alternative for the Czech Republic would be to weather the short fall but this does not take account of other reasons for upgrading the system.
- 3.3.5 Estonia has a potential shortfall in 2008, however it also has the ability to add another sector into its current, new, system. Hungary is implementing an upgrade to its centre in 2004, which should also take account of the potential shortfall shown for 2007. The likely shortfalls in Romania and Poland by 2009 are probably beyond their current planning horizons. Additional sectors would almost certainly be added to add capacity prior to the next generation of systems.

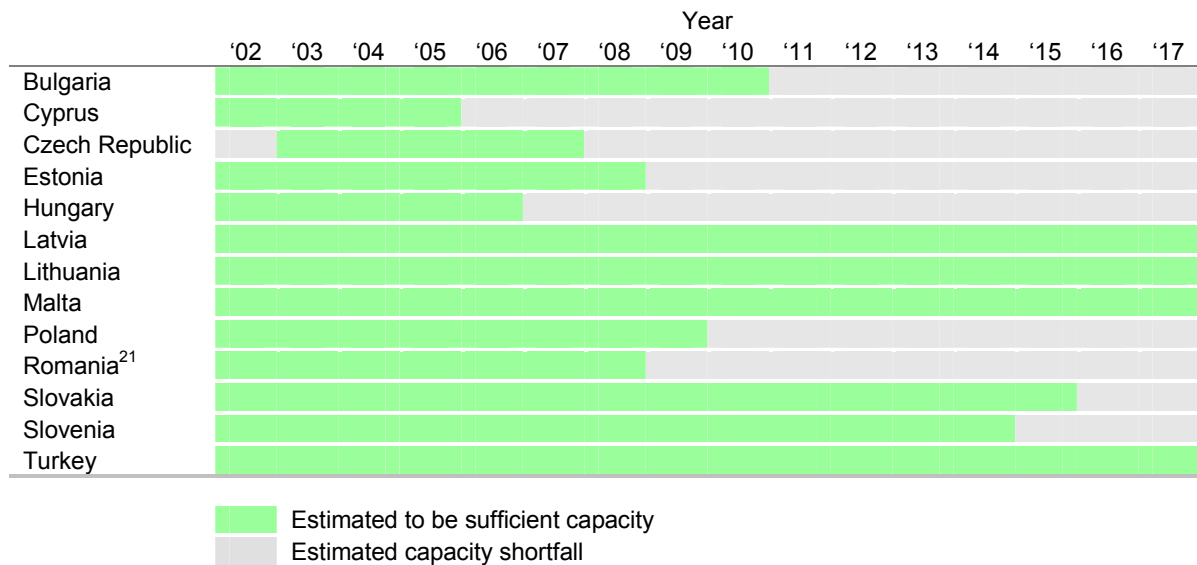


Figure 3-3: Estimated future capacity shortfalls

- 3.3.6 It is useful to compare the above picture with States' placement in their investment cycle. As part of the benchmarking we have collected average system ages for major system components. To translate this into an investment cycle, we have used equipment lifetimes of 12 years for CNS equipment and 7 years for data processing and display systems. The following figure presents the results of this analysis, presented as the number of ANSPs that are likely to be replacing systems, and in roughly what time period.

²¹ Capacity plans to be confirmed as the new centre will have sufficient capacity for many more years.

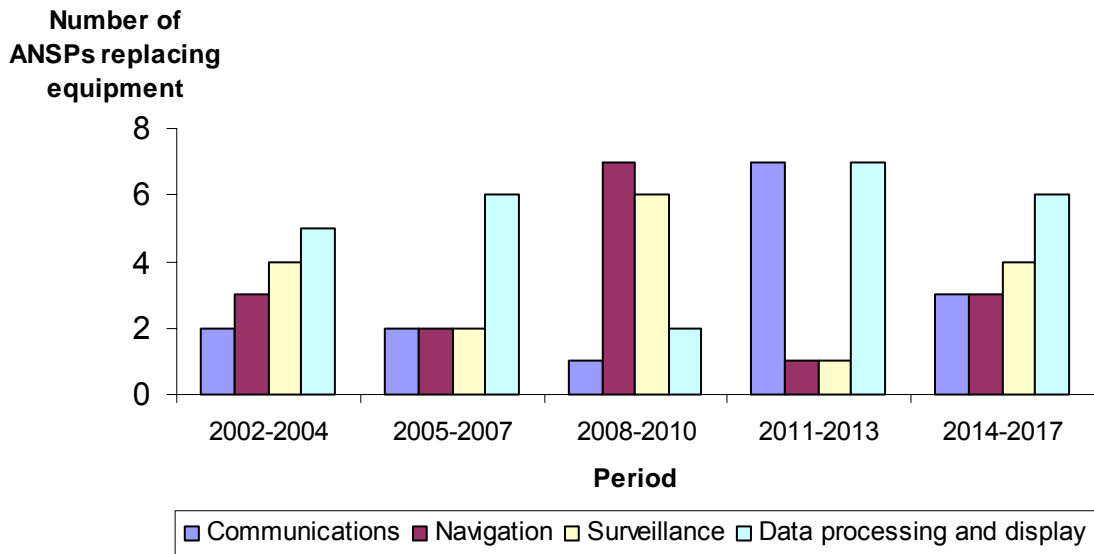


Figure 3-4: Candidate States' investment cycle (estimated)

3.3.7 According to this analysis, Slovenia, Lithuania and Turkey would be expected to have upgraded data processing and display (DP&D) equipment in the first period (2002 – 2004); whilst Latvia, Malta, Czech Republic, Cyprus, Hungary and Slovakia would be expected to upgrade DP&D in the second period (2005 – 2007). We note that Cyprus is currently evaluating tenders that will lead to an upgrade in the first period. We note that Turkey's plans are to upgrade by 2010, several years longer than we would expect from the above. As a consequence they will have particular challenges in extending their system lifetimes.

3.3.8 Although there is ample warning of the investment needs discussed above, the analysis points to the importance of integrated strategic planning. It also highlights the potential timeframe to introduce new operational concepts, such as multi-sector planning. This may be an area for a concerted action by Eurocontrol to work with States at both the concept and technical requirements levels.

3.4 Notes on States' investments

Bulgaria

3.4.1 The two FIRs (Sofia and Varna) will be consolidated and controlled by a new system at Sofia to replace the Hughes Trackview and Airsys EUROCAT 200 systems. (The upper airspace sectors of the Varna ACC will be transferred to the Sofia ACC in 2004.)

3.4.2 The new system with 45 consoles is to be supplied by AMS (contract signed in 2000) and is planned to be fully operational in 2003. The new building has been completed with space for military cells. The new centre is known as the CNATCC (Common National Air Traffic Control Centre). The CNATCC system is based on Open system architecture with Eurocontrol ARTAS tracker and an AMS conventional multi-radar tracker to be used as fallback.

- 3.4.3 All terminal radars have recently been upgraded with MSSR and PSR sensors from Alenia Marconi Systems. Long range PSRs have been upgraded and SSRs replaced by Cardion MSSRs.
- 3.4.4 Communications have generally been upgraded, with planned implementation of new VCS systems for Varna (ACC/APP/TWR) and Burgas APP/TWR by the end of new 2002. New VHF radios will be implemented for Sofia TWR. A new national ATM network is to be implemented in 2003.
- 3.4.5 A new runway at Sofia airport is scheduled for completion by the end of 2003. The ground handling capacity of Sofia airport has been increased since September 2001 by the reconstruction of the terminal building and improved facilities.

Cyprus

- 3.4.6 As the current ACC system (Airsys AIRCAT 200) is almost 17 years old, there are plans to upgrade facilities. The plans include:
- A new ACC in Nicosia including new building. This will also include radar approach for the Larnaca Terminal Control Area. The project encompasses ATM data processing, input and display systems, test and development environment and a training simulator. The new system would be able to accommodate five sectors with two working positions per sector and be expandable to cope with future demand.
 - Replacement of Kionia long range radar station. The existing MSSR/PSR system in Kionia has been in operation for 16 years. The project is at the planning stage and a new station is expected to be operational at the end of 2004.
 - Voice Communication System (VCS) and Voice Recording and Replay System (VRRS). A VCS and digital VRRS will be procured and installed in the new ACC building to meet the associated needs of the new ACC. Although new facilities have recently been implemented (VCS air/ground and ground/ground, VRRS) they would not be sufficient to support the new LEFCO system.
 - Replacement of the Larnaca airport ILS and possible upgrade of the main runway from CAT I to CAT II/III.
- 3.4.7 The existing ATC system was recently upgraded with a new Multi Radar Tracking (MRT) System to support RVSM operations. Cyprus has also recently installed a new Cossor - Raytheon MSSR at Lara, near Paphos, and Thales STAR2000 PSR/MSSR at Larnaca airport.

Czech Republic

- 3.4.8 The systems and infrastructure of the Czech Republic have been undergoing a programme of modernisation since 1992, with almost complete refreshment of CNS/ATM systems.
- 3.4.9 The ANS is also involved in new technology development such as ADS, passive surveillance and ground movement systems.
- 3.4.10 The Thales Aircat 2000 system provides radar and flight information data to the controllers of Prague ACC and APP as well as APP/TWR for local airports and the military. There are a number of auxiliary systems such as an information

display system and a remote control and monitoring system developed in the Czech Republic. There is also a new Voice Communication System and ground network. Prague and Ruzyne airports have airport surface radar. All secondary surveillance radars have been either replaced or updated to be compliant with Eurocontrol standards and data is exchanged with adjacent centres.

- 3.4.11 A VHF ground station programme is underway, to modernise the systems by 2006, including new buildings.

Estonia

- 3.4.12 In 1994 Estonia began an upgrade of CNS equipment, ACC and APP systems including a new building and training facilities. Estonia is a member of the BAN project. No major investments are currently planned.

Hungary

- 3.4.13 Hungary began implementation of a new ACC and APP in 1992, including a new building and training facilities. The Thales EUROCAT VA0.3 accommodates 12 sectors, TWR and APP facilities. The facility is located at Ferihegy airport near Budapest and is an improved version of the PALLAS system installed at Athens, Greece. The system has been operational since early 2000 and is an interim system. It will be replaced by a EUROCAT V1 at end 2003.
- 3.4.14 CNS equipment was also upgraded, including new radars and nav aids. A new VCCS has been operational since early 2000.

Latvia

- 3.4.15 Latvia is a member of the BAN project and the Baltic CNS/ATM implementation planning project (involving Latvia, Lithuania, Estonia and Poland). Corresponding investments are currently being identified.

Lithuania

- 3.4.16 Lithuania is a member of the BAN project. No major investments are currently planned.

Malta

- 3.4.17 The new Luqa ACC has given the system sufficient capacity until at least 2010. MATS are in the early stages of planning a simulator unit for local training and as fallback ACC in case of major system failure.
- 3.4.18 Malta is currently upgrading and extending its radar coverage due to deterioration of the sensors. The Dingli radar has recently been replaced with a new MSSR and a new MSSR antenna has been installed at Luqa TAR. Radar data from the Ustica (Italy) has been integrated into the new centre.

Poland

- 3.4.19 The Polish ATM system has been undergoing modernisation in two phases. Phase I, which is now complete, saw the implementation of the current Northrop Grumman AMS 2000 system as an interim system for the new centre. Phase II will see procurement and installation of new equipment to meet ECIP objectives for Warsaw/ACC.

Slovakia

- 3.4.20 A new ACC is planned for implementation by 2006. Currently the ACC/APP is housed in the new TWR building. New PSR/MSSR sensors are planned for Bratislava Airport.
- 3.4.21 Slovakia carried out a major update programme in conjunction with the Czech Republic, commencing in 1994. The Thales Aircat 2000 system became operational in 2001. It provides radar and flight information data to the controllers of Bratislava ACC and APP as well as APP/TWR for local airports, the military and airport authorities. A new Voice Communication System and ground network has also been implemented.
- 3.4.22 Similarly to the Czech Republic, radars have been replaced or upgraded to meet Eurocontrol standards. The ANS are also involved in the VHF ground station modernisation programme.

Slovenia

- 3.4.23 Slovenia's ATM systems were provided by Siemens/Plessey (now Thales) in 1994 and are a simplified version of the Austrian Vienna system.
- 3.4.24 The principal radar used in the ACC is the Brink airport Plessey Watchman, installed in 1993. Radar data is processed by Comsoft RMCDE installed in 1995 to provide format conversion facilities and the capability of exchanging radar data with adjacent centres.

Romania

- 3.4.25 Since 1994, Romania has been undergoing a complete renewal of its ATM system. Two new secondary locations for Bucharest ACC are now operational in Arad and Constanta with a new Bucharest ACC still under construction. The current plan is to reduce the three ACCs to a single one at Bucharest, once operational.
- 3.4.26 The new Bucharest system is being supplied by AMS. It can accommodate 20 sectors and has 50 consoles. The new building is completed and the system is installed and undergoing testing.
- 3.4.27 New radars, nav aids, communication radios, MET equipment and training are also being implemented. The radars have all been replaced by AMS radars and are operational. A new VCCS will be part of the new Bucharest centre.

Turkey

- 3.4.28 A new system is currently being planned to enable Turkey to meet its LCIP/ECIP objectives and align itself to the EATMP ATM 2000+ Strategy. The total cost is estimated at €116M. The project consists of the procurement and installation of new ATC systems in the following centres:
- new Ankara ACC/APP;
 - Ankara TWR;
 - Istanbul APP and Atatürk airport TWR;
 - APP/TWR at Izmir, Antalya, Dalaman and Bodrum.

3.4.29 The new centres will comprise, amongst other things, radar and flight data processing (RDPS and FDPS), operational display and input system (ODS) and voice control communications system (VCCS).

3.5 Sources of finance

3.5.1 As part of the benchmarking, we have looked at whether there are any particular constraints to ANSPs in attracting investment funds. Given that there has been widespread investment in recent years, there would overall appear to be no major difficulties. However, we note the following points:

- Four ANSPs use revenue to fund investments, one of these in combination with market loans.
- Eight ANSPs use market loans, the majority of which are from the EIB, which is then backed by Government guarantees.
- Three ANSPs may be funded by Government loans or grants, whilst three more may receive direct funding. However, it should be noted that direct funding by Government is rarely used.

4 Status of ATM in States

4.1 Introduction

4.1.1 This section gives short overviews of the status of ATM in each candidate State.

4.2 Bulgaria

4.2.1 Civil aviation in Bulgaria is the responsibility of the Ministry of Transport and Communications. The Civil Aviation Administration (CAA) is the Bulgarian regulatory authority, responsible for the certification of civil aircraft and equipment, aircraft accident/incident investigation, supervision of the safety of aviation in the national airspace, certification and licensing of staff involved in civil aviation and the licensing of training centres.

4.2.2 The Air Traffic Services Authority (ATSA) of Bulgaria has recently become a separate entity from the Ministry, whilst remaining 100% State owned. It will continue to be regulated by the CAA.

4.2.3 ATSA provides air traffic services over Bulgaria and international waters of the Black Sea. It also carries out a variety of air traffic management functions, including aeronautical information services, alerting, air space management, and flow control management. ATSA operates ACCs at Sofia and Varna to cover the two FIRs. The Sofia Centre has five sectors including one approach control sector. The Varna Centre has four sectors including one approach control sector. Civil and military air traffic control is separate and the Flexible Use of Airspace concept has been implemented.

4.2.4 The main airports in Bulgaria are operated by individual state-owned enterprises regulated by the CAA. A new runway is planned for Sofia Airport, for completion scheduled for the end of 2003, which will provide for an increase in the capacity for airside operations.

4.2.5 The current safety management principles applied in ATSA have been in force for over 20 years. ATSA have internal safety occurrence investigation procedures and continuous performance monitoring of reports from operational and technical units. The ATSA safety management system is developed by the safety department, whose head reports directly to the DG. The safety department carries out a number of safety assurance functions including compliance monitoring, incident investigation and making safety improvement recommendations.

4.2.6 ATSA has implemented a wide ranging modernisation programme, having updated its communication and navigation infrastructure and procured Monopulse Secondary Surveillance Radars (MSSR). With EIB funding, ATSA is also implementing a new Common National Air Traffic Control Centre (CNATCC) at Sofia, to be operational in 2003, into which Varna ACC will then be merged. The CNATCC ATC equipment is being provided by Alenia Marconi Systems. There are also plans to implement a national ATM network for ground/ground data and voice communications, to be operational in 2003. A radar modernisation programme was completed in 2001.

4.3 Cyprus

4.3.1 Civil aviation in Cyprus is the responsibility of the Ministry of Communications and Works. The Department of the Civil Aviation of Cyprus (DCAC) acts both as the aviation regulator and a service provider. It is responsible for the certification

of civil aircraft and equipment, aircraft accident investigation and supervises the safety of aviation in the national airspace, but does not specifically regulate ATM.

- 4.3.2 All the ANS systems procurement, operation and maintenance support to the DCAC is provided by the Cyprus Telecommunications Authority (CYTA). CYTA is also a government body and the monopoly telecommunications services supplier organisation, although there are plans for its privatisation.
- 4.3.3 There is one ACC in Lefkosia (Nicosia) and two tower air traffic units at Larnaca and Paphos airports. The Nicosia FIR borders with FIRs of six different countries, four of them are non-ECAC States: Egypt, Israel, Syria and Lebanon.
- 4.3.4 A new aviation law has been prepared and should be adopted by the end of 2002, with a new Air Navigation Order to be effective shortly after.
- 4.3.5 Cyprus has signed letters of agreements with all its neighbouring countries except Turkey. There is no delegation of ATS with neighbouring countries, although the British Air Force control traffic in the airspace above their bases over which UK has sovereignty.
- 4.3.6 Since Cyprus has no air force, the Flexible Use of Airspace concept has not yet been fully implemented. However, numerous other military users operate within the Nicosia FIR airspace.
- 4.3.7 Revenue streams for DCAC comprise airport revenues and en-route charges as well as government funding. Cyprus does not separately recover costs for ATS in the terminal areas - some of this element is included in the en route cost base. The revenues from CRCO are retained by DCAC, and are absorbed each year into the government approved budget. Budgets are set each year to cover anticipated operating and capital expenditure, and must be approved by Parliament.
- 4.3.8 Air Traffic Controllers are civil servants and part of the work force of the Department of Civil Aviation, at the Ministry of Communications and Works of the Republic of Cyprus.
- 4.3.9 The current Data Processing & Display System (DPS) in Nicosia ACC is 17 years old, albeit upgraded, hence DCAC has plans to replace the facilities. Part of this plan is the deployment of a new Area Control Centre (ACC) in Nicosia. A new building will accommodate the ACC sectors and possibly the new Radar based Approach Control for the Larnaca Terminal Control Area or new TMA.
- 4.3.10 There is an incident reporting system fully compliant with ICAO, but it does not yet cover Eurocontrol ESARR 2 (improve safety reporting). Safety approval of changes to ATM operations is done in each sub-unit using its own approval mechanism. No formal approval and safety case analysis is made for changes to ATM equipment, ATM procedures and training of ATCOs. However, the limited safety management system requires the safety implications of changes to be addressed.

4.4 Czech Republic

- 4.4.1 Civil aviation policy in the Czech Republic is the responsibility of the Ministry of Transport and Communications. Within that ministry, safety regulation of civil aviation, including air navigation services, is the responsibility of the Civil Aviation Authority (CAA), although other aspects of regulation, such as economic regulation and airspace regulation, are the responsibility of other parts of the Ministry. The Czech Republic is participating in CEATS.

- 4.4.2 The air traffic service provider is Řízení letového provozu České republiky, státní podnik (Air Navigation Services of the Czech Republic, or ANS CR), which is a State-Owned Enterprise (SOE). SOEs in the Czech Republic are regulated by general business law. SOEs are established by a special act.
- 4.4.3 ANS is responsible for en-route air navigation services within the Prague FIR, and for terminal services at all airports with the exception of military airfields and private airfields serving aircraft manufacturers. At Prague, the ANS's responsibility extends to apron control; at regional airports apron control is the responsibility of the airport authority.
- 4.4.4 Military OAT is the responsibility of the military, although GAT flights are controlled by ANS. A military ACC is currently operated side by side with Prague ACC and there is extensive cooperation and data sharing between civil and military operations.
- 4.4.5 Airspace management is the responsibility of a Permanent Committee for Airspace Management comprising members from the Ministries of Transport and Defence, from the CAA and from ANS. However, airspace management within civil airspace is the responsibility solely of ANS.
- 4.4.6 Average delays in Czech airspace are less than 1 minute per flight. Nevertheless, Eurocontrol has produced targets for the expansion of capacity. These are not endorsed by ANS, which is currently preparing its own National Capacity Plan.
- 4.4.7 Institutional training of air traffic controllers is carried out at ANS's training centre, located close to the Prague ACC. The centre carries out substantial amounts of training under contract to other ANSPs.
- 4.4.8 There are separate operating units for Prague ACC, Prague APP and TWR, and each of the regional airports. In 2006, it is planned that Prague APP and ACC will be integrated into one ATS room.
- 4.4.9 ANS has also made good progress in adopting ESARRs and implementing a safety management system. ESARRs 2, 3 and 4 have been adopted, with ESARR 5 currently being implemented.

4.5 Estonia

- 4.5.1 The Ministry of Economic Affairs and Communication is responsible for the Civil Aviation Policy in Estonia. The Estonian aviation regulatory authority is the Civil Aviation Administration (ECAA). The ECAA has the authority under the Ministry of Economic Affairs and Communications to exercise civil aviation State inspection and supervise the implementation of national laws and regulations. The main function of the ECAA is to ensure the safety of aviation and execute national aviation policy co-operate with other States and international aviation organisations.
- 4.5.2 The air traffic service provider is Lennuliiklusteeninduse AS, also known as the Estonian Air Navigation Services (EANS). In 1998 EANS became a government-owned stock company. The core activities of EANS are: air traffic management; to ensure flight safety in Estonian airspace; provision of air traffic services; airspace management and control; preparation, exchange and promulgation of aeronautical information; search and rescue co-ordination; aviation expertise and consultancy services. The Military air traffic service within designated airspace is the responsibility of the Estonian Air Force. The GAT traffic is controlled by

EANS. Institutional training of air traffic controllers is carried out at the Tartu Aviation College, which is a State college, jointly with Lennuliiklusteeninduse AS.

- 4.5.3 Estonia is a member of ICAO and ECAC. The discussions to join Eurocontrol are currently under way. Full membership of the JAA is expected in the near future.
- 4.5.4 EANS is responsible for the provision of Air Traffic Services in Tallinn FIR, which has common boundaries with Tampere FIR and Helsinki TMA to the north, St. Petersburg FIR to the east, Velikie Luki FIR to the southeast, Riga FIR to the south and Malmö/Stockholm FIR to the west. Tallinn ACC delegates ATS to Riga ACC in the southwest corner of Tallinn FIR. The civil military cooperation is close and positive. Military traffic within Tallinn FIR is very limited.
- 4.5.5 EANS has completed a modernisation project and in May 2002 a new ATM system (TATCI) became operational. The system is based on the Thales Eurocat 2000 and has a number of safety nets and controller tools. It enables also the controllers to co-ordinate and to control the traffic by means of electronic flight strips.
- 4.5.6 EANS has a good knowledge of safety standards and already complies with ESARR2 on safety occurrence investigation and reporting even though they are not officially enforced in Estonia. It has had a safety management system in place since 1993 and is working towards compliance with ESARR3. EANS agreed its safety policy in 2000 and has recently appointed a safety manager, who reports directly to the CEO and deputy-CEO. EANS has recently gained ISO 9000 accreditation for its Aeronautical Information Services.
- 4.5.7 EANS co-operates with Latvia, Lithuania, Sweden and Finland in the creation of the Baltic ATS Organisation Network (BAN), a ground digital communication project. It participates in Baltic Integration project to harmonise the ATM systems of the Baltic States and Poland.

4.6 Hungary

- 4.6.1 The Hungarian Regulatory Authority is part of the Ministry of Economics and Transport. The Authority is responsible for the supervision of the safety of aviation in the national airspace. Since 1 January 2002, HungaroControl has been set up as a State Agency to provide Civil Air Navigation services. Aviation training is provided by the HungaroControl training centre in Budapest.
- 4.6.2 Safety regulation, licensing and audit are the responsibility of the DGCA and CAA. It is the responsibility of the DGCA to provide safety policy guidelines and for the CAA to monitor compliance with safety regulations. The civil aviation authority has a military equivalent, which is responsible for, eg military controller licensing. The air accident and incident investigation Board has been devolved from the CAA and is now a new independent body. There is an equivalent military CAA and investigation body.
- 4.6.3 HungaroControl is responsible for providing ATS in Hungary's airspace, although there are two cases of delegation with neighbouring States. There is an ATS delegation to Slovakia, south of Košice airport, and simplified sector boundaries between Vienna and Budapest ACC. In addition, the CEATS Convention has been ratified by the Hungarian Parliament.
- 4.6.4 Hungary has one air traffic control centre, MATIAS, which contains seven ACC sectors and one military sector. Control of GAT is by civil or military controllers.

There are currently twelve ATCOs with both civil and military ATC (en-route) licenses.

4.6.5 In transiting between airbases, military traffic fly as OAT under the military controllers at MATIAS. The military unit, known as ATKAS, is part of HungaroControl. MATIAS also exchanges radar data with the air defence centre in Veszprem. Training exercises are controlled by air defence operators. HungaroControl has previously handled air to air refuelling operations. Since the military aerodromes are connected to a sequence of TSAs there is not too much demand on ATKAS, and they spend much of their time controlling civil traffic. Military APP and TWR traffic are handled solely by military controllers at these units.

4.6.6 Hungary applies the FUA concept. A joint High-level National Airspace Coordination Committee has been established. Daily airspace coordination is through the AMC at the MATIAS centre and AUPs are published. At the tactical level, there is practically complete integration, as the military/civil and civil controllers sit side by side.

4.7 Latvia

4.7.1 The Ministry of Transport is responsible for civil aviation policy in Latvia, with regulatory functions carried out by the separate Civil Aviation Administration (CAA). The CAA has regulatory responsibility for the safety of civil aviation in Latvia. The air navigation service provider is Latvijas Gaisa Satiksme (LGS). LGS and the CAA report separately to the Ministry of Transport. The Latvian Air Force is responsible for military aviation, however GAT is controlled by the civil LGS staff with military coordination.

4.7.2 Since 1997 LGS has been a state owned joint-stock company. LGS manages the Latvian airspace and serves both civil and military aviation. It also provides air traffic services to airports. The technical and training branches of LGS are effectively out-sourced to a private company: Air Navigation Services (ANS) Ltd. ANS Ltd has a number of subsidiaries including the ANS Training Centre which carries out institutional training for LGS.

4.7.3 LGS is responsible for the provision of ATM, including ATS, in the whole of Latvia. Riga FIR adjoins Tallinn FIR to the North, Velikie Luki FIR to the East and Minsk FIR to the Southeast. To the South is Vilnius FIR with Malmö and Stockholm FIR to the West. Control of part of Tallinn and Vilnius FIRs are delegated to LGS.

4.7.4 The military have their own airfields and dedicated airspace. They are also free to use uncontrolled airspace below FL 95. Outside this, in normally controlled airspace, LGS provides military flights with navigation services. All military flights, including Latvian ones, are exempt from charges.

4.7.5 LGS provides terminal air navigation services at Riga Airport and at airport Liepaja in the Western part of Latvia. Meteorological services are provided by the state weather service as part of a contract with ANS Ltd.

4.7.6 The ATM infrastructure is quite modern and supports multi radar tracking, electronic flight data and OLDI connections. However there are limited ground data-link connections (OLDI) with neighbours, which is currently being addressed through the Baltic Area Network project. LGS has a policy of not buying single manufacturer, 'turn-key' solutions and ANS Ltd has sufficient internal expertise to support this. ANS Ltd supported the implementation of the SiATM ACC system,

'ATRACC', and integrated commercial system components from a number of other suppliers. ATRACC has a number of controller tools and safety nets including STCA, MSAW and APW.

4.7.7 LGS has highly developed procedures and has ISO 9000 accreditation for the whole of its operations. This also applies to the ANS Ltd company.

4.8 Lithuania

4.8.1 The Ministry of Transport and Communications' is responsible for civil aviation policy in Lithuania. Regulation comes under the Civil Aviation Administration, which is also in charge of Lithuania's international airports. The CAA certifies and approves civil aerodromes and navigational equipment. Up until July 2001 the CAA was also responsible for ATM service provision but the organisations were separated following the new aviation law in October 2000. The newly separated air navigation service provider is Oro Navigacija.

4.8.2 Oro Navigacija is a State-owned Enterprise, headed by a Director General, and reports through the CAA to the Ministry. It is responsible for the safe and efficient air traffic control within Vilnius FIR, flight information services, air traffic advisory services and alerting services. The civil aviation law makes navigation aids and equipment property of the State, although there are exceptions to this at private airports, which have their own assets.

4.8.3 The Vilnius FIR is bordered by five other FIRs: Riga, Minsk, Warsaw, Malmö and Kaliningrad. Control of some airspace over the Baltic sea is delegated to Riga ACC to simplify transfer of traffic between Malmö and Riga.

4.8.4 There is no permanently reserved military airspace in Lithuania. The Lithuanian Air Force is quite small, having only 5 training fighters, 10 helicopters and a few transport aircraft. There are no military air traffic controllers and outside of training areas the military fly as GAT under civil control. There is, however, a military coordination position within the ACC. Inside training areas the aircraft are controlled by air defence units.

4.8.5 Safety regulation is carried out by the Civil Aviation Administration. Oro Navigacija is implementing a safety management system according to the ESARR 3 requirements. A safety manager has been appointed and a safety policy developed.

4.8.6 Vilnius ACC uses the EUROCAT 200 ATM system, in service since January 1995. The next major investment will be an update for this system, however, there are currently no large capital projects planned. Oro Navigacija is involved in a regional cooperation to develop a Baltic ATS organisation Network, including the Baltic States, Poland, and Sweden.

4.9 Poland

4.9.1 The Department of Civil Aviation is the central authority of civil aviation and is responsible for policy, drafting regulations and air law, negotiating agreements etc. The General Inspectorate of Civil Aviation carries out certification, flight safety, security, aerodrome inspection, licensing and examinations, but only limited ATM regulation. Since 17 November 2002, the DGCA and regulator have been combined into the new Civil Aviation Authority. This follows from the new Aviation Act of July 2002. There are also provisions within the act for an Investigation Commission as an independent body for the investigation of aviation accidents and incidents. As these are fairly recent changes, the

following text mainly reflects the status of ATM in Poland before 17 November 2002.

- 4.9.2 The air navigation service provider, Polish Air Traffic Agency or 'PATA' is part of the Polish Airports State Enterprise (PPL). PPL is independent legally and financially.
- 4.9.3 The Warsaw FIR is monitored and controlled by PATA. There is one ACC located in Warsaw and TMAs for Warsaw, Gdańsk and Kraków. All units are co-located. A dedicated military ACC is co-located with the civil ACC in Warsaw.
- 4.9.4 Currently, Polish airspace is divided into operational airspace administered by the military units and the controlled airspace generally designated for use by civil traffic. ICAO airspace classification is adhered to within controlled airspace. The remaining airspace is called operational airspace, which has not been classified to ICAO classifications.
- 4.9.5 The regulator, GICA, carries out licensing and examinations, but most other ATM regulatory activities are carried out by the ATS Inspection Division within PATA or the affected division / department. There is no appointed safety manager. However, PATA has established safety accountabilities and documented procedures.
- 4.9.6 A joint civil/military advisory body has been established for future airspace management, based on the Flexible Use of Airspace concept.
- 4.9.7 There are delegations of responsibility for controlling airspace in two areas over the Baltic Sea to Sweden. Here the charges collected are shared 50:50 with Sweden (Malmö). There are also limited delegations with Germany for operational reasons, APP to Herringsdorf and Drewitz, but with no financial exchange.
- 4.9.8 PATA has its own system for selection, training and human resource management for ATS and engineering staff. Training of ATS staff is performed by a small number of dedicated ATC training staff, augmented by operational personnel serving part-time in the recently established Warsaw training centre.

4.10 Malta

- 4.10.1 Civil aviation in Malta is the responsibility of the Ministry of Transport. The regulatory authority is the Department of Civil Aviation, Malta (DCAM). DCAM is responsible for the certification of civil aircraft and equipment, aircraft accident investigation and supervises the safety of aviation in the national airspace. Since January 2002, Malta's air traffic services have been provided by a newly formed company, Malta Air Traffic Services Ltd (MATS).
- 4.10.2 Safety regulation of MATS is carried out by the DCAM, which sets and enforces technical and operational standards relating to operation and maintenance of aircraft, and the rating and licensing of aircrew and Air Traffic Controllers.
- 4.10.3 There is no military air traffic control organisation. The military operate a few light aircraft and helicopters for surveillance, search and rescue and medivac. They are always under the control of MATS.
- 4.10.4 Maltese airspace is a single FIR with one ACC located at Luqa airport. The FIR is approximately 500 by 150 Nm and is divided into the approach control area and an East and West sector. There are letters of agreement with all adjacent

FIRs, ie Italy, Greece, Tunisia and Libya. There are also contingency plans to pass traffic to these neighbours in case of a total system failure.

- 4.10.5 The ACC also has delegated control over a part of the Italian airspace adjacent to Sicily in order to facilitate descent into Malta. In the Western Sector there was reported to be good surveillance coverage and a radar service is provided. However, coverage to the East of the FIR is limited and the control is procedural. The Malta ACC is co-ordinating some of its actions with the adjacent ACCs of Italy (Rome, Brindisi) and Greece (Athens). Further, Tunisia and Libya are two adjacent non-ECAC States with which there are actions being carried out to greatly improve co-ordination.
- 4.10.6 Malta has a new integrated RDP, FDP and display system supplied by Alenia, which entered into service in 2000. There is ample capacity for the medium term both at the ACC and Luqa airport.
- 4.10.7 Malta is currently organising an initial audit of its safety service, according to ESARRs 2,3,4 and 5. The audit will be carried out by Eurocontrol Safety, Quality and Standards Unit. It has already been determined in principle that Malta meets the requirements of the EATMP Safety Policy.
- 4.10.8 Malta has been re-assessing the route structure at the interface with the African countries and has been trying to improve co-ordination with Algeria, Tunisia and Libya.

4.11 Romania

- 4.11.1 Civil aviation in Romania is the responsibility of Ministry of Public Works, Transport and Housing (MoT), which acts as State authority. Within the MoT there are two departments dedicated to civil aviation - the Directorate General of Air Transport and Airports (DGCA) and the State Inspectorate for Civil Aviation (SICA). The DGCA is responsible for high level policy and regulations, whilst the day to day regulatory functions are delegated to the Civil Aeronautical Authority of Romania (RCAA). Air traffic services are provided by the Romanian Air Traffic Services Administration (ROMATSA), which is a State agency. SICA conducts the official and independent investigations of accidents and serious incidents.
- 4.11.2 The authorisation of air traffic services in Bucharest FIR is under supervision of the RCAA, Air Navigation Services Directorate.
- 4.11.3 Civil - military co-ordination takes place at management and operational levels. At the management level, the Air Forces are represented in the Administration Board of ROMATSA. At the operational level, the military ATC has military co-ordination cells implemented at each ACC site. Military air exercises take place within predefined exercise areas. There is no published Temporary Segregated Airspace (TSA) for military air exercises in Bucharest FIR. No conditional routes are required given the civil route structure. The organisation and principles of the use of airspace are managed jointly by the MoT and the MoD.
- 4.11.4 The FIR is organised in a Control Area (CTA) with an upper limit of Flight Level FL490. For air traffic services purposes the CTA is sectorised laterally and in most cases vertically. A Terminal Control Area (TMA) exists for Bucharest airports (Otopeni and Baneasa).
- 4.11.5 There is a single Bucharest Area Control Centre, located in Bucharest, and two secondary locations in Arad and Constanta. Each of them has an autonomous Radar Data Processing Systems (RDPS). Modernisation of Arad (commissioned

in 1995) and Constanta (commissioned in 1996) is taking place simultaneously with the Bucharest modernisation to deliver a common and integrated system. All three locations cover upper and lower airspace, and the two secondary locations (Arad and Constanta) are available for contingency purposes.

- 4.11.6 Flight data processing is performed centrally at ACC Bucharest, which distributes flight plan data of the central Flight Data Processing System (FDPS) to all secondary locations.
- 4.11.7 Since January 15, 2000, ROMATSA has a separate Safety and Quality Directorate, which is working towards implementing the ESARRs. ESARR 2 compliance involves all the stakeholders in the ATM system. So far, co-ordination for ESARR 2 compliance by Romania has been ensured by RCAA which represents Romania in the SRC. From December 2001 the responsibility for the ESARR 2 implementation belongs to the State Inspectorate of Civil Aviation.

4.12 Slovakia

- 4.12.1 Civil aviation in Slovakia is the responsibility of the Ministry of Transport, Posts and Telecommunications (MoT). Within the MoT, The Civil Aviation Administration (CAA) is responsible for regulation of ATM including, amongst other things: personnel licensing, approving flight procedures, safety oversight in the provision of air traffic services and accident/incident investigation. Air navigation services are provided by Letové Prevádzkové Služby (LPS). Its responsibilities include the provision of air navigation services, aeronautical telecommunication services, aeronautical information services and co-ordination of search and rescue operations.
- 4.12.2 LPS SR became a State enterprise in 2000. It is responsible for the provision of air navigation services and other services mentioned above in the airspace of the Slovak Republic and at specified public airports (Bratislava, Košice, Piešťany, Poprad-Tatry, Sliač and Žilina). In terms of the number of flights, the major airports are in Bratislava and in Košice. However, the use of all of them is still well below their offered capacity.
- 4.12.3 There is some limited delegation of ATS to HungaroControl and AustroControl for operational reasons and there are no financial transactions. Slovak en-route airspace is controlled from a single ACC in Bratislava.
- 4.12.4 The military and civil ATS were operationally and organisationally separate until December 1999. Since then OAT within common airspace is controlled by a military unit which is incorporated in LPS SR Bratislava. The OAT unit shares the same equipment as the civil ACC unit. All data available from civil sources are distributed into the military system (Air Operations Control Centre). However, at Košice and Sliač (combined civil/military airports) facilities are duplicated because different procedures between civil and military flights within terminal areas still exist.
- 4.12.5 The military flights of the Slovak Air Force are not subject to any charges, and other States' military flights are exempt under reciprocal arrangements. VFR flights are exempt from en-route charges, but not for approach and aerodrome control. The military is not charged for the use of LPS SR facilities, except for AFTN lines between Bratislava and two military sites.
- 4.12.6 LPS SR is required to publish audited accounts. Common costs are allocated between en-route and terminal charges in the proportion 93% to 7%.

- 4.12.7 LPS SR has established an independent safety organisation reporting directly to the Director General. Its aim is to promote the safety management concept throughout the organisation. The establishment of a Safety Management Systems (SMS) is in progress in accordance with the recommendations of Eurocontrol Safety Policy and ESARR standards. The Safety Management Manual has been produced including policy, targets and techniques.
- 4.12.8 Close co-ordination is done with the adjacent centres. LPS SR has strategic plans covering the period up to 2015/20. These plans cover all aspects of the provision of services as considerable harmonisation and integration will have to take place within the CEATS region. The plans include common airspace classification, licensing of Air Traffic Controllers and operational concepts.
- 4.12.9 The Slovak Republic is within the CEATS area. That means, as from 2010 the provision of air traffic services at FL 285 and above will be fully delegated to the CEATS UAC. LPS SR will then retain control of the airspace below this level.
- 4.12.10 The Slovak Republic is a regular member of ICAO, ECAC, EUROCONTROL and a member of JAA with candidate status. LPS SR itself is a member of the CEATS ANS providers' support association (CAPA), CANSO and IKSANO.

4.13 Slovenia

- 4.13.1 The Ministry of Transport is responsible for the high level Civil Aviation Policy in the Republic of Slovenia. The Slovene aviation regulatory authority is the Civil Aviation Administration (CAA), which is an independent administrative body within the Ministry, established in 1991. The CAA is responsible for ANS safety regulation including personnel licensing. The CAA is also responsible for the certification of civil aerodromes, aircraft, flight personnel and equipment.
- 4.13.2 The ATS provider is currently a department of the CAA, known as the Air Navigation Services of Slovenia (ANSS). Currently the revenue and capital expenditure budget for the ANSS, as part of the CAA, is directly controlled by the Slovene Treasury. An Act of Parliament has been drafted to establish the ANSS as an independent commercial organisation. This should be passed before the end of 2002, however there are strong concerns as to whether it will be enacted.
- 4.13.3 ANSS is responsible for providing services to air traffic in the Ljubljana FIR, which is bounded by Wien FIR to the north, Budapest FIR to the east, Zagreb FIR to the south and Milan UIR to the west. Ljubljana ACC delegates ATS of the north-east (Mura) sector of Slovenian airspace to Wien ACC.
- 4.13.4 ANSS controls military air traffic flying as GAT. There is little operational military activity in Slovenia. There are only a few turbo prop aircraft, which confine their activities to below FL240. Slovenia has adopted the principles of the flexible use of airspace but in practice only a minimum amount of tactical and pre-tactical coordination is required.
- 4.13.5 ANSS is the monopoly provider of ATS for en route and airports. Presently terminal navigation costs are covered by the State budget but proposals are now well advanced to bill separately for terminal charges through the CRCO, with the separation of ANSS. The military contribute to the ANSS budget by seconding eight military ATCOs to the CAA, who then work as civil controllers in the normal roster.
- 4.13.6 A safety organisation in accordance with Eurocontrol guidelines is established and implemented in the Slovene CAA and a safety manager is assigned. The

safety manager reports directly to the Director General. A Safety Management System (SMS) and safety standards are about to be implemented in accordance with Eurocontrol ESARRs. ANSS has a good knowledge of safety standards and already complies with ESARR2 on safety occurrence investigation and reporting. The CAA agreed its ANS safety policy in 2002. The CAA publishes airprox statistics on an annual basis and collated data is forwarded to Eurocontrol.

4.13.7 As part of CEATS, Slovenia plans to delegate control responsibility in the upper airspace, above FL285, to the CEATS UAC in Vienna. The ANSS will retain responsibility for aircraft in the lower airspace and terminal areas.

4.13.8 A quality management system is in place, which conforms to Slovenian national standards.

4.14 Turkey

4.14.1 Civil aviation in Turkey is the responsibility of the Ministry of Transport. Within the Ministry, regulatory responsibility is exercised by the Directorate General of Civil Aviation (DGCA). This body certifies civil aircraft and equipment; all civil aviation staff; and carries out aircraft accident investigation and supervision of the safety of aviation in the national airspace.

4.14.2 Service provision is the responsibility of the State Airports Authority, Devlet Hava Meydanlari İşletmesi (DHMI). This organisation is responsible both for airport operation and air navigation service provision. It manages thirty four airports and aerodromes and terminal navigation services for all airports in Turkey. Its Air Navigation Department provides all en-route air navigation services, and services at all DHMI airports.

4.14.3 Safety regulation is part of the DGCA's overall regulatory responsibility. Turkey is in the preliminary stages (evaluation) of its safety service and procedures and, in particular, the influence of ESARR implementation.

4.14.4 DHMI is a State controlled enterprise reporting directly to the Turkish Ministry of Transport. The DGCA are also a part of the Ministry and are responsible for regulation over the whole aviation sector. A new Civil Aviation Law is currently in draft, and will be considered by Parliament in the near future. This will result in a major re-organisation of the DGCA, and we understand this to involve independence from the Ministry of Transport.

4.14.5 Airspace in Turkey is organised into two FIRs: İstanbul and Ankara. The İstanbul FIR is subdivided into a northern part and a southern part. These services are supported by three main units: İstanbul ACC, Ankara ACC, İzmir APP. The Ankara ACC is responsible for the Ankara FIR (six sectors) and approach services into Ankara airport. The İstanbul ACC is responsible for the northern part of the İstanbul FIR (three sectors) and approach services into İstanbul airport. The İzmir APP is responsible for the southern part of the İstanbul FIR (one sector) and for approach services into Menderes airport.

4.14.6 Turkey intends to adopt the standard ICAO classifications for its airspace and talks are due to commence with the military in September 2002. The co-ordination of civil and military air traffic control is overseen by a high level co-ordination but Turkey has not yet adopted the principles of the flexible use of airspace.

- 4.14.7 The operational environment poses a number of specific problems to DHMI. In particular, Turkey is responsible for the transition of traffic from outside European airspace and this involves, for example, changes in lateral separation standards. Furthermore most of Turkey's neighbours do not operate RVSM.
- 4.14.8 DHMI has started a wide ranging modernisation programme called SMART (Systematic Modernisation of the ATM Resources in Turkey). The programme involves the merger of all existing ACC's into a single unit at Ankara by 2010. SMART involves a radical reorganisation of airspace design. TAMP (Turkish ATC Modernisation Project) is that part of SMART which deals with the CNS/ATM infrastructure. The SMART plan is being developed in conjunction with Eurocontrol Support to States.
- 4.14.9 There is no shortfall in sector capacity at either İstanbul or Ankara and this is reflected by the negligible delay statistics. The largest risks to ATS operations are equipment reliability and controller availability. Equipment reliability is being addressed by the SMART programme and controller availability by an extensive recruitment/ training programme.
- 4.14.10 The implementation of safety procedures under the ESARR requirements is at the early planning stage. A safety management system is planned for 2003. The provision of quantitative safety data for systems is likely to take much longer and probably confined to new systems provided under the SMART/TAMP programme.
- 4.14.11 There is a need to increase controller numbers to reduce workload. DHMI have initiated a recruitment programme in conjunction with the Eurocontrol Institute of Air Navigation Services, to increase the controller complement by 200. To support this programme, budgetary provision is available and new simulator facilities have been installed at Ankara. DHMI are constrained by the relatively long process of recruitment of trainees through the centralised Government recruitment agency.
- 4.14.12 Civil and military ANS are completely separate. A co-ordination group comprising the Military, DGCAA, and Ministry of Foreign Affairs has been set up. This group are responsible for making all decisions associated with the resolution of the civil/military interface at the strategic level. Co-ordination at the tactical level is achieved by coordination between controllers at the relevant ACC/ADNC. Meeting the Military demand for airspace is not a significant problem given the large geographical area. There are no detailed plans for the implementation of the full principles of FUA.

5 Development scenarios

5.1 Introduction

- 5.1.1 In this chapter we consider the development needs of candidate States on an individual basis and in the context of a Single European Sky. Much of this chapter could equally apply to some EU States.
- 5.1.2 Through the benchmarking we have established that, on the whole, the provision of air traffic services is handled very professionally by the candidate States. Our view is that the problems facing candidate States are similar to those facing European Union States. The challenges for candidate States are also similar, to improve efficiency / cost effectiveness, safety and quality of service. Where they differ is that, for the medium to long term, there are no particular capacity problems.
- 5.1.3 To form scenarios for the development of ATM in the candidate States, we have considered:
- the current status of ATM, discussed in the preceding chapter;
 - the current levels of cooperation between candidate States;
 - the results of the benchmarking.
- 5.1.4 Our analysis has led us to develop scenarios in the short, medium and long term. In turn, these scenarios have led us to recommend actions on a national, regional or European basis. A framework for the scenarios is shown in the following figure.

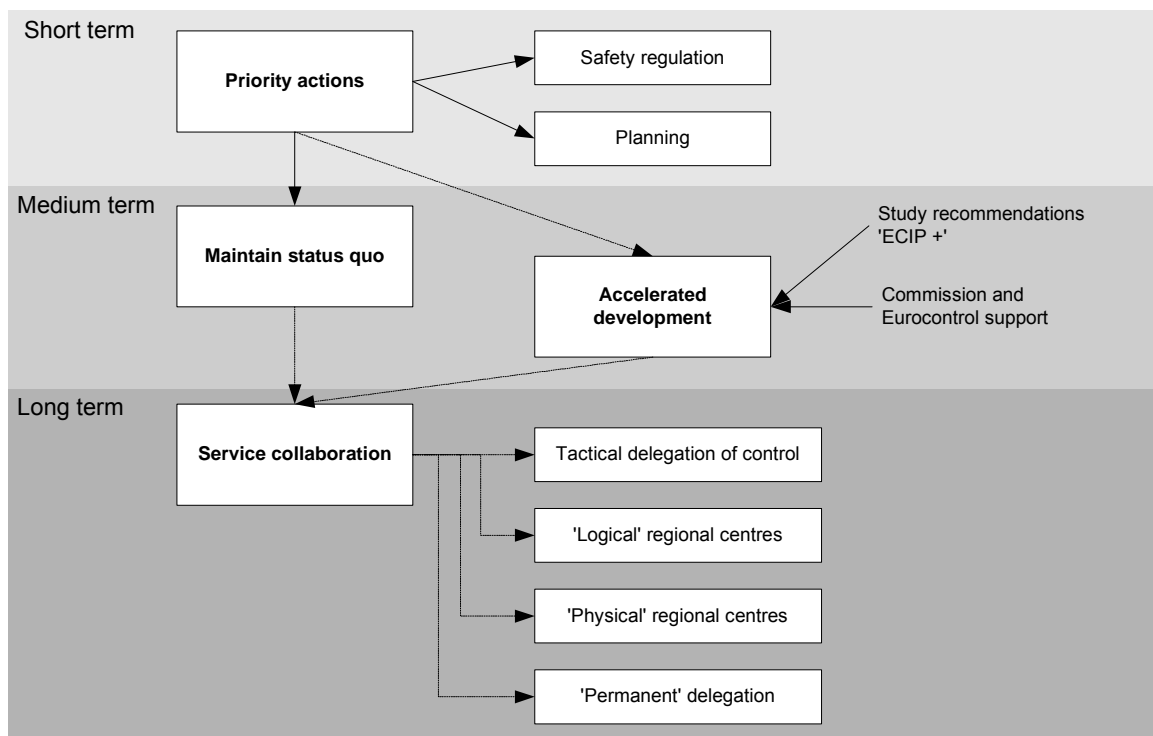


Figure 5-1: Framework for development scenarios

- 5.1.5 The short term covers areas where we believe there is a high priority to take action in the next one to two years.
- 5.1.6 The medium term addresses potential development actions that may lead to an improved quality and robustness of service. The medium term covers the three to five year timescale. It is not intended to duplicate the European Convergence and Implementation Plan, or 'ECIP'²². However, some of the findings point to areas where we think the ECIP objectives should be reinforced, and some look beyond the time-frame of the ECIP. In the figure we have labelled these as ECIP+, although as a living plan, the ECIP could very well include similar actions in future.
- 5.1.7 The long term considers the potential for substantial cooperation between ANSPs. As mentioned previously, Maastricht and CEATS are models for future collaboration. However, we have also proposed alternative measures of cooperation.
- 5.1.8 This section describes the short, medium and long term scenarios and gives our proposals for national, regional and European level actions to support these scenarios.

5.2 Short term development - priority actions

- 5.2.1 Most of the short term development proposals are specific to individual States and have been separately presented to States as proposed national actions. However, there are some common regional or European actions of particular note, as follows.

Adoption of ESARRs

- 5.2.2 Application of ESARRs in some States is not well advanced. This is due in several States to a lack of resources of both ANSP and regulator. Regional assistance has already been given through the PHARE programme to some countries but we would recommend a review of the success of this support and, if appropriate, further support. It is likely that coordination by the Safety Regulation Unit would be beneficial.

ATM regulatory resources

- 5.2.3 Regulatory staff resources seem particularly low in several States. The required numbers and proficiencies of ATM regulatory staff have not been determined in this study, but there is evidence that the current resources are low. In several States this results in substantial delegations of regulatory responsibility to the ANSP, whilst the regulator retains moderate oversight.

Contingency plans

- 5.2.4 Many States do not have contingency plans for loss of major facilities. As the majority of States will soon have only one ACC, it would be sensible to have contingency plans involving, for example, delegation of traffic to neighbouring States or retention of old facilities. This is an area for regional cooperation that

²² The ECIP provides a Europe-wide, high level implementation plan driven by performance requirements. These requirements reflect the ATM 2000+ Strategy as well as performance and safety objectives set by the PRC and SRC.

could probably be enhanced by additional expert support from Eurocontrol. We recommend a review of contingency planning guidelines across all States.

Business planning

- 5.2.5 Strategic business planning is at various stages of development in States. Some are well advanced, whilst others have little in the way of integrated business planning. Because good business planning underpins all future performance, it should be a high priority for States to review their planning process against the PRC model we have used in the benchmarking.

5.3 Medium term – maintain status quo or accelerated development

- 5.3.1 The medium term development scenario is partly focused on administrative processes, such as quality management, but also proposes greater regional cooperation for non-core services, such as training.

Formal quality management

- 5.3.2 Many States are considering the adoption of formal quality management across their entire operations, following from the implementation of ISO 9000 for aeronautical information services. However, we would recommend that this is generally adopted and given appropriate support.
- 5.3.3 Those States cooperating in CEATS have reported difficulties in planning whilst the detailed CEATS planning issues remain unresolved. Whilst this is a particular issue for CEATS, we are concerned that it should not undermine the eventual benefits of CEATS or result in undue cost escalation in the CEATS region.

Training facilities

- 5.3.4 Several States maintain their own training facilities in spite of what is generally a low requirement for controller training. This is an obvious area for increased collaboration between States, which would be greatly supported by further harmonisation of standards in basic training.

Military flights

- 5.3.5 Several States offer a service to military flights without recompense, either due to reciprocal arrangements or because national military flights are exempt. This can cause particular problems when there are large numbers of flights. As an example, 20% of flights handled by MATS in January 2002 were military and exempt from charges. Common European principles in this area may be of benefit to particularly affected service providers.

Foreign military operations

- 5.3.6 Military operations, eg by the US, can also cause operational difficulties for some States and there are certain safety concerns. Concerned States could potentially be assisted by a European airspace regulator.

Regulator funding

- 5.3.7 There is a disparity in how States fund regulation, for example through en-route charges and / or license fees or from the State budget. Through the benchmarking study we have found that several regulators seem quite under-resourced. An underlying problem for some States appears to be that regulators

compete for funds within the Government budget. A symptomatic problem is that regulatory staff are then poorly paid in relation to their service provider counterparts. Anecdotal evidence suggests that this can lead to poor relationships and potentially undermine safety.

- 5.3.8 Regulator funding is likely to be an issue for EU Member States and is an area where the Commission could work with the Safety Regulation Commission to develop funding and resource principles.

5.4 Long term development – service collaboration

- 5.4.1 As indicated in Figure 5-1, there is a spectrum of potential service collaboration actions, of which regional centres such as Maastricht or the planned CEATS are good examples. We have defined four basic categories, as follows:

- ‘tactical’ delegation;
- ‘logical’ regional centres;
- ‘physical’ regional centres;
- ‘permanent’ delegation.

‘Tactical’ delegation

- 5.4.2 For the States with smaller operations, there are clear difficulties in maintaining efficient services during low traffic demand periods, for example during the night. It would therefore be worthwhile States considering future delegations of their airspace in low periods. Given the typical cost sharing agreements for ‘permanent’ delegations, this may be of particular interest to some States.

- 5.4.3 We have looked at a three day sample of traffic data from June 2001 to determine whether this is a viable concept. The figure below shows the approximate ratio of demand to peak ACC capacity, gathered from the 2001 ECIP Status report. This is an approximate analysis, and uses average demand within each period to illustrate the principle that in some periods, there exists the possibility for tactical delegation to gain pan-European economies of scale.

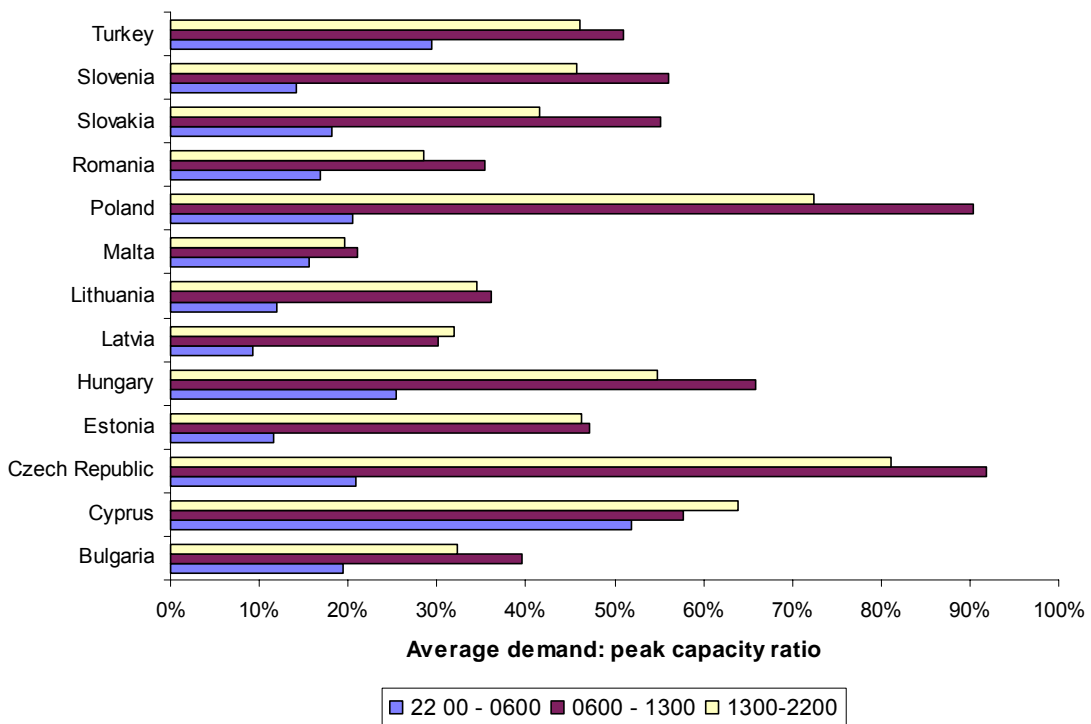


Figure 5-2: Average demand to peak capacity ratio (June 2001 traffic sample)

- 5.4.4 The figure clearly shows that demand is typically less than 30% of peak capacity for the majority of States during the eight hour period 22.00 to 06.00. The figure also gives a clear indication of why delays were experienced in 2001 for Poland, Cyprus and the Czech Republic.
- 5.4.5 To consider this concept further, it is interesting to look at two geographical groups in more detail, both of which are already highly cooperative: candidate States that are members of CEATS; and the Baltic States. These groups are also familiar with delegating control of airspace, and with some including financial transactions. The two following figures show, from the same traffic sample, the average hourly demand.

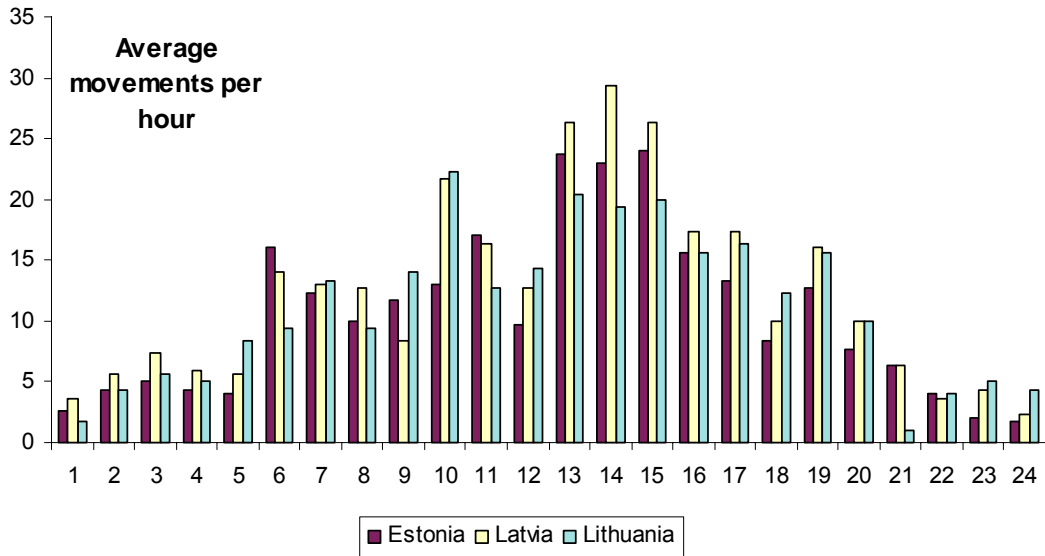


Figure 5-3: Average hourly movements, Baltic States (June 2001 traffic sample)

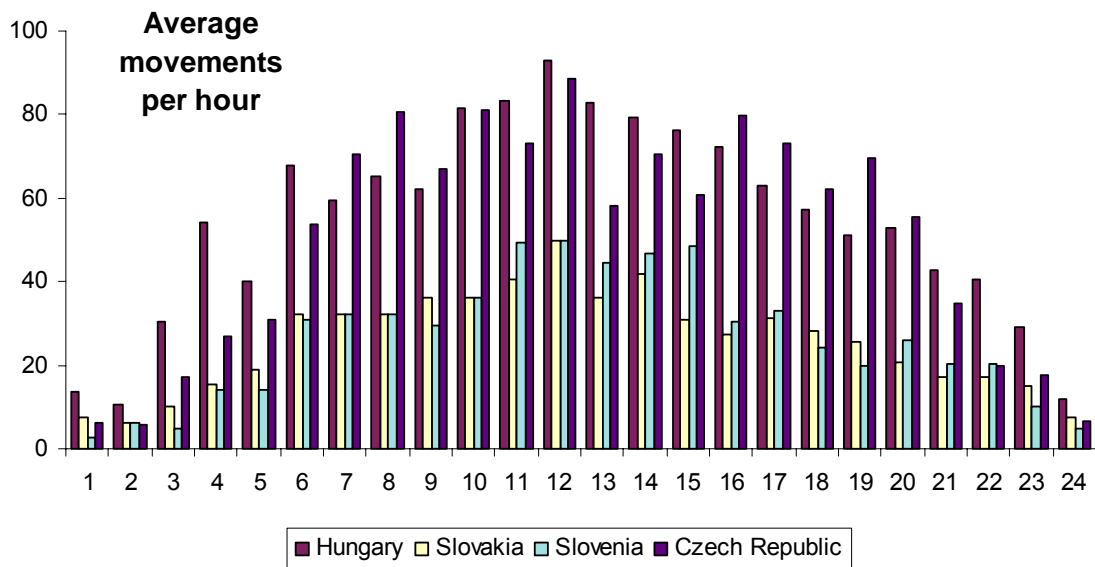


Figure 5-4: Average hourly movements, CEATS States (June 2001 traffic sample)

5.4.6 The above analysis shows that there is at least the potential for benefits, for what could be described as tactical delegation of control. Aside from the savings in costs, there are likely to be additional benefits through greater network resilience. This concept would clearly have implications for training and communication and data processing systems.

‘Logical’ or ‘virtual’ regional centres

5.4.7 The concept of ‘logical’ regional centres embraces the functional blocks of airspace defined by the Single European Sky, with a distributed, yet seamless

control concept. At one level, it is similar to the previous category of tactical delegations, enabling cross border opening and closing of sectors. However, this category includes all periods throughout the day and could extend to ACCs that are not adjacent.

'Physical' regional centres

- 5.4.8 Maastricht and the planned CEATS are examples of physical centres. Within this category, there is the potential for increasing collaboration from the upper airspace (as Maastricht and CEATS) to terminal areas and lower airspace control. The potential for cost savings is likely to increase in line with the degree of collaboration, through increased operational flexibility.

'Permanent' delegations of control

- 5.4.9 Delegations of control are reasonably common for operational reasons but there are also several examples where there is a financial exchange. This typically involves 50% of the charges being retained by each State. Given this cost sharing principle, it is perhaps surprising that there are not more such delegations. This is clearly an area for further investigation as it may aid the formation of functional airspace blocks. These 'permanent' delegations would range from control of small areas to whole scale delegations, either to neighbours or regional centres. It is likely that a specialist ATM body would need to be maintained in each State for CNS, administration etc.

6 Impact of the Single Sky regulations on EU enlargement

6.1 Introduction

6.1.1 This section is drawn from direct discussions with States on the impact of the draft single sky regulations, supplemented with findings from the benchmarking where there is direct relevance to the Single Sky. In particular, the benchmarks relating to the following areas are relevant: ESARRs; airspace design; the flexible use of airspace; accounting; pricing policies; recruitment and training. Before discussing these areas, we note the main concerns of States.

6.2 Synthesis of States' views on the impact of implementing the Single Sky regulations

Burden of implementing the single sky proposals

6.2.1 There was a general concern over the burden of implementing the regulations. There was a particularly strong concern for the requirements on national regulators and, for some States, the need to change existing Air Law and possibly other legislation.

Military awareness of the SES proposals

6.2.2 At the beginning of the study, there was concern that ANSPs military counterparts were not well briefed on the draft Single Sky regulations. Most participants took an action to discuss the proposals with their military colleagues, and military representatives from several States were involved later on in the study. As a consequence, there should now be heightened military awareness of the Single Sky, although we would encourage further discussions with military ATC.

Candidate representation on Single Sky Committee

6.2.3 A strong recommendation was made by participants to involve candidate States in the workings of the proposed Single Sky Committee. If there were to be both civil and military representatives, then this would also encourage local understanding and cooperation through the flexible use of airspace.

Incompatible national legislation

6.2.4 Several participants believed that significant changes to their national legislation would be necessary to adapt to the Single Sky regulations. This may cause particular problems for those who have only recently changed their air law. Areas of concern were:

- delegating control of airspace;
- separation of regulation from service provision, albeit that the minimum requirement for functional separation should be achievable;
- citizenship and nationality requirements for air traffic controllers.

Regulation

6.2.5 A number of issues were raised concerning the requirements on regulators:

- Current and future lack of resources and expertise within safety regulators. For example, several regulators are behind service providers in adopting the Eurocontrol Safety Regulatory Requirements (ESARRs).
- The general burden on regulators in implementing the Single Sky regulations.
- The feasibility of delegating regulatory tasks to external agencies.
- The need to separate regulation and service provision in Eurocontrol. It was noted that contributions to Eurocontrol costs include a regulatory component.
- Information on regulators should also be reported, potentially through safety regulator performance indicators.
- The independence of government departments were questioned where they receive funds from the service provider and also regulate.

Competition

6.2.6 Several States are already operating in competitive environments, particularly smaller States where airlines have an alternative choice of routes either over or bypassing states to achieve lower charges. This particularly applies to Malta, Slovenia, Estonia, Latvia and Lithuania.

6.2.7 There is also some concern that some adjacent non ECAC States such as Tunisia, apply different rules from Eurocontrol States giving un-fair competition. This concern extends to the perception that there are unofficial agreements between Maghreb States to encourage traffic to fly over each other's airspace, avoiding Maltese airspace.

6.3 Benchmarking issues relevant to the Single Sky proposals²³

ESARRs

6.3.1 Part I Article 5 (1) of the draft Single Sky regulations (the provision of Air Navigation Services) requires the adoption of ESARRs. The majority of States have started implementing ESARRs and several have completed or near completion. Most progress has been made in ESARR 2 and ESARR 5. Nearly all States have found difficulties with ESARR 4, and some have commented that it is not well defined in places. From the Eurocontrol 2001 ECIP Status report²⁴, it appears that the majority of ECAC States are behind in their implementation of ESARRs.

6.3.2 Although there have been delays in implementing ESARRs, no States have informed us of any substantial problems. From the Single Sky perspective, there are unlikely to be any fundamental problems with the requirement to adopt ESARRs.

²³ References to the draft regulations in this section are to COM (2001) 564 final, 'Regulation of the European Parliament and of the council on the provision of Air Navigation in the Single European Sky Brussels, 10 October 2001.

²⁴ The European Convergence and Implementation Plan (ECIP) 2001 Status Report.

Airspace design

- 6.3.3 Part 2 Articles 6 and 8 of the draft Single Sky regulations (the organisation and use of the airspace) specify measures for the harmonisation of airspace and on airspace design.
- 6.3.4 Eleven States report that they have fully adopted the ICAO airspace classifications and from a review of AIPs we have found no reported differences to ICAO. There are two exceptions in the candidate States: Turkey and Poland, which were discussed in section 2.6.
- 6.3.5 Twelve of the thirteen States report that they consult with both airspace users and neighbouring States over airspace design proposals. Many have been active through Eurocontrol in implementing route changes optimised to the European network. The majority of States either have established, or are very close to establishing, a high level joint civil-military airspace policy committee.
- 6.3.6 No States reported any particular concerns with the establishment of common European upper and lower flight information regions.
- 6.3.7 Our conclusion is that at least at a high level the necessary mechanisms will be in place to meet the requirements of the draft Single Sky regulations. Any concerns are likely to be with the degree of user consultation.

The flexible use of airspace

- 6.3.8 Part 3 Article 10 of the draft Single Sky regulations (the organisation and use of the airspace) proposes the uniform and full application of the flexible use of airspace (FUA). Most States report that they have adopted the concept of the flexible use of airspace, although only a few appear to have fully adopted it according to the FUA Handbook. However, the degree of civil military cooperation appears entirely appropriate and, for some States any further adoption would not be beneficial. This is because in many candidate States there is only limited military training activity, which is often away from the main civil traffic flows.
- 6.3.9 By the end of 2002, the majority of States will have established a joint high level airspace policy body. Several States do not require extensive pre-tactical cooperation. Only a few States publish an airspace use plan as there is generally a low requirement for conditional routes. At the tactical level cooperation is generally good for most States, with some requiring just coordination between civil and military controllers and many States with collocated units.
- 6.3.10 Our conclusion is that in for the most part there are no particular barriers to the adoption of the flexible use of airspace concept. However, care must be taken as to the degree of adoption required in each State. At present most States have a level of cooperation commensurate with their military's training requirements. A possible exception is Turkey since, although it has civil – military coordination, it could develop this much further.

Accounting

- 6.3.11 Part 2 Article 11 of the draft Single Sky regulations (the provision of Air Navigation Services) sets out a number of measures relating to accounting standards. From the benchmarking, we have found that most States produce annual accounts that are independently audited, although for some States this is

by a Government auditor. Many States already conform to international accounting standards and several more plan to do this in the next few years.

6.3.12 In terms of accounting separation, it appears that for most States this will not be a particular issue given their current accounting systems, although it will require efforts to resolve cost allocations.

6.3.13 We conclude that the accounting related measures in the draft regulations are unlikely to pose particular problems to candidate States.

Pricing policies

6.3.14 Part 2 Articles 13 and 14 of the draft Single Sky regulations (the provision of Air Navigation Services) refer to pricing policies, including transparency. For the majority of States, ie those that are already within the central route charges system, the pricing policies should be fairly consistent. The issues that have emerged are that:

- some States do not explicitly charge terminal navigation charges;
- there is at least anecdotal evidence that terminal navigation charges are kept artificially low in some States, subsidised by en-route charges;
- Poland discriminates between domestic and international users.

6.3.15 The draft regulations will therefore require particular efforts by States to ensure their charging principles are transparent and cost reflective. Poland's charging policy is likely to change when they join Eurocontrol.

Recruitment and training

6.3.16 Part 1 Article 6 of the draft Single Sky regulations (the provision of Air Navigation Services) proposes future measures on the mobility of air traffic controllers and enhanced training. Although the detail of these measures has not yet been defined, the study has yielded a number of relevant findings. In particular there appears to be plenty of scope to formalise and improve 'on the job' training of controllers and instructors. Concerning mobility, the institutional status of some ANSPs may be a barrier where the ANSP remains part of the civil service and thereby requires citizenship. No States reported particular concerns about losing controllers to other States, however, this must surely become a concern.

7 Summary results of the benchmarking

7.1 Introduction

7.1.1 This section describes the main findings from Part 2 of this report, organised according to each domain of analysis. The findings arise directly from the benchmarking. Several have already been referred to in earlier sections of this document but are repeated here for completeness. Not all of the benchmarks are mentioned and only summary details and recommendations are given.

7.2 Institutional factors

7.2.1 The benchmarking questions concerning the legal framework of States focused on whether there were any particular constraints affecting service providers. The main cause of constraint has been found to be where ANSPs are part of Government Departments. This can lead to difficulties in recruitment: where Government wide restrictions are imposed; or additional requirements such as citizenship. No States reported particular problems in raising investment capital and most had access to a variety of sources.

7.2.2 As already mentioned, regulatory resources are of concern for several States. From the main cash flows between organisations in each State we have determined the following about regulator funding:

- Direct funding of the regulator from the ANSP, eg through a licence fee occurs in three States: Bulgaria, Romania, Slovakia.
- Funding of the CAA from the Government budget is the practice in eight States: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Slovenia and Turkey.
- There is no explicit ATM regulator in Cyprus and Poland, although this should change in the short term.

7.3 The regulatory framework

7.3.1 From an international perspective, a few issues arise for States that are not already members of Eurocontrol. It is likely that they will join Eurocontrol in the medium term, which we support. However we recognise that these States have concerns about Eurocontrol's costs, particularly the route charges and IFPS systems. Where States are not part of the CRCO system, we propose that they should adopt the same rules, as is already done by Estonia. This would remove any remaining discrimination towards users.

7.3.2 We believe it is important to address transparency in cost allocation and prices in developing the detail of Single Sky regulations. In particular this would address a thorough review and action on cost allocation mechanisms for terminal navigation charges. We also believe that a common European approach could be taken towards charges exemptions, particularly VFR and military.

7.3.3 During the benchmarking study, we had direct contact with only a few of States' regulators, which we believe is symptomatic of their low resources. This is a key concern and raises a number of questions about safety regulators in particular. We would recommend further targeted study and dialogue in this area.

7.4 Economics and performance

Discussion

7.4.1 We have largely followed the work of the PRU in determining financial and related performance indicators. In particular the measures of input that we have used comprise capital costs (according to CRCO definitions) and operating costs: divided into the staff costs relating to ATCOs in the operations room, and other costs.

7.4.2 The principal measures of input are:

- for en-route navigation services, flight-hours controlled or km controlled;
- for terminal navigation services, terminal IFR movements and terminal VFR movements.

7.4.3 To determine operational complexity our indicators comprise:

- 'density', as the number of IFR flight-km controlled per year per km² of airspace;
- 'the number of vertical movements per movement'
- 'complexity' which includes both these measures, plus some further measures less readily quantified.

7.4.4 The 'density' measure is not a perfect indicator but we believe is suitable for our analysis. For example, it does not account for the different extent of flight levels of different ANSPs or the different military constraints. It also varies widely across the airspace in a given FIR. The PRU in some of their work have attempted to reflect this by the use of 'concentration indices', with limited success.

Cost effectiveness

7.4.5 The measures of cost effectiveness we have used comprise, for en-route navigation services:

- total en-route costs per en-route km controlled;
- en-route capital costs per en-route km controlled;
- en-route operating costs per en-route km controlled.

7.4.6 And for terminal navigation services:

- total terminal costs per IFR terminal movement;
- terminal operating costs per IFR terminal movement.

7.4.7 Among the States, there is a wide variation in costs per km controlled, with a factor of more than three difference between the lowest and highest. This indicator is highly correlated with the unit rate for charging.

7.4.8 We have found no correlation between overall en-route costs and density. Neither have we found any relationship between cost and the proportion of terminal movements. Indeed, the States with more vertical movements seem to have lower costs.

- 7.4.9 We have looked at the component costs of service provision in three categories: the costs of the front-line staff – ATCOs in operations; other operating costs and capital-related costs. There is a remarkably wide range of the ATCO costs component. One country is particularly noteworthy, as only 2% of its service costs are for employing ATCOs.
- 7.4.10 For the cost-effectiveness of providing terminal services, there is a wide variation even among the six States for which we have data. With a factor of four variation between the least and the most costly. There is an even wider variation in the ratio of capital to other costs, with the capital costs being very low in Hungary and Lithuania, and higher in the other States. We may be looking here at the effects of some different approaches to cost allocation.

Productive efficiency

- 7.4.11 The efficiency of production requires a measure of the capacity provided, which was not sought by the PRU in their request for information as it was found to be too difficult for the ANSPs to obtain. A detailed discussion is in Part 2 of this report.
- 7.4.12 We have, however, tried to determine insights by breaking down the overall cost-effectiveness into components. In this context, en-route labour productivity is measured by flight-hours or flight-km controllable, and terminal labour productivity by terminal movements controllable per ATCO-hour in the operations room.
- 7.4.13 By comparing the flight-km controlled per ATCO-hour in operations there is a huge variation, with a factor of over 4 between the greatest and the smallest. Our hypothesis is that this indicator might be low for areas with few sectors, since they had not the same flexibility to reduce staffing at night.
- 7.4.14 The flight-hours per sector-hour show that averaged over the period, a sector in each of the States controls somewhere between a little over four aircraft in the Czech Republic and a little over one in Lithuania.
- 7.4.15 We have compared sector manning as ATCO-hours per sector-hour. We would expect manning per sector to be in broad terms a little higher than the number of staff required to open a sector position, to allow for breaks, supervision and flow management positions. However for some ANSPs the figures are much higher, which we believe is due to a misunderstanding of the data required by the Information Disclosure Documents.

Asset productivity

- 7.4.16 The PRU suggest measures of asset productivity as sector-hours (or flight-hours controllable, if available) per unit value of assets, and flight-hours controlled per unit value of assets. Their measure of the value of assets is the Net Book Value (NBV), ie net of depreciation. Given the difficulty in getting data on capacity provided, we have preferred to use flight-km controlled as the numerator in our indicators.
- 7.4.17 The en-route flight-km controlled per €-worth of fixed assets (NBV) shows a remarkable variation, with a factor of twenty between the lowest, where a €'s worth of assets is required to control 0.23 flight-km, and the highest where it controls nearly 14 flight-km. This may be related to the age of systems – ideally this should be confirmed by seeking GBV figures.

- 7.4.18 We believe that the Gross Book Value (that is, before allowing for depreciation) would be a better choice for the denominator but this data was not included in the Information Disclosure Documents. CANSO examine capital expenditure per movement. However, capital expenditure in a year can be volatile, especially in small organisations so we have continued with the PRU measures.

Support cost productivity

- 7.4.19 The 'support cost ratio' indicates for each Euro that is spent on ATCOs in operations, how much is spent in other operating costs, such as maintenance staff and costs, and administrative staff and costs.
- 7.4.20 We have compared the variation of the 'support cost ratio' between States. In many States this ratio is around 2, with the lowest measured being 1.67. However, it rises to 10 in two States and over 30 in one. This variation clearly either represents a misunderstanding of the data required as part of Information Disclosure or radically different ways of operating.
- 7.4.21 We have also found large variations in MET costs, measured as MET costs per 1000 en-route flight-km. States costs vary from €1.5 to nearly €70. Variations in MET costs most often reflect the fact that ANSPs are normally required to purchase services from a national monopoly provider.

Employment costs of ATCOs

- 7.4.22 In practice, the data we have obtained permit us to look at only a subset of these indicators. The Information Disclosure Document requests data on 'Staff Costs for ATCOs in OPS' and on the number of these staff. We therefore can infer the employment cost per ATCO in OPS. The Information Disclosure Document also gives us data on the ratio of employment cost to wage rates for ANSP staff in general, from which we can infer the wage costs of ATCOs, on the assumption that this ratio applies equally across all staff.
- 7.4.23 Again, the variation in costs is enormous, with over a factor of nearly eight between the most expensive and the cheapest. The ratio of ATCO wages to GDP/head gives for the most part a fairly narrow range of around 3 to around 7. However, in one country it is 2.4, and another it is over 18.

Quality of service

- 7.4.24 Delays were the only measure of service quality we have been able to measure and are discussed in section 2.3 of this document. Generally there are very few delays in the candidate States.

7.5 Safety

Benchmarking of National ATM safety regulator performance

- 7.5.1 Even though the Single Sky concept and regulations are not a legal requirement, most of the candidate States are well on the road to establishing an adequate ATM safety regulatory process within their countries. Most countries have some form of occurrence reporting and assessment arrangements in place but only two States have mandated procedures that comply fully with the requirements of the ESARRs. The most common shortcomings are reporting to Eurocontrol and sharing data with other States.

- 7.5.2 This appears to be a satisfactory picture, however, we also see that the safety regulatory staff may be seriously under-resourced in several States. The benchmarking against the proposed regulatory framework has determined established or planned processes in States but not the quality to which they are carried out.
- 7.5.3 One obstacle to the adoption of European standards in many States is the availability of the requirements in the national language. Many ESARRs are not yet available in languages other than English. We found that in some candidate States legislation was being introduced to allow reference to international standards in the original language. Several participants in the benchmarking study were strongly in favour of such an approach because it ensures that the standards are not reinterpreted during translation. We would recommend that the translation of aviation safety standards into the national language be investigated further.
- 7.5.4 Not only is it important for each State to implement the right regulatory framework but it is equally important that the regulatory functions are staffed with appropriate levels of specialists and administrative staff to make the system effective. At the start of this study, several air traffic service providers indicated privately that their regulator was under resourced and effectively 'rubber-stamping' their outputs. To find evidence to support their concerns, we have simply compared the number of specialist ATM regulatory staff per 100,000 flight km. This denominator was initially viewed as being useful to compare across States. However, the reality is that much of a regulator's activity is tied to the number of personnel being regulated.
- 7.5.5 Several States have, in both relative and absolute terms, a surprisingly small safety regulatory resource. Generally there is the potential to undermine the safety of ATM through inadequate challenge of service providers. We believe that this benchmark should be further developed to account for a better measure of regulatory workload, such as staff and flight km. The benchmark should also be applied across all ECAC States. Furthermore, we recommend particular study and action to support those States with apparently low resources.

Benchmarking service providers against ESARR 3

- 7.5.6 At least six of the candidate States are well advanced with the implementation of formal safety management systems in general conformity with the Eurocontrol requirements.

Benchmarking service providers against ESARR 4

- 7.5.7 Only two States have implemented ESARR4, with most some way from completion. Risk assessment and mitigation probably represents the most difficult of the ESARRs to implement. The most common means of introduction of the techniques is to specify the analysis as part of the procurement specification for new systems. This approach takes the burden off the ANSP and puts it onto the supplier, who most probably has already performed much of the necessary analysis and assessment in respect of similar systems. There is still however a need to place the assessments for new systems into the overall context of the entire ATM system including procedural aspects as well as associated systems.
- 7.5.8 The minimum effort required to implement ESARR 4 is nearly independent of traffic levels and this requirement represents a significant workload on small ANSPs. This can be seen in the results for this benchmark.

Benchmarking service providers against ESARR 5

- 7.5.9 All States have a well advanced process of ATS personnel certification and fitness assessment in place. This is not surprising as the ICAO requirements in this respect have been established for many years as Standards and Recommended Practices in Annex 11, and the Eurocontrol requirements are a further refinement of these.

7.6 Management, ATC operations and systems

Forecasting and strategic planning

- 7.6.1 Several ANSPs report that they undertake strategic planning in accordance with the good practice determined by the PRC. However, we have generally found many ANSPs carry out individual planning processes but not necessarily do this in an integrated fashion.
- 7.6.2 A detailed discussion of forecasting is at section 3.1 of this document.

Financial and performance records

- 7.6.3 All the ANSPs but one have their accounts audited, or are part of an organisation which has its accounts audited, in some form. In two cases the auditing is carried out by a Government body operating to public-service standards. These are not strictly independent for Government-owned companies; and tend to operate according to different principles from commercial auditors.
- 7.6.4 Most accounts conform to IAS, and some that do not plan to move to IAS. Most publish their accounts, but in the case of Turkey and Poland, they are part of a wider organisation running airports as well as ANS.

Complexity

- 7.6.5 On the selected criteria, Turkey appears as the most complex area for the provision of air traffic services in the candidate States. This is because of the relatively high levels of en route and approaching and departing traffic coupled with significant interface issues with non European airspace. Turkey provides a key interface for traffic flying to and from Asia. Also showing a higher order of complexity are Hungary, the Czech Republic, and Poland.

Methods of operation

- 7.6.6 Co-ordination procedures within ACCs are generally well developed. There is scope for development of automation-based transfers with adjacent centres in a number of States. Furthermore, a number of States indicated that while they had the capability to carry out automation-based transfers; the scope for this was limited by the lack of capability in adjacent States (noting that a number of States are at the boundary of ECAC). Given the importance of inter-centre communication under the Single European Sky, it is recommended that a more detailed study of the standards, scope and development plans for inter-centre communication is carried out.

Service monitoring

- 7.6.7 Monitoring of service standards, and in particular delays, can be used to assess system safety, customer satisfaction and requirements for future development. A number of questions about how ANSPs monitor their service have been posed.

Although not many States have noticeable delays, many of them do monitor the delay statistics using a variety of sources: their own or CFMU derived data and/or CODA reports. Even if a State does not induce any delays we would judge that monitoring to some degree is good practice. For those States with noticeable delays or highly seasonal traffic flows it would appear to be good practice to monitor traffic on a daily basis.

- 7.6.8 Knowledge of the ACC capacity is essential for business planning and all States have some means of calculating their ACC capacity. Not many States use the Eurocontrol method, relying instead on their own operational judgement and, for many, simulations.

Contingency planning

- 7.6.9 Although all States stated that they had contingency plans for critical systems failure, in a large number of cases only limited testing had been carried out. On the whole, the backups for the individual technical facilities are well developed although in some cases increased redundancy in FDP would be advisable.
- 7.6.10 We consider that best practice in this area is the availability of a tested plan for the loss of major facilities that can provide a defined, acceptable (to users) level of service. In the case of individual critical services or systems, dual systems should be provided in all cases.
- 7.6.11 We recommend that approaches to cost-effective contingency planning should become a Europe-wide initiative.

Operational development plan

- 7.6.12 Many of the States comply with the basic requirements of an operational development plan but in some cases plans are incorporated in another document. This is a reasonable approach provided the operating concepts are clear. In the future, operating concepts are likely to change at an increasing rate and there is an overriding requirement to predict the required number of controllers.
- 7.6.13 We advocate that the preparation of an operational development plan is an essential step to the maintenance of the required level of service. There is some tendency for States to assume that a budgetary plan or compliance with EATMP constitutes adequate analysis of future operations.

Operational requirements definition

- 7.6.14 On the whole ANSPs are used to developing operational requirements and utilise their ATC experts to advantage. Customers are not widely consulted; usually general agreement is assessed by reliance on the EATMP. Cost-benefit analysis is not universally used to decide the optimum approach to service provision, which is surprising given the high levels of funding involved. This benchmark also highlighted a number of cases where the use of standard quality procedures was not standard practice although internal procedures were often defined.

Operational involvement in project implementation

- 7.6.15 Most States recognised the complexity of managing project implementation from an operational perspective and the need to have expert ATC staff involved at all stages of project implementation. A common approach was to request that the

supplier manages the transition plans for new projects. This requires the supplier to have a detailed understanding of existing infrastructure and procedures, which is unlikely to be the case.

- 7.6.16 The development of the Single European Sky will depend on the transition into operation being a fully coordinated and documented process at State and European levels. We recommend that further studies be made into the procedures for planning and implementing the transition of new systems into operational service.

Civil–military cooperation

- 7.6.17 We have found that States have adopted a level of coordination in accordance with the military training activity.
- 7.6.18 Most States report to have adopted the principles of the Flexible Use of Airspace concept and claim no difference between this and the Eurocontrol definition. There is a failure here of this high level question, as clearly many States have not adopted the FUA concept, as shown by the later responses.
- 7.6.19 The majority of States already have, or are in the process of forming a joint civil-military policy committee.
- 7.6.20 Pre-tactical airspace management has been found to vary according to military demand. Not all States need to fully implement this level, particularly if they rarely have any military exercises. Hence in many cases there appears to be a spectrum of coordination at the pre-tactical level and at what appears to be appropriate to each State. In this case best practice might be considered to be the minimum coordination commensurate with the planned use of airspace by the military.
- 7.6.21 At the tactical level, communications are critical to good civil military cooperation. Where States have military traffic, the majority have separate civil and military ATS organisations. A surprisingly large number of candidate States will soon have co-located civil and military centres, with many very highly integrated. Good practice depends on the individual environment. States such as Estonia and Lithuania have military coordinators working in the same operations room as civil controllers. At the larger end of the scale Hungary is of particular interest. Its military en-route controllers hold both military and civil licences. They are employed by HungaroControl and also control civil traffic when there is no military demand. This represents a very high level of coordination and may be of interest to other States.

System availability

- 7.6.22 It is encouraging that most ANSPs collect statistics of system downtime, reduced redundancy and the nature of faults. Increased automation of this process can be expected with new systems.
- 7.6.23 In our opinion, best practice uses automated systems for the collection of system availability data which can be used to determine:
- system failures as a causal factor in operational service availability;
 - validity of maintenance procedures;
 - maintenance staffing;

- system design problems that require rectification by the supplier; and
- requirements for system replacement.

Monitoring and control

- 7.6.24 On the whole the level of monitoring and control across all States seems satisfactory. The absence of an integrated approach is understandable given that systems are generally of different ages and use different philosophies for control and monitoring. However, different arrangements for each sub-system can increase the workload and militate against a coherent picture of overall service performance.
- 7.6.25 In our opinion, the goal for best practice is to have an integrated system for the control, integrity monitoring, remote diagnostics and performance logging for all operational systems. Achievement is likely only in the longer term (> 10 years).
- 7.6.26 All States have adequate radar and communications record and replay facilities in place.

Projects and engineering resources

- 7.6.27 Most ANSPs are undertaking major projects that require skills in the project management, procurement, planning and systems architecture areas to prepare procurement specifications and to manage suppliers through to the acceptance stage.
- 7.6.28 In a number of cases it was found that there is comparatively few staff in the project management and planning of system architecture areas. This implies that significant reliance is placed on system suppliers and possibly consultants for project implementation resources. We believe that it is beneficial for a service provider to have a core capability in these disciplines. The skills required are generally different to those required for the ongoing maintenance function. We have not been able to correlate this benchmark with project performance to gain further understanding.

Project management

- 7.6.29 Nearly all the ANSPs have their own project management and quality management procedures in force. An analysis of the depth of these procedures would be outside the scope of this study but most ANSPs who do not currently have ISO accreditation are planning to gain it in the short term. This is not an insignificant task, and it has to be planned and resourced while other major projects are implemented.
- 7.6.30 In our view, best practice is for ANSPs to be accredited to ISO standards for all processes and related documents (ie not just for project related aspects). Projects should be implemented in accordance with a well defined set of procedures.

Project performance

- 7.6.31 Although data on the time and cost variance has been collected in most cases, no attempt has been made to analyse this aspect. In general, time and cost performance is subject to many factors outside the direct control of the service provider and any assessment on the basis of the data provided may be misleading.

- 7.6.32 Our view is that best practice is to carry out a formal review, according to documented procedures, comparing pre- and post-project assessments of net benefits based on a formal process such as CBA. This would also involve consultation with all stakeholders.

7.7 Human resources

ATCO working practices

- 7.7.1 Perhaps the most illustrative benchmark in this area is the comparison between contracted hours and those that controllers actually work. Although they may be subject to external influences such as national legislation and collective bargaining, contracted hours are within the control of the ANS provider. Of the States that have the highest contractual hours, two permit overtime. Whilst in low intensity environments this practice may not seem particularly onerous, overtime can have an adverse effect, especially when combined with lengthy shift periods.
- 7.7.2 Some States have indicated that they employ 11 to 12-hour single shifts, matched by equal off-duty periods. Although easier to roster and popular with some controllers, this practice is not an ideal way of ensuring maximum efficiency, particularly towards the end of the shift. The Czech Republic has recently reduced shift lengths to seven hours. We regard this as best practice, in combination with realistic contractual hours.

On-console time

- 7.7.3 A particularly important benchmark is the amount of time ATCOs actually spend controlling in a single session. For practical reasons, such as traffic density and operating complexities, a controller's workload can vary markedly from low to very high intensity. However, there should be a maximum time that controllers are required to spend actually at the console without a break.
- 7.7.4 Most States have at least a nominal 'on-console' time but it is not clear how many specifically enshrine this requirement in law or by regulation. There may be an unspecified norm in those countries where the supervisor is solely responsible for determining the controller's workload. We believe that best practice, in the interests of safety and the controllers themselves, is that they should be protected by regulation. A period of two hours on console with a minimum 30 minutes break is a realistic benchmark.

Controller recruitment

- 7.7.5 There is no battery of tests that can predict with certainty which students will be training successes. Consequently, many countries have opted for their own testing methods or a combination of internal and imported methodologies. Many make extensive use of psychological tests and some have quite complex procedural processes. In many respects this situation mirrors practice elsewhere. Importantly, however, quite a number of States do not appear to employ any form of computer-based skills tests, the use of which is generally regarded as best practice by the training experts we consulted during this study.

Training facilities

- 7.7.6 All the candidate States have internal training organisations. Some of the smaller countries have limited facilities, essentially for conversion training. Most of the States appear to have designed their training capacity to match the anticipated student throughput.

- 7.7.7 There are variable factors which determine instructor/student ratios. At one end of the scale are group activities such as classroom instruction and CBT. At the other end is practical training involving dynamic radar simulators where the benchmark ideal instructor/student ratio is one-to-one. Most States appear at or close to this figure although it is possible that some of the reported ratios may not be based purely on practical training.

Instructor selection

- 7.7.8 The bedrock of any successful training system is the quality of instruction. A well trained, enthusiastic and highly motivated instruction staff is the key to producing confident, high quality graduates properly prepared for OJT. The first pre-requisite is to ensure the recruitment of high calibre operational ATCOs who are evidently suited to instruction.
- 7.7.9 Nearly all States have processes in place to identify suitable instructors. A common problem is that potentially excellent instructors are put off by reductions in income through the loss of operational duty or shift pay. Estonia has overcome this obstacle by offering specialist pay. Some States ask for volunteers and, for many, lengthy operational experience is required. Latvia has a comprehensive OJTI selection programme well in advance of many current member States, which, if replicated for institutional Instructors, we believe would be considered best practice.

Instructor training

- 7.7.10 Nearly all the States ensure that their instructors complete formal training with many utilising the IANS OJTI course. However, many of the courses are not subject to certification, which we regard as particularly important. It is our understanding that while the IANS course has an excellent reputation it does not have a pass/fail element.
- 7.7.11 In our view, there should be some process that ensures instructors have reached a certain standard that is demonstrably being maintained. We consider that best practice should ensure all instructors are subject to regular competency checks and are required to demonstrate operational capability. Ideally, they should also be rotated back to operational duties after a defined period.

EATMP Common Core Syllabus

- 7.7.12 There is no doubt that adoption of the common core syllabus is the benchmark for all States to achieve.

Ab-initio course

- 7.7.13 To a certain extent the length and content of an ab-initio course is determined by the size and complexity of the air traffic organisation it is serving. Therefore, direct comparisons can be misleading. For instance, some courses may be limited to aerodrome only or, possibly, orientated towards procedural training. With the exception of Slovenia, all the candidate State courses appear to include practical training and utilise simulators for this task.
- 7.7.14 Surprisingly few States appear to use part-task trainers and presumably those that do not, conduct all their skills training on real time simulators. Most striking, however, are the wide variations in the time allocated by States to theoretical and practical training. Taking into account different requirements, some States

are apparently investing less than 3 hours per week in simulator training. Moreover, none of the States have a particularly high usage ratio.

- 7.7.15 There are too many untested training development and management factors to draw purely statistical conclusions from these figures. However, there appears to be some correlation between simulator hours and success rates.

Student support

- 7.7.16 The majority of States are well aware of the value in providing students with information on their performance. Virtually all are prepared to offer remedial training, usually through the provision of additional training sessions. Demands on the simulators and the training schedule often make it very difficult to provide remedial training specially tailored to the individual. However, this is generally held as best practice and it may be possible to find ways of personalising additional sessions to student needs.

On the Job (OJT) Training

Organisation

- 7.7.17 OJT is often left to individual units to organise in the belief that it is essentially a local matter. While this is partly true, it can, and does, lead to different interpretations as to how this training should be administered. This in turn can result in disjointed student training programmes and frequent changes in mentors/coaches who may apply slightly different standards. The result is inefficient training, confused students and a lack of standardisation.
- 7.7.18 Most of the candidate States have central guides but many do not see the need for a dedicated training organisation. Clearly, smaller units do not need an elaborate training organisation but it is important that there is one person who is qualified to manage OJT.

OJT – time to rating

- 7.7.19 We have found a surprising variance in the time to rating, even allowing for the complexities of the task and other factors already mentioned. In some States it takes in excess of 15 months to gain a rating. This appears excessive and should perhaps prompt a review of OJT. For the reasons already stated a benchmark target is unrealistic but it seems reasonable to suggest that 6 months is an adequate period.

8 Conclusions

8.1 Discussion

8.1.1 Although the focus of this study has been on benchmarking, the draft Single Sky regulations have given a strong context to the work. Overall, the benchmarking has revealed that there are unlikely to be any substantial barriers to candidate States in adopting the Single Sky legislation. However, many States anticipate a significant amount of work to implement the regulations. There was a particularly strong concern for the requirements on national regulators and, for some States, the need to change existing Air Law and possibly other legislation.

Safety regulation

8.1.2 The majority of the benchmarking has concentrated on air navigation service providers, however, the study team found that there were some particular concerns about national safety regulators. In the study, this was looked into to a certain degree but there are still a number of unknowns and apparent incongruities in European ATM Safety Regulation. Whilst the functional independence of safety regulators is being addressed by the Single Sky, we believe the capabilities of regulators should become a priority. New regulations, systems and technologies are creating a burden on regulators that does not appear to be matched by their resources. Some aspects of this are being addressed by the draft Single Sky regulations and others will be covered in future ICAO safety oversight audits. The Eurocontrol Safety Regulation Commission already intends to look further into the state of safety regulation in Europe with the support of the Commission.

8.1.3 One obstacle to the adoption of European standards in many States is the availability of the requirements in the national language. Many ESARRs are not yet available in languages other than English. We found that in some candidate States legislation was being introduced to allow reference to international standards in the original language. Several participants in the benchmarking study were strongly in favour of such an approach because it ensures that the standards are not reinterpreted during translation.

Flexible use of airspace

8.1.4 Most States report that they have adopted the concept of the flexible use of airspace, although only a few appear to have fully adopted it according to the FUA Handbook. However, the degree of civil military cooperation appears entirely appropriate and, for some States any further adoption would not be beneficial. This is because in many candidate States there is only limited military training activity, which is often away from the main civil traffic flows.

8.1.5 By the end of 2002, the majority of States will have established a joint high level airspace policy body. No States reported any particular concerns with the establishment of common European upper and lower flight information regions. Our conclusion is that at least at a high level the necessary mechanisms will be in place to meet the requirements of the draft Single Sky regulations. Any concerns are likely to be with the degree of user consultation.

Pricing

8.1.6 The draft Single Sky regulations (the provision of Air Navigation Services) refer to pricing policies, including transparency. For the majority of States, ie those

that are already within the central route charges system, the pricing policies should be fairly consistent. The general issues that have emerged are that:

- some States do not explicitly charge terminal navigation charges;
- there is at least anecdotal evidence that terminal navigation charges are kept artificially low in some States, subsidised by en-route charges.

8.1.7 The draft regulations will therefore require particular efforts by States to ensure their charging principles are transparent and cost reflective.

Institutional aspects

8.1.8 The benchmarking questions concerning the legal framework of States focused on whether there were any particular constraints affecting service providers. The main cause of constraint has been found to be where ANSPs are part of Government Departments. This can lead to difficulties in recruitment: where Government wide restrictions are imposed; or additional requirements such as citizenship. No States reported particular problems in raising investment capital and most had access to a variety of sources.

Quality of service

8.1.9 Delays were the only measure of service quality we have been able to measure, and, generally there are very few delays in the candidate States.

Systems and operations

8.1.10 Although all States stated that they had contingency plans for critical systems failure, in a large number of cases only limited testing had been carried out. On the whole, the backups for the individual technical facilities are well developed although in some cases increased redundancy in FDP would be advisable.

8.1.11 We advocate that the preparation of an operational development plan is an essential step to the maintenance of the required level of service. There is some tendency for States to assume that a budgetary plan or compliance with EATMP constitutes adequate analysis of future operations.

8.1.12 On the whole ANSPs are used to developing operational requirements and utilise their ATC experts to advantage. Customers are not widely consulted; usually general agreement is assessed by reliance on the EATMP. Cost-benefit analysis is not universally used to decide the optimum approach to service provision, which is surprising given the high levels of funding involved. This benchmark also highlighted a number of cases where the use of standard quality procedures was not standard practice although internal procedures were often defined.

8.1.13 Most States recognised the complexity of managing project implementation from an operational perspective and the need to have expert ATC staff involved at all stages of project implementation. A common approach was to request that the supplier manages the transition plans for new projects. This requires the supplier to have a detailed understanding of existing infrastructure and procedures, which is unlikely to be the case.

8.1.14 It is encouraging that most ANSPs collect statistics of system downtime, reduced redundancy and the nature of faults.

- 8.1.15 In a number of cases it was found that there is comparatively few staff in the project management and planning of system architecture areas. This implies that significant reliance is placed on system suppliers and possibly consultants for project implementation resources. We believe that it is beneficial for a service provider to have a core capability in these disciplines.
- 8.1.16 In our view, best practice is for ANSPs to be accredited to ISO standards for all processes and related documents (ie not just for project related aspects).

Human resources

- 8.1.17 Regarding human resources, the most illustrative benchmark in this area is the comparison between contracted hours and those that controllers actually work. Although they may be subject to external influences such as national legislation and collective bargaining, contracted hours are within the control of the ANS provider. Of the States that have the highest contractual hours, two permit overtime. Whilst in low intensity environments this practice may not seem particularly onerous, overtime can have an adverse effect, especially when combined with lengthy shift periods.
- 8.1.18 Some States have indicated that they employ 11 to 12-hour single shifts, matched by equal off-duty periods. Although easier to roster and popular with some controllers, this practice is not an ideal way of ensuring maximum efficiency, particularly towards the end of the shift. The Czech Republic has recently reduced shift lengths to seven hours. We regard this as best practice, in combination with realistic contractual hours.
- 8.1.19 A particularly important benchmark is the amount of time ATCOs actually spend controlling in a single session. For practical reasons, such as traffic density and operating complexities, a controller's workload can vary markedly from low to very high intensity. However, there should be a maximum time that controllers are required to spend actually at the console without a break.
- 8.1.20 Most States have at least a nominal 'on-console' time but it is not clear how many specifically enshrine this requirement in law or by regulation. We believe that best practice, in the interests of safety and the controllers themselves, is that they should be protected by regulation. A period of two hours on console with a minimum 30 minutes break is a realistic benchmark.
- 8.1.21 All the candidate States have internal training organisations. Some of the smaller countries have limited facilities, essentially for conversion training. Most of the States appear to have designed their training capacity to match the anticipated student throughput.
- 8.1.22 The bedrock of any successful training system is the quality of instruction. A well trained, enthusiastic and highly motivated instruction staff is the key to producing confident, high quality graduates properly prepared for OJT. The first pre-requisite is to ensure the recruitment of high calibre operational ATCOs who are evidently suited to instruction.
- 8.1.23 Nearly all States have processes in place to identify suitable instructors. A common problem is that potentially excellent instructors are put off by reductions in income through the loss of operational duty or shift pay. Estonia has overcome this obstacle by offering specialist pay. Some States ask for volunteers and, for many, lengthy operational experience is required. Latvia has a comprehensive OJT selection programme well in advance of many current member States,

which, if replicated for institutional Instructors, we believe would be considered best practice.

- 8.1.24 Nearly all the States ensure that their instructors complete formal training with many utilising the IANS OJTI course. However, many of the courses are not subject to certification, which we regard as particularly important. It is our understanding that while the IANS course has an excellent reputation it does not have a pass/fail element.
- 8.1.25 In our view, there should be some process that ensures instructors have reached a certain standard that is demonstrably being maintained. We consider that best practice should ensure all instructors are subject to regular competency checks and are required to demonstrate operational capability. Ideally, they should also be rotated back to operational duties after a defined period.
- 8.1.26 To a certain extent the length and content of an ab-initio course is determined by the size and complexity of the air traffic organisation it is serving. Therefore, direct comparisons can be misleading. For instance, some courses may be limited to aerodrome only or, possibly, orientated towards procedural training. With the exception of Slovenia, all the candidate State courses appear to include practical training and utilise simulators for this task.
- 8.1.27 Surprisingly few States appear to use part-task trainers and presumably those that do not, conduct all their skills training on real time simulators. Most striking, however, are the wide variations in the time allocated by States to theoretical and practical training. Taking into account different requirements, some States are apparently investing less than 3 hours per week in simulator training. Moreover, none of the States have a particularly high usage ratio.
- 8.1.28 OJT is often left to individual units to organise in the belief that it is essentially a local matter. While this is partly true, it can, and does, lead to different interpretations as to how this training should be administered. This in turn can result in disjointed student training programmes and frequent changes in mentors/coaches who may apply slightly different standards. The result is inefficient training, confused students and a lack of standardisation.
- 8.1.29 We have found a surprising variance in the time to rating, even allowing for the complexities of the task and other factors already mentioned. In some States it takes in excess of 15 months to gain a rating. This appears excessive and should perhaps prompt a review of OJT. For the reasons already stated a benchmark target is unrealistic but it seems reasonable to suggest that 6 months is an adequate period.

8.2 Recommendations

- 8.2.1 A number of detailed recommendations have been made in sections 6 and 7, and the following are therefore high level recommendations. Unless otherwise indicated, we believe they are applicable to both current and future Member States' and their ANSPs:
- Involve candidate States in the workings of the proposed Single Sky Committee. We note that ten accession States (for 2004 entry) will be included and the remaining States will be fully informed.
 - Undertake a detailed review of the state of safety regulation throughout Europe, concentrating on the independence, available resources, delegation of responsibilities, representation and funding mechanism and, to some

degree, the competence of national regulators. We note that such a review has now been proposed, headed by the SRC.

- Where States are not part of the CRCO system, we propose that they should adopt the same rules, as is already done by Estonia. This would remove any remaining discrimination towards users.
- Review ATC training with regard to improving and formalising 'on the job' training of controllers and instructors.
- Address transparency in cost allocation and prices in developing the detail of Single Sky regulations. In particular this would address a thorough review and action on cost allocation mechanisms for terminal navigation charges. We also believe that a common European approach could be taken towards charges exemptions, particularly VFR and military.
- Investigate the pros and cons of translating aviation safety standards into the national language.
- Approaches to cost-effective contingency planning should become a Europe-wide initiative.
- All ANSPs and their regulators should adopt formal quality management above the current ECIP objectives for AIS.
- Promote integrated business planning.
- Study the feasibility of tactical cross border delegation.

8.2.2 Finally, as regards future benchmarking, we would recommend the following actions:

- Encourage, support and widen the process of information disclosure.
- Support in internalising benchmarking, so that it becomes a management tool used regularly by ANSPs to improve their service.

A ATM fact sheets

- A.1 This annex contains 2 page fact sheets on each Candidate State, concentrating on the ATM provider.
- A.2 The sources of data listed below. There are a few missing data, which it has not been possible to add during the course of the study without overburdening the participants.
- Benchmarking study
 - Institutional status and organisational relationships
 - Estimate of average unit rate for Poland
 - Eurocontrol STATFOR February 2002 Forecasts
 - Forecasts 2002 - 2009
 - Domestic, international, over-flights and total flights
 - European Commission (Economic Reform Monitor and Accession Status reports, November 2001)
 - Population
 - GDP per head
 - Country area
 - Eurocontrol Performance Review Commission Reports
 - Airspace controlled
 - Unit rate
 - Cost per km
 - Responsible bodies
 - Airports Council International
 - Airport movements and passengers
- A.3 The FIR/UIR charts for each State were produced using Eurocontrol's Sky View 2 package (data accurate at 31/10/2002).

BULGARIA



Key facts

Population ²⁰⁰⁰	7,707,495
GDP per head (€) ²⁰⁰⁰	1,600
Country area (km ²)	110,910
Airspace controlled	145,470
Domestic Flights ²⁰⁰¹	5,638
International Flights ²⁰⁰¹	29,433
Overflights ²⁰⁰¹	280,423
Total flights ²⁰⁰¹	315,494

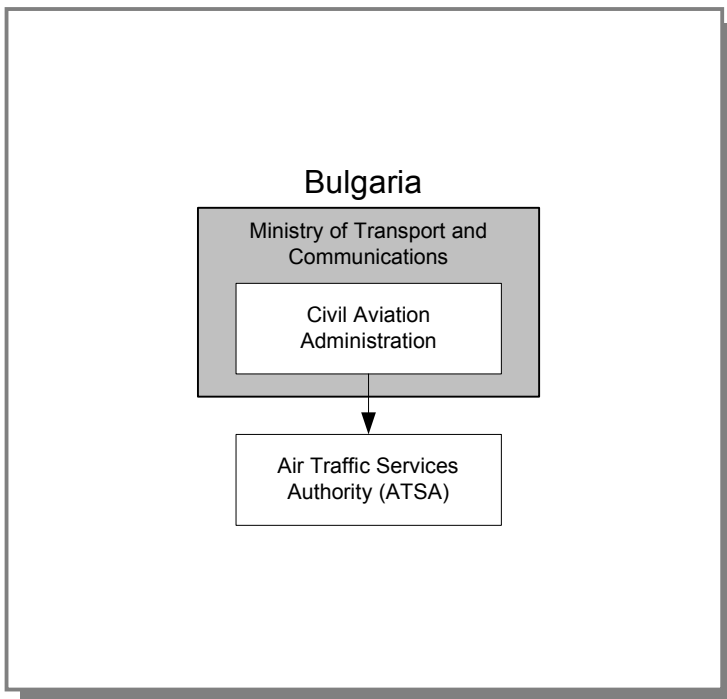
ANSP Status: State enterprise as of April 2001 (Art 53, 1 of the Civil Aviation Law)

Responsible bodies:

Safety Regulation: Civil Aviation and Administration (Ministry of Transport and Communication)

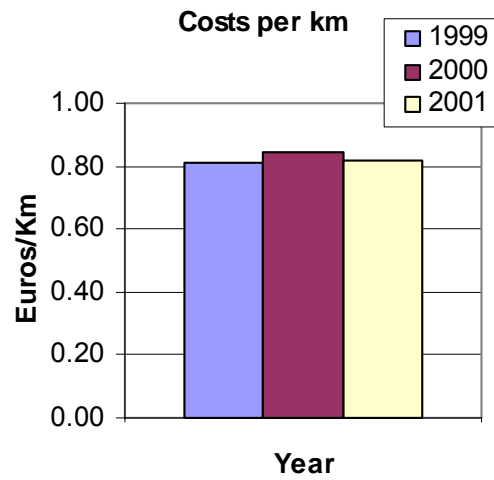
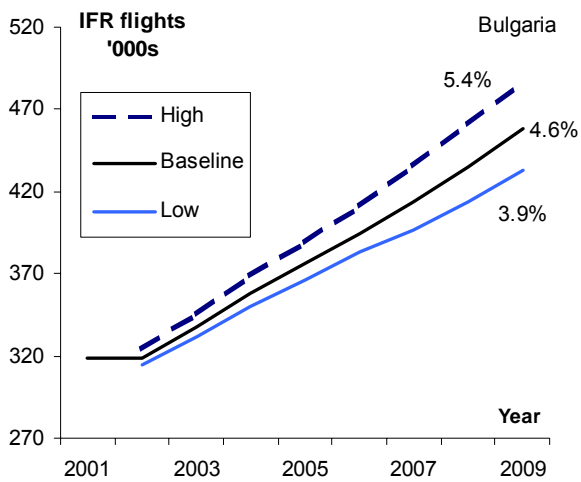
Economic Regulation: Ministry of Transport and Communication

Airspace: Airspace Management Council



Membership of International Organisations

JAA	✓
Eurocontrol	✓
ECAC	1991
NATO	X



Year	1999	2000	2001	2002	01/ 99
Total staff					
Total ATCOs	446	450	450		0.1%
No of IFR flights	340,000	313,000	325,000		-4.4%
Unit rate (€)	58.01	57.77	56.99	55.3	

Main airports	Aircraft movements ²⁰⁰⁰	Passenger numbers ²⁰⁰⁰
Sofia	24,785	1,127,848
Varna	9,425	708,529
Burgas		

CZECH REPUBLIC



Key facts

Population ²⁰⁰⁰	10,264,212
GDP per head (€) ²⁰⁰⁰	5,400
Country area (km ²)	78,866
Airspace controlled	78,864
Domestic Flights ²⁰⁰¹	5,201
International Flights ²⁰⁰¹	91,748
Overflights ²⁰⁰¹	215,833
Total flights ²⁰⁰¹	312,782

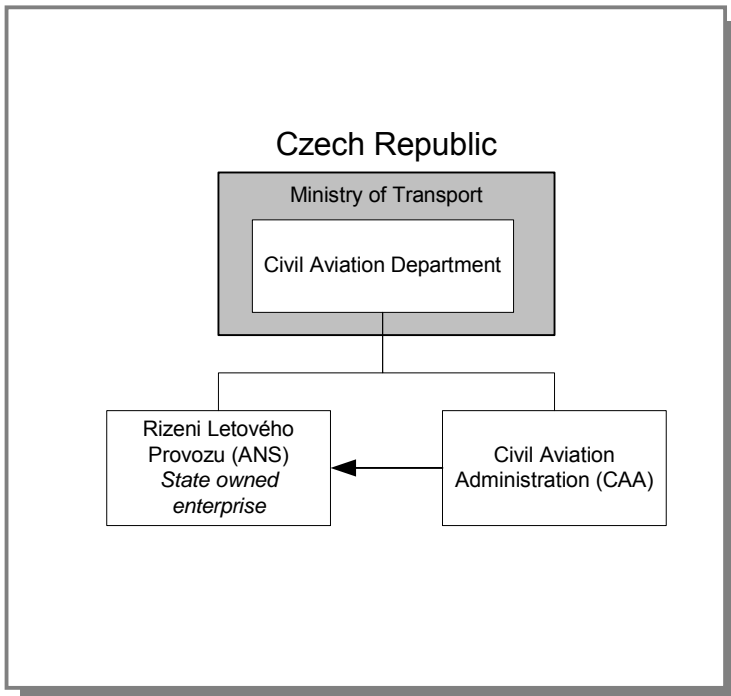
ANSP Status:

Responsible bodies:

Safety Regulation: Civil Aviation Authority (CAA)

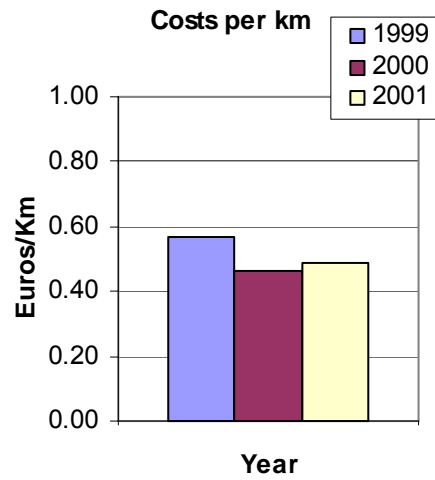
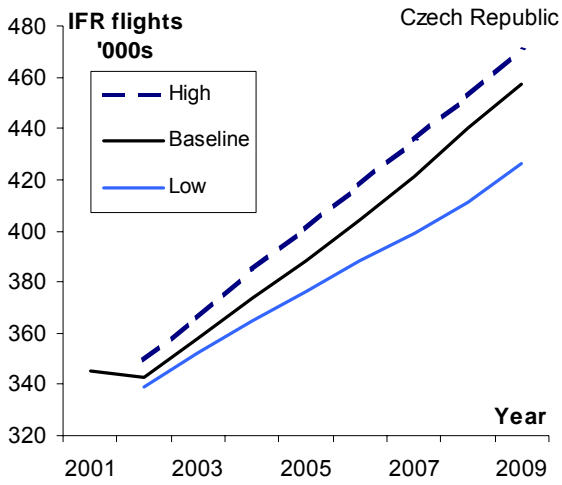
Economic Regulation: Ministry of Transport, Civil Aviation Department

Airspace: Ministry of Transport, Civil Aviation Department



Membership of International Organisations

JAA	✓
Eurocontrol	1996
ECAC	1991
NATO	1999



Year	1999	2000	2001	2002	01/ 99
Total staff					
Total ATCOs	153	165	168		9.8%
No of IFR flights	307,000	322,000	362,000		17.9%
Unit rate (€)	45.76	36.35	34.72	36	

Main airports	Aircraft movements ²⁰⁰⁰	Passenger numbers ²⁰⁰⁰
Ruzyne	94,117	5,553,532

CYPRUS



Key facts

Population ²⁰⁰⁰	762,887
GDP per head (€) ²⁰⁰⁰	14,200
Country area (km ²)	9,250
Airspace controlled	174,459
Domestic Flights ²⁰⁰¹	2,208
International Flights ²⁰⁰¹	50,095
Overflights ²⁰⁰¹	158,764
Total flights ²⁰⁰¹	211,067

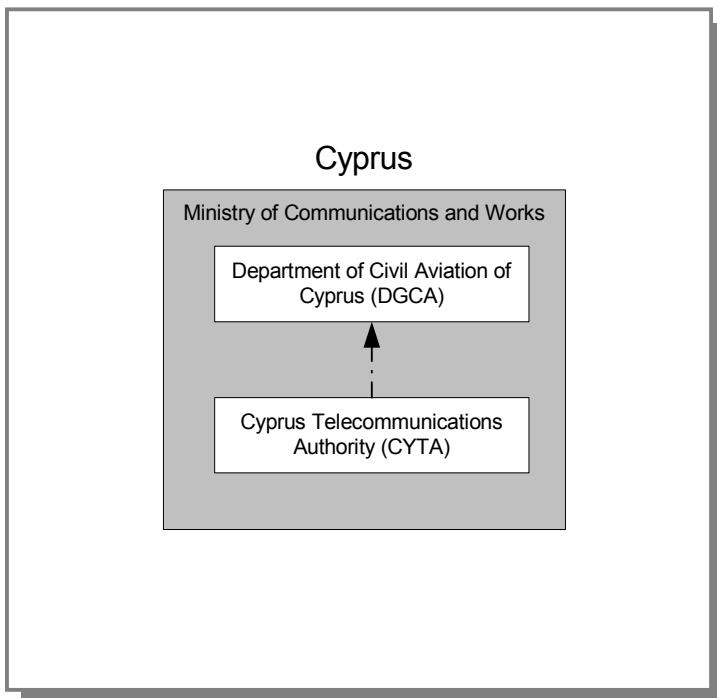
ANSP Status:

Responsible bodies:

Safety Regulation: Ministry of Transport, Department of Civil Aviation of Cyprus (DCAC)

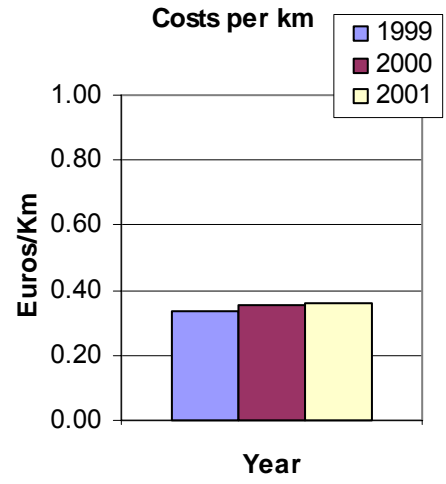
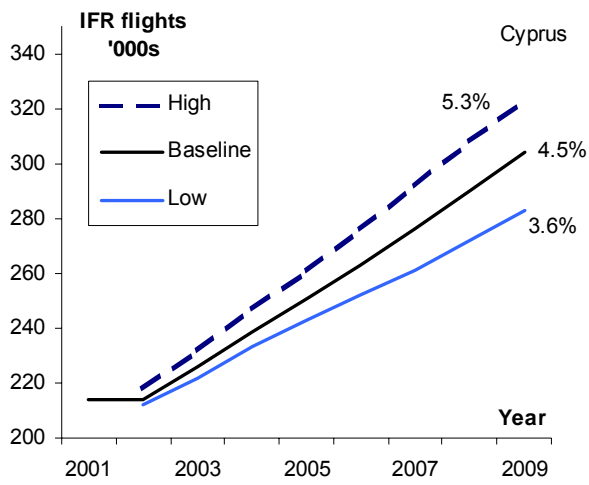
Economic Regulation: DCAC for ANS charges. Pax and Landing Charges approved by Council of Ministers

Airspace: Ministry of Transport, Department of Civil Aviation of Cyprus (DCAC)



Membership of International Organisations

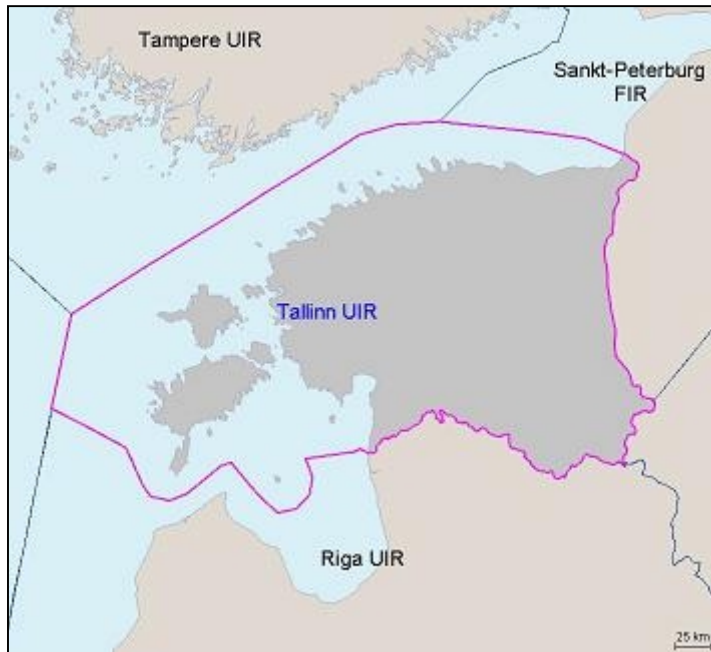
JAA	✓
Eurocontrol	1991
ECAC	1969
NATO	X



Year	1999	2000	2001	2002	01/ 99
Total staff					
Total ATCOs	58	79	80		38%
No of IFR flights	193,000	209,000	207,000		7.3%
Unit rate (€)	24.15	23.25	19.63	26.44	

Main airports	Aircraft movements ²⁰⁰⁰	Passenger numbers ²⁰⁰⁰
Paphos	15,356	1,384,555
Larnaca	47,981	4,880,360

ESTONIA



Key facts

Population ²⁰⁰⁰	1,423,316
GDP per head (€) ²⁰⁰⁰	3,800
Country area (km ²)	45,226
Airspace controlled	79,000
Domestic Flights ²⁰⁰¹	3019
International Flights ²⁰⁰¹	27,770
Overflights ²⁰⁰¹	55,195
Total flights ²⁰⁰¹	85,984

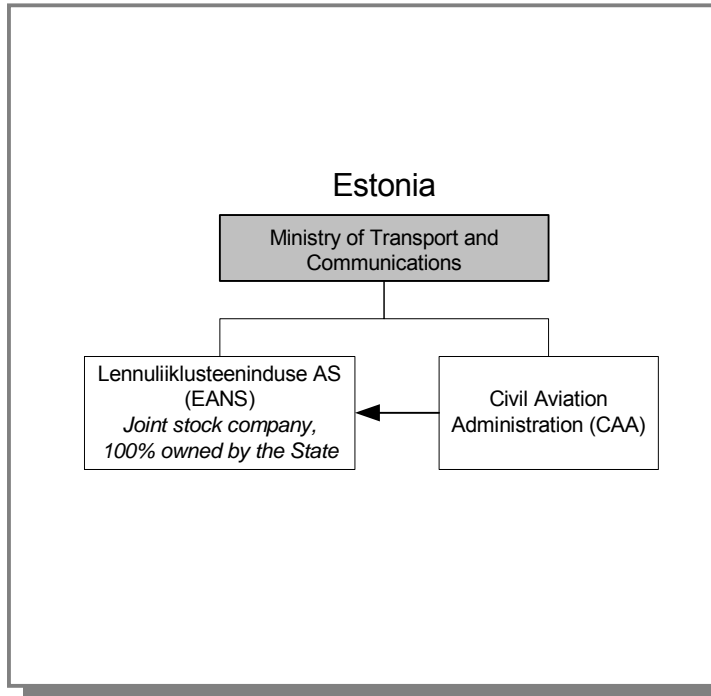
ANSP Status:

Responsible bodies:

Safety Regulation: Civil Aviation and Administration

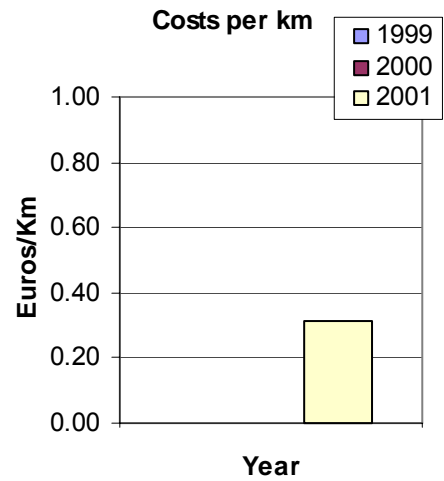
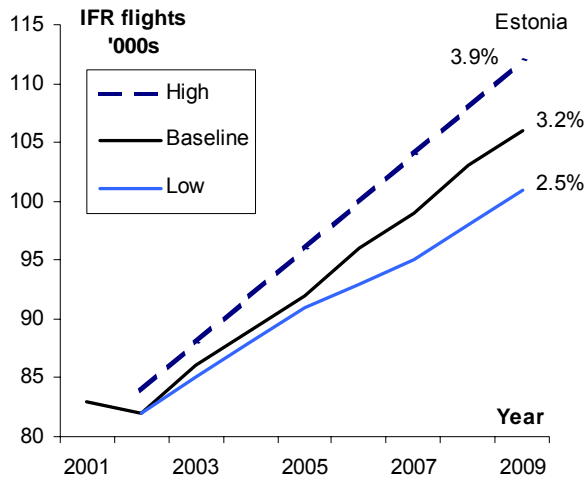
Economic Regulation: Ministry of Transport and Communications

Airspace: Ministry of Transport and Communications



Membership of International Organisations

JAA	✓
Eurocontrol	X
ECAC	1995
NATO	X



Year	1999	2000	2001	2002	01/ 99
Total staff	122	112	100		-18.0%
Total ATCOs	38	38	34		-10.5%
No of IFR flights	72,130	77,935	82,854		
Unit rate (€)	24.03	24.03	24.03	24.03	

HUNGARY



Key facts

Population ²⁰⁰⁰	10,106,017
GDP per head (€) ²⁰⁰⁰	4,900
Country area (km ²)	93,030
Airspace controlled	93,000
Domestic Flights ²⁰⁰¹	201
International Flights ²⁰⁰¹	78,589
Overflights ²⁰⁰¹	353,623
Total flights ²⁰⁰¹	432,413

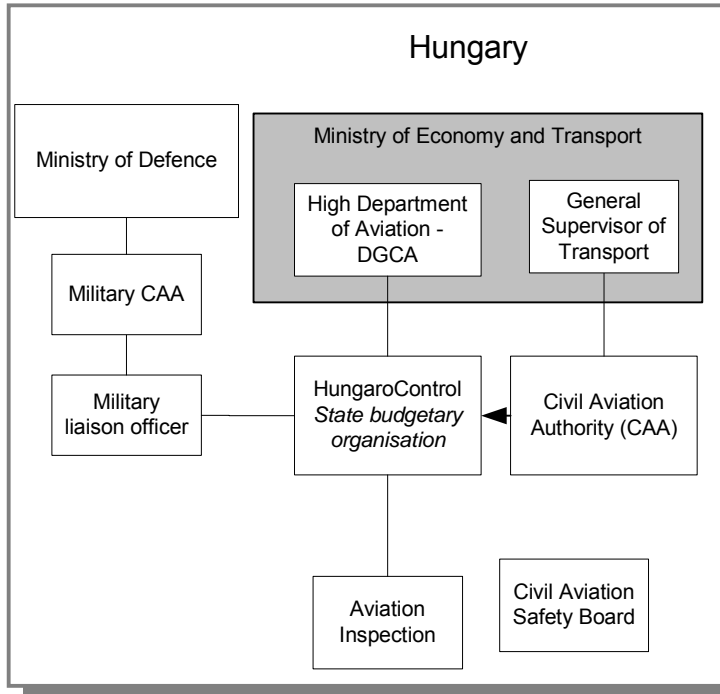
ANSP Status:

Responsible bodies:

Safety Regulation: DGCA for rulemaking but CAA for oversight and enforcement

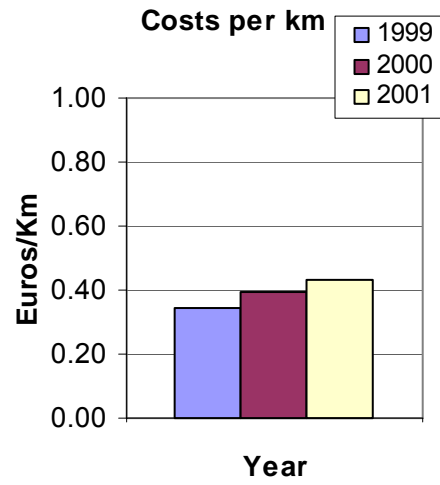
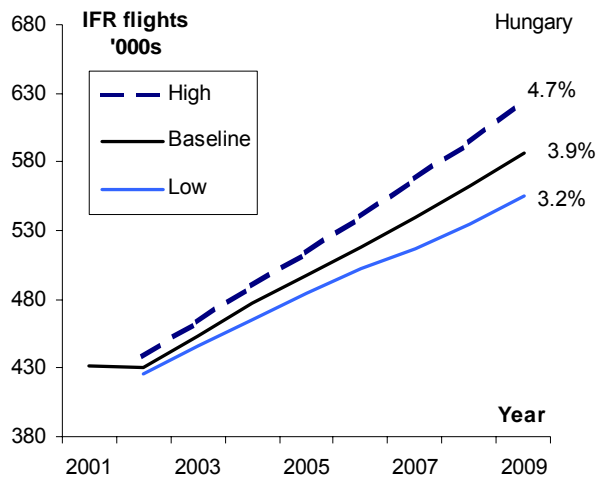
Economic Regulation: The Ministry of Economics and Transport Economic division approve route charges. The annual budget of HungaroControl is approved first by the MoET and then by Parliament. The Ministry of Finance also has a regulation role.

Airspace: Shared between MoET and MoD



Membership of International Organisations

JAA	✓
Eurocontrol	1991
ECAC	1990
NATO	1999



Year	1999	2000	2001	2002	01/ 99
Total staff					
Total ATCOs	193	182	182		-5.7%
No of IFR flights	421,000	433,000	440,000		4.5%
Unit rate (€)	22.99	26.71	28.85	35.95	

Main airports	Aircraft movements ²⁰⁰⁰	Passenger numbers ²⁰⁰⁰
Riga	18,070	574,870



Key facts

Population ²⁰⁰⁰	2,366,231
GDP per head (€) ²⁰⁰¹	3,600
Country area (km ²)	64,589
Airspace controlled (km ²)	95,324
Domestic Flights ²⁰⁰¹	809
International Flights ²⁰⁰¹	18,023
Overflights ²⁰⁰¹	76,323
Total flights ²⁰⁰¹	95,155

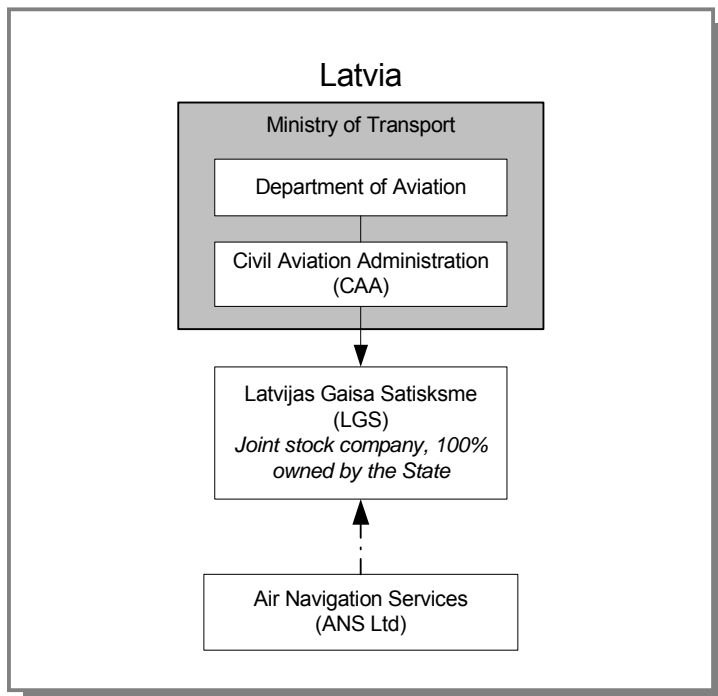
ANSP Status:

Responsible bodies:

Safety Regulation: Civil Aviation Administration (CAA)

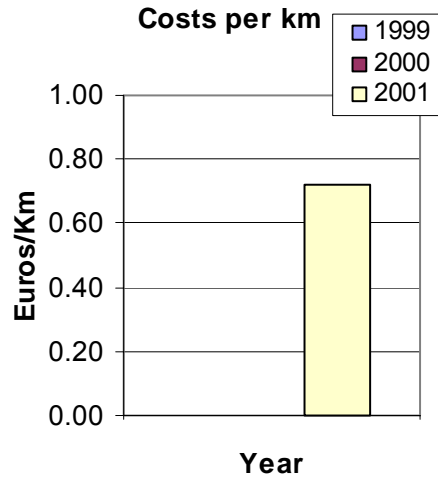
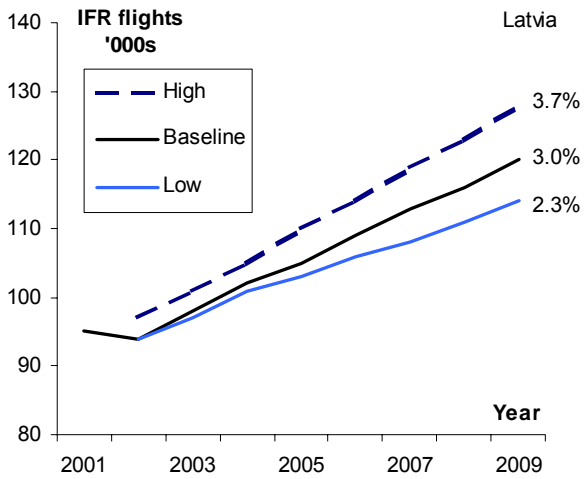
Economic Regulation: Ministry of Transport (Aviation Department)

Airspace: Civil Aviation Administration (CAA)



Membership of International Organisations

JAA	✓
Eurocontrol	X
ECAC	1993
NATO	X



Year	1999	2000	2001	2002	01/ 99
Total staff			111		
Total ATCOs			56		
No of IFR flights	96,000	95,000	97,000		1.0%
Unit rate (€)*	32.9	38.15	39.2	37.1	

*A constant \$35 each year, converted to € using each year's average exchange rate

Main airports	Aircraft movements ²⁰⁰⁰	Passenger numbers ²⁰⁰⁰
Ferihegy	80,747	4,683,176

LITHUANIA



Key facts

Population ²⁰⁰⁰	3,610,535
GDP per head (€) ²⁰⁰⁰	3,300
Country area (km ²)	65,200
Airspace controlled	0
Domestic Flights ²⁰⁰¹	2,363
International Flights ²⁰⁰¹	20,430
Overflights ²⁰⁰¹	42,857
Total flights ²⁰⁰¹	65,650

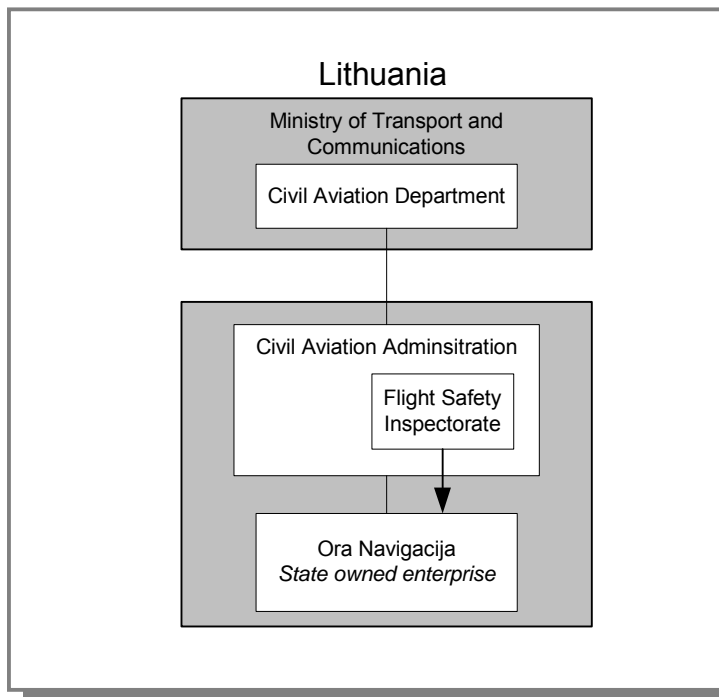
ANSP Status:

Responsible bodies:

Safety Regulation: Civil Aviation Department (CAA)

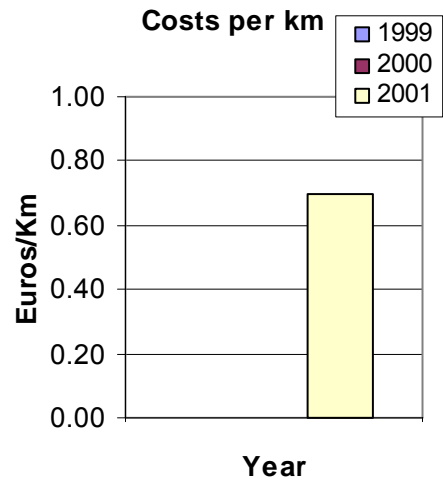
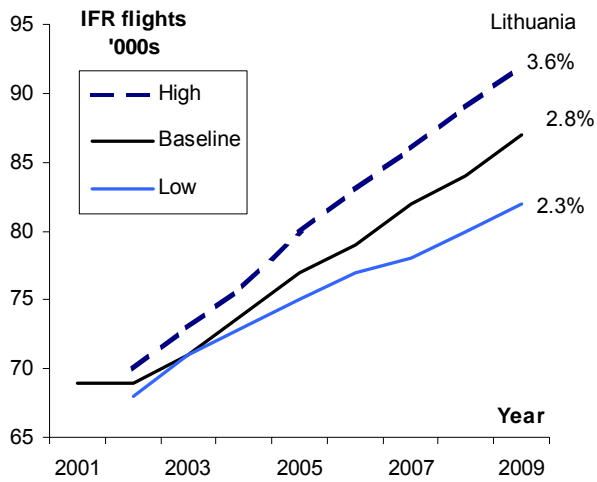
Economic Regulation: Maximum tariffs established by Gov but Oro Navigacija (ON – Air Navigation Services Provider) sets lower charges

Airspace: Drafted by ON in consultation with CAA and military then Government approved



Membership of International Organisations

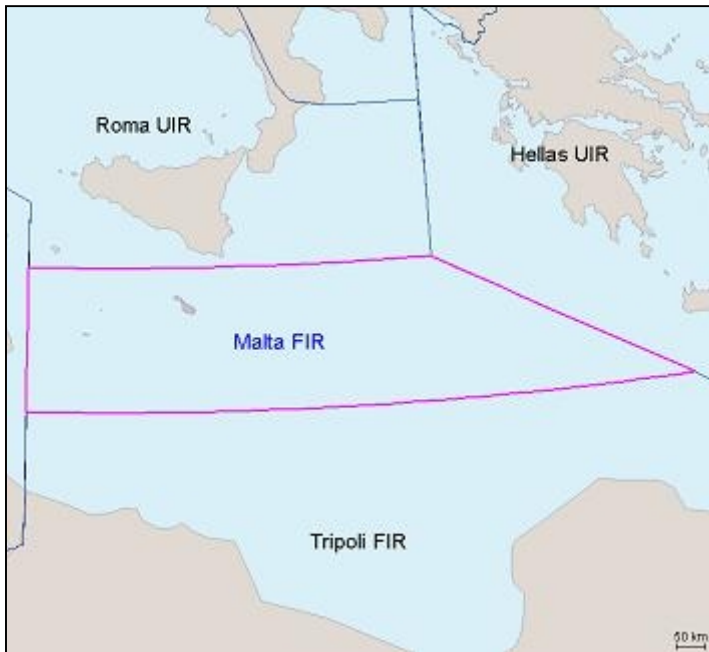
JAA	X
Eurocontrol	X
ECAC	1992
NATO	X



Year	1999	2000	2001	2002	01/ 99
Total staff					
Total ATCOs					
No of IFR flights		66,000	69,000		
Unit rate (€)					

Main airports	Aircraft movements ²⁰⁰⁰	Passenger numbers ²⁰⁰⁰
Kaunas	4,190	19,202
Palanga	4,722	56,440
Vilnius	17,277	521,529

MALTA



Key facts

Population ²⁰⁰⁰	394,583
GDP per head (€) ²⁰⁰⁰	9,900
Country area (km ²)	316
Airspace controlled	215,000
Domestic Flights ²⁰⁰¹	9
International Flights ²⁰⁰¹	30,368
Overflights ²⁰⁰¹	29,463
Total flights ²⁰⁰¹	59,840

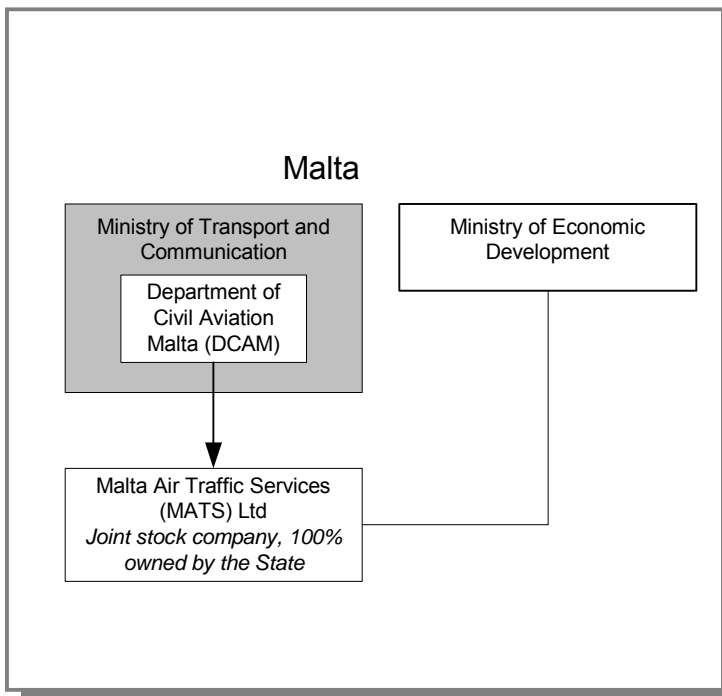
ANSP Status:

Responsible bodies:

Safety Regulation: Maltese
Department of Civil Aviation (DCAM)

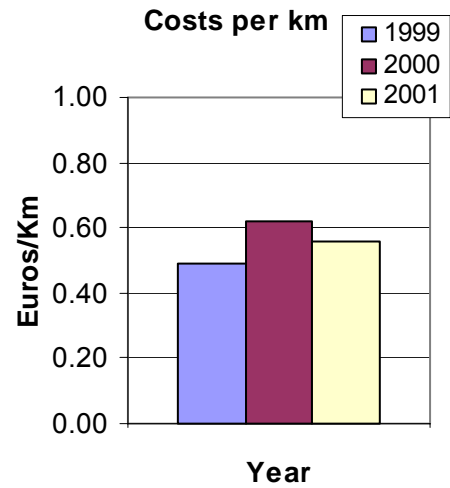
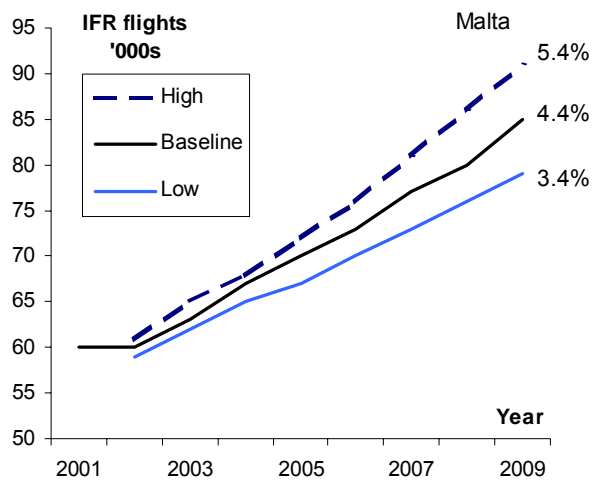
Economic Regulation: Maltese
Department of Civil Aviation (DCAM)

Airspace: Maltese Department of Civil
Aviation (DCAM)



Membership of International Organisations

JAA	✓
Eurocontrol	1989
ECAC	1979
NATO	X



Year	1999	2000	2001	2002	01/ 99
Total staff					
Total ATCOs	44	48	52		18%
No of IFR flights	56,500	60,400	62,340		10.3%
Unit rate (€)	34.85	33.49	44.25	40.38	

Main airports	Aircraft movements ²⁰⁰⁰	Passenger numbers ²⁰⁰⁰
Luqa	36,489	3,004,714

POLAND



Key facts

Population ²⁰⁰⁰	38,633,912
GDP per head (€) ²⁰⁰⁰	4,400
Country area (km ²)	312,685
Airspace controlled	0
Domestic Flights ²⁰⁰¹	29,507
International Flights ²⁰⁰¹	95,311
Overflights ²⁰⁰¹	124,807
Total flights ²⁰⁰¹	249,625

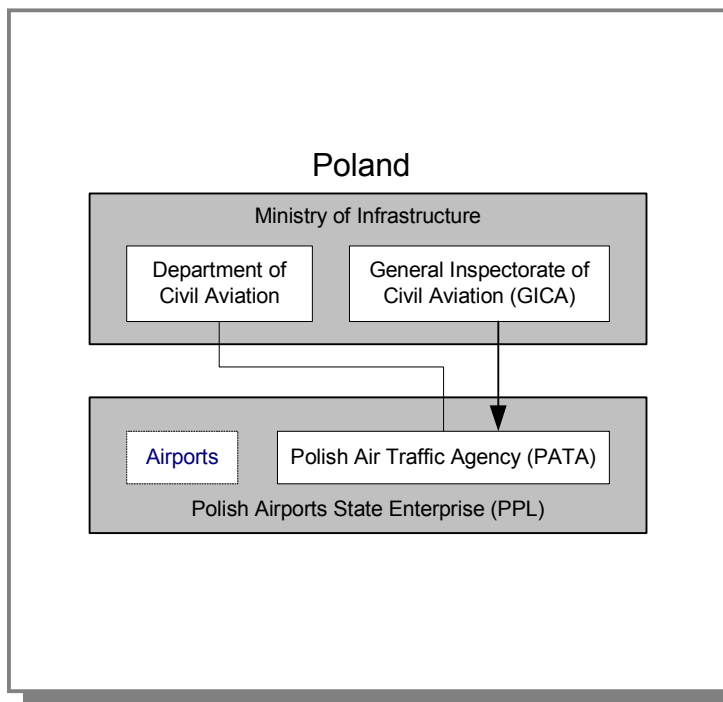
ANSP Status:

Responsible bodies:

Safety Regulation: General Inspectorate of Civil Aviation (GICA)

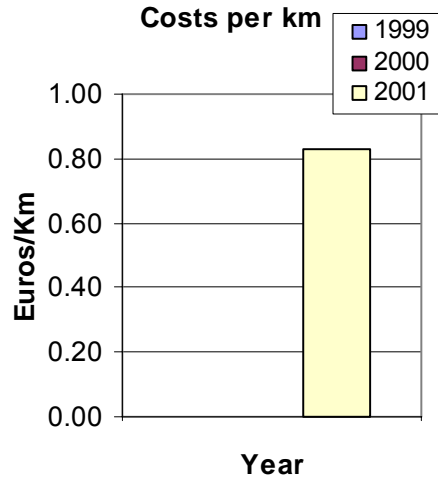
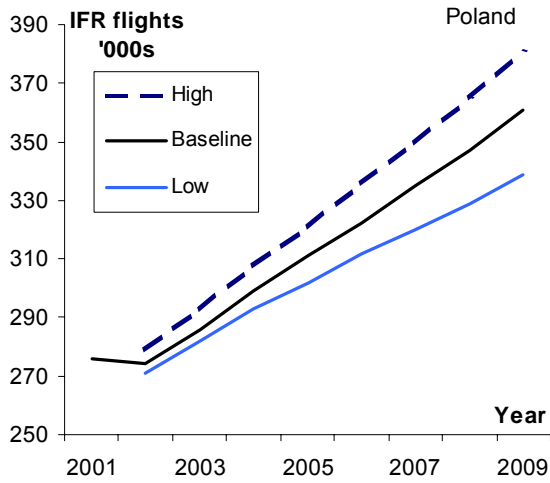
Economic Regulation: Planned in new air law – will be CAA. (Currently charges reviewed by customers / IATA)

Airspace: Ministry of Defence and Ministry of Transport



Membership of International Organisations

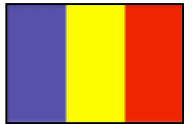
JAA	✓
Eurocontrol	X
ECAC	1990
NATO	1999



Year	1999	2000	2001	2002	01/ 99
Total staff					
Total ATCOs					
No of IFR flights		250,000	262,000		
Unit rate (€)			66.5 ^{estimate}		

Main airports	Aircraft movements ²⁰⁰⁰	Passenger numbers ²⁰⁰⁰
Poznan		
Gdansk		
Krakow	8,295	258,470
Warsaw	92,057	4,325,814

ROMANIA



Key facts

Population ²⁰⁰⁰	22,364,022
GDP per head (€) ²⁰⁰⁰	1,800
Country area (km ²)	237,500
Airspace controlled	250,000
Domestic Flights ²⁰⁰¹	11,704
International Flights ²⁰⁰¹	37,964
Overflights ²⁰⁰¹	251,908
Total flights ²⁰⁰¹	301,576

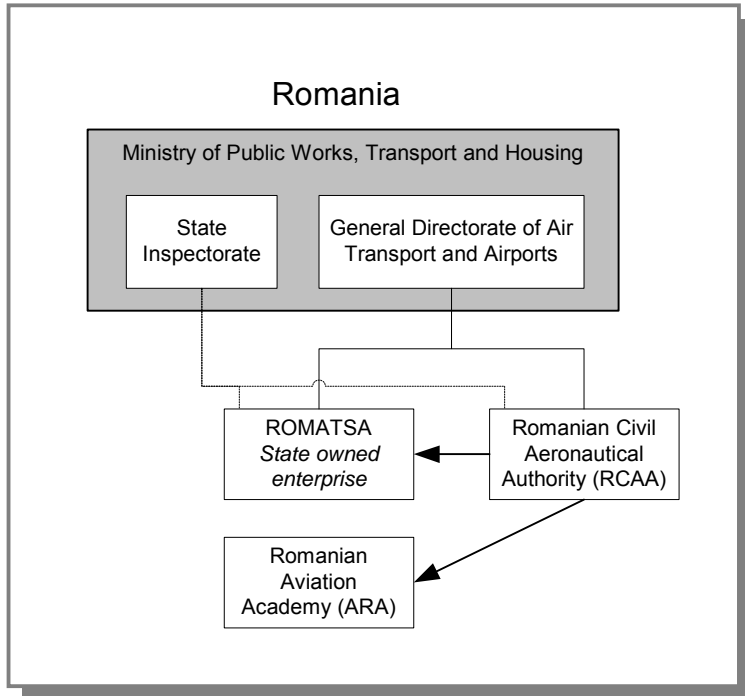
ANSP Status:

Responsible bodies:

Safety Regulation: MoT- civil (approval of regulations) & RCAA (regulation enforcement & safety oversight); MoD- military (approval of regulations) + Air Force Staff (regulation enforcement & safety oversight)

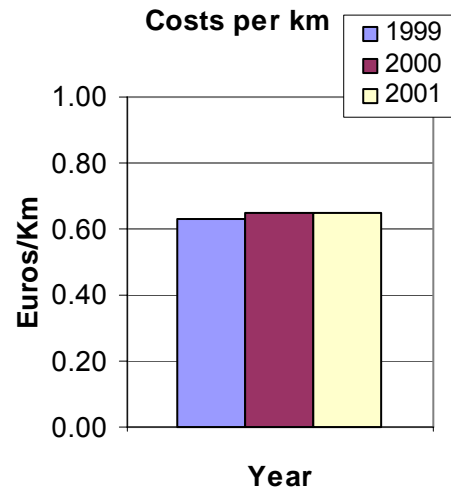
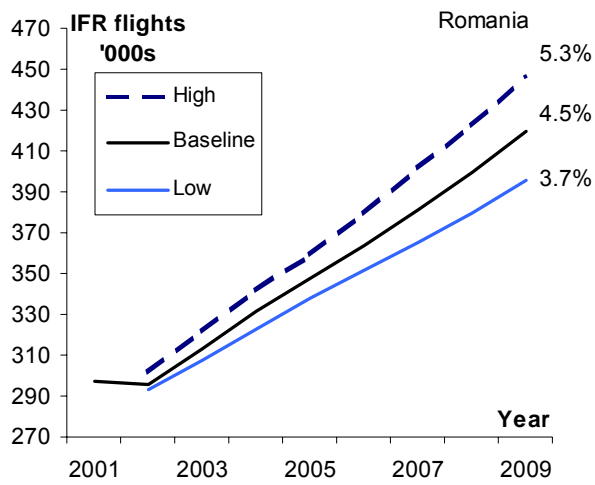
Economic Regulation: MoT (approval of regulations) prepared by the Directorate General for Economic and Budgetary Relations within MoT

Airspace: MoT- civil & RCAA; MoD- military + Air Force Staff



Membership of International Organisations

JAA	✓
Eurocontrol	1996
ECAC	1991
NATO	X



Year	1999	2000	2001	2002	01/ 99
Total staff					
Total ATCOs	546	540	525		-3.8%
No of IFR flights	376,000	300,000	318,755		15.2%
Unit rate (€)	39.82	39.82	42.52	47.06	

SLOVAKIA



Key facts

Population ²⁰⁰⁰	5,414,937
GDP per head (€) ²⁰⁰⁰	3,900
Country area (km ²)	48,845
Airspace controlled	49,000
Domestic Flights ²⁰⁰¹	2,744
International Flights ²⁰⁰¹	13,150
Overflights ²⁰⁰¹	155,434
Total flights ²⁰⁰¹	171,328

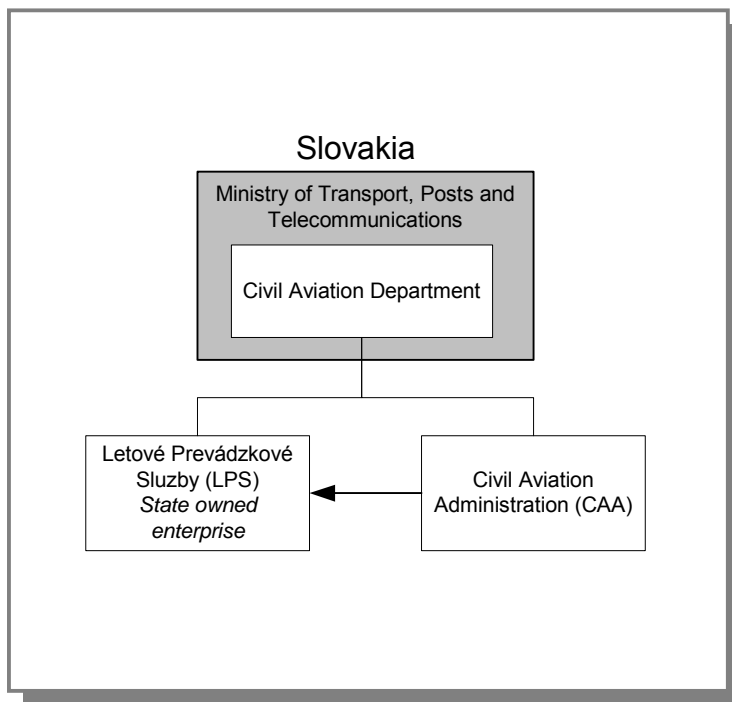
ANSP Status:

Responsible bodies:

Safety Regulation: Civil Aviation Administration (CAA)

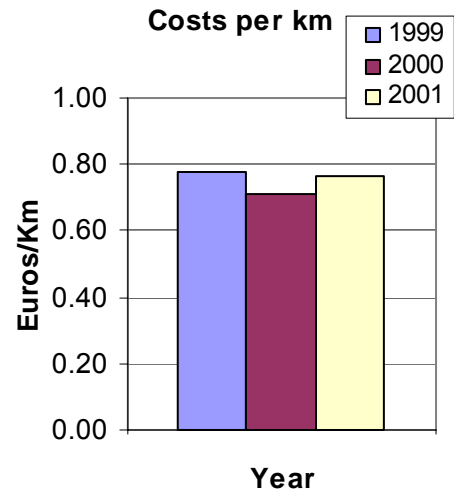
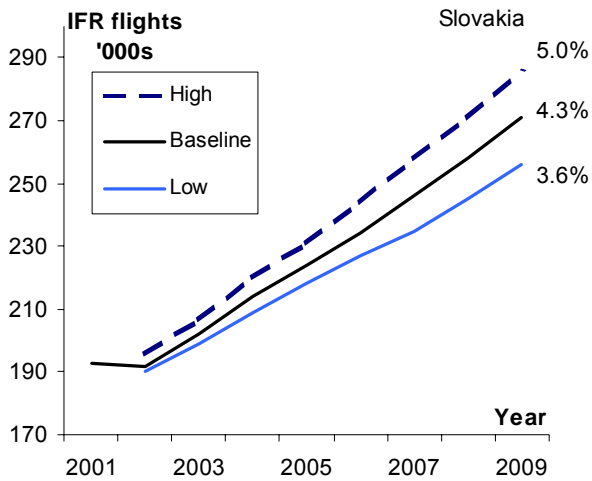
Economic Regulation:

Airspace:



Membership of International Organisations

JAA	✓
Eurocontrol	1997
ECAC	1991
NATO	X



Year	1999	2000	2001	2002	01/ 99
Total staff					
Total ATCOs	136	136	135		-0.7%
No of IFR flights	210,000	177,000	181,340		-13.6%
Unit rate (€)	70.76	54.74	58.96	59.39	

Main airports	Aircraft movements ²⁰⁰⁰	Passenger numbers ²⁰⁰⁰
Kosice	17,117	126,688
Bratislava	16,407	292,515



Key facts

Population ²⁰⁰⁰	1,930,132
GDP per head (€) ²⁰⁰⁰	9,800
Country area (km ²)	20,253
Airspace controlled	20,273
Domestic Flights ²⁰⁰¹	718
International Flights ²⁰⁰¹	23,406
Overflights ²⁰⁰¹	112,238
Total flights ²⁰⁰¹	136,632

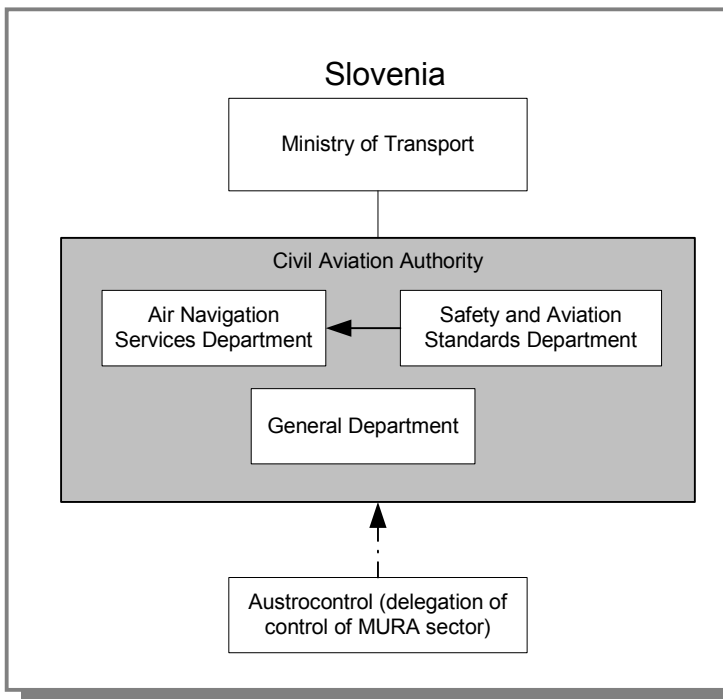
ANSP Status:

Responsible bodies:

Safety Regulation: Civil Aviation Administration (CAA)

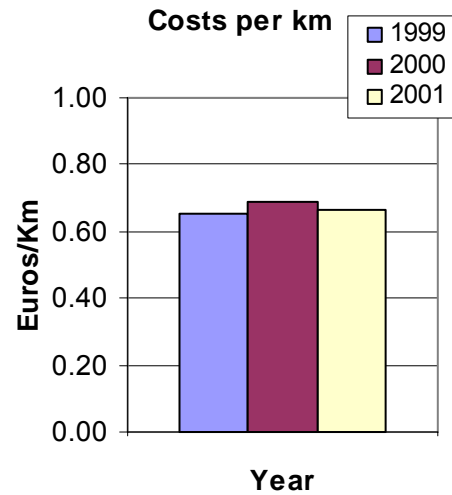
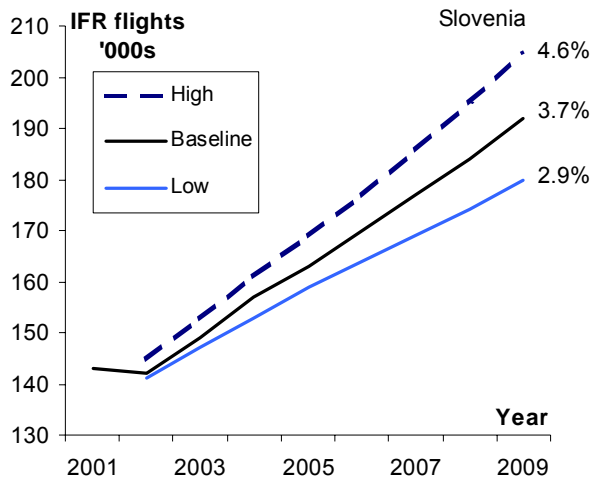
Economic Regulation: Ministry of Transport and Ministry of Finance endorse price tariff

Airspace: Civil Aviation Administration (CAA)



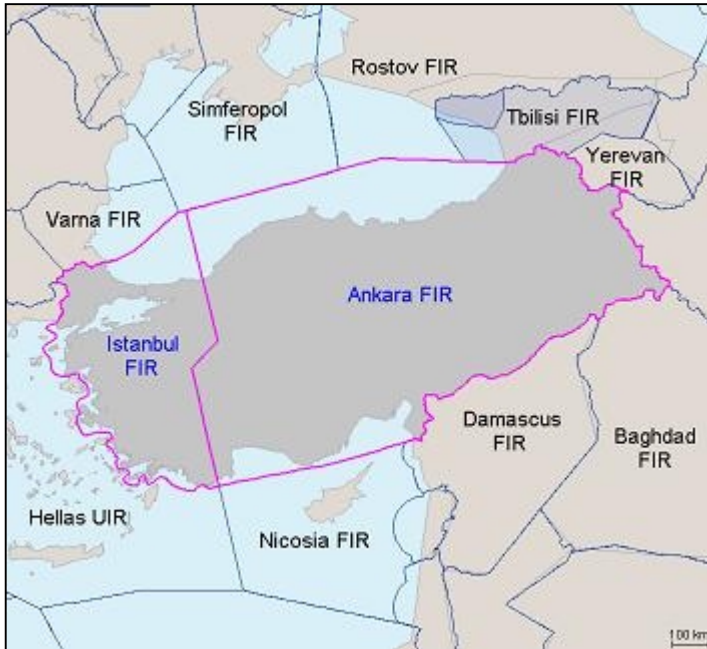
Membership of International Organisations

JAA	✓
Eurocontrol	1995
ECAC	1992
NATO	X



Year	1999	2000	2001	2002	01/ 99
Total staff					
Total ATCOs	90	90	89		-1.1%
No of IFR flights	99,000	136,362	144,340		45.8%
Unit rate (€)	43.11	63	62.84	61.85	

Main airports	Aircraft movements ²⁰⁰⁰	Passenger numbers ²⁰⁰⁰
Portoroz		
Ljubljana	29,965	980,351



Key facts

Population ²⁰⁰⁰	66,493,970
GDP per head (€) ²⁰⁰⁰	3,200
Country area (km ²)	780,580
Airspace controlled	1,206,000
Domestic Flights ²⁰⁰¹	90,088
International Flights ²⁰⁰¹	184,523
Overflights ²⁰⁰¹	150,718
Total flights ²⁰⁰¹	425,329

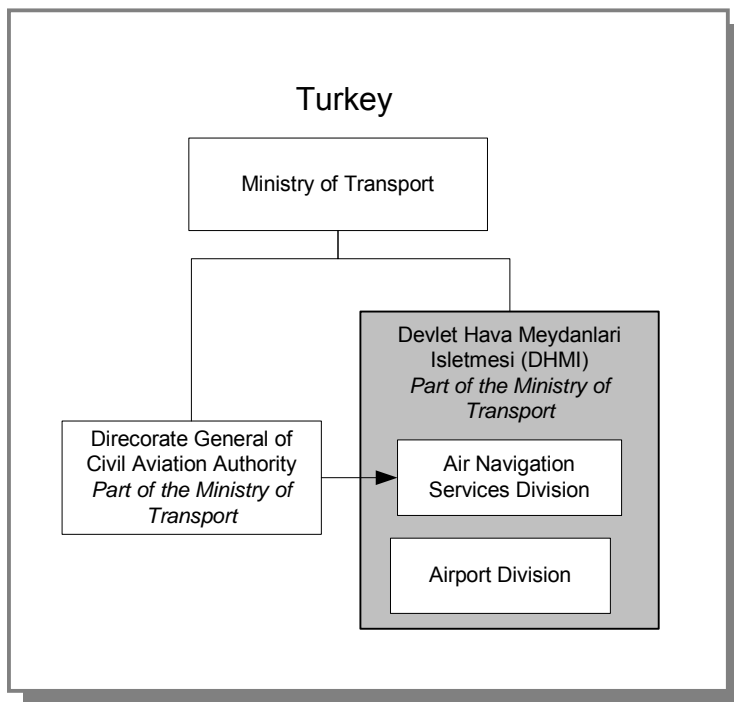
ANSP Status:

Responsible bodies:

Safety Regulation: DGCAA

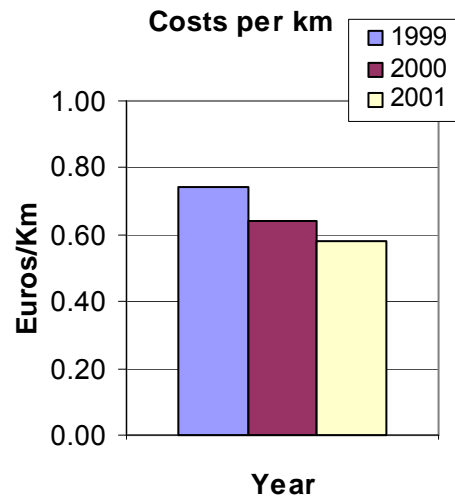
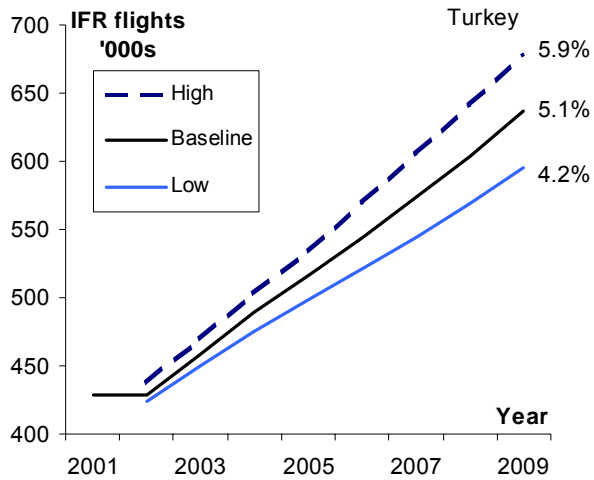
Economic Regulation: Ministry of Finance

Airspace: A joint committee



Membership of International Organisations

JAA	✓
Eurocontrol	1989
ECAC	1955
NATO	1949



Year	1999	2000	2001	2002	01/ 99
Total staff					
Total ATCOs					
No of IFR flights	450,000	447,000	481,000		6.9%
Unit rate (€)	43.75	39.1	44.49	30.11	

Main airports	Aircraft movements ²⁰⁰⁰	Passenger numbers ²⁰⁰⁰
Izmir	27,519	2,611,094
Ankara	52,491	4,079,188
Antalya	53,864	7,501,386
Istanbul	171,714	15,969,009
Izmir	27,519	2,611,094