EUROCONTROL

REPORT COMMISSIONED BY THE PERFORMANCE REVIEW COMMISSION

ATM Cost-Effectiveness (ACE) 2008 Benchmarking Report

Prepared by the Performance Review Unit (PRU)
with the ACE Working Group

June 2010

BACKGROUND

This Report has been commissioned by the Performance Review Commission (PRC).

The PRC was established in 1998 by the Commission of EUROCONTROL, in accordance with the ECAC Institutional Strategy (1997).

One objective in this Strategy is "*to introduce strong, transparent and independent performance review and target setting to facilitate more effective management of the European ATM system, encourage mutual accountability for system performance and provide a better basis for investment analyses and, with reference to existing practice, provide guidelines to States on economic regulation to assist them in carrying out their responsibilities.*"

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The Performance Review Unit (PRU) has made every effort to ensure that the information and analysis contained in this document are as accurate and complete as possible. Should you find any errors or inconsistencies we would be grateful if you could please bring them to the PRU's attention.

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ABSTRACT

This report is the eighth in a series of annual reports based on mandatory information disclosure provided by 36 Air Navigation Services Providers (ANSPs) to the EUROCONTROL Performance Review Commission (PRC). This report comprises factual data and analysis on cost-effectiveness and productivity for the 36 ANSPs for the year 2008, including high level trend analysis for the years 2004-2008. The scope of the report is both en-route and terminal navigation services (i.e. gate-to-gate). The main focus is on the ATM/CNS provision costs as these costs are under the direct control and responsibility of the ANSP. Costs borne by airspace users for less than optimal quality of service are also considered. The report describes a performance framework for the analysis of cost-effectiveness. The framework highlights 3 key performance drivers contributing to cost-effectiveness (productivity, employment costs and support costs). The report also presents detailed productivity comparisons for 64 Area Control Centres (ACCs) grouped in 3 clusters of different traffic complexity characteristics. Finally, the report analyses forward-looking information for the years 2009-2013, inferring on future financial cost-effectiveness performance at both system and ANSP levels, and displaying future capital expenditures and future capacity plans.

Keywords

EUROCONTROL Performance Review Commission - Economic information disclosure – Benchmarking – Target setting – Exogenous factors – Complexity metrics - ATM/CNS cost-effectiveness comparisons - European Air Navigation Services Providers (ANSPs) - Gate-to-gate - En-route and Terminal ANS - Inputs and outputs metrics – Aeronautical MET costs – Regulatory costs - Performance framework - Quality of service - 2008 data - Factual analysis – Historic trend analysis - Costs drivers - Productivity – Employment costs - Support costs – Area Control Centres (ACCs) productivity comparisons – Current and future capital expenditures – ATM (FDP, RDP) systems - Forward-looking trend analysis.

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TABLE OF CONTENTS

READER'S GUIDE ..... **I**
EXECUTIVE SUMMARY ..... **III**
1 INTRODUCTION **1**
1.1 Organisation of the report 1
1.2 Overview of participating ANSPs 2
1.3 Data submission 4
1.4 Data validation, processing and reporting 5
1.5 ANSPs' Annual Reports 6
1.6 Use of published ACE data and reports 8
PART I: EUROPEAN ANS DATA AND INTRODUCTION TO ANSP BENCHMARKING **9**
2 EUROPEAN ANS SYSTEM DATA **11**
2.1 System outputs 12
2.2 ANS revenues 13
2.3 ANS costs 13
2.4 Assets, liabilities and capital expenditures 15
2.5 Staff 18
2.6 Summary data for the European system (2007 and 2008) 19
3 TOTAL ANS COSTS VERSUS ATM/CNS PROVISION COSTS **21**
3.1 Introduction 21
3.2 ANS cost categories 21
3.2.1 MET costs 23
3.2.2 Payments to governmental and regulatory authorities 26
3.2.3 EUROCONTROL Agency costs (excluding MUAC & CEATS) 27
3.2.4 Payment to other ANSP or States for delegated services 28
3.2.5 Irrecoverable Value Added Tax (VAT) 29
3.2.6 ATM/CNS provision costs 29
4 FACTORS AFFECTING PERFORMANCE **33**
4.1 Introduction 33
4.2 Exogenous factors 34
4.3 Progress in quantifying some exogenous factors 36
4.4 Endogenous factors 40
4.5 How should these factors be taken into account for benchmarking purposes? 42
PART II: FINANCIAL COST-EFFECTIVENESS **45**
5 FINANCIAL COST-EFFECTIVENESS (2008) **47**
5.1 Introduction 47
5.2 Overall financial cost-effectiveness 48
5.3 Framework for gate-to-gate cost-effectiveness and productivity analysis 51
5.4 Breakdown of gate-to-gate cost-effectiveness for individual ANSPs 52
5.4.1 ATCO-hour productivity (2008) 52
5.4.2 ATCO employment costs per ATCO-hour (2008) 54
5.4.3 ATCO employment costs per composite flight-hour (2008) 55
5.4.4 Support cost ratio (2008) 56
5.4.5 Support costs per composite flight-hour (2008) 58
5.4.6 Performance ratios (2008) 65
6 CHANGES IN FINANCIAL COST-EFFECTIVENESS (2004-2008) **69**
6.1 Introduction 69
6.2 ATM/CNS costs structure and reactivity of the European ATM industry to significant decreases in traffic demand 70
6.2.1 Fixed and variable costs components in the provision of ATM/CNS services 70
6.2.2 Reactivity of the European ATM industry to significant decreases in traffic demand 72
6.3 Medium term changes in financial cost-effectiveness (2004-2008) 73
6.4 Changes in financial cost-effectiveness at ANSP level (2004-2008) 74
6.5 Changes in the components of financial cost-effectiveness (2004-2008) 75
6.5.1 Changes at European system level (2004-2008) 76
6.5.2 Changes in ATCO-hour productivity at ANSP level (2004-2008) 77
6.5.3 Changes in ATCO employment costs at ANSP level (2004-2008) 80
6.5.4 Changes in support costs per composite flight-hour (2004-2008) 82
7 FORWARD-LOOKING FINANCIAL COST-EFFECTIVENESS (2009-2013) **87**
7.1 Introduction 87

7.2 Forward-looking financial cost-effectiveness at European system level 87
7.2.1 Changes in planned unit ATM/CNS provision costs at ANSP level 89
7.3 Changes in fixed assets and capital expenditure (capex) 90
7.3.1 Cumulative capex (2009-2013) to 2008 revenues ratio at ANSP level 91
7.4 Changes in ATCOs in OPS and en-route ATC capacity 92
8 COMPARISON OF ATCO PRODUCTIVITY AT ACC LEVEL 95
8.1 Introduction 95
8.2 ACC data for 2008 95
8.3 ATFM FDP and RDP systems 97
8.4 Changes in key ACC data between 2004 and 2008 98
8.5 Exogenous factors: traffic variability and complexity measures for ACCs 99
8.6 Framework for ATCO productivity analysis at ACC level 101
8.7 Changes in productivity for ATCOs at European ACCs (2004-2008) 101
8.8 ATCO-hour productivity results at ACC level (2008) 102
8.9 ATCO-hour productivity for the different clusters (2008) 104
8.10 ATCO-hour productivity and quality of service 106
8.11 The breakdown of ATCO-hour productivity (2008) 107
8.12 Changes in ATCO-hour productivity at ACC level (2004-2008) 108
PART III: ECONOMIC COST-EFFECTIVENESS 113
9 ECONOMIC COST-EFFECTIVENESS 115
9.1 Introduction 115
9.2 The measures of quality of service 115
9.3 The measure of economic gate-to-gate cost-effectiveness 117
9.4 Comparison of economic cost-effectiveness (2008) 117
9.5 Trends in economic cost-effectiveness (2004-2008) 120
PART IV: COST-EFFECTIVENESS PERFORMANCE FOCUS AT ANSP LEVEL 125
10 COST-EFFECTIVENESS PERFORMANCE FOCUS AT ANSP LEVEL 127
10.1 Objective of this chapter 127
10.2 Historical development of performance, 2004-2008 127
10.3 The planned and projected development of performance, 2009-2013 128
10.4 Cost-effectiveness performance focus at ANSP level 129
ANNEX 1 – STATUS ON ANSPs YEAR 2008 ANNUAL REPORTS 203
ANNEX 2 - PERFORMANCE INDICATORS USED FOR THE COMPARISON OF ANSPs 205
ANNEX 3 – TRAFFIC COMPLEXITY INDICATORS AT ANSP LEVEL 207
ANNEX 4 – COST OF CAPITAL REPORTED BY ANSPs 209
ANNEX 5 – EXCHANGE RATES, INFLATION RATES AND PURCHASING POWER PARITIES (PPPs) 2008 DATA 211
ANNEX 6 - KEY DATA 213
ANNEX 7 - ANSP FACT SHEETS 219
GLOSSARY 257

TABLES

Table 0.1: Key system data for 2007 and 2008 vi
Table 1.1: States and ANSPs participating in ACE 2008 3
Table 1.2: IFRS reporting status 7
Table 2.1: Summary data for the European ANS system in 2008 prices 20
Table 3.1: Breakdown of total ANS costs by category, 2008 21
Table 3.2: Breakdown of en-route and terminal ANS costs (State view), 2008 22
Table 5.1: The components of gate-to-gate cost-effectiveness, 2008 66
Table 6.1: Changes in ATCO-hours on duty and traffic volumes (2004-2008) 79
Table 6.2: Breakdown of changes in unit support costs, 2004-2008 (real terms) 84
Table 7.1: Summary of cost-containment measures 89
Table 8.1: ACC 2008 data 96
Table 8.2: Traffic complexity and traffic variability indicators at ACC level, 2008 100
Table 9.1: Economic cost-effectiveness KPI, 2008 117
Annex 1 - Table 0.1: Status on ANSP's 2008 Annual Reports 203
Annex 3 - Table 0.1: Traffic complexity indicators at ANSP level, 2008 207
Annex 4 - Table 0.1: Comments on cost of capital reported by ANSPs, 2008 210
Annex 5 - Table 0.1: 2008 Exchange rates, inflation rates and PPPs data 211
Annex 6 - Table 0.1: Breakdown of total ANS revenues (en-route, terminal and gate-to-gate), 2008 213
Annex 6 - Table 0.2: Breakdown of total ANS costs (en-route, terminal and gate-to-gate), 2008 214
Annex 6 - Table 0.3: Breakdown of ATM/CNS provision costs (en-route, terminal and gate-to-gate), 2008 215
Annex 6 - Table 0.4: Balance Sheet data at ANSP level, 2008 216
Annex 6 - Table 0.5: Total staff and ATCOs in OPS data, 2008 217
Annex 6 - Table 0.6: Operational data (ANSP and State level), 2008 218

FIGURES

Figure 0.1: Geographic coverage of ACE 2008 iii
Figure 0.2: The development of en-route ANS costs, traffic and en-route ANS unit costs (1990-2014), real terms.... iv
Figure 0.3: Conceptual framework for analysis of ATM/CNS cost-effectiveness.... v
Figure 0.4: FDP systems suppliers, 2008 vii
Figure 0.5: FDP systems upgrades and replacements (2005-2015) vii
Figure 0.6: Composition of balance sheet of ANSPs (2008)....viii
Figure 0.7: Distribution of ATM/CNS provision costs in 2008 viii
Figure 0.8: Changes in gate-to-gate cost-effectiveness KPI (2004-2008, real terms) ix
Figure 0.9: Economic gate-to-gate cost-effectiveness KPI, 2008 ix
Figure 0.10: Share of ATFM delays in unit economic costs, 2008.... x
Figure 0.11: ANSPs cumulative capex (2004-2008) x
Figure 0.12 Changes in the financial cost-effectiveness KPI, 2004-2008 (real terms) xi
Figure 0.13: Cost-effectiveness improvement (2004-2008, real terms) xi
Figure 0.14: Breakdown of changes in financial cost-effectiveness, 2004-2008 (real terms)....xii
Figure 0.15: Changes in ATCO-hour productivity (2004-2008)....xii
Figure 0.16: Annual traffic growth for the medium-term (2004-2008) and for the short-term (2007-2008)....xiii
Figure 0.17: Productivity and ATCO employment costs for the five largest ANSPs (2008)....xiii
Figure 0.18: Change in support costs per composite flight-hour at ANSP level, 2004-2008 (real terms)....xiv
Figure 0.19: Forward-looking cost-effectiveness at European system level (2008-2013, real terms) xv
Figure 0.20: Summary of cost-containment measures.... xv
Figure 0.21: Summary of ACC productivity results for each cluster, 2008....xvi
Figure 1.1: Progress with submission of 2008 data 4
Figure 1.2: Data validation, processing and reporting....5
Figure 1.3: Status of 2008 Annual Reports 7
Figure 1.4: Relationship between ANSPs benchmarking and cost-effectiveness 8
Figure 2.1: Geographic coverage of ACE 2008 analysis & key data 11
Figure 2.2: Increases in output and size of the system under ACE review....12
Figure 2.3: Breakdown of gate-to-gate ANS revenues in 2008....13
Figure 2.4: Breakdown of total ANS costs at system level in 2008....14
Figure 2.5: Breakdown of European ATM/CNS provision costs in 2008....15
Figure 2.6: ANSP assets and liabilities structure, 2008 16
Figure 2.7: ANSP capex structure, 2008....17
Figure 2.8: Surveillance and navigation aids physical assets, 2008 18
Figure 2.9: Breakdown of European ANS system staff in 2008 18
Figure 3.1: Arrangements for provision of aeronautical MET services (2008) 23
Figure 3.2: Proportion of MET costs in total gate-to-gate ANS costs (2008) 23
Figure 3.3: Proportions of direct and core costs in gate-to-gate MET costs (2008)....24
Figure 3.4: Trends in gate-to-gate MET costs (2004-2008) 25
Figure 3.5: Changes in gate-to-gate MET costs (State level, 2004-2008, real terms)....25
Figure 3.6: EUROCONTROL Agency costs relative to total European en-route ANS costs 27
Figure 3.7: EUROCONTROL Agency costs per establishment & expenditure (Parts I & IX) 27
Figure 3.8: Changes in planned costs for the EUROCONTROL Agency (Parts I & IX)....28
Figure 3.9: ANSPs' gate-to-gate ATM/CNS provision costs in 2008 29
Figure 3.10: Breakdown of ATM/CNS provision costs, 2008 30
Figure 4.1: Factors affecting cost-effectiveness performance 34
Figure 4.2: Legal & socio-economic conditions....35
Figure 4.3: Operational conditions....35
Figure 4.4: Institutional & governance arrangements....36
Figure 4.5: Index of PPP cost of living, 2008 37
Figure 4.6: Traffic complexity metrics for ANSPs, 2008....38
Figure 4.7: Overall complexity scores at ANSP level, 2008....39
Figure 4.8: Seasonal traffic variations, 2008 40
Figure 4.9: Organisational factors 41
Figure 4.10: Managerial & financial aspects 41
Figure 4.11: Operational & technical setup 42
Figure 5.1: Conceptual framework for the analysis of financial cost-effectiveness....47
Figure 5.2: Comparison of the financial cost-effectiveness KPI, 2008....48

Figure 5.3: Adjustment of the financial cost-effectiveness KPI for ANSPs operating in the Four States airspace (2008) 49
Figure 5.4: Breakdown of financial cost-effectiveness into en-route and terminal, 2008 50
Figure 5.5: Performance framework for gate-to-gate cost-effectiveness analysis 51
Figure 5.6: ATCO-hour productivity (gate-to-gate), 2008 53
Figure 5.7: ATCO employment costs per ATCO-hour (gate-to-gate), 2008 54
Figure 5.8: Employment costs per ATCO-hour with and without PPPs, 2008 55
Figure 5.9: ATCO employment costs per composite flight-hour, 2008 55
Figure 5.10: Components of ATCO employment costs per unit output, 2008 56
Figure 5.11: Support cost ratio (gate-to-gate), 2008 57
Figure 5.12: Framework for support costs analysis 58
Figure 5.13: Support costs per composite flight-hour, 2008 59
Figure 5.14: Non-ATCO employment costs with and without adjustment for PPPs, 2008 60
Figure 5.15: Breakdown of non-ATCO employment costs 60
Figure 5.16: Employment costs per non-ATCO staff and non-ATCO staff per unit of output, 2008 . 61
Figure 5.17: Breakdown of non-ATCO staff, 2008 62
Figure 5.18: Breakdown of capital-related costs 63
Figure 5.19: Components of depreciation costs per composite flight-hour, 2008 63
Figure 5.20: Asset bases and average rates used to compute the cost of capital, 2008 65
Figure 6.1: Relationship gate-to-gate ATM/CNS provision costs and composite flight-hours at European system level (2002-2008) 70
Figure 6.2: Breakdown of ATM/CNS costs (2008) 71
Figure 6.3: The development of en-route ANS costs, traffic and en-route ANS unit costs (1990-2014), real terms 72
Figure 6.4: Changes in financial cost-effectiveness KPI (2004-2008, real terms) 73
Figure 6.5: Cost-effectiveness improvement (2004-2008, real terms) 74
Figure 6.6: Changes in gate-to-gate ATM/CNS provision costs per composite flight-hour, 2004-2008 (real terms) 74
Figure 6.7: Changes in ATM/CNS provision costs and traffic volumes (2004-2008) 75
Figure 6.8: Breakdown of changes in financial cost-effectiveness, 2004-2008 (real terms) 76
Figure 6.9: Improvement in ATCO-hour productivity (2004-2008) 77
Figure 6.10: Trends in ATCO-hour productivity at ANSP level (2004-2008 and 2007-2008) 77
Figure 6.11: Traffic growth for the medium-term (2004-2008) and for the short-term (2007-2008) .. 78
Figure 6.12: Changes in ATCO employment costs per ATCO-hour, 2004-2008 (real terms) 80
Figure 6.13: Changes in ATCO productivity and employment costs, 2004-2008 (real terms) 81
Figure 6.14: Changes in the components of support costs per composite flight-hour, 2004-2008 (real terms) 82
Figure 6.15: Improvement in support costs per composite flight-hour (2004-2008, real terms) 82
Figure 6.16: Change in support cost per composite flight-hour at ANSP level, 2004-2008 and 2007-2008 (real terms) 83
Figure 6.17: Changes in ATCOs in OPS and “support” staff for the five largest ANSPs 85
Figure 7.1: Status of ANSPs planned costs and traffic data submission 87
Figure 7.2: Forward-looking cost-effectiveness at European system level (2008-2013, real terms) 88
Figure 7.3: Changes in planned costs and traffic at European system level (2008-2012, real terms) 88
Figure 7.4: ANSPs planned changes in gate-to-gate unit costs (2008-2013, real terms) 89
Figure 7.5: Asset structure at European system level (2004-2008) 90
Figure 7.6: Forward-looking capex and depreciation costs at European system level (2004-2013, real terms) 91
Figure 7.7: Changes in planned capex at European system level (2008-2012, real terms) 91
Figure 7.8: ANSPs cumulative capex (2009-2013) on 2008 revenues ratio 91
Figure 7.9: Planned number of ATCOs in OPS at European system level (2004-2013) 93
Figure 7.10: Changes in planned number of ATCOs in OPS at European system level (2008-2012) 93
Figure 7.11: Planned number of en-route sectors and sector-hours at European system level (2004-2013) 93
Figure 8.1: Areas controlled by the European ACCs in the ACE 2008 data set 95
Figure 8.2: FDP systems suppliers, 2008 97
Figure 8.3: FDP systems upgrades and replacements (2005-2015) 97
Figure 8.4: Key ACC data at European system level (2004-2008) 98
Figure 8.5: Overall complexity score per ACC and seasonal traffic variability (2008) 99
Figure 8.6: Performance framework for ACC productivity analysis 101
Figure 8.7: Breakdown of changes in ACC ATCO productivity, 2004-2008 101

Figure 8.8: ATCO-hour productivity indicator at ACC level, 2008 103
Figure 8.9: The complexity classification of ACCs, 2008 104
Figure 8.10: Summary of productivity results for each cluster, 2008 105
Figure 8.11: ATCO-hour productivity and quality of service for each cluster, 2008 107
Figure 8.12: Sector productivity and staffing per sector, 2008 108
Figure 8.13: Changes in ATCO-hour productivity and ATFM delays per flight-hour (Cluster 1) 109
Figure 8.14: Changes in ATCO-hour productivity and ATFM delays per flight-hour (Cluster 2) 110
Figure 8.15: Changes in ATCO-hour productivity and ATFM delays per flight-hour (Cluster 3a) ... 111
Figure 8.16: Changes in ATCO-hour productivity and ATFM delays per flight-hour (Cluster 3b) ... 112
Figure 9.1: Trade-off between cost-effectiveness and quality of service 115
Figure 9.2: Conceptual framework for the analysis of economic cost-effectiveness 116
Figure 9.3: Economic gate-to-gate cost-effectiveness KPI, 2008 118
Figure 9.4: Share of ATFM delays in unit economic costs, 2008 119
Figure 9.5: ANSPs cumulative capex (2004-2008) 119
Figure 9.6: Breakdown of ATFM delays, 2008 120
Figure 9.7: Causes of en-route and airport ATFM delays, 2008) 120
Figure 9.8: Trend in gate-to-gate economic cost-effectiveness KPI (2004-2008, real terms) 121
Figure 9.9: Changes in economic cost-effectiveness for the 15 most “complex” and the 21 less “complex” ANSPs (2004-2008) 123

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READER'S GUIDE

This table indicates which chapters of the report are likely to be of most interest to particular readers and stakeholders.	
Executive summary	All stakeholders with an interest in ATM who want to know what this report is about, or want an overview of the main findings.
Chapter 1: **Introduction**	Those wanting a short overview of the structure of the report, the list of participating ANSPs, and the process to analyse the data comprised in this report.
Part I: - European ANS data and introduction to ANSP benchmarking	
Chapter 2: **European ANS system data**	Brief summary of the main economic financial and operational metrics for the whole European ANS system in 2008.
Chapter 3: **Total ANS costs versus ANSP's controllable costs**	All those who are interested in obtaining a high-level view of MET costs, EUROCONTROL Agency costs, regulatory costs, and payment for delegation of ATS. These costs are not directly controlled by the ANSP, and therefore to ensure like-with-like comparisons, they are excluded in the subsequent ANSP benchmarking analysis. This chapter is particularly relevant to airspace users who are charged for these costs and who need to understand how the ANS charges can be reconciled with the ANSP costs which are benchmarked.
Chapter 4: **Factors affecting performance**	All those who are interested in the main (measurable) factors which affect the observed performance of an ANSP such as size, cost of living, traffic complexity and traffic variability. This chapter is particularly relevant to scholars and economic regulators who are interested in developing econometric methodology to benchmark ANSPs with a view to produce a normative assessment of performance.
Part II: - Financial cost-effectiveness	
Chapter 5: **Financial cost-effectiveness (2008)**	All those who are interested in understanding how ATM/CNS provision cost-effectiveness in 2008 is measured and benchmarked for each ANSP, including its three main economic drivers (productivity, employment costs and support costs). This chapter is particularly relevant to ANSPs' management and regulators in order to identify best practices and areas for improvement.
Chapter 6: **Changes in financial cost-effectiveness (2004-2008)**	All those who are interested in trends and dynamic analysis of ATM/CNS cost-effectiveness performance between 2004 and 2008. This chapter is particularly relevant to ANSPs' management and regulators in order to identify how cost-effectiveness performance has evolved and which have been the sources of improvement (productivity, employment costs and support costs).
Chapter 7: **Forward looking financial cost-effectiveness (2009-2013)**	All those who are interested in forward-looking expectations of ATM/CNS cost-effectiveness performance for the 2009-2013 period, including capital investment and staff projections. This chapter is particularly relevant for those interested in cost-effectiveness planning and for airspace users during their consultation processes.
Chapter 8: **Comparison of ATCO productivity at**	All those who are interested in understanding how ATCO productivity is measured and benchmarked for

ACC level	each ACC, including its two main components (sector productivity and staffing per sector). This chapter is particularly relevant to ANSPs' management in order to identify best practices and areas for improvement with implications in terms of future ATC capacity provision and associated quality of service (e.g. ATFM delays). This chapter is also relevant to scholars and regulators who are interested in methodology to benchmark ACCs with a view to model ATC capacity and develop a normative assessment of ACC performance.
Part III: - Economic cost-effectiveness	
Chapter 9: **Economic cost-effectiveness**	All those who are interested in understanding how the quality of service (currently only ATFM delays) is factually measured, valued in monetary terms and benchmarked for each ANSP. This chapter is particularly relevant to ANSPs' management and regulators in order to identify areas for improvement, and understand trade-offs between quality of service and financial cost-effectiveness.
Part IV: - Performance focus at ANSP level	
Chapter 10: **Cost-effectiveness performance focus at ANSP level**	All those who are interested in obtaining an assessment of individual ANSP historic cost-effectiveness performance (2004-2008), and an analysis of ANSPs forward-looking projections (2009-2013). This chapter is particularly relevant to ANSPs' management, airspace users and regulators in order to identify how cost-effectiveness performance has evolved and which have been the sources of improvement, as well as what are the prospects for further improvements based on forward-looking expectations of ATM/CNS cost-effectiveness performance, including capital investment and staff projections.
Annexes:	Tables with data used in the report.

EXECUTIVE SUMMARY

The ACE Report presents an independent benchmarking of the cost-effectiveness of 36 European ANSPs

This ATM Cost-Effectiveness (ACE) 2008 Benchmarking Report, the eighth in the series, presents a review and comparison of ATM cost-effectiveness for 36 Air Navigation Service Providers (ANSPs) in Europe.

ACE 2008 presents information on performance indicators relating to cost-effectiveness and productivity for the year 2008, and how they changed over time (2004-2008). It examines both individual ANSPs and the European ATM/CNS system as a whole. In addition, ACE 2008 examines forward-looking information covering 2009-2013 which was provided by ANSPs on November 2009.

The geographical coverage of the ACE benchmarking analysis is shown in Figure 0.1.

The benchmarking analysis is based on information provided by ANSPs in compliance with Decision No. 88 of the Permanent Commission of EUROCONTROL on economic information disclosure.

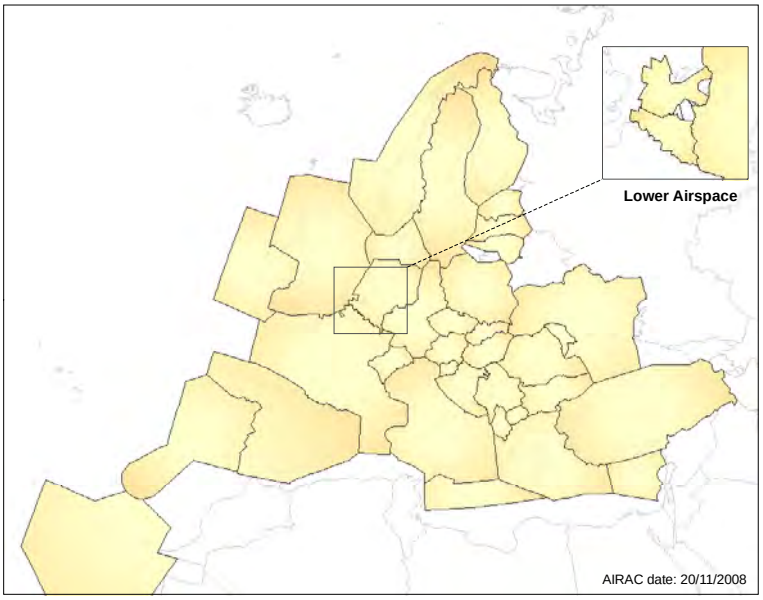


Figure 0.1: Geographic coverage of ACE 2008

Since 2001, there has been a gradual and general improvement in the quality, quantity and timing of ACE data submission. The timeliness of submissions continues to improve; 25 were delivered on time. This was achieved despite the introduction of the new Version 2.6 of the Specification for Information Disclosure, which requires data disclosure in new areas to enhance comparability and understanding of performance drivers. There remain, however, problems in few individual cases both with timeliness (Croatia Control) and quality of data (HCAA).

The data processing, analysis and reporting were conducted with the assistance of the ACE Working Group, which comprises representatives from participating ANSPs, airspace users, regulatory authorities and the PRU. This enabled participants to share experiences and gain an improved common understanding of underlying assumptions and limitations of the data.

Regular disclosure of information in the context of ACE since 2001 and the analysis provided in the ACE reports has undoubtedly contributed to raising awareness of cost-effectiveness among ANSPs senior managers and ATM stakeholders in general. Access to high-quality information, consistent across ANSPs, will be increasingly important in the new regulatory environment introduced with the enactment of the Single European Sky second package (SES II).

ACE 2008 reviews ATM performance at a time of new challenges

2008 was a year in which a new challenge to ANSPs started to emerge. Traffic, which had grown steadily for a number of years, in some parts of Europe at very high rates, showed distinct signs of slackening growth in the year. Subsequent developments have shown that this slackening foreshadowed the first stages of an unprecedented -7% downturn in traffic across the continent for 2009. A major theme of this ACE 2008 report is how well ANSPs are adapting to a period of lower growth or indeed declines in traffic, while containing costs, and preserving the flexibility to provide the necessary ATC capacity when traffic recovery comes.

It is a fact that the flexibility to adjust costs downwards in the short-term is still not a feature of the ATM industry in general. Figure 0.2 below shows that although traffic (blue line) was expected to decrease in 2009, costs (red line) were planned to increase at a similar pace as between 2006 and 2007.

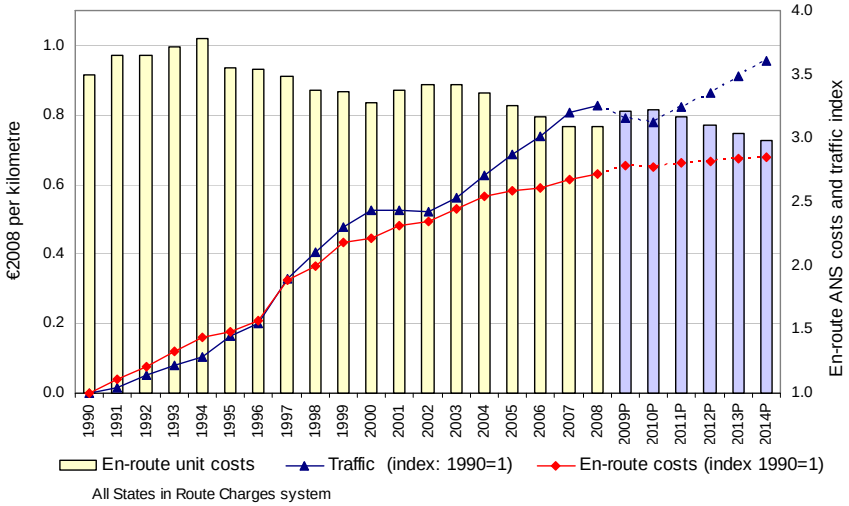


Figure 0.2: The development of en-route ANS costs, traffic and en-route ANS unit costs (1990-2014), real terms

The limited degree of downwards flexibility is certainly linked to the characteristics of the costs structure, but also to the genuine lack of incentives provided by the full cost recovery regime.

In the very short run, virtually all ATM/CNS provision costs are fixed. However, on practical timescale, there are degrees of variability of costs to demand. In the medium-term, support costs (69% of total ATM/CNS provision costs) are not expected to increase in line with traffic volumes because they have an element of “fixity”. At the same time, the ATM industry has demonstrated that these costs have a certain degree of flexibility (both downwards and upwards) for example by reconsidering staffing needs for support functions. On the other hand, ATCOs in OPS employment costs (31% of total ATM/CNS provision costs) could be considered as more “variable” because they are directly linked to traffic demand, but in practice they show a very limited degree of downwards flexibility. In fact, in case of temporary decrease in demand it is neither sensible nor economical to reduce the number of ATCOs in OPS given the costs and the lead time for recruitment and training. The cutback of overtime hours and the relinquishment of financial bonuses and rewards are in practice the main short term measures to reduce ATCO in OPS employment costs.

Clearly, under the full-cost recovery regime, ANSPs have no strong incentives to reduce costs and to be reactive to significant drops in traffic. The introduction of incentives, as provided for in the second SES package, may help improve ANSPs reactivity to adjust costs downwards in case of significant decrease in traffic volumes.

How is ANSPs' cost-effectiveness performance measured?

ACE 2008 first considers the total costs at State level for providing ANS (left-hand side of Figure 0.3).

Since some elements of the costs of ANS provision are outside the control of individual ANSPs (such as the contribution to EUROCONTROL), it then focuses on the specific costs of providing ATM/CNS.

These constitute 88% of total ANS costs, as shown in Table 0.1.

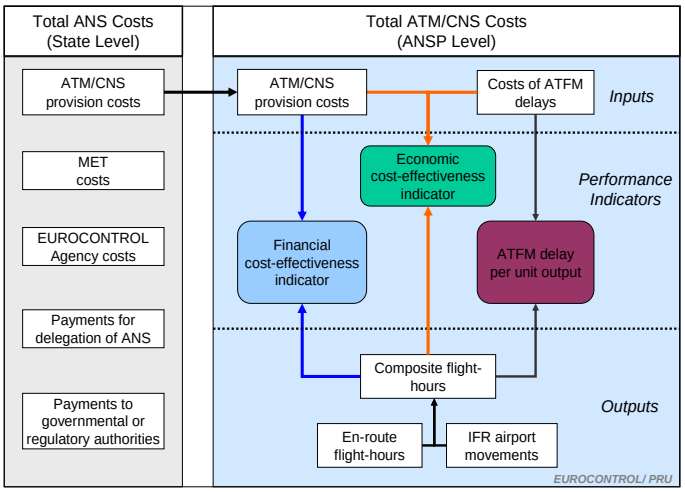


Figure 0.3: Conceptual framework for analysis of ATM/CNS cost-effectiveness

ANSPs' controllable costs are then divided by an output metric to obtain a measure of performance – the **financial cost-effectiveness KPI** (Figure 0.3). The output is a "gate-to-gate" measure which combines en-route flight-hours controlled and IFR airport movements controlled. As the allocation of costs between en-route and terminal ANS is not carried out consistently across all the European ANSPs, performance comparisons carried out separately for en-route and terminal services are distorted. Therefore, as in previous ACE reports, the focus of the analysis of ANSPs' cost-effectiveness is "gate-to-gate".

An assessment of the overall performance of an ANSP should take into account all the areas related to the economics of ANS - not only financial cost-effectiveness but also the **quality of service** provided, such as efficient routings and adequate levels of ATC capacity while ensuring ANS safety. ACE therefore introduced the concept of **economic cost-effectiveness KPI**, which adds a monetary value of the cost of ground ATFM delay to the controllable financial costs. Other elements of quality of service such as flight-efficiency and airborne holdings have not been included in the indicator as they cannot be so readily quantified. This indicator allows the assessment of performance to take into account trade-offs between quality of service and cost.

ACE presents a factual benchmarking analysis – many further factors would need to be considered in a normative analysis

Many factors contribute to observed differences in costs between ANSPs. Some of these factors are measurable; others (such as regulatory constraints) are less obviously quantifiable. Ideally, since the 36 ANSPs operate in very diverse environments across Europe, all of these should be taken into account in making fair performance comparisons, especially since many of these factors are outside the control of an ANSP.

As in previous years, the analysis undertaken is a purely **factual** analysis of the cost-effectiveness indicators – measuring what the indicators **are**. The present analysis does not reflect the diversity of the operational and economic characteristics of European ANSPs to the extent that a **normative** analysis would do – determining what the performance **should be**. A fair assessment of cost inefficiencies would require proper account to be taken of identified and measurable exogenous factors by the means of sound econometric modelling.

Work is currently under way to develop evidence-based methods for identifying the impact of such exogenous factors and to estimate cost inefficiencies. Such methods will be valuable in helping set Community-wide targets for performance improvement in the context of SES II. However, such analysis inevitably has limitations, and the quantification of the scope for improvement will require a combination of various approaches, including expert judgement based on the best measurement and also factual analysis available.

Methods have been developed to measure a subset of exogenous factors. In fact, three of them - cost of living, traffic complexity, and seasonal variability - are quantified with specific metrics and discussed in this report.

The European ANS system is a business of €8 660M with some 57 600 staff

The European ANS system analysed in this report comprises the system operated by the 36 participating ANSPs, excluding elements related to services provided to military operational air traffic (OAT), oceanic ANS, and landside airport management operations. The European ANS system also includes National Supervisory Authorities (NSAs), national MET providers and the EUROCONTROL Agency. In 2008, total ANS costs were around €8 660M (see Table 0.1 below), of which some €7 600M related directly to the provision of gate-to-gate ATM/CNS.

Key Data for the European ANS system	2007	2008
ANSPs	36	36
Area Control Centres (ACCs)	65	64
En-route sectors at maximum configuration	674	684
Approach Units (APPs)	232	249
Towers (TWRs)	437	439
AFIS units	99	88
Flight-hours controlled (M)	14.2	14.5
IFR flights controlled (M)	10.0	10.1
Distance controlled (km) in charging area (M)	9 433	9 629
IFR airport movements (M)	16.1	16.2
Total Air Navigation Service Providers (ANSPs) staff	56 737	57 599
Air Traffic Controllers in Operational duty (ATCOs in OPS)	16 701	16 607
Gate-to-gate ATFM delays > 15 min. ('000 min.)	16 786	18 823
Gate-to-gate ANS costs (€ M)	**8 578**	**8 658**
Gate-to-gate ANS revenues (€ M)	8 063	8 072
Gate-to-gate NBV of fixed assets (€ M)	7 286	7 078
Gate-to-gate capex (€ M)	1 131	1 185

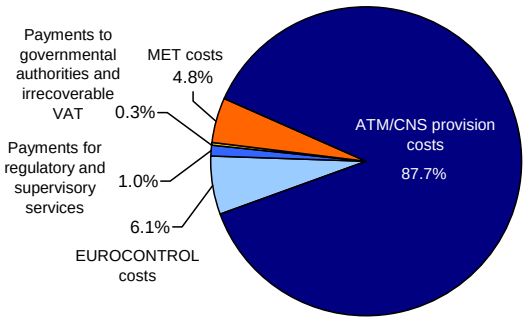


Table 0.1: Key system data for 2007 and 2008

Total ANS revenues in 2008 amounted to some €8 100M. This is the same order of magnitude as the combined revenues of Europe's three largest airport operators (BAA, ADP and Fraport), which amount to €7 700M. Finally, the European ANSPs employed some 57 600 staff, which is slightly larger than the workforce at Airbus worldwide (52 000 employees). Some 16 600 staff (29%) were ATCOs working on operational duty, compared to some 13 000 in the United States (FAA/ATO). On average, in Europe 2.5 additional staff are required for every ATCO.

The focus of the analysis in this report is the ATM/CNS provision costs (88% of total ANS costs), which exclude elements of cost that are not under the control of individual ANSPs. Costs of aeronautical meteorology services (MET) which constitute around 5% of total ANS costs are broadly declining since 2004. Similarly, in 2008 the costs of the EUROCONTROL Agency (6% of total ANS costs) decreased for the second consecutive year. The costs associated to regulatory and supervisory services amounted to 1.0% of total ANS costs in 2008.

The total Net Book Value (NBV) of fixed assets used by the European ANSPs to provide ATM/CNS services is valued at some €7 000M, which means that overall for the ANS industry €0.9 of fixed assets are required to generate €1 of revenue, an indication of relative capital intensity (this ratio is about 2 for airlines and about 3 for main airports

operators). Fixed assets mainly relates to ATM/CNS systems and equipments in operation or under construction.

For the first time in 2008, data was collected concerning the physical numbers of surveillance and navigation assets. The 36 ANSPs were responsible for 323 secondary surveillance radars (SSRs), Mode S and MSSR, many of which were co-located with primary radars. This amounts to 25 SSRs per million km^2, with densities of SSRs tending to be low (less than 20) in peripheral areas and higher in the core. A rather similar pattern is observed with different types of navaids. On average, there were 70 DMEs and 52 VORs per million km^2, with in general lower values observed in peripheral areas.

The new version of the SID also requests information on the main ATM softwares for the Flight Data Processing (FDP) and Radar Data Processing (RDP) systems. Most FDP systems are provided by a small number of suppliers (Figure 0.4).

The largest suppliers in terms of flight-hours served in Europe are Thales (19%), Selex-Alenia (18%), Raytheon (15%) and INDRA (15%).

A number of ACCs use "bespoke" systems, developed in-house specifically for the ACC or the ANSP. This is the case for DSNA and NAV Portugal (FIR Lisboa) as illustrated in Figure 0.4.

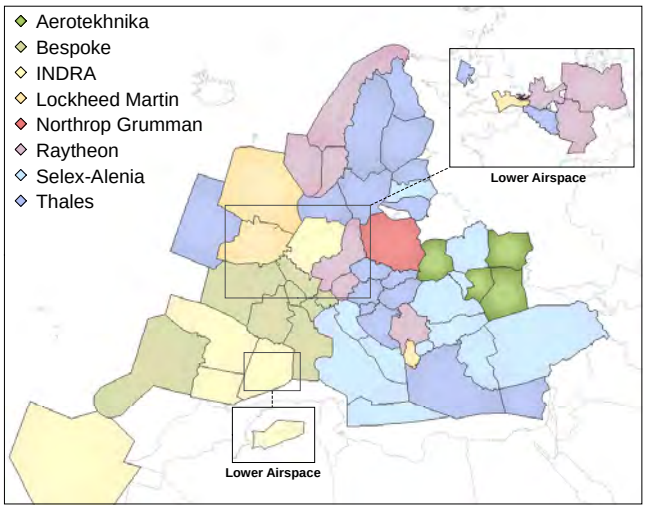


Figure 0.4: FDP systems suppliers, 2008

Figure 0.5 shows that 16 ACCs performed major upgrades of their FDP systems in 2008 which is significantly more than in any of the five preceding years. Figure 0.5 also indicates that more than 40 ACCs plan to replace their current FDP systems between 2009 and 2015. This will lead to substantial capital expenditure in the next five years. It will be a challenge for ANSPs to deploy these new systems without negatively impacting the level of quality of service provided.

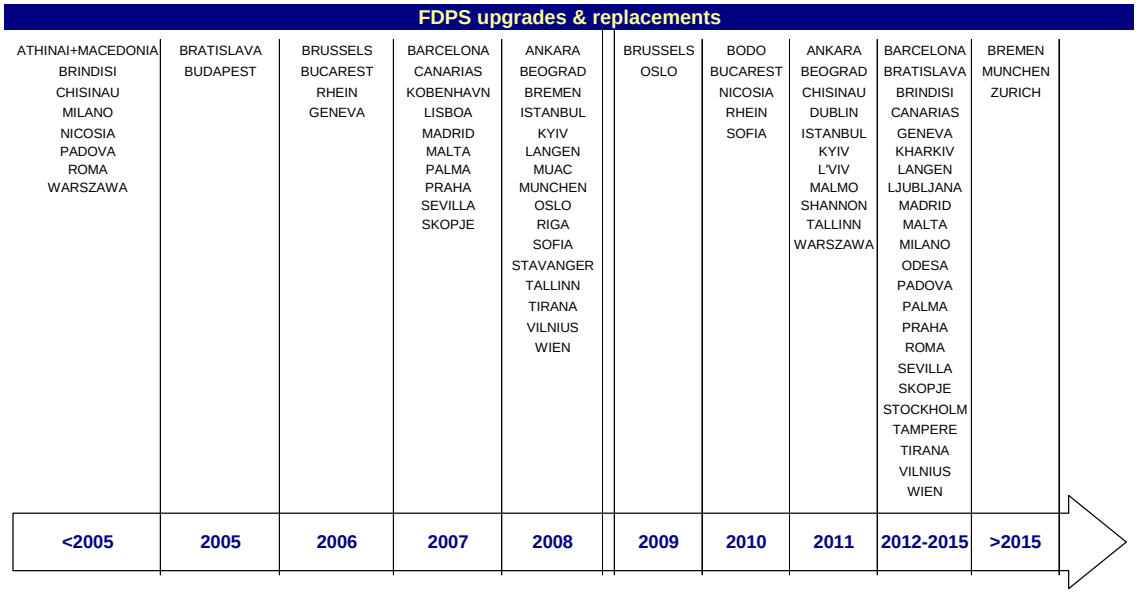


Figure 0.5: FDP systems upgrades and replacements (2005-2015)

SESAR represents the technological pillar of the SES, its objective is to develop the new generation of ATM systems for the next 30 years. It is essential that the SESAR initiative significantly contributes to reduce the fragmentation and increases the interoperability between ATM systems.

Under full cost recovery several ANSPs have been able to build up "war chests"

A new element of data collected in 2008 concerned the composition of the balance sheet of ANSPs, both assets and liabilities (see Figure 0.6). A feature of the liabilities side of the balance sheet is that ANSPs' equity substantially exceeds their long-term debt. Understanding why, on average, ANSPs capital and reserves exceed their long-term debt would deserve further investigation.

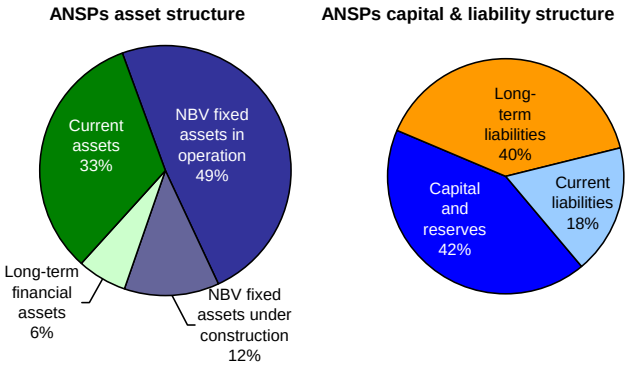


Figure 0.6: Composition of balance sheet of ANSPs (2008)

Another interesting feature is that the ratio of current assets to current liabilities at the end of 2008 - a measure of the "liquidity" risk to fund an immediate shortfall in revenue – was at 1.8. Even when using a more stringent measure of liquidity, such as the "quick ratio" (retaining only debtors and cash assets instead of all current assets) the ratio is 1.3. It indicates that, on average, ANSPs would be able to pay 130% of their current debt by only using their most liquid assets. In several cases the current ratio is extremely high, suggesting that these ANSPs have been able to build up "war chests", even under full cost recovery. Indeed, the cost recovery rules allow for a reasonable return on equity. This return appears in accounting terms as profit. If this profit is retained, rather than being distributed as tax and dividends, or used to cross-subsidise other activities, then reserves are built up. In the context of the current traffic downturn, these reserves can be used to finance the revenue shortfall and therefore to limit increases in unit rates.

The system is fragmented: around 40% of the business is provided by 31 ANSPs

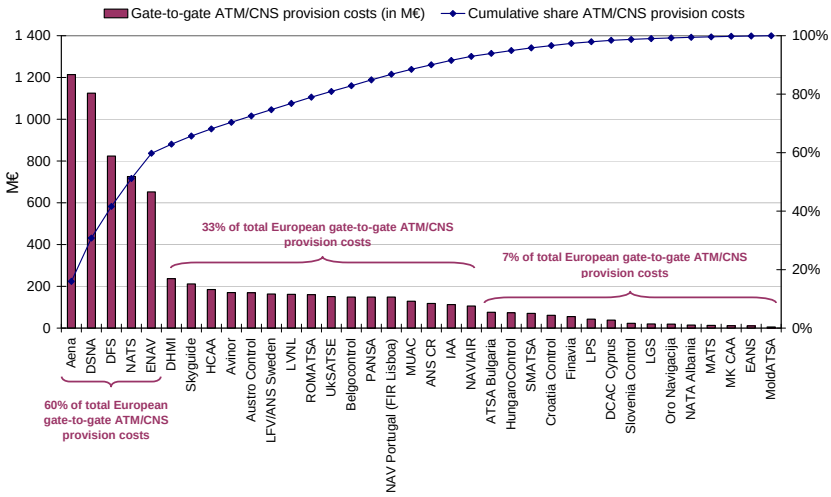


Figure 0.7: Distribution of ATM/CNS provision costs in 2008

Five ANSPs (Aena, DSNA, NATS, DFS and ENAV) bear 60% of the total ATM/CNS provision costs (Figure 0.7). Aena ranks first in terms of gate-to-gate costs while it ranked third in 2003.

Because of their magnitude in relation to the whole European system, significant changes in costs for these five ANSPs inevitably have an impact on the ATM/CNS provision costs for Europe as a whole.

Following some years' improvement, European cost-effectiveness has slightly worsened in 2008

The economic cost-effectiveness KPI, which includes both the financial cost per unit output, and a measure of the cost of ground ATFM delay, fell steadily until 2006, and slightly worsened in 2007 and 2008 (left-hand side of Figure 0.8). Compared to 2004, the economic cost-effectiveness KPI shows only marginal improvement in 2008 (-2.6%). While costs continued to rise, this rise was no longer counterbalanced by traffic whose growth slowed from 4-6% a year to only 1.6% in 2008. As a result, the financial cost-effectiveness KPI (see blue bar in Figure 0.8) slightly decreased by -0.7% in 2008. At the same time, the unit costs of ATFM delays increased substantially, which is disappointing given the relatively low traffic growth in 2008. The result was a slight increase in 2008 of +0.6% in the economic cost per composite flight-hour.

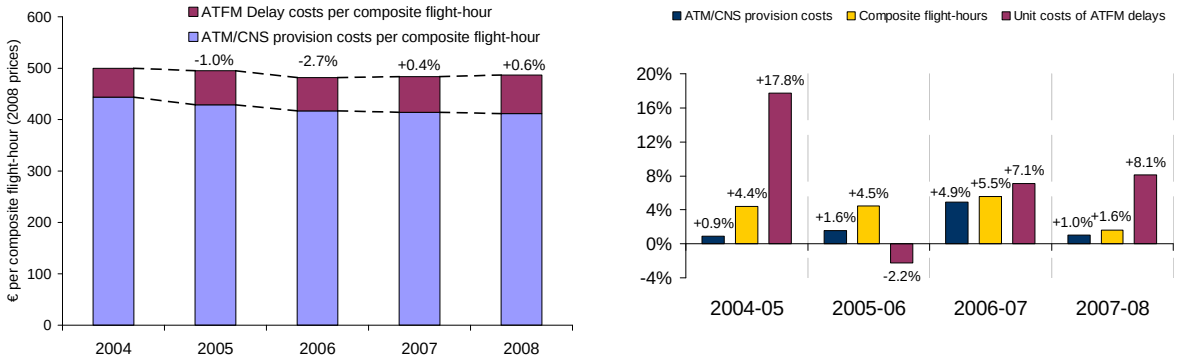


Figure 0.8: Changes in gate-to-gate cost-effectiveness KPI (2004-2008, real terms)

Average consumer prices increased by 11% between 2004-2008, this means that the economic unit costs at system level increased by some 8% in nominal terms.

There is a wide diversity of cost-effectiveness performance among ANSPs

The economic cost-effectiveness KPI ranges from €796 (Belgocontrol) to €153 (EANS), a factor of five (see Figure 0.9). When the more homogenous five largest ANSPs are considered the factor drops to 1.5 – still an appreciable difference in economic cost-effectiveness performance. The gap between Belgocontrol (€796) and the ANSP with the second highest unit economic costs (LVNL, €701) has widened in 2008.

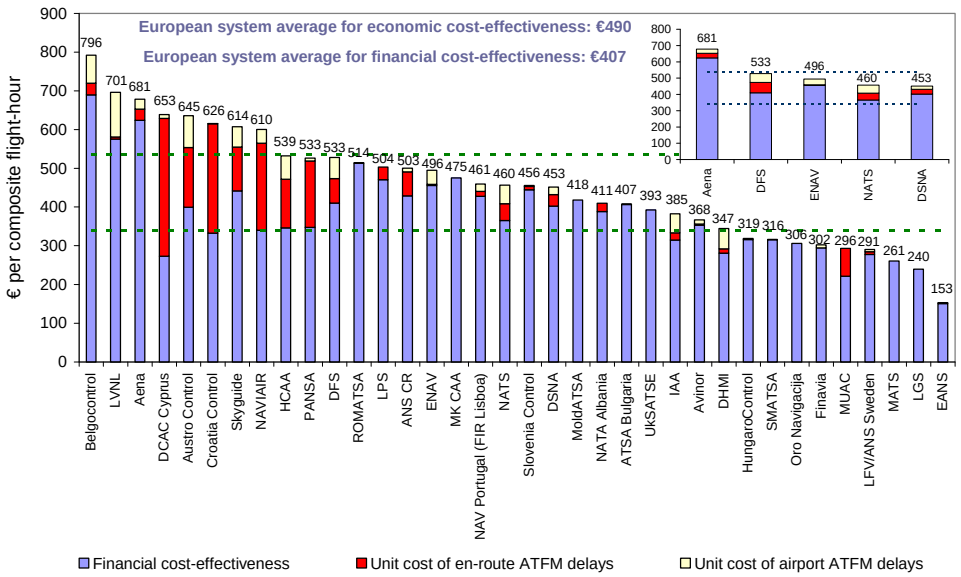


Figure 0.9: Economic gate-to-gate cost-effectiveness KPI, 2008

Across Europe, ATFM delays contributed to 17% of the total economic cost in 2008. Figure 0.10 shows that the number of ANSPs which experienced significant lack of ATC capacity in 2008, indicated by ATFM delays contributing more than 20% to their economic cost of ATM/CNS provision, rose to ten. Austro Control, Croatia Control, DCAC Cyprus, HCAA, MUAC, PANSA, and Skyguide were joined in 2008 by DFS, NAVIAIR and NATS. On the other hand, ANS CR is no longer on this list as ANS CR's delays significantly reduced in 2008.

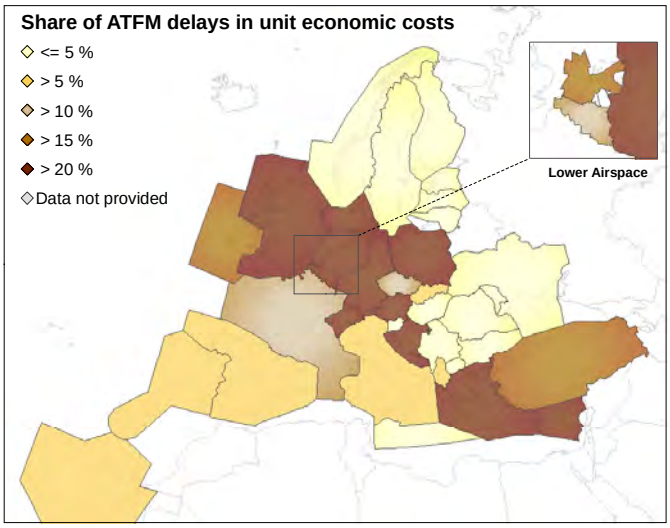


Figure 0.10: Share of ATFM delays in unit economic costs, 2008

Among the five largest ANSPs, DSNA and ENAV managed to improve both the quality of service and the financial cost-effectiveness over the period 2004-2008. In the meantime, Aena experienced both a rise in unit ATM/CNS provision costs and a rise in the costs of ATFM delays per unit output.

The level of ATFM delays mainly depends on the extent to which the ATC capacity provided by an ANSP is in line with the traffic demand. In the medium-term, the level of capacity provided can be gradually increased through a variety of measures including the recruitment of additional ATCOs and capital investment (e.g. ATM systems with higher capabilities, etc.).

During the period 2004-2008 ANSPs invested over €6 000M with different investment cycles and magnitudes across ANSPs. Average ANSPs "capex to revenue" ratios – a measure of the magnitude of the investment - for the period 2004-2008 are shown in Figure 0.11. For 13 ANSPs, the "capex to revenue" ratio is higher than 20% indicating substantial investments over the period. For a number of ANSPs, these large capital investments did not yet result in a significant increase of ATC capacity as the level of ATFM delays was still high in 2008 (e.g. Croatia Control, NAVIAIR, NATS and Skyguide, see Figure 0.10).

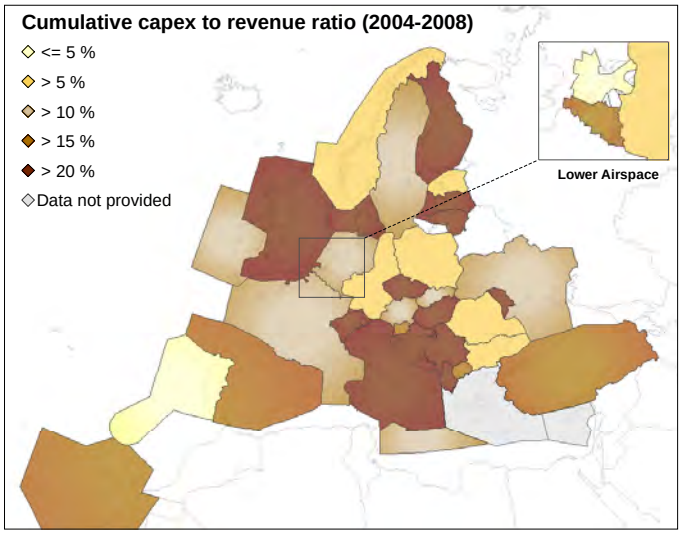


Figure 0.11: ANSPs cumulative capex (2004-2008)

There is certainly a lag between capital expenditure and the time when investments are effectively put in operation and contribute to provide additional ATC capacity. However, further analysis is required to better understand why the quality of service has not improved for these ANSPs.

Between 2004 and 2008, financial cost-effectiveness improved for most ANSPs: 26 ANSPs achieved a reduction in real unit costs, including four of the five largest (DSNA,

DFS, ENAV and NATS see Figure 0.12). DFS managed to improve its financial cost-effectiveness for the fifth consecutive year.

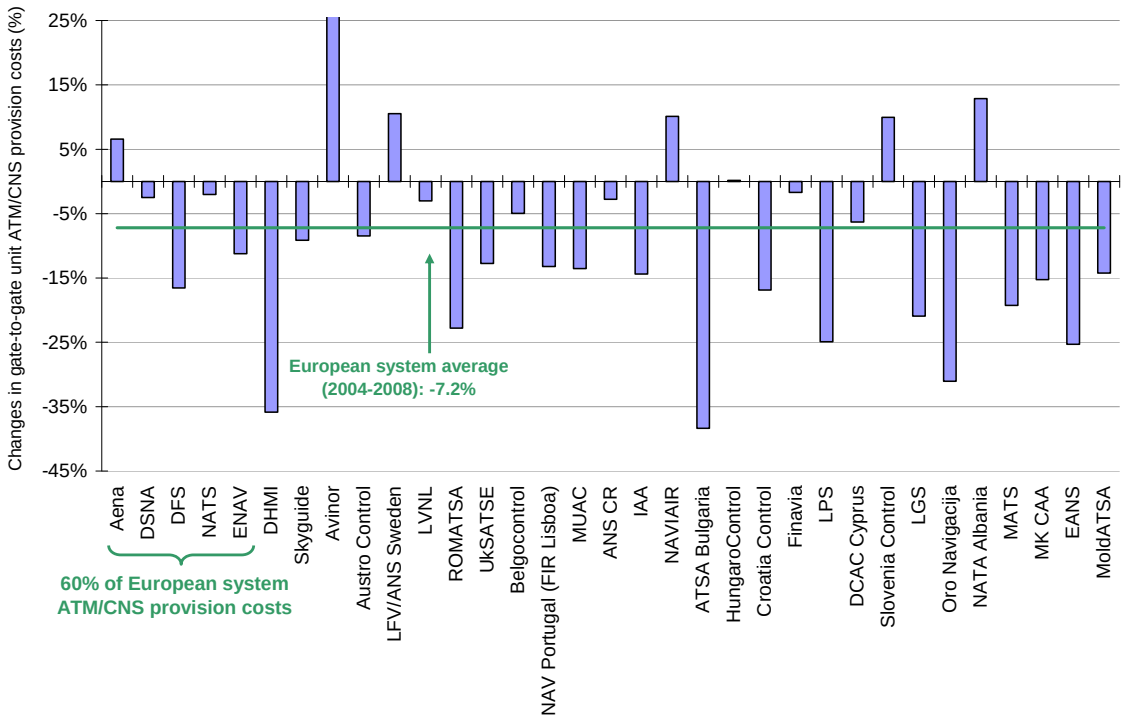


Figure 0.12 Changes in the financial cost-effectiveness KPI, 2004-2008 (real terms)

The fall in unit costs for Europe as a whole over five years was accompanied by substantial convergence between the costs of the most cost-effective ANSPs and those of the least. Most of the improvement comes from cost reductions for the least cost-effective ANSPs, while the lower-cost organisations were able to retain their low costs.

This is demonstrated by the fall of the top quartile (the line above which 25% of ANSPs are found) in Figure 0.13, while the bottom quartile (below which 25% of ANSPs are found) remains broadly constant.

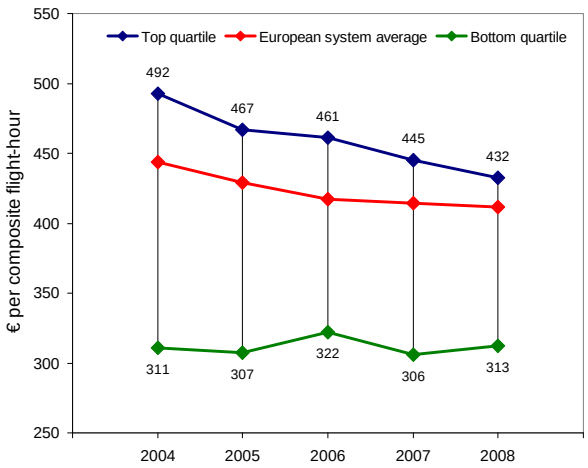


Figure 0.13: Cost-effectiveness improvement (2004-2008, real terms)

Reductions in support cost are a major element of the performance improvement at European system level

This ACE report provides an analytical framework that allows each ANSP's cost-effectiveness KPI to be broken down into a number of key components.

Figure 0.14 shows that for Europe as a whole, unit ATCO employment cost rose by +21% over 2004-2008. This rise was not compensated for by the increase in ATCO-hour productivity (+13%), and as a result ATCO employment costs per composite flight-hour rose (+8%). However, the increase in support costs (+2%) was greatly outweighed by traffic growth (+17%). Support costs per composite flight-hour therefore showed a

marked fall (-13%). Given the respective weights of ATCO employment costs (31%) and support costs (69%), this led to a -7% overall fall in unit costs.

The decrease in support costs per composite flight-hour is consistent with expectations of scale effects; support costs are generally fixed costs and should not increase proportionally with traffic volumes. The fall in unit support costs is consequently less than observed in last year's five-year window, as traffic growth is substantially reduced.

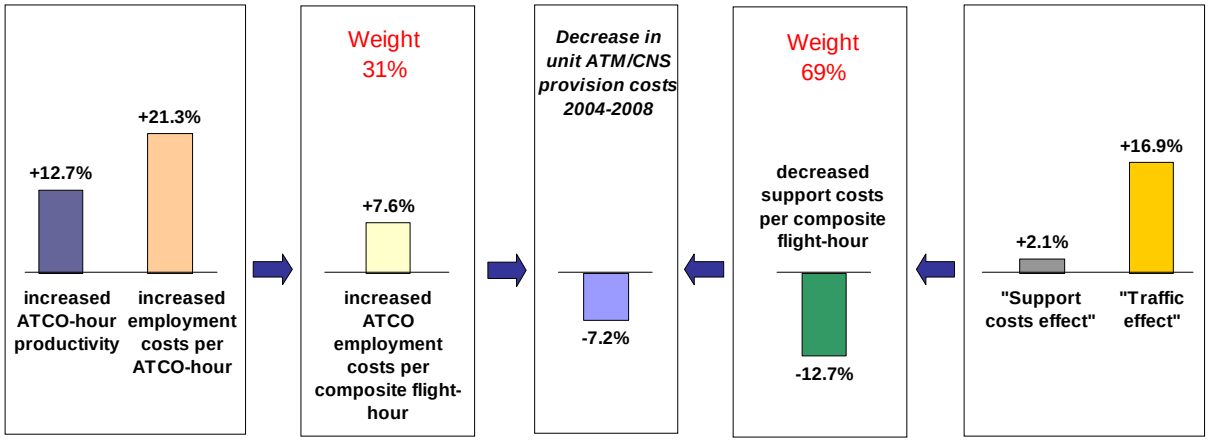


Figure 0.14: Breakdown of changes in financial cost-effectiveness, 2004-2008 (real terms)

ATCO-hour productivity rose rapidly in many smaller ANSPs

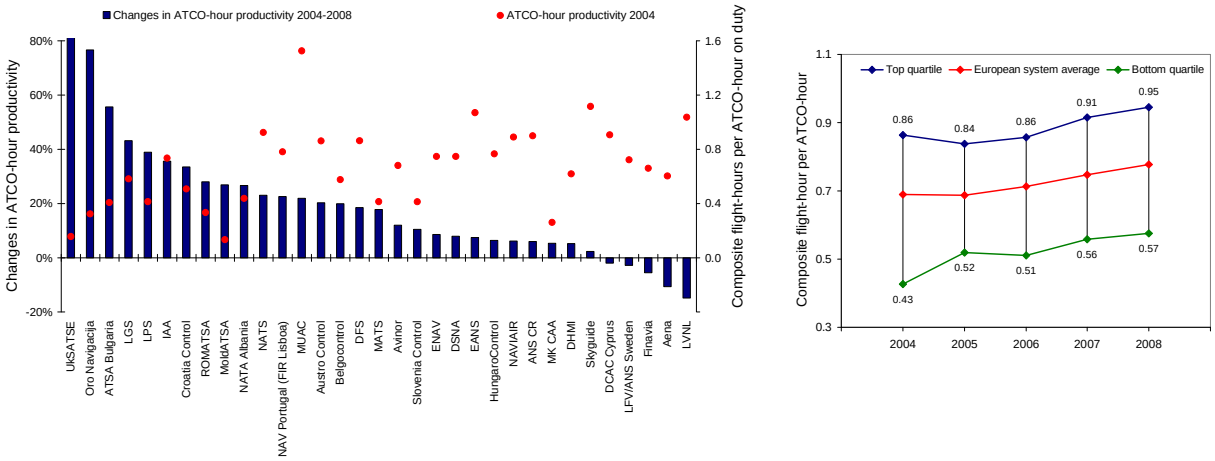


Figure 0.15: Changes in ATCO-hour productivity (2004-2008)

Between 2004 and 2008, ATCO-hour productivity rose for 28 of the 33 ANSPs reporting consistently over the period (left-hand side of Figure 0.15). The +12.7% productivity increase at European system level was to some extent the result of homogenous improvements for the top and bottom quartiles, with the greatest improvements occurring in ANSPs that started with a lower base in 2004 (left-hand side of Figure 0.15).

Strong productivity increases were achieved by small Central and Eastern Europe ANSPs benefiting from high traffic growth (see the left-hand side of Figure 0.16) and more effective use of spare capacity and existing resources. However, significant improvements in productivity were also achieved by some ANSPs which started from a higher base in 2004 (IAA, NATS, NAV Portugal, MUAC, Austro Control and DFS).

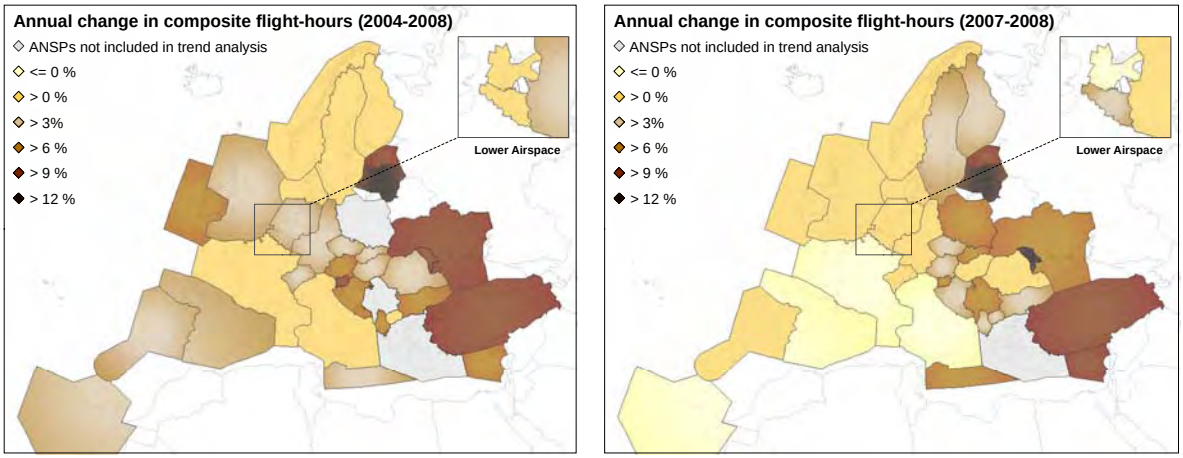


Figure 0.16: Annual traffic growth for the medium-term (2004-2008) and for the short-term (2007-2008)

Raising the European average productivity to the level of the top quartile (0.95) would bring significant gains in cost-effectiveness. However, achieving large improvements in ATCO-hour productivity might require concomitant rises in costs (for example, if more sophisticated ATM tools and technical solutions are required, support costs might rise). Similarly, improvement in ATCO-hour productivity should not be achieved at the expense of the quality of service provided. The right-hand side of Figure 0.16 shows that in 2008 traffic growth was negative for Aena, DSNA, ENAV and LVNL. Achieving productivity improvements in a context of declining traffic is going to be a challenge. It will require a critical review of managing overtime and more effective use of the ATCO-hours on duty.

Managing ATCO employment costs and productivity is important

High ATCO employment costs may be compensated for by high productivity, resulting in reduced ATCO employment costs per unit of output. Therefore, in the context of staff planning and contract renegotiation, it is important for ANSPs to manage ATCOs employment costs effectively and to set quantitative objectives for ATCO productivity.

Among the largest ANSPs, however, Aena has by far both the lowest productivity (see left-hand side of Figure 0.17) and the highest employment costs per ATCO-hour (see right-hand side of Figure 0.17). This raises a serious performance issue.

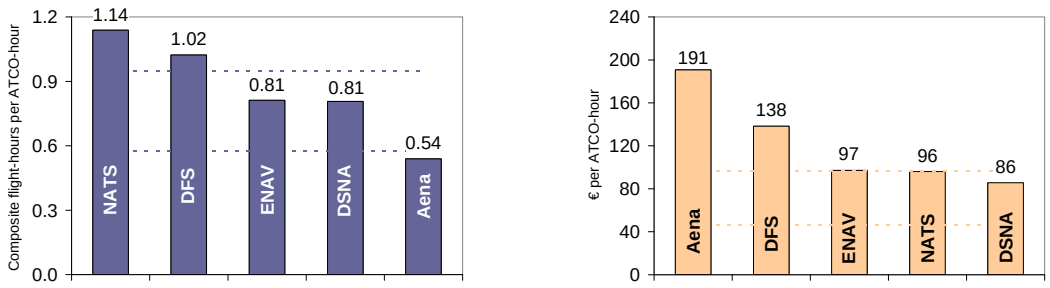


Figure 0.17: Productivity and ATCO employment costs for the five largest ANSPs (2008)

In many Central and Eastern Europe ANSPs ATCO employment costs are catching up…

Significant increases in ATCO employment costs per ATCO-hour are observed for ANSPs starting from a relatively low base in 2004. The convergence of unit employment costs between Central and Eastern European economies and Western Europe, because of deepening economic interaction and enhanced labour mobility, appears to be continuing.

Employment costs are typically subject to complex bargaining agreements between management and staff which usually are embedded into collective agreements. The duration of the agreement, the terms and methods for renegotiation greatly vary across ANSPs. In many cases, salary conditions are negotiated every year. A number of the increases in employment costs are associated with the implementation of new collective agreements or unplanned expensive salary renegotiations.

…while in many Western Europe ANSPs, generous pension schemes are putting a serious strain on costs

In recent years pensions have had a major impact on unit employment costs (both for ATCOs and non-ATCOs). In fact, there has been a growing recognition from States/ANSPs that the costs of providing generous pension schemes are substantially higher than was expected. This arises from a number of factors, including increased life expectancy, strong increases in wages and salaries, earlier retirement age, historically inadequate contributions and, as a consequence of the financial turmoil, lower than expected returns on pension assets.

Furthermore, the SES requirement for ANSPs to adopt International Accounting Standards has required transparent accounting and reporting for these costs. ANSPs have taken various approaches to dealing with this, including increased contributions and one-off payments. These various approaches do not have the same impact on costs and contribute to the differences in employment costs observed across ANSPs. Several ANSPs have taken decisive actions to deal with future pension obligations, notably changing the pension scheme for new recruits and moving away from a "defined benefit" pension plan. However, it appears inevitable that these costs will need to be fully recognised across the industry, and as a consequence the impact of pensions on measured performance is likely to rise.

Reductions in support costs have been the main cause of the improvement in cost-effectiveness

Unit support costs fell for most ANSPs, including all the five largest, between 2004 and 2008 (left-hand-side of Figure 0.18). The largest percentage falls have been for ANSPs which started from a higher base in 2004; this is an indication of some convergence between ANSPs in addressing support costs (right-hand-side of Figure 0.18). However, unit support costs remained constant between 2007 and 2008, a sign that particular attention needs to be paid to support costs in an environment of reduced traffic growth.

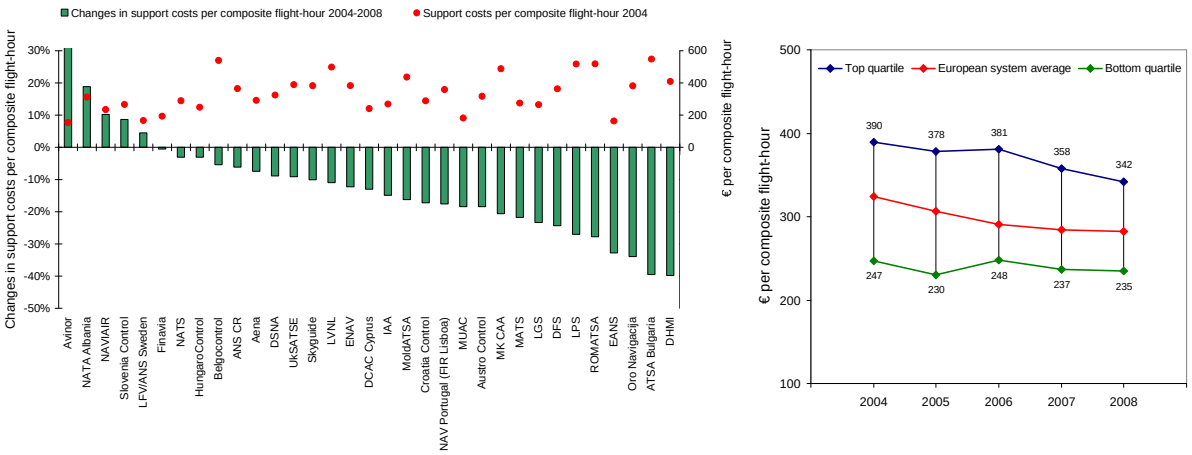
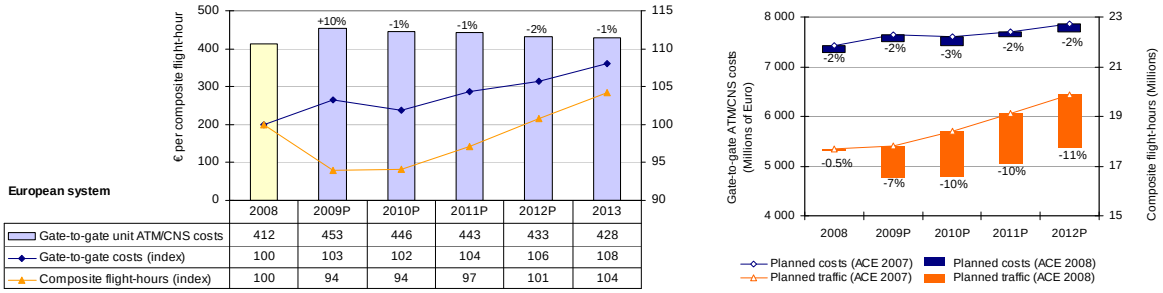


Figure 0.18: Change in support costs per composite flight-hour at ANSP level, 2004-2008 (real terms)

ANSPs unit costs are planned to significantly increase in 2009

Unit ATM/CNS provision costs are planned to rise by +10% in real terms between 2008 and 2009. While costs are planned to go up by +3% traffic was expected to fall by -6%.



European system

	2008	2009P	2010P	2011P	2012P	2013
Gate-to-gate unit ATM/CNS costs	412	453	446	443	433	428
Gate-to-gate costs (index)	100	103	102	104	106	108
Composite flight-hours (index)	100	94	94	97	101	104

Figure 0.19: Forward-looking cost-effectiveness at European system level (2008-2013, real terms)

Compared to ACE 2007 plans, the volumes of traffic planned from 2009 onwards have been revised significantly downwards (-7%) reflecting the impact of the economic downturn on the aviation community. In the meantime, planned costs have been slightly revised downwards in November 2009 plans (-2%) but are still planned to increase in 2009 (+3% in real terms). This highlights the difficulties of the ATM industry to reactively adjust costs if traffic falls significantly.

From 2011 onwards, traffic growth is expected to resume at a pace of +3% per year. Since costs are also planned to increase, unit costs are planned to remain well above 2008 levels until 2013. This profile significantly differs from previous years plans. The challenge for ANSPs in the coming years will be to reverse this increasing unit costs trend and adapt to reduced traffic growth, by controlling and adjusting costs, while retaining the flexibility to deal with traffic levels that will return when growth is restored.

A majority of ANSPs is planning to implement a number of cost containment measures for the years 2009 and 2010 (see Figure 0.20 below). These measures certainly contribute to the revisions of planned costs for 2009 (-2%) and 2010 (-3%) compared to the plans made in ACE 2007 (some €370M for the two years).

Cross-subsidies and transfers	ATCO productivity	ATCO employment costs	Other operating costs	Capital-related costs
ANSP seeks additional revenue for inadequately funded services State funds specific elements of the cost base Use stabilisation fund or other reserves to smooth unit rate fluctuations Reduced requirement for return on State-owned equity	Improved shift planning	Enhanced management of overtime Change pension scheme for new recruits Increase retirement age	Review staffing needs for support functions Pay freeze for top executives Postpone recruitment Curtail travel Postpone training	Review property needs. Sell surplus assets. Improved procurement processes Extend life of technical systems Review investment plan

Across-the-board areas of improvement for ANSPs	
Critical review of plans Critical review of operational processes Rationalise ACCs and other operational units	Seek improvements through cooperation (FABs) More rigorous budgetary control

Figure 0.20: Summary of cost-containment measures

A number of these measures (in the blue column on the left) are not directly focused on costs reduction, but rather on reducing or stabilizing the unit rate that will be charged to airspace users. Across the board measures for ANSPs include critical reviews of plans, and reviews of processes to identify areas of potential savings. Given the severe economic downturn, it is important that these planned cost-containment measures materialise into genuine cost-savings for airspace users for 2010 and subsequent years.

Between 2009 and 2013, the cumulated planned capex at European system level is over €6 billion. It is noteworthy that four ANSPs which are part of FAB CE plan significant

investments relating to the construction of new ACCs or to the upgrade of the ATM system. It is clear that these initiatives in the context of a FAB will not alleviate the current fragmentation of the European system.

The dispersion of ATCO-hour productivity across ACCs is still very large and productivity remains extremely low in several ACCs

In 2008, the ACC productivity at European system level is 0.95 flight-hours controlled per ATCO-hour. This means that on average, for each flight in the air, there is one area control ATCO on duty on the ground.

ATCO productivity varies extremely widely between ACCs, from a low value of 0.07 flight-hours per ATCO-hour in Dnipropetrovs'k to a high value of 1.99 in Warszawa. This wide dispersion among ACCs, and the fact that at European system level ATCO-hour productivity is less than one (0.95), suggest that overall there is scope for ACC productivity improvements. To analyse this diversity, the ACCs were divided into clusters based on complexity, average flight level handled, and size.

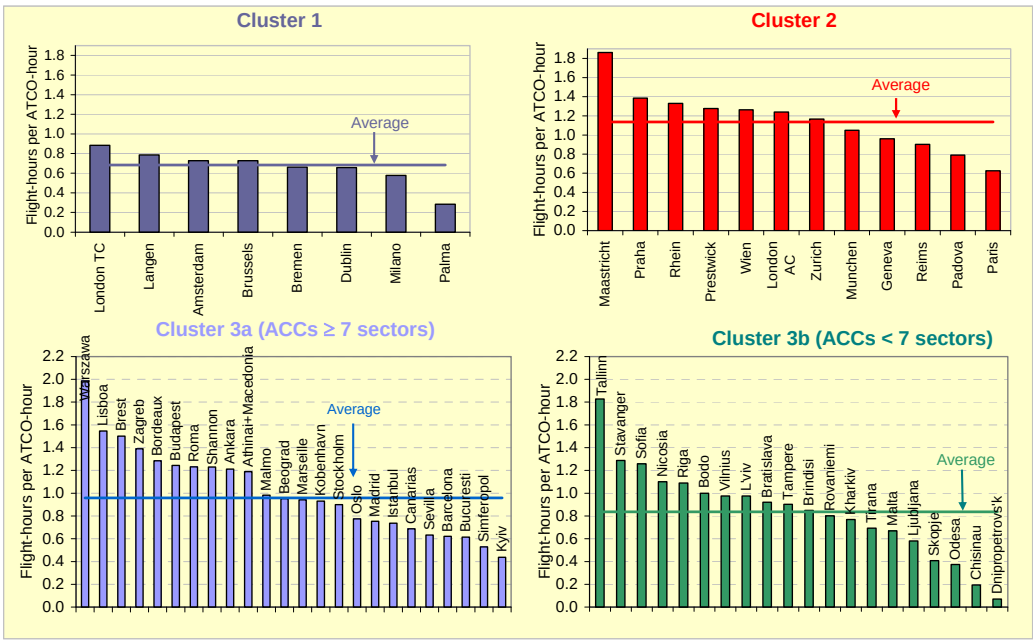


Figure 0.21: Summary of ACC productivity results for each cluster, 2008

There are still large differences in productivity performance across individual ACCs within these clusters (Figure 0.21). Several factors are likely to affect ATCO-hour productivity, in particular an ACC's capability to adapt its resources to handle the traffic. Low productivity is often associated with spare capacity and low utilisation of the available resources, especially in the less dense, less complex, ACCs. Low productivity is also associated with higher seasonal traffic variability.

There is no clear relationship between ACC productivity and ATFM delays. It is however noteworthy that in Cluster 1, the relatively low ATCO-productivity (0.68) is associated with relatively low ATFM delays per flight-hour (0.49). Whereas, in Cluster 2 the higher ATCO-hour productivity (1.14) is associated with higher en-route ATFM delays per flight-hour (1.39). Most of the ACCs which are part of Cluster 2 operate in dense areas and tend to handle high traffic volumes. It is likely that the trade-offs between productivity and quality of service are higher in Cluster 2 than in any other cluster.

Clusters 3a and 3b comprise ACCs operating in relatively less complex areas. Overall, there seem to be significant room for productivity improvements for most of the ACCs grouped in these Clusters where low productivity is often associated with low traffic volumes and with lower ATFM delays.

1 INTRODUCTION

The Air Traffic Management Cost-Effectiveness (ACE) 2008 Benchmarking Report commissioned by EUROCONTROL's independent Performance Review Commission (PRC) is the eighth in a series of reports comparing the ATM cost-effectiveness of EUROCONTROL Member States' air navigation service providers (ANSPs)[1].

The report is based on information provided by ANSPs in compliance with Decision No. 88 of the Permanent Commission of EUROCONTROL, which makes annual disclosure of ANS information mandatory, according to the Specification for Information Disclosure[2] (SID), in all EUROCONTROL Member States.

The ANSPs analysed in this report are very diverse in terms of airspace controlled, scope of ANS services provided, and organisational structure. So that the sample is consistent for the comparison of ATM performance, and also because these services are outside the PRC's terms of reference, this report does not address performance relating to:

- Oceanic ANS;
- Services provided to military operational air traffic (OAT); or,
- Airport (landside) management operations.

The focus of the report is primarily a cross-sectional analysis of ANSPs for the year 2008. However, the aviation community is also interested in measuring how cost-effectiveness and productivity at the European and ANSP levels varies over time, and in understanding the reasons why variations occur. Hence, this report makes use of previous years' data from 2004 onwards to examine changes over time, where relevant and valid.

Five-year periods are considered to form a solid basis to examine changes in the medium term. This is particularly relevant given the characteristics of the ANS industry which requires a long lead time to develop ATC capacity and infrastructure.

1.1 Organisation of the report

This report follows the same structure as the 2007 ACE report, which allows traceability and comparability of the results. The structure of the ACE 2008 benchmarking report is as follows.

Chapter 1 provides an overview of the participating ANSPs and outlines the processes involved in the production of this report. Then the report is divided into four parts.

Part I provides an overview of the economics of the European ATM system with a focus on the supply side.

- Chapter 2 presents 2008 key data for the European ATM system;
- Chapter 3 reviews all the components of ANS costs and the relationships between them at ANSP level. It also explains how the PRU makes the data adjustments to ensure comparability of ANSPs cost-effectiveness performance;

[1] Previous reports in the series from ACE 2001 (Sept. 2003) to ACE 2007 (May 2009) can be found on the PRC web site at http://www.eurocontrol.int/prc/.
[2] PRC Specification for Information Disclosure - Version 2.6, December 2008, can be found on the PRC web site.

- Chapter 4 examines the importance of exogenous factors (such as cost of living, traffic variability and traffic complexity) and endogenous factors (such as operational and technical set-up) when assessing and benchmarking the performance of an ANSP.

Part II focuses on the financial cost-effectiveness of ANSPs, based on their gate-to-gate ATM/CNS provision costs per unit of traffic output.

- Chapter 5 compares ANSPs' 2008 financial cost-effectiveness and the various components of cost-effectiveness (productivity, employment costs, and support costs);
- Chapter 6 looks at how financial cost-effectiveness and its components have changed over time (2004-2008);
- Chapter 7 analyses ANSPs' five-year data projections (2009-2013), as disclosed to the PRU in November 2009. The chapter infers on future financial cost-effectiveness performance and shows explicit links between the current average accounting life of assets, depreciation and future capital expenditure at European level;
- Chapter 8 offers a detailed analysis of productivity at ACC level, how this relates to traffic characteristics and quality of service, and how it has changed over time (2004-2008).

Part III looks at economic cost-effectiveness by valuing ATFM delays (a measure of the quality of service) attributable to ANSPs in monetary terms. Given the likely trade-offs at play, a measure of quality of service is important in considering the performance of an ANSP. This analysis is expected to expand in future years, as more data becomes available for analysis.

- Chapter 9 compares ANSPs' 2008 economic cost-effectiveness and considers how it has changed over time (2004-2008).

Part IV provides a cost-effectiveness performance focus at ANSP level.

- Chapter 10 provides a two-page summary for each ANSP. It includes an individual assessment of ANSPs' cost-effectiveness performance between 2004 and 2008, and identifies for each ANSP what were the main sources of changes in performance. Finally, it examines what the prospects for further improvements are, based on the ANSPs' forward-looking expectations in terms of ATM/CNS cost-effectiveness performance, including capital investment and staff projections for the period 2009-2013.

To conclude the report comprises several annexes which include statistical data used in the report, and individual ANSP Fact Sheets comprising a factual description of the governance and institutional arrangements in which the ANSP operates.

1.2 Overview of participating ANSPs

In total, 36 ANSPs reported 2008 data in compliance with the requirement from Decision No. 88 of the Permanent Commission of EUROCONTROL (see Table 1.1). In addition to the EUROCONTROL Member States, the en-route ANSPs of two Baltic States (Estonia and Latvia) provided data on a voluntary basis for inclusion in the analysis. The 36 reporting ANSPs are the same as those reporting in 2007. With one exception[3], all the reported information relates to the calendar year 2008.

[3] For NATS, the disclosed data relate to the financial year 1 April 2008 to 31 March 2009.

	ANSP	Code	Country	Organisational & Corporate Arrangements	OAT Services	Oceanic	MUAC	CEATS	Delegated ATM	Internal MET	Ownership and management of airports
1	Aena	ES	Spain	State enterprise							x
2	ANS CR	CZ	Czech Republic	State enterprise				x			
3	ATSA Bulgaria	BG	Bulgaria	State enterprise						x	
4	Austro Control	AT	Austria	Joint-stock company (State-owned)				x		x	
5	Avinor	NO	Norway	Joint-stock company (State-owned)	x	x					x
6	Belgocontrol	BE	Belgium	State enterprise			x			x	
7	Croatia Control	HR	Croatia	Joint-stock company (State-owned)				x	x	x	
8	DCAC Cyprus	CY	Cyprus	State body							
9	DFS	DE	Germany	Limited liability company (State-owned)	x		x				
10	DHMİ	TR	Turkey	State body (autonomous budget)	x						x
11	DSNA	FR	France	State body (autonomous budget)					x		
12	EANS	EE	Estonia	Joint-stock company (State-owned)							
13	ENAV	IT	Italy	Joint-stock company (State-owned)				x		x	
14	Finavia	FI	Finland	State enterprise	x				x	x	x
15	HCAA	GR	Greece	State body							x
16	HungaroControl	HU	Hungary	State enterprise				x		x	
17	IAA	IE	Ireland	Joint-stock company (State-owned)		x					
18	LFV/ANS Sweden	SE	Sweden	State enterprise	x				x	x	x
19	LGS	LV	Latvia	Joint-stock company (State-owned)	x					x	
20	LPS	SK	Slovak Republic	State enterprise	x			x			
21	LVNL	NL	Netherlands	Independent administrative body			x				
22	MATS	MT	Malta	Joint-stock company (State-owned)							
23	MK CAA	MK	F.Y.R. Macedonia	State body (acting as a legal entity)	x					x	
24	MoldATSA	MD	Moldova	State enterprise	x					x	
25	MUAC			International organisation							
26	NATA Albania	AL	Albania	Joint-stock company (State-owned)	x					x	
27	NATS	UK	United Kingdom	Joint-stock company (part-private)		x					
28	NAV Portugal (FIR Lisboa)	PT	Portugal	State enterprise		x					
29	NAVIAIR	DK	Denmark	State enterprise					x		
30	Oro Navigacija	LT	Lithuania	State enterprise							
31	PANSA	PL	Poland	State body (acting as a legal entity with an autonomous budget)	x						
32	ROMATSA	RO	Romania	State enterprise						x	
33	Skyguide	CH	Switzerland	Joint-stock company (part-private)	x				x		
34	Slovenia Control	SI	Slovenia	State enterprise	x			x			
35	SMATSA	RS ME	Serbia Montenegro	Limited liability company	x				x	x	
36	UkSATSE	UA	Ukraine	State enterprise						x	

States covered by the SES Regulations
States part of the ECAA
States not covered by the SES Regulations

Table 1.1: States and ANSPs participating in ACE 2008

Table 1.1 shows the list of participating ANSPs, describing both their organisational and corporate arrangements, and the scope of ANS services provided. More detailed information on each ANSP can be found in the individual Fact Sheets provided in Annex 7 on p.219 of this Report.

This Table indicates (coloured yellow) which ANSPs were at 1 January 2008 part of the Single European Sky (SES), and hence subject to relevant SES regulations and obligations. In addition to SES members, a number of States (coloured blue) are committed, following the signing of an agreement relating to the establishment of a European Common Aviation Area (ECAA)[4], to cooperate in the field of ATM, with a view to extending the SES regulations[5] to the ECAA States. Hence all the en-route ANSPs of EUROCONTROL States and other States disclosing information to the PRC are covered by the SES regulations, except Moldova, Turkey and Ukraine.

Table 1.1 also shows the extent to which the ANSPs incur costs relating to services that are not provided by all ANSPs. In order to enhance cost-effectiveness comparison across ANSPs, such costs, relating to oceanic ANS, military operational air traffic (OAT), airport management operations and payment for delegation of ATM services[6] were excluded to the maximum possible extent (see details in Chapter 3).

[4] Decision 2006/682/EC published on 16 October 2006 in the Official Journal of the European Union. States which have signed this Agreement but are not yet EU members comprise the Republic of Albania, Bosnia and Herzegovina, the Republic of Croatia, the former Yugoslav Republic of Macedonia, the Republic of Iceland, the Republic of Montenegro, the Kingdom of Norway, and the Republic of Serbia.

[5] For the time being, the framework regulation (EC No 549/2004), the service provision regulation (EC No 550/2004), the airspace regulation (EC No 551/2004), the interoperability regulation (EC No 552/2004), the common requirements for the provision of ANS (EC No 2096/2005) and the common rules for the flexible use of airspace (EC No 2150/2005).

[6] The column 'Delegated ATM' in Table 1.1 relates to the delegation of ATM services to other ANSPs, based on financial agreements.

1.3 Data submission

The SID (see footnote 2) requires that participating ANSPs submit their information to the PRC/PRU by 15 July in the year following the year to which it relates. During 2007 and 2008, the PRU has revised the SID Version 2.5 in the context of new requirements for performance review in the SES legislation[7] and consistency with the Common Charging Scheme[8] and the updated EUROCONTROL Charging Principles[9]. A formal consultation phase involving a large number of stakeholders took place between May and August 2008. The SID Version 2.6 has been adopted by EUROCONTROL on the 6th January 2009.

The ACE 2008 data has been submitted in the SID Version 2.6 which is being used on a pilot basis for two years (relating to ACE2008 and ACE2009 data). This will ensure that any refinements or clarification can be taken into account in the event that the SID will become mandatory as part of the SES II legislation. The Version 2.6 of the SID requires information in new areas such as physical units of assets, information on the ATM systems in place in ACC operational units and more detailed data on staff and working-hours. These new features of the SID promises improved insights into many area of performance.

Despite the introduction of the new SID, the timeliness of submissions has continued to improve, by 15 July 2008 25 out of 36 ACE data submissions had been received (compared to 22 for ACE 2007), as shown in Figure 1.1 below. It is important that this timely submission of ACE data is sustained and improved. The ACE benchmarking must be seen as timely since several stakeholders, most notably ANSPs' management and airspace users, have a keen interest in receiving the information in the ACE reports as early as possible. Clearly, the timescale of production of a benchmarking report is inevitably delayed if data is not submitted on time.

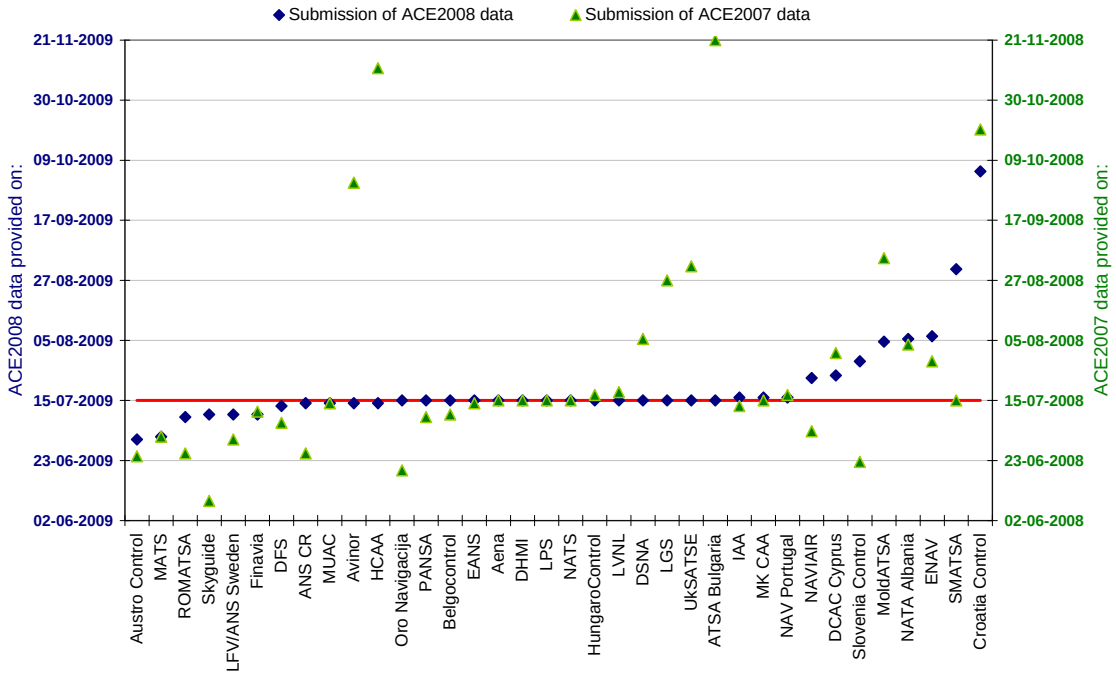


Figure 1.1: Progress with submission of 2008 data

[7] Regulation EC 549/2004 (Article 11).
[8] Regulation EC 1794/2006, adopted 6 December 2006.
[9] EUROCONTROL Document Number 07,60,01 – October 2007.

The general and gradual improvement in the quality and the timing of the ACE data submission is marred by some problems in individual ANSPs. In particular, there are recurrent delays in the provision of data for Croatia Control. HCAA provided a timely submission of ACE 2008 data, however little progress has been made by HCAA in terms of data quality and quantity. Since 2002 HCAA has never been in a position to provide the value of ANS-related assets, although capital-related costs are charged to airspace users. Similarly, the quality of the operational data provided by HCAA (in particular staff numbers and working hours) is not satisfactory. This issue with HCAA is of particular concern and the implementation of adequate data submission processes by HCAA would greatly contribute to improve the quality and the quantity of the information provided.

1.4 Data validation, processing and reporting

The PRU is supported by a ACE Working Group (WG), including regulatory authorities, ANSPs and airspace users' representatives. The process leading to the production of the ACE report, which comprises data validation, analysis and consultation, is summarised in Figure 1.2 below.

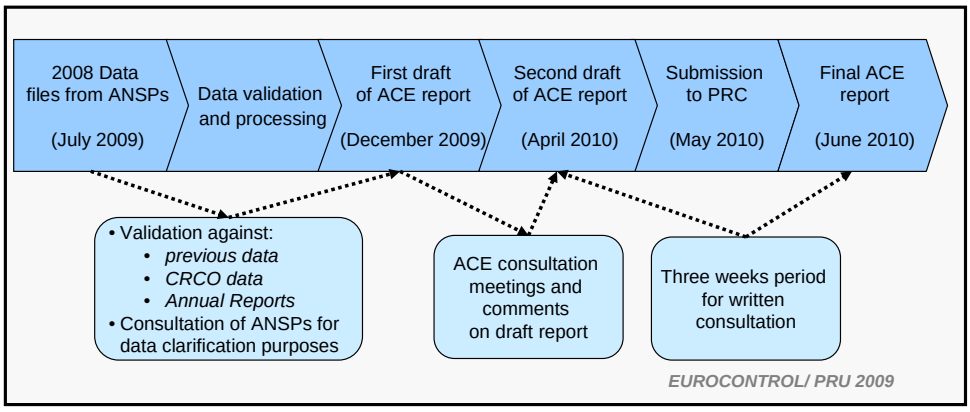


Figure 1.2: Data validation, processing and reporting

In order to ensure comparability among ANSPs and quality of analysis, the information submitted by the ANSPs is subject by the PRU to a thorough data validation process which makes extensive use of ANSPs' Annual Reports and of their statutory financial accounts.

During this validation process a number of issues emerged:

- Annual Reports with disclosure of financial accounts are not available for some ANSPs (see Section 1.5 below), which removes one means of validating the financial data submitted;
- ANSPs which are involved in non-ANS activities (such as airport ownership and management, see Table 1.1) do not necessarily disclose separate accounts for their ANS and non-ANS activities. This means that the financial data submitted for the ANS activities cannot be validated with the information provided in the Annual Report;
- Except for a few ANSPs, Annual Reports do not disclose the separate costs for the various segments of ANS (such as en-route and terminal ANS) which means that the cost breakdown submitted cannot be validated;

As ANSPs progressively comply with the SES Regulation on Service Provision, which requires publication of Annual Reports including statutory accounts, and separation of ANS from non-ANS activity in ANSPs internal accounts, some of these shortcomings are expected to be soon overcome (see also Section 1.5 below).

In most cases, CFMU data has been used as the basis for the output metrics used in the ACE data analysis, and this practice has been generally accepted, including in cases where in previous years there had been discrepancies. However, for Estonia (EANS) and Latvia[10] (LGS), who are not part of the CFMU area, the output metrics used in this report are based on their own traffic data.

1.5 ANSPs' Annual Reports

ANSPs' Annual Reports provide a valuable means of validating the 2008 information disclosure data.

The SES Service Provision Regulation (SPR) (EC No 550/2004) came into force on 20 April 2004 and is applicable to 2008 Financial Accounts in all EU Member States (plus Switzerland and Norway) and to associated ANSPs. This Regulation is also applicable to States which have signed the ECAA Agreement (see Section 1.2), although the timing of its implementation is not yet decided for individual States. Among other provisions, the SPR requires that ANSPs meet certain standards of information disclosure (transparency) and reporting, and in particular that:

- ANSPs should draw up, submit to audit and publish their Financial Accounts (Art.12.1);
- In all cases, ANSPs should publish an Annual Report and regularly undergo an independent audit (Art 12.2);
- ANSPs should, in their internal accounting, identify the relevant costs and income for ANS broken down in accordance with EUROCONTROL's principles for establishing the cost-base for route facility charges and the calculation of unit rates[11] and, where appropriate, shall keep consolidated accounts for other, non-air navigation services, as they would be required to do if the services in question were provided by separate undertakings (Art 12.3). The latter requirement is particularly relevant for the ANSPs which are part of an organisation which owns, manages and operates airports, such as Aena, LFV, Avinor, Finavia, HCAA, and DHMI[12].

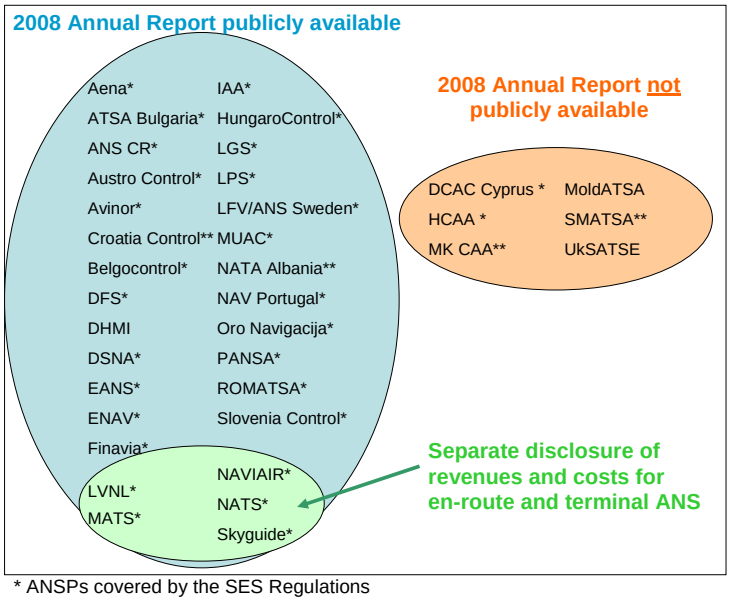
Figure 1.3 displays the status of ANSPs 2008 Annual Reports. Only 30 out of 36 participating ANSPs have published an Annual Report for the year 2008.

[10] Latvia has now applied for EUROCONTROL membership and will therefore join the CFMU area as soon as it is member.
[11] See footnotes 8 and 9.
[12] Although it should be noted that DHMI is not covered by the SES Regulations.

The PRU considers that an Annual Report produced according to "best practice" should comprise three main components:

- a Management Report;
- Annual Financial Accounts with relevant business segmentation and explanatory notes; and,
- an independent Audit Report.

Six ANSPs (including two who are subject to SES Regulations – namely HCAA and DGAC Cyprus) have not published Annual Reports for 2008.



* ANSPs covered by the SES Regulations
** ANSPs operating in States member of ECAA

Figure 1.3: Status of 2008 Annual Reports

ANSPs' Annual Accounts are drafted in accordance with specific accounting principles. Often, (national) General Accepted Accounting Principles (GAAP) are used. In the context of the SES, Article 12 of the SPR prescribes that ANSPs Annual Accounts shall comply, to the maximum extent possible, with International Financial Reporting Standards (IFRS). The left column of Table 1.2 below shows the ANSPs whose 2007 Annual Accounts were partly or fully prepared according to IFRS. The central column shows the ANSPs whose 2008 Annual Accounts are now partly or fully prepared according to IFRS. No additional ANSPs are planning to implement IFRS as of 2009.

ANSPs reporting according to IFRS since 2007	ANSPs reporting according to IFRS since 2008
ANS CR	Aena
ATSA Bulgaria	Austro Control
Croatia Control	Avinor
DFS	LVNL
EANS	NATA Albania
LGS	ROMATSA
LPS	
MATS	
NATS	
Oro Navigacija	
PANSA	
Skyguide	

Table 1.2: IFRS reporting status

It should be noted that in some cases, the implementation of IFRS may have a significant impact on an ANSPs' cost base[13] (such as different treatment of costs related to the pension scheme, and changes in depreciation rules), hence the importance to identify and understand the impact of changes in the accounting principles used to draw the financial accounts.

[13] From 2007 onwards, this has been true for the German ANSP, DFS, whose cost base includes costs recognised only since the conversion to IFRS. These costs, mainly due to the revaluation of DFS pension obligations, have been spread over a period of 15 years.

1.6 Use of published ACE data and reports

The regular disclosure of information on ATM cost-effectiveness of European ANSPs since 2001 and the analysis provided in the ACE benchmarking reports has undoubtedly contributed to raise awareness of cost-effectiveness among ANSPs senior managers, and ATM stakeholders in general.

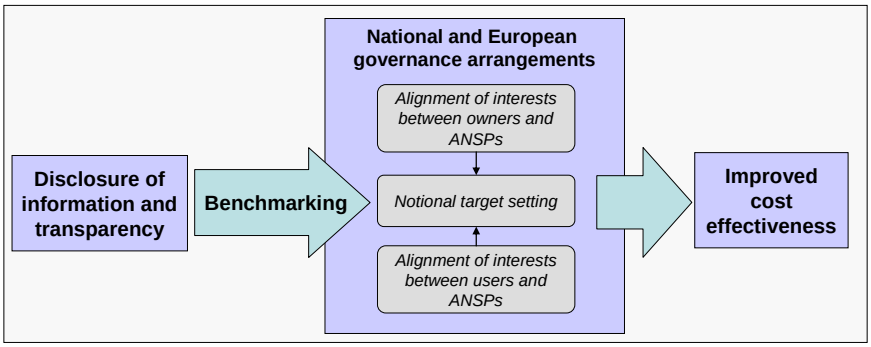


Figure 1.4: Relationship between ANSPs benchmarking and cost-effectiveness

As shown in Figure 1.4 above, external and independent benchmarking contributes to the reduction of asymmetries of information, both between ANSPs and their airspace users, and between ANSPs and their regulators and owners. The availability of robust and comparable indicators is a prerequisite to reach a common understanding of performance achievements and objectives, and to set realistic targets. The ACE factual and independent benchmarking analysis sets the foundations for a more normative analysis of determining the level of cost-inefficiencies and quantifying scope of improvement. This will form a vital building block for the process of economic oversight and target setting that are expected to be required in the second package of Single European Sky legislation (SES II) as defined in the Performance Scheme Implementing Rules (2010).

In order to improve transparency and to increase the availability of ACE data, the PRU has developed in 2008 a web-based application[14] which comprises the main data which are presented in the ACE reports. This application can be used by ACE stakeholders to derive their own analysis of the data provided by the ANSPs in the SID.

[14] Access to the ACE web application can be obtained on request to the PRU at the following address: pru@eurocontrol.int.

PART I: EUROPEAN ANS DATA AND INTRODUCTION TO ANSP BENCHMARKING

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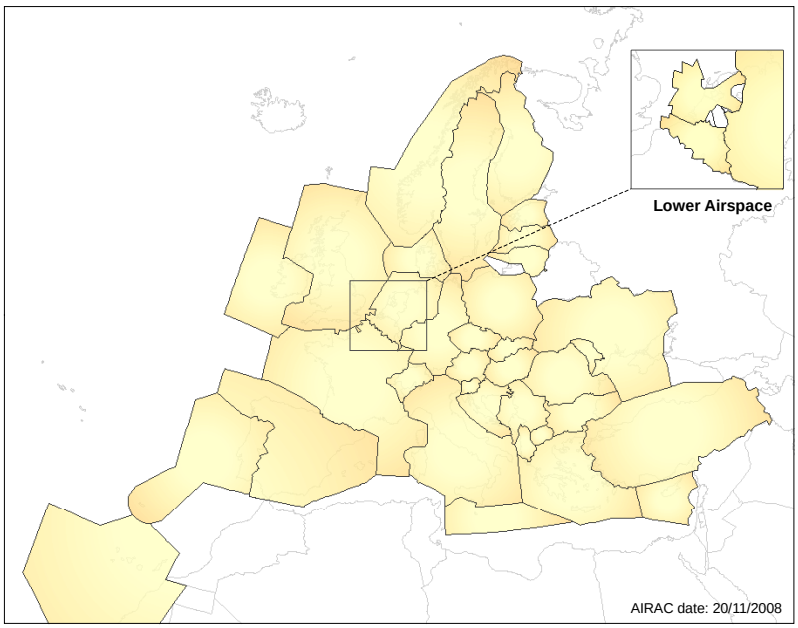
2 EUROPEAN ANS SYSTEM DATA

This chapter provides aggregate information on the European ANS system[15] reported, in compliance with the SID for the year 2008.

This includes all EUROCONTROL Member States as of 1 January 2008, with two exceptions: Armenia[16], and Bosnia & Herzegovina[17], for which information was not requested. In addition, it includes the ANSPs of two Baltic States (Estonia and Latvia[18]), which provided information on a voluntary basis. For the purpose of this report, oceanic airspace was excluded. The geographical area covered by the information disclosed is shown in Figure 2.1.



Key Data for the European ANS system	2007	2008
ANSPs	36	36
Area Control Centres (ACCs)	65	64
En-route sectors at maximum configuration	674	684
Approach Units (APPs)	232	249
Towers (TWRs)	437	439
AFIS units	99	88
Flight-hours controlled (M)	14.2	14.5
IFR flights controlled (M)	10.0	10.1
Distance controlled (km) in charging area (M)	9 433	9 629
IFR airport movements (M)	16.1	16.2
Total Air Navigation Service Providers (ANSPs) staff	56 737	57 599
Air Traffic Controllers in Operational duty (ATCOs in OPS)	16 701	16 607
Gate-to-gate ATFM delays > 15 min. ('000 min.)	16 786	18 823
Gate-to-gate ANS costs (€ M)	8 578	8 658
Gate-to-gate ANS revenues (€ M)	8 063	8 072
Gate-to-gate NBV of fixed assets (€ M)	7 286	7 078
Gate-to-gate capex (€ M)	1 131	1 185

Figure 2.1: Geographic coverage of ACE 2008 analysis & key data

[15] For the purpose of this report, the "European ANS system" includes all 36 ANSPs that submitted data following the requirement from Decision No. 88 of the Permanent Commission of EUROCONTROL.

[16] Armenia has been a EUROCONTROL Member State since 1 March 2006. As in January 2008 it was not technically "integrated" into the Multilateral Route Charges System, the PRU did not request the Armenian ANSP, ARMATS, to provide 2008 data.

[17] Although Bosnia & Herzegovina (B&H) has been a EUROCONTROL Member State since 1 March 2004, its ANSP was not requested to report data according to the SID, since the area control services in B&H's airspace are provided by Croatia Control and SMATSA.

[18] Latvia has applied in 2008 for membership of EUROCONTROL.

Over the last five years, ACE has provided increasing coverage of a growing system. Figure 2.2 illustrates the size of the system, using total IFR flight-hours controlled.

Since 2004, the output of the system has continuously increased and is in 2008 18% higher than in 2004. 34 ANSPs participated in the ACE 2004 data analysis. In 2005 and 2006, two more ANSPs (PANSA and SMATSA) started to participate in information disclosure, which has increased the coverage of ACE by around an additional 4%.

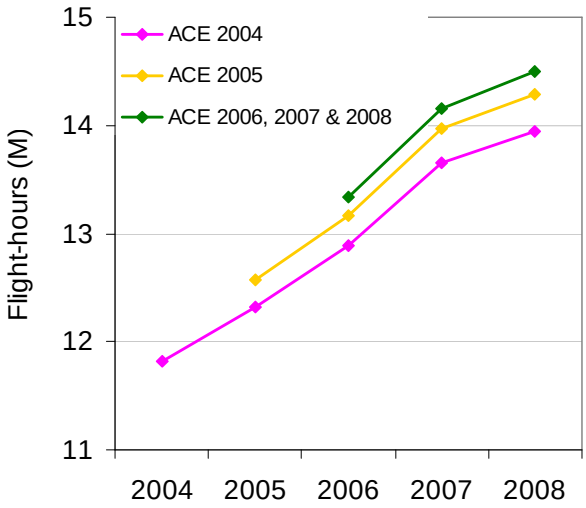


Figure 2.2: Increases in output and size of the system under ACE review

2.1 System outputs

In 2008, European ATC operational units controlled 14.5M flight-hours over a total distance of 9 629M kilometres[19]. The various TWR units handled 16.2M IFR airport movements and 3.8M VFR airport movements.

In ACE 2001 (Chapter 4) the concept of "composite flight-hours" was introduced, to reflect the fact that the service provided by ANSPs is "gate-to-gate" and that difference in the boundaries used by different ANSPs between terminal and en-route ANS could distort the picture obtained if they were considered individually. Composite gate-to-gate flight-hours were defined as en-route flight-hours **plus** IFR airport movements weighted by a factor that reflected the relative (monetary) importance of terminal and en-route costs in the cost base. Details of the calculation are shown in Annex 2, and the definition is:

Composite gate-to-gate flight-hours = (en-route flight-hours) + (0.26 x IFR airport movements)

According to this definition, the total number of composite flight-hours for the European system in 2008 is 18.7M. The average weighting factor (0.26) is based on the total monetary value of the outputs over the 2002-2008 period.

En-route flight-hours are computed from the flight plans provided by airspace users to the EUROCONTROL CFMU (so-called "CFMU Model III[20]"). En-route flight-hours comprise the number of flight-hours controlled by ACCs and APPs operational units[21]. Similarly, the number of IFR airport movements controlled by the TWRs operational units is used as the output measure for terminal ANS.

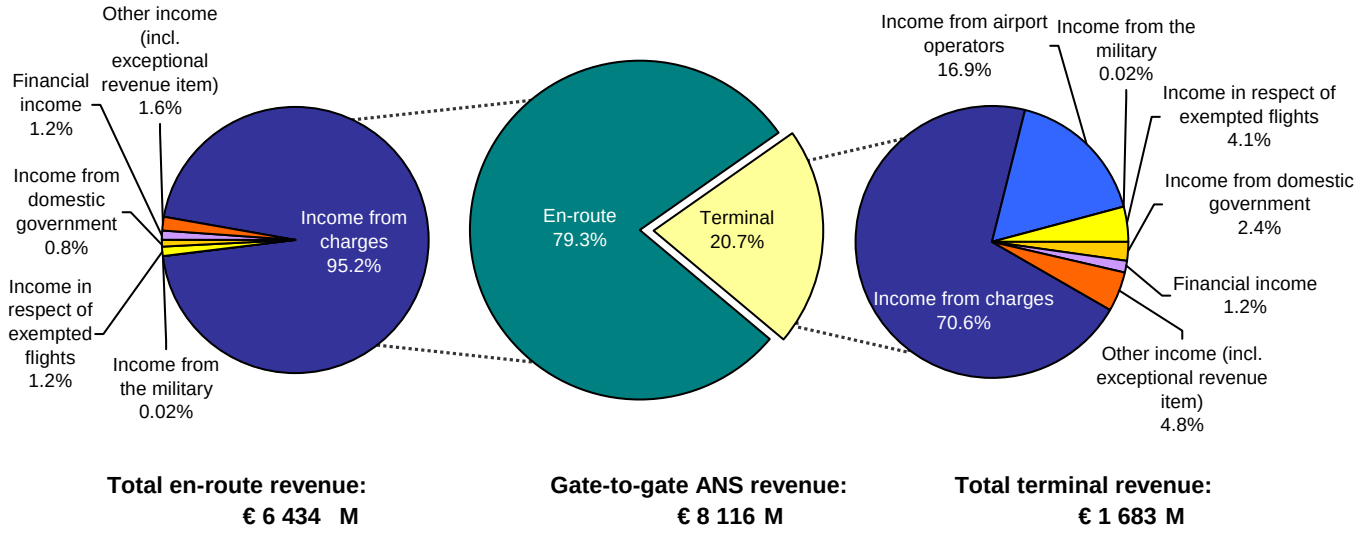
[19] Distance excludes the 20 km of flight closest to the airport at each end of the flight leg.
[20] In the CFMU Model III, the flight plan is updated with the actual position of the flight, when a given threshold of lateral, horizontal and time deviations are observed. It is therefore not as accurate as radar tracks, but is nevertheless fairly close to actual trajectories.
[21] Since 2007, en-route flight-hours include time spent in Terminal Manoeuvring Areas (TMAs) and therefore account for airborne holdings.

2.2 ANS revenues

Total ANS revenues in 2008 were €8 116M. This is the same order of magnitude as the combined revenues of Europe's three largest airport operators (BAA, AdP and Fraport), which amount to €7.7B.

The breakdown of these revenues is shown in Figure 2.3. The main share (79.3%) was collected for en-route ANS services and the remainder (20.7%) for terminal services. Overall, this share has remained fairly stable between 2004 and 2008. However, changes are expected in the forthcoming years with the progressive adoption of the Common Charging Scheme Regulation (EC No. 1794/2006), which *inter alia*, will harmonize the computation of the terminal service units and will enhance the transparency on the financing of terminal ANS.

Almost all en-route revenue comes from the collection of charges (95.2%, see left pie chart). The proportion is lower for terminal revenue (70.6%, a massive fall from 81.5% in 2007, see right pie chart), as additional income may come from airport operators (16.9%, compared to 10.1% in 2007) much of which is subsequently recovered from users.



Total en-route revenue: € 6 434 M | **Gate-to-gate ANS revenue: € 8 116 M** | **Total terminal revenue: € 1 683 M**

En-route	%	Gate-to-gate revenues (€ M)	Terminal	%
6 122	95.2%	Income from charges	1 188	70.6%
n.a.	n.a.	Income from airport operators	284	16.9%
1.1	0.02%	Income from the military	0	0.0%
75.1	1.17%	Income in respect of exempted flights	69	4.1%
51.9	0.81%	Income from domestic government	41	2.4%
78.2	1.2%	Financial income	21	1.2%
105	1.6%	Other income (incl. exceptional revenue item)	80	4.8%
6 434	100.0%		1 683	100.0%

Figure 2.3: Breakdown of gate-to-gate ANS revenues in 2008

2.3 ANS costs

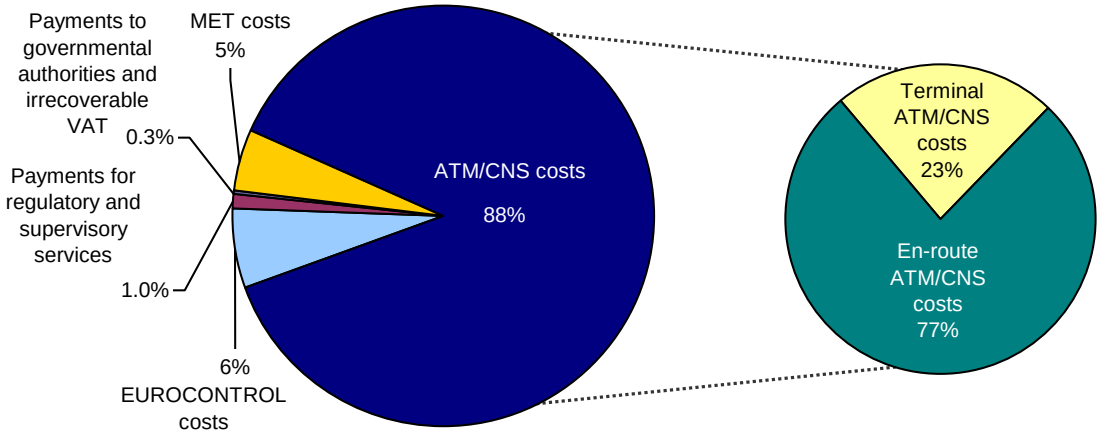
Total ANS costs for the European system amounted to €8 658M in 2008, comprising the following five cost categories[22] (see Figure 2.4):

- ATM/CNS provision costs[23] (including MUAC[24]);

[22] Detailed definitions of these costs are given in the SID.
[23] The costs of providing ATM services and the Communication, Navigation and Surveillance infrastructure. For the purpose of this report this includes the costs for Aeronautical Information Services (AIS) and, if any, Search and Rescue Services (SAR).

- Aeronautical Meteorological costs (MET)[25];
- EUROCONTROL costs[26];
- Payments for regulatory and supervisory services, and
- Payments to governmental authorities (e.g. for the use of government-owned assets).

Around 88% of the total relates to the provision of ATM/CNS, and is under the direct control and responsibility of the ANSP. These ATM/CNS provision costs amounted to €7 596M in 2008, and form the basis for the analysis of ATM cost-effectiveness in Parts II, III, and IV of this report.



Total ANS costs
€ 8 658 M

Total ATM/CNS provision costs
€ 7 596 M

Gate-to-gate ANS costs (€ M)	2008	% total
ATM/CNS provision costs (including AIS & SAR)	7 596	87.7%
MET costs	417	4.8%
EUROCONTROL costs	528	6.1%
Payment for regulatory and supervisory services	90	1.0%
Payment to governmental authorities and irrecoverable VAT	26	0.3%
Gate-to-gate ANS costs	8 658	100.0%

Figure 2.4: Breakdown of total ANS costs at system level in 2008

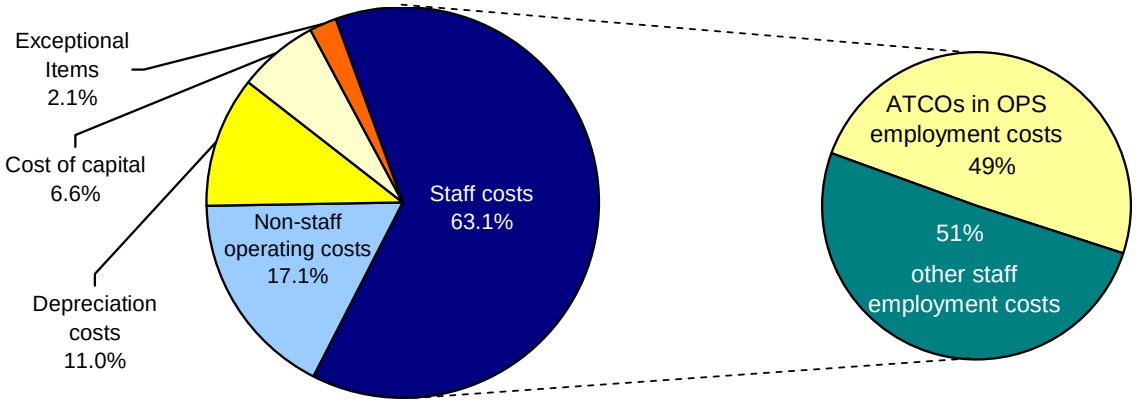
ATM/CNS provision costs can be further broken down into the following cost types[27]:

- Staff costs, comprising:
  - Employment costs for ATCOs in OPS;
  - Employment costs for all other staff;
- Non-staff operating costs (e.g. rentals, energy, telecom, insurance, outsourced maintenance);
- Capital-related costs comprising:
  - Depreciation;
  - The cost of capital;
- Exceptional items.

[24] Costs for MUAC are included in the ATM/CNS costs in Figure 2.4 as MUAC is an operational ANSP in its own right and therefore included in the cost-effectiveness analysis.
[25] Including MET costs reported by the UK and Danish CAAs.
[26] Excluding MUAC, CEATS, and CRCO administrative costs.
[27] Detailed definitions of these costs are given in the SID.

The distribution of costs between these categories is shown in Figure 2.5 below. Staff costs are the main element of costs, followed by direct operating costs, depreciation costs and cost of capital.

At European system level, operating costs (including staff costs and exceptional cost items) account for 82% of total ATM/CNS provision costs, and capital-related costs (cost of capital and depreciation) amount to 18%.



Total ATM/CNS provision costs: € 7 596 M

ATM/CNS provision costs (€ M)	En-route	%	Terminal	%	Gate-to-gate	%
Staff costs	3 617	62.1%	1 178	66.4%	4 795	63.1%
ATCOs in OPS employment costs	n.a.	n.a.	n.a.	n.a.	2 366	-
other staff employment costs	n.a.	n.a.	n.a.	n.a.	2 429	-
Non-staff operating costs	1 008	17.3%	293	16.5%	1 301	17.1%
Depreciation costs	656	11.3%	178	10.0%	834	11.0%
Cost of capital	403	6.9%	101	5.7%	504	6.6%
Exceptional Items	138	2.4%	24	1.4%	162	2.1%
Total	5 822	100.0%	1 774	100.0%	7 596	100.0%

Figure 2.5: Breakdown of European ATM/CNS provision costs in 2008

The cost structure of ANSPs is analysed in more detail in Chapter 3.

2.4 Assets, liabilities and capital expenditures

For the comparison of ATM performance across ANSPs, only that capital employed by the ANSPs which is directly related to the provision of en-route and terminal ANS should be used. Therefore, in this report assets have been excluded when they relate to ANS activities reported under the "Other ANS" column of the Specification for Information Disclosure, such as Oceanic and OAT.

The disclosure of consistent and reliable ANS assets and liabilities data is proving particularly difficult for ANSPs which are part of an organisation which owns, manages and operates airports. The more extensive disclosure of balance sheet information required by the SID V2.6 has allowed a more comprehensive and consistent picture of ANSPs assets and liabilities to be developed.

In ANSPs' balance sheets, assets comprise:

- the net book value (NBV) of fixed assets both in operation[28] and under construction;
- current assets, comprising principally stock, cash and debtors; and,

[28] The Net Book Value (NBV) is the value of the asset net of cumulative depreciation.

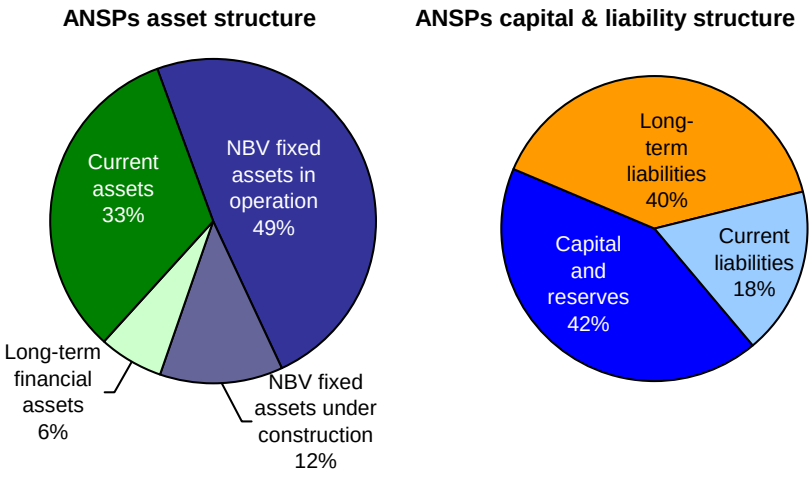
- long-term financial assets, including investments in other companies, and investments required to cover provisions for pensions.

The liabilities (which are numerically equal to the assets), comprise:

- capital and reserves – the equity in the organisation, including both shareholders' funds and the accumulated retained profit;
- current liabilities, comprising creditors, short-term loans and provisions; and
- long-term liabilities, comprising long-term loans, and provisions for pensions and other long-term liabilities.

The total NBV of the fixed assets used by the European ANSPs to provide ATM/CNS is valued at some €7 078M[29], which means that overall for the ANS industry €0.9 of capital is required to generate €1 of revenue, an indication of capital intensity (this ratio is about 2 for airlines and about 3 for main airports operators). Figure 2.6 shows the composition of the balance sheet for European ANS, both assets and liabilities.

Asset values comprise chiefly fixed assets (61%) either already in operation (49%) or under construction (12%). Current assets amount to 33% and long-term financial assets represent 6% of the total. The liability side of the balance-sheet comprises capital and reserves (42%), long-term liabilities (40%) and current liabilities (18%).



ANSP Fixed Asset Structure (€ M)	Gate-to-gate ANS
Total NBV fixed assets in operation	5 661
Land & Buildings	*2 148*
Systems & Equipments	*2 919*
Intangible assets	*594*
Total NBV fixed assets under construction	1 417
Land & Buildings	*226*
Systems & Equipments	*975*
Intangible assets	*216*
Total NBV of fixed assets	7 078

Figure 2.6: ANSP assets and liabilities structure, 2008

Another new element of data collected in 2008 concerned the composition of the balance sheet of ANSPs, both assets and liabilities. A feature of the liabilities side of the balance sheet is that at European system level ANSPs' equity substantially exceeds their long-term debt, although this is not the case for few individual ANSPs. Understanding the

[29] Note that this figure exclusively relates to assets booked in ANSPs accounts. Assets owned by MET service providers and NSAs are not included.

main drivers for the differences in the equity/long-term debt ratio across ANSPs would require further investigation.

Another interesting feature is that the ratio of current assets to current liabilities at the end of 2008 - a measure of the "liquidity" risk to fund an immediate shortfall in revenue – was 1.8. Even when using a more stringent measure of liquidity, such as the "quick ratio" (retaining only debtors and cash assets instead of all current assets) the ratio is 1.3. It indicates that, on average, ANSPs would be able to pay 130% of their current debt by only using their most liquid assets. In several cases the current ratio is extremely high, suggesting that these ANSPs have been able to build up "war chests", even under full cost recovery. Indeed, the cost recovery rules allow for a reasonable return on equity. This return appears in accounting terms as profit. If this profit is retained, rather than being distributed as tax and dividends, or used to cross-subsidise other activities, then reserves are built up. Some ANSPs use such reserves to finance a revenue shortfall in order to stabilise the unit rates that are charged to airspace users.

The value of assets in operation and in construction arises from past and present capital expenditure.

Figure 2.7 shows the breakdown of 2008 capital expenditure (capex) between Land & Building and Systems & Equipments. At European system level, the capex for ANS amounted to €1 185M in 2008.

The asset structure of ANSPs, the changes in NBV of fixed assets in operation and under construction, and the planned capex are analysed in more detail in Chapter 7 and in Part IV.

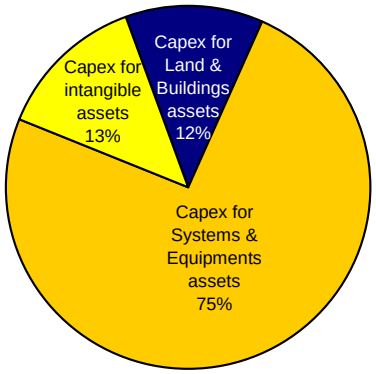


Figure 2.7: ANSP capex structure, 2008

For the first time, in 2008, data was collected concerning the physical numbers of surveillance and navigation assets. The 36 ANSPs were responsible for 206 primary radars, and 323 secondary surveillance radars (SSRs), Mode S and MSSR, many of which were co-located with primary radars. This amounts to 25 SSRs per million km^2. Densities of SSRs tend to be low (less than 20) in peripheral areas (although in some cases this is inevitable as the areas include major areas of sea), and higher in the core.

A rather similar pattern is observed with different types of navaids. On average, there were some 70 DMEs and 52 VORs per million km^2, with in general lower values observed in peripheral areas. Note that in the table below, no SSRs are displayed for MUAC which uses the CNS infrastructure made available by the four States contributing to MUAC budget (see lower airspace map).

Surveillance and navigation aids physical assets	2008
Primary radar only	40
Primary radar co-located with Mode S	59
Primary radar co-located with MSSR	107
MSSR only	157
Surface movement radars	70
ADS-B ground stations	44
Wheather radars	52
Other surveillance assets	60
Distance measuring equipment (DME)	920
Non-directional beacons (NDBs)	891
Very high frequency omni-directional ranges (VORs)	682
Runway ends with ILS	474
Other navaids assets	210

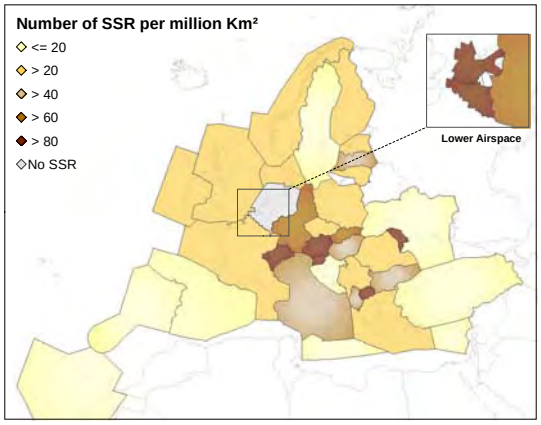


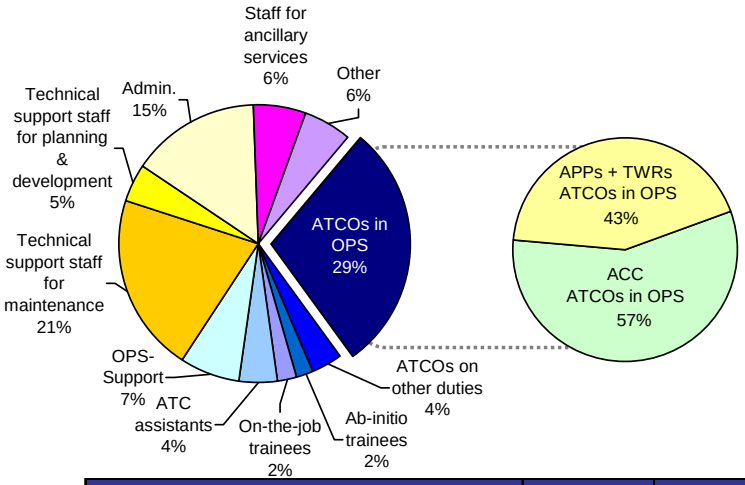
Figure 2.8: Surveillance and navigation aids physical assets, 2008

2.5 Staff

ANSPs are required to disclose information about a number of staff categories.[30] The staff numbers are reported as Full Time Equivalents (FTEs).

The 36 European ANSPs, including MUAC, employed 57 599 staff[31]. Of these, some 48% are directly involved in operations (blue colours in Figure 2.9 below).

The largest share (29%) relates to air traffic controllers working on operational duty (ATCOs in OPS). Some 57% of ATCOs in OPS work in ACCs and 43% in APP and TWR operational units, as illustrated in Figure 2.9 below.



Staff	2008	% total
Number of ANSPs	36	
ATCOs in OPS:	16 607	28.8%
ACC ATCOs in OPS	*9 444*	*56.9%*
APPs + TWRs ATCOs in OPS	*7 163*	*43.1%*
ATCOs on other duties	2 156	3.7%
Ab-initio trainees	1 139	2.0%
On-the-job trainees	1 164	2.0%
ATC assistants	2 565	4.5%
OPS-Support	3 973	6.9%
Technical support staff for maintenance	12 003	20.8%
Technical support staff for planning & development	2 666	4.6%
Administration	8 605	14.9%
Staff for ancillary services	3 523	6.1%
Other	3 199	5.6%
Gate-to-gate ANS Staff	57 599	100%

Figure 2.9: Breakdown of European ANS system staff in 2008

[30] Precise definitions of the categories are in the SID - see footnote 2 on page 1.
[31] This excludes EUROCONTROL Agency staff other than MUAC.

In addition to operational duties, some 2 156 FTE ATCOs (3.7% of the total workforce) participate in activities outside the operations room (such as providing training, or working on special projects) which are not directly related to the active control of traffic.

The second and third largest categories are technical support staff for maintenance (21%) and administration staff (15%) (see Figure 2.9 above).

For the purpose of this report, "support staff" are defined as staff who are not ATCOs in OPS, and the "support staff ratio" is defined as:

$$\text{Support Staff Ratio} = \frac{\text{Total Staff}}{\text{Total ATCOs in OPS}} = \frac{57\,583}{16\,592} = 3.5$$

That means that for every ATCO in OPS there are 2.5 **additional** staff needed for support.

2.6 Summary data for the European system (2007 and 2008)

Table 2.1 shows summary data for the European ANS system in 2007 and 2008, all expressed in 2008 prices.

In 2008, gate-to-gate ATM/CNS provision costs rose by +1.1%, with en-route costs increasing (+2.2%) and terminal costs decreasing (-2.1%). En-route costs have apparently risen in 2008, and terminal costs fallen, partly because for some ANSPs costs relating to approach control which were previously reported as terminal ANS have been reassigned to en-route ANS.

MET costs remained fairly constant compared to 2007. Further details are given in Chapter 3, Section 3.2.1.

EUROCONTROL Agency costs borne by the 36 ANSPs included in the analysis decreased by -2.2% in real terms. Further details on EUROCONTROL Agency costs are given in Chapter 3, Section 3.2.3.

Total gate-to-gate ANS staff increased slightly by +1.5%.

These changes occurred in a context of a traffic growth much slower than in previous years. In 2008, the flight-hours controlled were +2.4% higher and IFR airport movements remained at 2007 levels (+0.2%).

Finally, it should be noted that the minutes of gate-to-gate ATFM delays greater than 15 minutes rose by +12.1% in 2008 which is surprising given the relatively low traffic growth.

	2007	2008	08/07
	36 ANSPs	36 ANSPs	36 ANSPs
Gate-to-gate ANS revenues (not adjusted by over/under recoveries) (in € M):	**8 063.4**	**8 072.4**	**0.1%**
En-route ANS revenues	6 461.9	6 389.7	-1.1%
Terminal ANS revenues	1 601.5	1 682.7	5.1%
Gate-to-gate ANS costs (in € M):	**8 578.2**	**8 658.2**	**0.9%**
ATM/CNS provision costs	7 510.2	7 596.1	1.1%
MET costs	418.9	417.1	-0.4%
EUROCONTROL Agency costs	540.1	528.4	-2.2%
Payment to national authorities and irrecoverable VAT	109.1	116.5	6.8%
Gate-to-gate ATM/CNS costs (in € M):	**7 510.2**	**7 596.1**	**1.1%**
En-route ATM/CNS costs	5 698.4	5 822.1	2.2%
Terminal ATM/CNS costs	1 811.7	1 774.0	-2.1%
Gate-to-gate ANS staff:	**56 737**	**57 599**	**1.5%**
ATCOs in OPS	16 701	16 607	-0.6%
ACC ATCOs	9 447	9 444	0.0%
APPs + TWRs ATCOs	7 254	7 163	-1.3%
NBV of gate-to-gate fixed assets (in € M)	**7 286**	**7 078**	**-2.9%**
Gate-to-gate capex (in € M)	**1 131**	**1 185**	**4.8%**
Outputs (in M)			
Distance controlled (km) in charging area	9 433	9 629	2.1%
ACC flight-hours controlled	12.4	12.8	2.5%
Total flight-hours controlled	14.2	14.5	2.4%
IFR airport movements controlled	16.1	16.2	0.2%
Gate-to-gate ATFM delays > 15 min. ('000 min.)	**16 786**	**18 823**	**12.1%**

Table 2.1: Summary data for the European ANS system in 2008 prices

3 TOTAL ANS COSTS VERSUS ATM/CNS PROVISION COSTS

3.1 Introduction

This chapter describes how a subset of the cost data submitted by ANSPs is extracted and adjusted so that it can be used meaningfully to compare performance across ANSPs and across time. This subset has been chosen to cover, as far as possible, those costs that are under the direct control of the ANSP, and relate to the provision of ATM/CNS services for European General Air Traffic (GAT). The costs excluded comprise:

- costs relating to services provided to military OAT, Oceanic ANS, AFIS/ATC at smaller regional aerodromes[32], and reported under the "Other" column in the Specification for Information Disclosure; and,
- other costs not under the direct control of an ANSP, as detailed in the next paragraph.

3.2 ANS cost categories

In Section 2.3, ANS costs for the whole system were divided into four main categories. For comparison across individual ANSPs, it is necessary to identify, in addition, payments for delegation of ANS (which, of course, sum to zero across the system as a whole). ANS costs are therefore broken down into the following categories:

1. MET costs (whether provided internally or externally);
2. Payments to governmental or regulatory authorities;
3. EUROCONTROL costs[33];
4. Payment to other ANSPs or States for delegated services, including payments for MUAC & CEATS; and,
5. ATM/CNS provision costs (including AIS & SAR)[34].

Category (4) comprises:

- payments to other ANSPs or States where operational ATM responsibility has been delegated; and,
- payments by ANSPs in the "Maastricht States" (Benelux and Germany) for the costs of MUAC and by CEATS members for CEATS, entrusted by International Treaty and for which the costs are included in the national cost-bases.

ANS cost categories other than ATM/CNS, excluded from the analysis in subsequent chapters, are described briefly in the following sections. The breakdown for the system as a whole is shown in Table 3.1.

Gate-to-gate ANS costs (€ M)	2008	% total
ATM/CNS provision costs (including AIS & SAR)	7 596	87.7%
MET costs	417	4.8%
EUROCONTROL costs	528	6.1%
Payment for regulatory and supervisory services	90	1.0%
Payment to governmental authorities and irrecoverable VAT	26	0.3%
Gate-to-gate ANS costs	8 658	100.0%

Table 3.1: Breakdown of total ANS costs by category, 2008

Table 3.2 shows the ANS cost categories as a proportion of total en-route and terminal ANS costs for individual ANSPs/States. The en-route and terminal ATM/CNS costs as shown in Table 3.2 are then used for the comparison of ATM/CNS cost-effectiveness between ANSPs in Part II, Part III and Part IV.

[32] This is the case for Avinor, ENAV, and Finavia.
[33] Excluding MUAC, CEATS and CRCO administration costs.
[34] The ATM/CNS provision costs as reported by the ANSPs in the SID include costs relating to AIS and SAR. These costs are around 2% of the total ANS costs.

Country	ANSP	EN-ROUTE ANS COSTS									TERMINAL ANS COSTS								Gate-to-gate ATM/CNS costs (in € '000)
		Total ANS costs (in € '000)	MET costs (%)	Payment for regulatory and supervisory services (%)	Payment to the State for provision of other services (%)	EUROCONTROL costs (%)	Payments for delegation of ANS (%)	Irrecoverable value added tax (VAT) (%)	ATM/CNS en-route costs (%)	ATM/CNS en-route costs (in € '000)	Total ANS costs (in € '000)	MET costs (%)	Payment for regulatory and supervisory services (%)	Payment to the State for provision of other services (%)	Payments for delegation of ANS (%)	Irrecoverable value added tax (VAT) (%)	ATM/CNS terminal costs (%)	ATM/CNS terminal costs (in € '000)	
Spain	Aena	917 350	3.7%	0.8%	0.7%	6.4%			88.4%	811 381	415 253	3.1%					96.9%	402 401	1 213 782
Czech Republic	ANS CR	98 814	1.7%			5.8%	1.0%		91.5%	90 459	28 050	2.8%					97.2%	27 252	117 711
Bulgaria	ATSA Bulgaria	78 019	7.3%	1.0%		6.2%		0.2%	85.2%	66 504	11 381	13.5%	3.9%			0.2%	82.4%	9 378	75 881
Austria	Austro Control	164 537	9.8%			7.2%			83.0%	136 576	35 977	9.2%					90.8%	32 675	169 251
Norway	Avinor	93 230	1.5%	0.6%		8.3%			89.6%	83 544	87 522	1.2%	0.5%				98.3%	86 033	169 578
Belgium	Belgocontrol	172 451	5.1%	0.4%		7.9%	22.0%		64.6%	111 329	41 920	9.4%	0.6%				90.0%	37 730	149 059
Croatia	Croatia Control	62 657	4.3%			5.8%	1.0%		88.9%	55 713	5 779						100.0%	5 779	61 491
Cyprus	DCAC Cyprus	40 077	7.7%	6.1%		5.8%			80.4%	32 217	7 270	7.4%	5.7%				86.9%	6 316	38 533
Germany	DFS	820 996	4.0%	0.7%		9.6%	7.0%		78.7%	646 362	187 754	4.7%	0.5%	0.5%			94.4%	177 183	823 544
Turkey	DHMI	219 044	7.4%	2.9%		6.9%			82.8%	181 464	55 572						100.0%	55 572	237 036
France	DSNA	1 085 066	5.8%	0.9%		7.8%	4.0%		81.5%	884 230	262 345	7.2%	0.9%				91.9%	241 140	1 125 370
Estonia	EANS	8 747	0.5%						99.5%	8 705	2 164	6.5%					93.5%	2 022	10 727
Italy	ENAV	633 546	7.5%			8.5%	0.1%		83.8%	531 220	126 068	3.9%					96.1%	121 194	652 414
Finland	Finavia	29 905	3.5%	0.9%		12.5%	0.8%		82.3%	24 612	35 059	10.8%	2.1%				87.0%	30 507	55 119
Greece	HCAA	180 202	5.8%	1.8%		7.4%			85.0%	153 231	33 387	1.0%							153 231
Hungary	HungaroControl	62 986	2.0%	1.9%		8.1%	1.1%		86.9%	54 749	20 264	6.8%					93.2%	18 882	73 631
Ireland	IAA	108 643	5.9%	1.4%	1.4%	6.8%			84.5%	91 781	22 898	7.0%	0.9%	1.5%			90.6%	20 751	112 531
Sweden	LFV/ANS Sweden + Sweden CAA	158 368	4.3%	2.3%		7.7%			85.8%	135 847	27 355		0.4%				99.6%	27 253	163 100
Latvia	LGS	17 527	6.9%	10.6%					82.5%	14 460	6 407	2.8%	9.1%				88.1%	5 643	20 103
Slovak Republic	LPS	39 953	1.8%			6.3%	1.5%		90.5%	36 161	6 973	4.4%					95.6%	6 665	42 825
Netherlands	LVNL	172 819	5.6%	0.7%		8.4%	18.4%	3.8%	63.2%	109 239	55 336					4.7%	95.3%	52 730	161 969
Malta	MATS	11 182	6.0%			7.1%			86.9%	9 719	3 146	5.0%					95.0%	2 988	12 707
F.Y.R Macedonia	MK CAA	10 219	3.8%			6.5%			89.7%	9 165	2 822	4.6%					95.4%	2 693	11 858
Moldova	MoldATSA	5 357	12.7%	2.2%		3.6%			81.5%	4 366	1 635	13.2%	2.0%				84.8%	1 386	5 752
	MUAC	128 434						0.0%	100.0%	128 429	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	128 429
Albania	NATA Albania	14 469	1.3%	2.5%		5.5%		2.6%	88.1%	12 748	1 787	3.6%				0.2%	96.2%	1 720	14 468
United Kingdom	NATS + UK CAA	686 009	4.5%	2.3%		9.7%			83.4%	572 425	156 820	0.1%	2.0%				97.9%	153 526	725 952
Portugal	NAV Portugal (FIR Lisboa)	135 413	3.8%	0.3%		7.3%			88.7%	120 125	28 511						100.0%	28 511	148 636
Denmark	NAVIAIR + Denmark CAA	98 203	4.2%	5.6%	0.1%	7.4%		4.5%	78.2%	76 794	29 069			0.1%			99.9%	29 026	105 819
Lithuania	Oro Navigacija	17 600	2.6%	1.4%		6.2%			89.8%	15 808	3 366	2.1%	1.5%				96.4%	3 244	19 053
Poland	PANSA	138 621	4.6%	2.0%		5.6%	0.4%		87.5%	121 304	30 924	9.0%	1.8%				89.1%	27 567	148 871
Romania	ROMATSA	161 241	4.6%	2.6%		6.4%			86.4%	139 263	21 654	1.7%	0.5%				97.8%	21 182	160 445
Switzerland	Skyguide + FOCA	170 579	4.7%	0.02%		6.2%			89.1%	151 966	63 289	5.6%	0.0%		0.2%		94.1%	59 578	211 545
Slovenia	Slovenia Control	23 043	5.9%	0.9%		5.2%	1.0%		87.0%	20 050	3 867	10.6%	0.8%				88.6%	3 428	23 478
Serbia and Montenegro	SMATSA	69 851	6.3%	6.5%		5.0%			82.3%	57 457	13 533	6.5%					93.5%	12 652	70 109
Ukraine	UkSATSE	134 543	0.9%			6.0%		1.9%	91.2%	122 721	28 313					2.0%	98.0%	27 759	150 480
										5 822 123								1 742 365	7 564 487

Table 3.2: Breakdown of en-route and terminal ANS costs (State view), 2008

3.2.1 MET costs

The organisational and operational responsibility for the provision of MET services varies by State. Most ANSPs use their national meteorological institution as the provider of MET services. Some, however, provide MET services internally (in part or completely).

Figure 3.1 shows that for 15 ANSPs, MET services are provided either wholly or partially internally[35] (see also Table 1.1 in Section 1.2).

In all other cases, MET services are provided by the national meteorological institution.

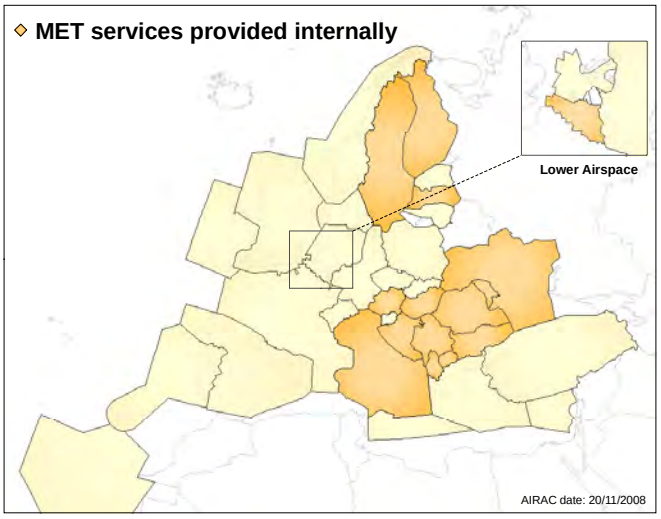


Figure 3.1: Arrangements for provision of aeronautical MET services (2008)

For comparison purposes, all costs relating to MET (whether internally provided or outsourced) were identified in Table 3.2 and **excluded** from the ATM/CNS costs used in the cost-effectiveness analysis in the following chapters.

Figure 3.2 below shows that there is a wide variation in the way MET costs are allocated between en-route and terminal ANS. In most cases, MET costs are mainly allocated to en-route ANS and in nine States, no MET costs were allocated to terminal ANS. In Turkey, MET costs for terminal ANS are neither disclosed nor charged to DHMI or included in the cost base; they are provided free of charge by the National MET authority.

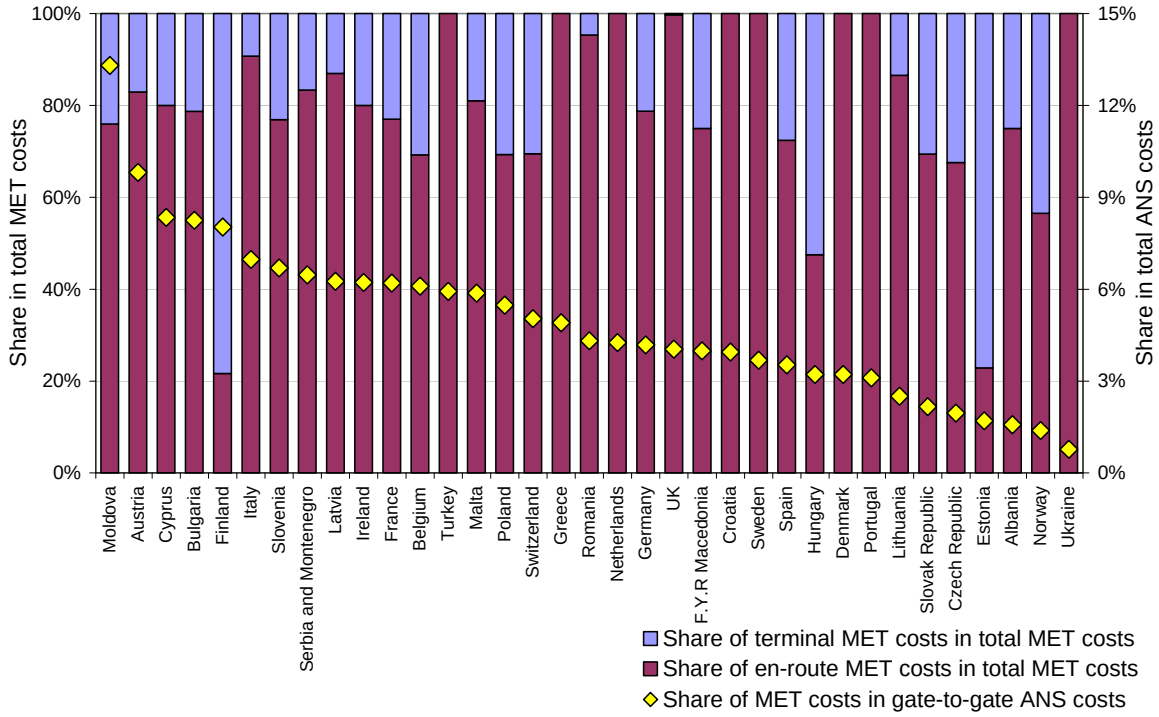


Figure 3.2: Proportion of MET costs in total gate-to-gate ANS costs (2008)

[35] For Finavia, HungaroControl, LFV/ANS Sweden, MoldATSA, ROMATSA and UkSATSE, MET services are also outsourced.

In Spain, although Aena provided the information relating to terminal MET costs in the SID, only en-route MET costs are recovered through air navigation charges. By contrast, a few ANSPs allocated most of their MET costs to terminal ANS, in Finland around 80% of total MET costs. There is clearly an issue of consistency in this area; however, in the context of ACE it has not been investigated further.

Figure 3.2 also indicates that for Moldova (13.3%), Austria (9.8%), Cyprus (8.3%), Bulgaria (8.3%) and Finland (8.0%), MET costs are equal or greater than 8% of the total gate-to-gate ANS costs.

In 2008, the use of the enhanced SID V2.6 required information that separated the "direct" costs of MET services from allocated "core" costs. The direct costs comprise the costs of providing specific services to civil aviation; the core costs comprise an allocation between different types of users of the general costs of providing a meteorological service. Disclosure of information relating to the allocation of "direct" and "core" MET costs is a requirement of the EUROCONTROL Route Charges Principles.

The proportions of MET costs that arise from "direct" and "core" elements are shown in Figure 3.3. A substantial majority of ANSPs (25) did not separately identify MET "core" costs in their ACE data submission. This naturally includes all those that provide MET internally. The remaining 10 for which consistent data were received include some allocated core costs; in some cases this amounts to 70% of total MET costs.

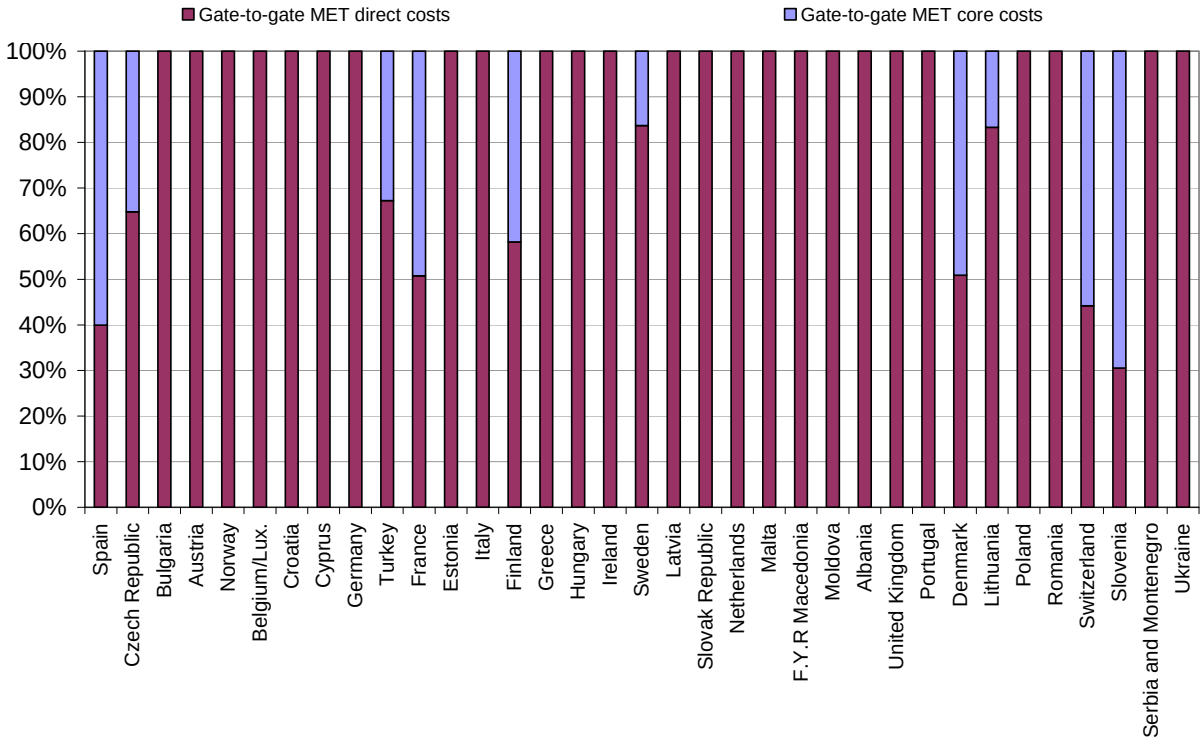


Figure 3.3: Proportions of direct and core costs in gate-to-gate MET costs (2008)

Figure 3.4 below shows that for the 33 States for which data over time are available, MET costs have fallen by some -2.1% since 2004, in real terms.

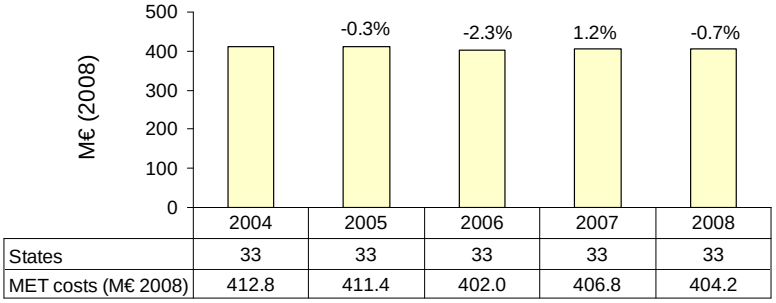


Figure 3.4: Trends in gate-to-gate MET costs (2004-2008)

Figure 3.5 below shows that the fall in MET costs at European system level is the net effect of contrasted movements in individual States. Among the States contributing most to European MET costs (see left-hand side of Figure 3.5), the cost reductions in Germany (-18%), UK (-5%), Austria (-20%) and Turkey (-18%) played a substantial role in the fall observed at European system level:

- In 2003, the German MET service provider (DWD) started a cost saving program with the aim to reduce the aviation MET costs by 15% in 2008. This cost decrease is mainly the result of (1) a reduction in the number of staff (-1.5% per year) and (2) a decrease in operating expenditures (i.e. EUMETSAT costs);
- The decrease in Austria MET costs is mainly caused by the restructuring of Austro Control MET department.

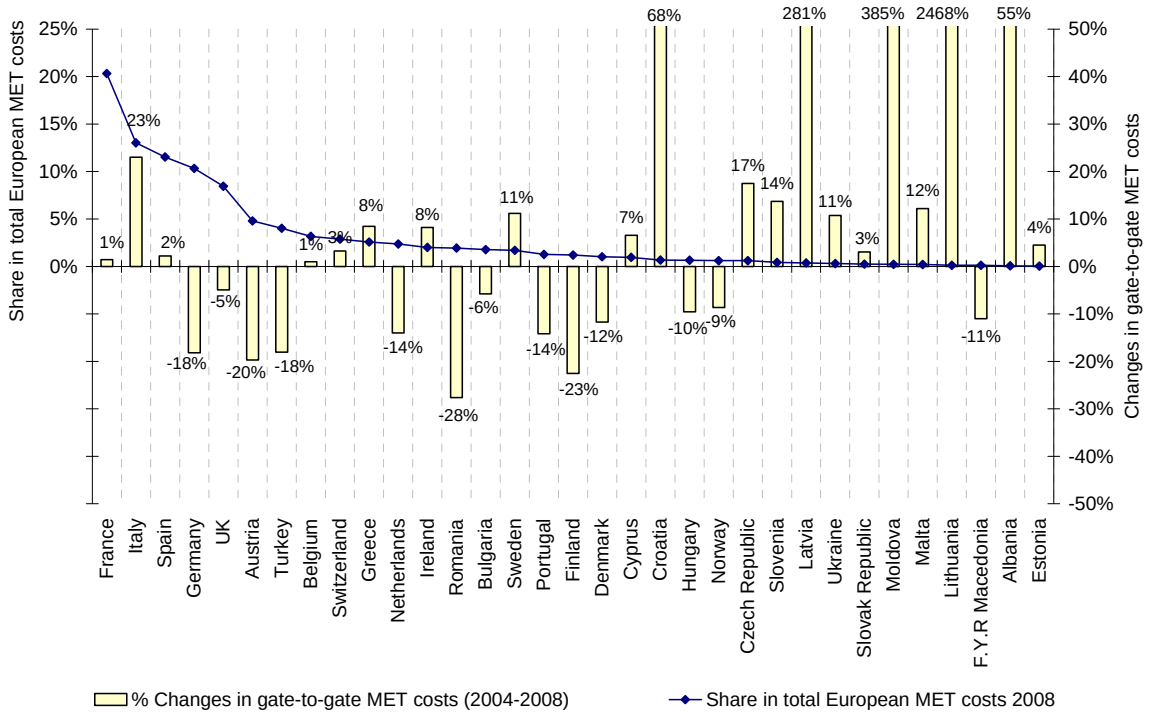


Figure 3.5: Changes in gate-to-gate MET costs (State level, 2004-2008, real terms)

Between 2004 and 2008, MET costs rose in 20 out of 33 States. The largest rises are mainly observed in States where the MET cost base was "small" in 2004 such as Albania, Moldova, Latvia and Lithuania[36] (see right-hand side of Figure 3.5).

[36] The apparent rise in MET costs in Lithuania is caused by the fact that Oro Navigacija reported MET costs for the first time in its 2006 data submission. Until 2005, MET services were provided free of charge by the Lithuanian national weather authority and Oro Navigacija only reported the costs of processing the MET information.

Figure 3.5 also shows that MET costs rose significantly in some States whose MET costs represent a major contribution to total European MET costs such as Italy (+23%), Greece (+8%) and Ireland (+8%). These increases should warrant further attention given that several components of MET costs are fixed and should not grow with traffic increase. The apparent increase in MET costs for Greece is due to the fact that HCAA reported terminal MET costs for the first time in 2007. For Italy, the increase in MET costs is mainly due to changes in the accounting system in 2006.

Since no obvious measure of MET output(s) is available, no cost-effectiveness KPIs have been developed.

3.2.2 Payments to governmental and regulatory authorities

The enhancements to the SID have helped distinguish different types of payments to government and regulatory authorities.

Payments to government and regulatory authorities may comprise **payments for regulatory and supervisory services** (safety, airspace, or economic regulation) provided by the National Supervisory Authority or the Civil Aviation Authority. They may also comprise **payments to the State for provision of other services** (for example the use of government-owned assets).

Payments for regulatory services are not always made via the ANSP; sometimes they are collected from users and paid directly to the regulatory authority. In other cases, users do not make any payment for regulatory services at all. For this reason, payments for regulatory services are not comparable between ANSPs for benchmarking purposes and are therefore **excluded** from the costs subject to benchmarking analysis in Part II, Part III, and Part IV.

Such payments by ANSPs for regulatory services amounted to €90M in 2008 (1.0% of total ANS costs).

Other payments to government amounted to €9M or around 0.1% of total ANS costs.

Payments to governmental and regulatory authorities, comprising both these items, amounted to €99M in 2008, a rise from €96M in 2007. This increase may be caused by some ANSPs starting to report such costs and include them in the cost base for the first time in 2008. The regulatory framework laid down by the SES regulations requires the designation of National Supervisory Authorities (NSAs) to be in charge of certifying ANSPs and to ensure the proper implementation of the SES regulations. When the costs of such authorities (or other governmental costs related to the provision of ANS) are recovered through ANS charges, Member States must establish and allocate their costs according to principles laid down in the Common Charging Scheme Regulation. More complete information on regulatory and supervisory costs should allow the PRU to take those costs into account as part of overall ANS performance measurement.

In 2008, 26 out of 36 States identified separately a payment for regulatory services (compared to 23 in 2007). Six States which are subject to SES regulations (Austria, Czech Republic, Slovak Republic, Estonia, Italy and Malta) did not report a payment for regulatory services, either because these costs were not charged to airspace users in 2008 (e.g. Italy) or because they were not identified. In principle, according to the Common Charging Scheme Regulation, those costs must be reported by each State/ANSP in specific tables from the year 2008 onwards for the purposes of the consultation process with airspace users.

Table 3.2 above (see page 22) shows that in 2008, the proportion of en-route ANS costs arising from payments to regulatory and supervisory services ranges, in these 26 ANSPs, from less than 1% in Switzerland to 10.6% in Latvia.

Caution is needed when comparing States/ANSPs in Table 3.2 since:

- There are differences in the scope of the regulatory activity among the various States;
- In some cases ANSPs are entrusted with regulatory duties on behalf of the State; and,
- In some cases, regulatory costs could not be identified separately and are therefore reported as part of the ATM/CNS provision costs.

It should also be noted that in several cases ANSPs did not book in their accounts any costs for regulatory services. This could be caused by one of the following two reasons:

- o regulatory costs in some cases are borne by taxpayers rather than airspace users;
- o in some cases users are charged directly by the regulatory authority.

3.2.3 EUROCONTROL Agency costs (excluding MUAC & CEATS)

EUROCONTROL Agency costs can be split into two main categories: the EUROCONTROL cost base (Parts I and IX, €531.6M in 2008) and the CRCO costs (Part II, €18.2M in 2008).

In 2008, the EUROCONTROL Agency cost base (Parts I and IX) represents 7.8% of total European en-route ANS costs, which is lower than in 2007 (8.3%). As indicated in Figure 3.6 the relative share of EUROCONTROL Agency costs is expected to remain fairly constant in 2009 and 2010, below the 8% threshold.

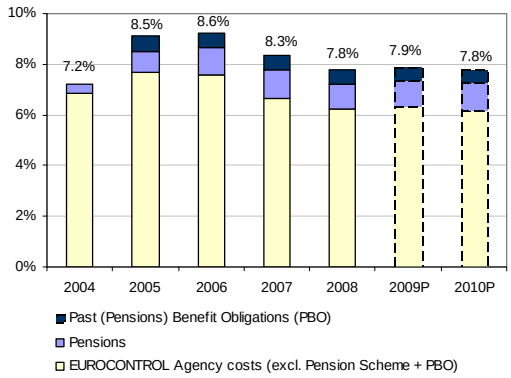


Figure 3.6: EUROCONTROL Agency costs relative to total European en-route ANS costs

Figure 3.7 displays the breakdown of EUROCONTROL Agency costs per establishment and expenditure between 2004 and 2008.

Establishment	Yearly costs (M€)						
	2004	2005	2006	2007	2008	% 08/04	% 08/07
CND/ASRO/MIL/HMU	205.7	215.3	226.1	220.2	232.4	13%	6%
Resources	68.2	73.5	71.5	71.1	68.6	1%	-4%
CFMU / EAD	99.8	113.5	111.7	119.9	119.9	20%	0%
Institutional bodies	6.4	6.4	7.0	5.0	5.1	-21%	1%
Pension in charge of the budget	20.7	48.6	65.2	69.2	69.4	236%	0%
PBO		35.4	35.4	35.8	36.2	-	1%
Total Parts I & IX	400.8	492.7	516.8	521.2	531.6	33%	2%
Price Index	1.076	1.103	1.129	1.149	1.201	12%	4%
Real costs (€2008) Total Parts I & IX	447.4	536.4	549.8	544.6	531.6	19%	-2%

Type of expenditure	Yearly costs (M€)						
	2004	2005	2006	2007	2008	% 08/04	% 08/07
Staff costs	188.1	192.9	209.0	219.6	221.9	18%	1%
PBO		35.4	35.4	35.8	36.2	-	1%
Pensions	20.7	48.6	65.2	69.2	69.4	236%	0%
Operating costs	89.2	99.5	141.1	143.8	140.0	57%	-3%
Depreciation costs	93.0	107.8	59.4	45.7	56.5	-39%	24%
Interest	9.7	8.6	6.8	7.2	7.5	-23%	5%
Total Parts I & IX	400.8	492.7	516.8	521.2	531.6	33%	2%
Price Index	1.076	1.103	1.129	1.149	1.201	12%	4%
Real costs (€2008) Total Parts I & IX	447.4	536.4	549.8	544.6	531.6	19%	-2%

Figure 3.7: EUROCONTROL Agency costs per establishment & expenditure (Parts I & IX)

The right-hand side of Figure 3.7 indicates that between 2004 and 2008, the total cost-base for the EUROCONTROL Agency rose by +19%. This increase contrasts with the 3% rise in support costs which is observed at European level for ANSPs support costs.

It should be noted that the rise in EUROCONTROL Agency costs is mainly due to the increase of pension related-costs, i.e. pensions charged to the budget and Pension Benefit Obligations (PBO). After reaching a peak in 2006, the total cost-base for the EUROCONTROL Agency decreased in real terms in 2007 (-1%) and 2008 (-2%).

It is also noteworthy that the 2008 actual EUROCONTROL Agency costs (i.e. €531.6M) are below the plans made in November 2007 (i.e. €536.3M which included the 98% cap). This decrease is mainly due to the containment of staff costs (+1%) and the decrease of non-staff operating costs (-3%). On the other hand, depreciation costs increased by +24% between 2007 and 2008. This increase is partly due to a larger depreciation of intangible assets (some €17M) in 2008 compared to previous years[37].

Figure 3.8 below shows that the EUROCONTROL cost-base is planned to decrease by -5.9% for the period 2009-2013. The EUROCONTROL Agency decided to freeze its 2010 cost-base at 2008 levels. The right-hand side of Figure 3.8 indicates that in November 2009, compared to November 2008 plans, the EUROCONTROL costs projected for 2010 onwards have been revised downwards.

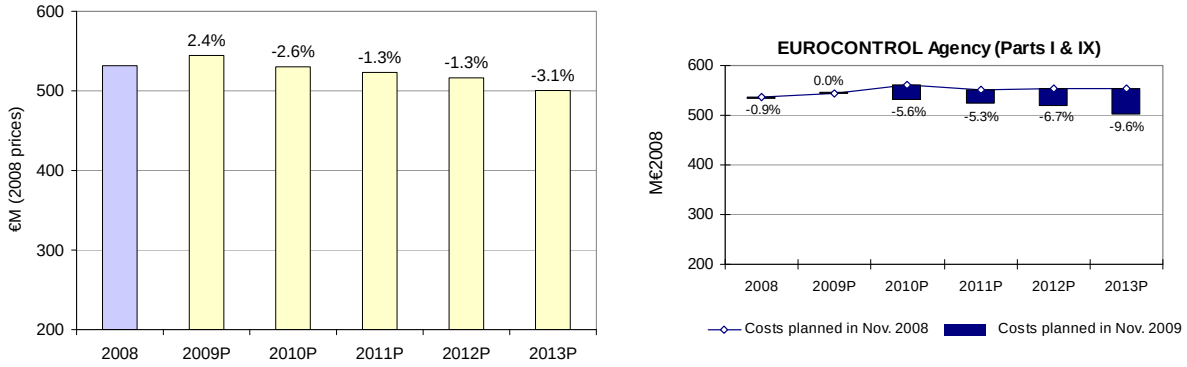


Figure 3.8: Changes in planned costs for the EUROCONTROL Agency (Parts I & IX)

The EUROCONTROL Organisation is supporting the Agency in initiating a reorganisation process to be more in line with stakeholders' expectations and with a new economic reality. This process should lead to genuine efficiency improvements and cost savings.

3.2.4 Payment to other ANSP or States for delegated services

Payments for delegation of operational ATM responsibility have not been included in the ATM performance comparison of ANSPs because the corresponding outputs, and hence the costs, were reported by the ANSP actually providing the service. Financial compensations comprise:

- DSNA payments to Skyguide and to Jersey for delegated ATM, representing 4.0% of DSNA's en-route ANS costs;
- Finavia payments for delegation of ATM to LFV/ANS Sweden representing 0.8% of Finavia's en-route ANS costs;
- PANSA's payment for the delegation of ATC services over the Northern part of Poland to LFV/ANS Sweden accounts for 0.4% of PANSA en-route ANS costs.

There are also numerous examples where ATM services are delegated for operational purposes without financial compensation[38], such as Skyguide services over southern Germany and northern Italy, NAVIAIR services over southern Sweden and in the Nordsee (UK airspace), DFS services over Tirol in Austria, MUAC services over Northern France and Austro Control services over Eastern Slovenia.

[37] It is planned that by 2012 all the remaining intangible assets will be full depreciated.

[38] In such cases, the absence of financial compensation may have an impact on unit rates (under the full cost recovery principle the costs related to delegation of ANS are ultimately borne by airspace users which did not generate them).

Payments to MUAC and CEATS are State obligations for entrusted ANS services and thus outside the direct control of ANSPs. MUAC is treated as an ANSP and included in the ATM/CNS cost-effectiveness analysis[39].

3.2.5 Irrecoverable Value Added Tax (VAT)

As disclosed in Table 3.2 above (see page 22), five ANSPs reported irrecoverable VAT as part of their costs.

VAT on goods and services purchased by ANSPs is treated differently in different Member States. In most cases the VAT can be recovered from the State, and is therefore not part of the costs chargeable to airspace users. However, in a minority of cases ANSPs cannot recover VAT on purchases. This is the case for ATSA Bulgaria, LVNL, NAVIAIR and NATA Albania.

There may be other cases where the ANSP cannot recover VAT on purchases, but where irrecoverable VAT was not disclosed as a separate item in the SID.

For the purposes of comparing cost-effectiveness performance across ANSPs irrecoverable VAT costs are not considered part of the controllable ATM/CNS provision costs described below.

3.2.6 ATM/CNS provision costs

Figure 3.9 shows individual ANSPs' total gate-to-gate ATM/CNS provision costs in 2008. These costs are used in subsequent chapters of Part II, Part III, and Part IV for the purposes of comparing ANSPs' ATM/CNS cost-effectiveness.

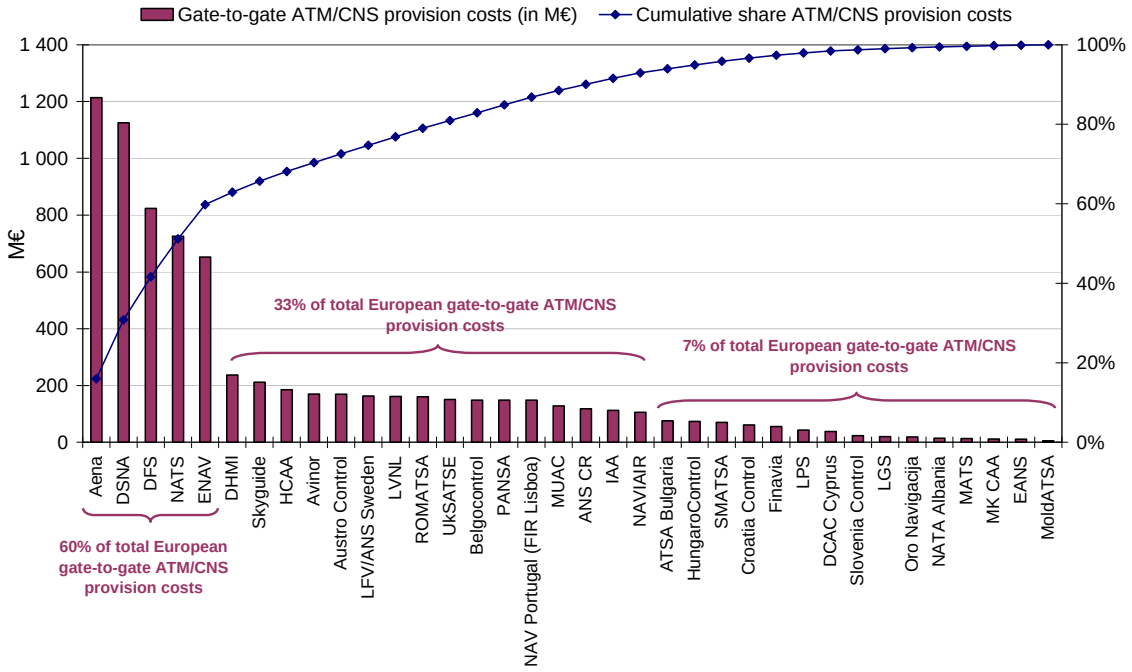


Figure 3.9: ANSPs' gate-to-gate ATM/CNS provision costs in 2008

Figure 3.9 highlights the wide heterogeneity of the European ANS system in 2008. The costs of Aena are 200 times those of MoldATSA.

The costs of the largest five ANSPs (Aena, DSNA, NATS, DFS, and ENAV) represent 60% of total European gate-to-gate ATM/CNS provision costs. However, their share of traffic is only 55%. At first sight, this result contrasts with the expectation of some form

[39] Total payments to MUAC are equal to the MUAC ATM/CNS provision costs.

of increasing returns to scale in the provision of ANS (the performance of larger ANSPs might benefit from their larger size). The impact of size on ANSPs performance would need to be further explored and analysed empirically. However, it should be noted that:

- Aena now has the highest costs; while in 2004 its costs were only the third highest. Without Aena the cost share of the four largest ANSPs as a whole is in line with their share of traffic (44%): a result which is more consistent with constant returns to scale;
- Under the current full cost recovery regime that applies to most ANSPs, they may have little incentive to exploit scale effects fully, hence the difficulty to observe them;
- Larger ANSPs tend to develop bespoke ATM systems internally which can be more costly than a commercial off-the-shelf (COTS) solution, and;
- Size is not the only factor that has an impact on ANSPs costs (see Chapter 4 for a detailed discussion on other factors affecting performance).

Because the largest five form such a large proportion of the total, significant changes in their costs inevitably have a commensurate impact on the European totals. The ACE report therefore gives particular attention to these five ANSPs, particularly in Chapter 6 which discusses the changes in ATM/CNS provision costs between 2004 and 2008.

Figure 3.10 provides a detailed breakdown of ATM/CNS provision costs (staff costs, non-staff operating costs, depreciation costs and cost of capital). ANSPs with the highest ATM/CNS provision costs are displayed on the left so that the ranking is consistent with Figure 3.9. To facilitate comparison, the breakdown of ATM/CNS provision costs for Europe as a whole is indicated in the last bar on the right of Figure 3.10.

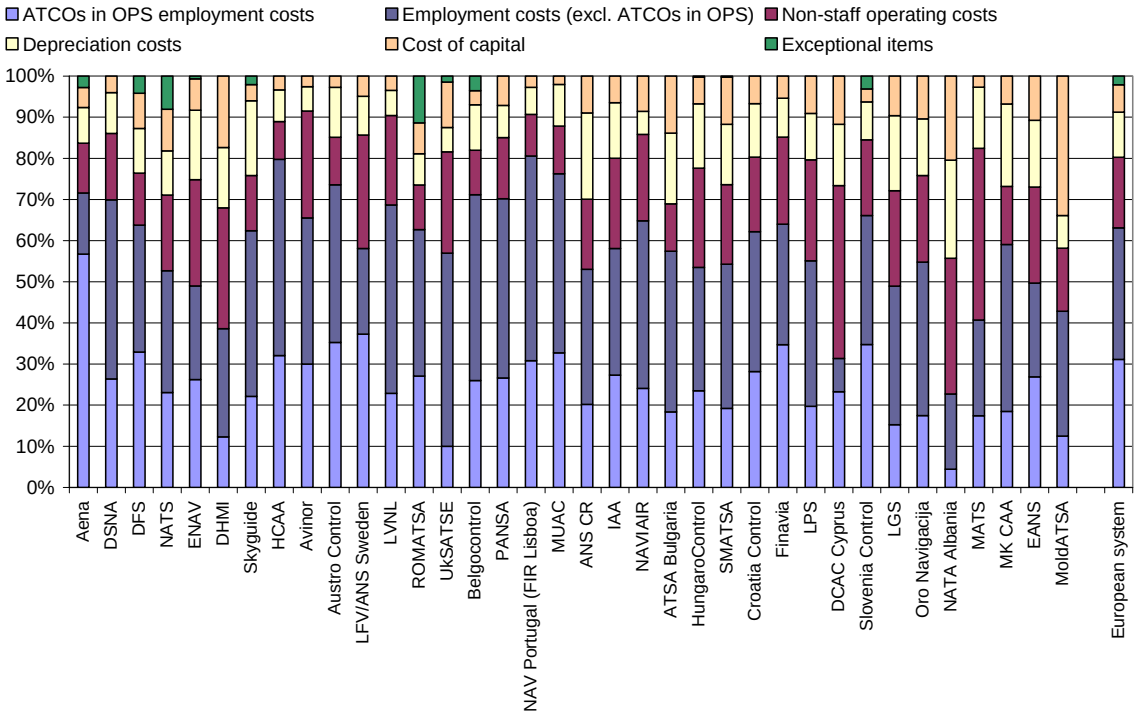


Figure 3.10: Breakdown of ATM/CNS provision costs, 2008

The cost structure varies significantly across ANSPs even among the five largest ANSPs. The share of employment costs for ATCOs in OPS in Aena's costs is more than twice that of DSNA, NATS or ENAV. Employment costs are influenced by the (local) cost of living and the bargaining power between staff and management, both of which can greatly differ across the 36 ANSPs. Another factor affecting the proportion of employment costs (excluding ATCOs in OPS) is the extent to which support services have been outsourced.

For Europe as a whole, employment costs (both ATCOs in OPS and other staff) accounts for the majority (63%) of ATM/CNS provision costs, equally split between employment costs for ATCOs in OPS and non-ATCOs in OPS. The share of employment costs in total ATM/CNS provision costs varies from 23% for NATA Albania to 81% for NAV Portugal (FIR Lisboa).

Non-staff operating costs, which on average account for 17% of the ATM/CNS provision costs, vary between 9% for HCAA and 42% for DCAC Cyprus.

On average, depreciation costs and cost of capital account for 11% and 7% of the ATM/CNS provision costs, respectively. These costs are influenced by each ANSP's particular investment cycle (higher depreciation follows from high investment) and by its policy for determining the valuation and remuneration of the capital employed.

Under the full cost recovery principle ANSPs are allowed to include, as part of their costs to be charged to the airspace users, a fair remuneration of their capital employed. In effect, this means that ANSP returns money to users once costs have been recovered and an ''agreed profit'' has been considered. This rate-of-return on capital employed is usually subject to some form of explicit or implicit economic regulation.

As part of the new SID V2.6, ANSPs are required to explicitly identify and report which average rate was used to calculate the cost of capital and on which asset base it was applied. For transparency purposes, this information is reported in Annex 4. As part of the new SID V2.6, ANSPs are required to explicitly identify and report which average rate was used to compute the cost of capital and on which asset base it was applied. This information is further analysed in Section 5.4.

Finally, Figure 3.10 shows that in 2008, 10 ANSPs reported exceptional costs. For five of these ANSPs, exceptional costs account for more than 3% of the total ATM/CNS provision costs:

- For ROMATSA (11%), exceptional costs include payments to staff in the context of an Early Retirement Scheme.
- For NATS (8%), exceptional costs relate to redundancy and relocation costs following the transfer of London TC operations (including 500 people) from West Drayton to Swanwick.
- For DFS (4%), they mainly relate to costs arising from the revaluation of DFS pension obligations following the transition to IFRS. These costs are being charged to airspace users and have been spread over a period of 15 years from 2007.
- For Belgocontrol (4%), exceptional costs include costs relating to extraordinary depreciation of amounts written-off, and the loss on disposal of fixed assets.
- For Slovenia Control (3%), exceptional costs include costs relating to write-offs of intangible fixed assets and property, plant and equipment assets.

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4 FACTORS AFFECTING PERFORMANCE

4.1 Introduction

The ACE benchmarking programme has the objective of comparing ATM cost-effectiveness performance across a wide range of ANSPs. The major focus of the analysis has been to examine and analyse the quantitative facts about the observed performance of the ANSPs. The bulk of this and previous ACE reports has been devoted to this factual benchmarking of ANSP outputs and costs. This factual analysis provides a comprehensive description and comparison of performance as viewed by the users of ATM/CNS services.

However, such a factual analysis cannot be either a complete explanation of performance differences between ANSPs, or an exhaustive guide to how performance can be improved, without some complementary consideration of how differences in performance have arisen. This is particularly true in the present context, where the second SES legislative package, enacted in September 2009[40] requires that ANSP performance be subject to quantified target setting. In Chapter 4 of ACE 2007, a first step was described in the process of examining the underlying causes of the observed differences in the factual performance indicators. It presented a framework for analysing the different factors that affect measured ATM cost-effectiveness performance, as comprehensively as possible.

This chapter recapitulates in summary the material in that chapter, and describes some of the progress that has been made over the intervening year.

The proposed framework is not at this stage intended to be applied quantitatively. Rather it should be seen as helping the understanding of differences in performance by:

- providing a comprehensive description of the factors that could possibly affect cost-effectiveness performance;
- making a preliminary *a priori* assessment of the direction and magnitude of their possible impacts;
- highlighting the complex set of interactions between the various factors; and
- demonstrating the limitations in the interpretation of benchmarking results.

Work is currently in progress to improve the understanding of at least some of these issues, and quantify some of the impacts. However, it is likely that many of the factors, even when recognised, may be impossible to reliably measure or quantify; others may be difficult even to observe.

The factual analysis presented in **Part II, Part III and Part IV** of this report does not explicitly take account of these factors; the results presented in those sections should therefore be viewed in the context of this chapter.

Exogenous and endogenous influences

The first and most important element in the framework is to understand the distinction between **exogenous** and **endogenous** influences on ANSP performance. This is illustrated in Figure 4.1 below. The figure, and the discussion in the chapter, focuses on cost-effectiveness performance, although a similar analytical framework could equally be applied to other performance areas.

[40] Regulation (EC) No 1070/2009.

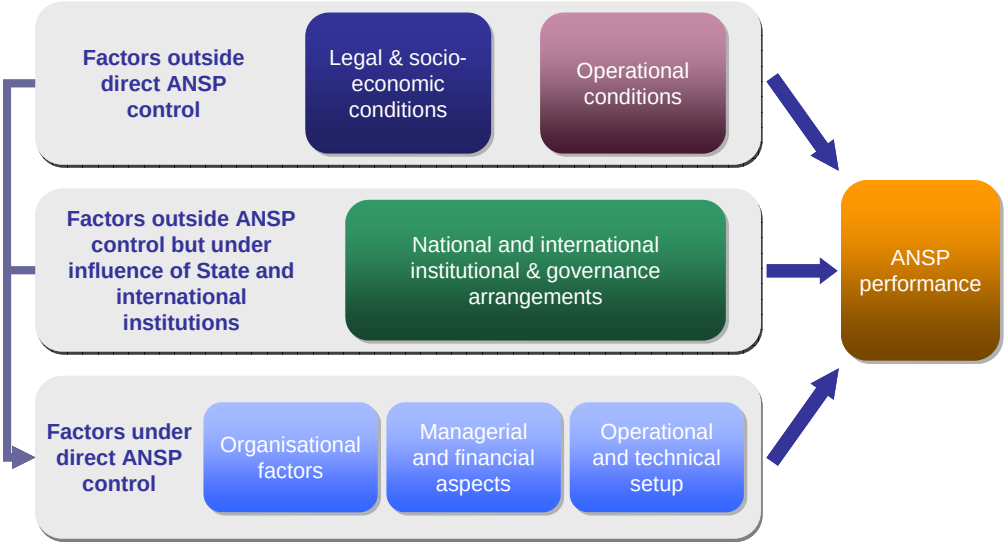

Figure 4.1: Factors affecting cost-effectiveness performance

Exogenous factors are those outside the control of an ANSP; endogenous factors are those entirely under the ANSP's control. Fair benchmarking needs to recognise the impact of exogenous factors. Effective target-setting will need to account for exogenous factors to the maximum extent possible, while encouraging the optimisation of endogenous factors through the recognition and movement towards best practice.

Exogenous factors can influence endogenous factors. For example, an ANSP's organisational and management decisions are to some extent influenced by its institutional, legal and socio-economic environment.

4.2 Exogenous factors

Exogenous factors arise from the basic conditions in which an ANSP operates, which can differ from one country to another. Exogenous factors are likely to influence the way ANSPs organise and conduct their business. In some cases they may also affect the way an ANSP manages costs and determines the level of charges.

Exogenous factors cover a spectrum of observability and measurability. At one extreme, the impact of irrecoverable VAT on inputs, which differs from state to state, is readily quantified. It has a direct impact on apparent performance which can be perfectly adjusted for. At an intermediate level there are factors for which it is possible to derive metrics (examples are traffic complexity, market wage rates, and exchange rate volatility), but it is difficult to specify exactly how such factors might affect performance. Even more difficult to take into account are factors such as political influence on ANS provision. Finally, there will inevitably be exogenous factors that are simply impossible to identify, although they are no less real than the other factors discussed.

Exogenous factors need, as far as possible to be taken into account both in achieving fair benchmarking, and in effective target setting:

- Local differences in exogenous factors can either create a direct advantage or a direct burden on performance;
- Local institutional and governance arrangements may have been set with the specific purpose of creating incentives to follow performance-driven strategies.

Capturing the local impact of an exogenous factor on ANSPs performance is not a straightforward exercise. First, there is no guarantee that a given exogenous factor will affect all ANSPs in the same manner. It is possible that similar conditions could create

effects working in opposite direction (bringing both benefits and difficulties). Second, similar exogenous factors may not necessarily affect different ANSPs to the same degree, either because of endogenous factors relating to how an issue is managed, or by other exogenous factors constraining an ANSP's response. So a given factor might create a small burden in one ANSP, while affecting another more seriously.

In Figure 4.1, exogenous factors that could have an impact on performance have been classified into two main areas (top and central set of factors in Figure 4.1), according to which set of decision-makers have an influence over them. The top set, comprising legal and socio-economic conditions, and operational conditions, are affected by decision makers and conditions outside aviation policy-making. The central set, comprising institutional and governance arrangements, are exogenous to the ANSP but are influenced by aviation sector policy decisions.

The **legal and socio-economic conditions** prevailing in individual countries are affected by national policy-makers at a more general level (for example taxation policy), or by national and international macro-economic conditions. Major examples include the prevailing national wage rates, and levels and systems of taxation.

Some examples that affect ATM cost-effectiveness performance are illustrated in Figure 4.2.

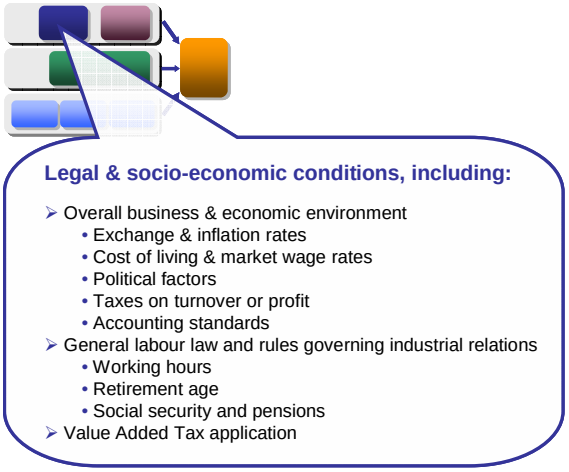

Figure 4.2: Legal & socio-economic conditions

The **operational conditions**, such as the traffic patterns the ANSP has to deal with, are determined by decisions made by airports, airlines, and especially, flying travellers.

Operational conditions include a number of factors, summarised in Figure 4.3.

Operational conditions undoubtedly have a direct impact on cost-effectiveness performance, although the extent and magnitude of the impact is not straightforward to isolate.

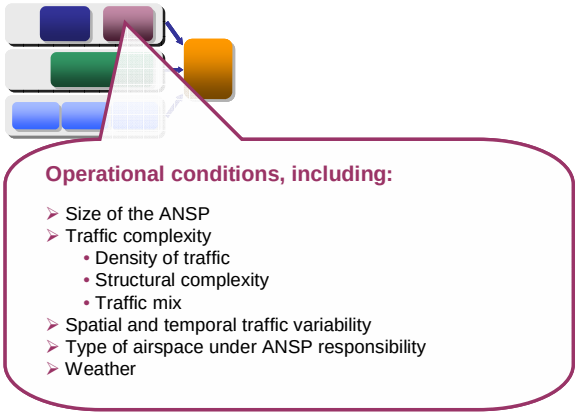

Figure 4.3: Operational conditions

The **institutional and governance arrangements** for ANS in a particular country are set in place by the policies and specific aviation laws of each country. These factors are exogenous to the ANSP but decision-making concerning some of them is largely driven by national aviation policy-makers. Some of these factors relate to international requirements such as those imposed by ICAO, EUROCONTROL and the Single European Sky. These policies at State and European level are subject to changes given strategic objectives for the sector.

Figure 4.4 provides a list of such factors, relating to:

- the way ANS is regulated;
- the institutional structure surrounding ANS, the ANSP ownership and control structure; and
- the civil/military arrangements.

Figure 4.4: Institutional & governance arrangements

It is generally considered that institutional and governance arrangements will not affect ATM cost-effectiveness directly; rather they act as influences or constraints affecting endogenous factors (such as the overall business objectives, the internal organisation, and the operational setup between civil and military).

4.3 Progress in quantifying some exogenous factors

Progress has been made in identifying ways of quantifying some exogenous factors that might have an impact on ATM performance, and the results of this analysis are shown in this report. The factors examined comprise:

- differences in prevailing wage rates between countries;
- measurements of traffic characteristics that can be classified under the general heading of "traffic complexity"; and,
- traffic variability.

Employment costs constitute a major part of the costs of providing ANS. Staff has to be recruited in local labour markets, and therefore the prevailing wage rates, for many different grades and types of staff, will have a major influence on the overall employment costs. A number of ways exist of measuring differences in prevailing wage levels between different countries. In previous ACE reports, unit employment costs have been compared with levels of GDP per head, and with Purchasing Power Parity (PPP[41]) indices. To demonstrate the variability of PPP across our sample, an index has been calculated which expresses the PPP index[42] relative to Former Yugoslavian Republic of Macedonia =100 (Former Yugoslavian Republic of Macedonia having the lowest PPP index). The interpretation of this index is that to achieve the same standard of living, earnings in Switzerland will need to be three times higher, using market exchange rates, as those in Former Yugoslavian Republic of Macedonia.

[41] PPP compares the price, in national currency, of a defined basket of goods and services, between different countries. PPP exchange rates are then the exchange rates at which the price of the basket is the same in the two countries being compared. A PPP index is the ratio of the PPP exchange rate to the market exchange rate, and a high PPP index means that the same amount of money, converted to national currency, will buy fewer goods and services.

[42] UkSATSE does not agree with the value of the PPPs used for Ukraine. According to UkSATSE the real PPP in Ukraine is significantly higher than the value used in Figure 4.5. It should be noted that the IMF PPP exchange rates for Ukraine have increased from 1.387 UAH per current international Dollar in 2004 to 2.816 UAH per current international Dollar in 2008 (+103%). The provisional IMF PPP figure for 2009 (3.099 UAH per current international Dollar) is 10% higher than in 2008. This indicates that the relative cost of living is increasing faster in Ukraine and that the difference in cost of living with the other States is diminishing. See Annex 5 for further details on the PPPs indices that are used in this report.

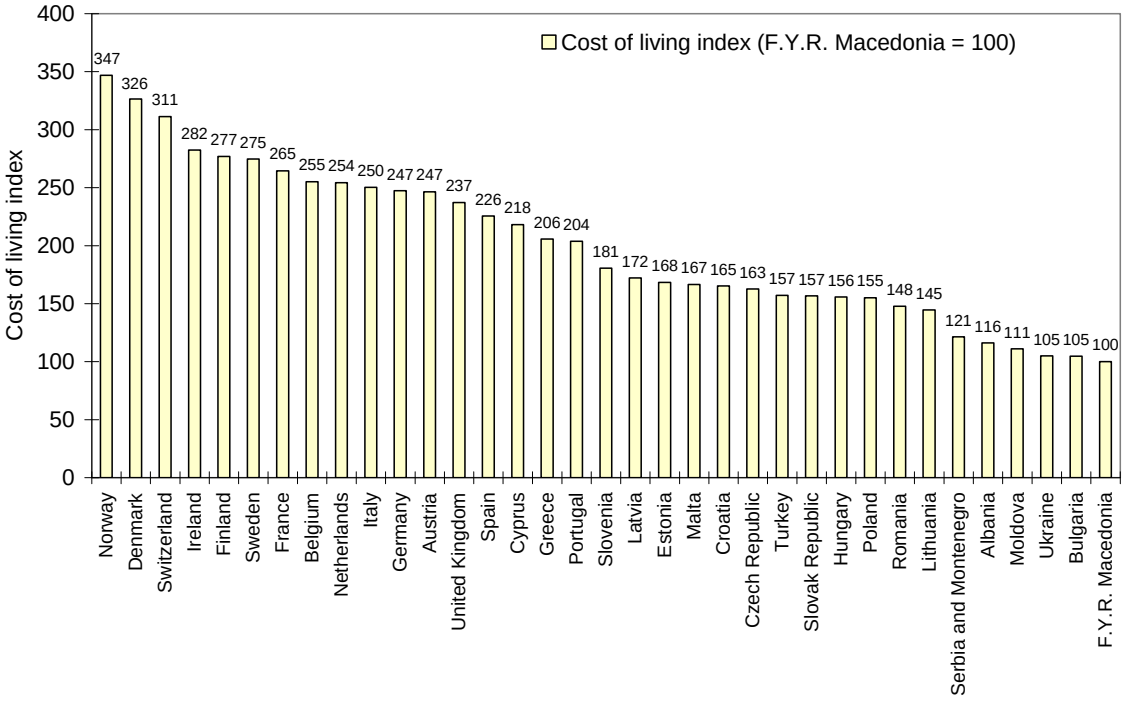

Figure 4.5: Index of PPP cost of living, 2008

The influence of prevailing wage levels on actual employment costs will differ for different classes of staff – for specialised, highly-qualified staff such as ATCOs there will be a degree of staff mobility which will cause some convergence of unit costs, compared with general wage levels.

A number of **traffic characteristics** that might be expected to have an impact on the cost-effectiveness performance have been grouped together under the generic label of "**traffic complexity**".

In ACE 2005, an indicator was introduced that gives a quantitative representation of the density of traffic and intensity of potential interactions between traffic, and thus represents some of the elements generally classified as "traffic complexity". This indicator of "traffic complexity" is a combination of two elements:

- an **adjusted density**, which is a measure of the concentration of traffic in a given volume of airspace (ANSP/ACC level), and defined in terms of minutes of interaction among aircraft per flight-hour[43]; and
- a **structural complexity** index, which captures the fact that the traffic in some areas is structurally more complex. The structural complexity is itself the sum of three metrics reflecting that more ascending and descending routes, more crossing routes, and variable speeds – a proxy for traffic mix - are additive elements of traffic complexity. Clearly, ATC provision in lower airspace will, all other things being equal, face a relatively higher proportion of ascending and descending routes.

Structural complexity and adjusted density are independent. Traffic in an area could be dense, but structurally simple; equally, traffic could be structurally complex but sparse. However, the two impacts are **multiplicative**; the impact of structural complexity is greater when the traffic is denser.

[43] Interactions are defined as a period in which two aircraft are simultaneously present in a cell of 20×20 Nautical Miles and 3 000 feet in height. Only cells above FL85 are considered in this computation.

The relationship between "traffic complexity" and cost-effectiveness, or ATM performance in general, is not straightforward. The effects of traffic complexity on ATM performance can work in either of two ways, which work in opposite directions as briefly described below:

Positive effect	Higher density is expected to contribute to a better utilisation of resources and to more effective exploitation of economies of scale (up to the point when resources become fully utilised). This is similar to the "density effect" argument described in the table above.
Negative effect	Higher structural complexity entails higher ATCO workload and more sophisticated ATM systems and tools for the same volume of traffic.

Traffic complexity can influence either costs or quality of service, depending on an ANSP's response to it.

The 2008 structural complexity index and adjusted density metric calculated at ANSP level (yearly data) are shown in Figure 4.6[44]. ANSPs with the greatest traffic complexity score (Belgocontrol, NATS, DFS, Skyguide) are in the area close to the top right corner. Moving left shows ANSPs (like Avinor) with high structural complexity but low density. Moving down shows ANSPs with high density but lower structural complexity (such as ATSA Bulgaria). Annex 3 provides the detailed figures of the traffic complexity metrics for each ANSP[45].

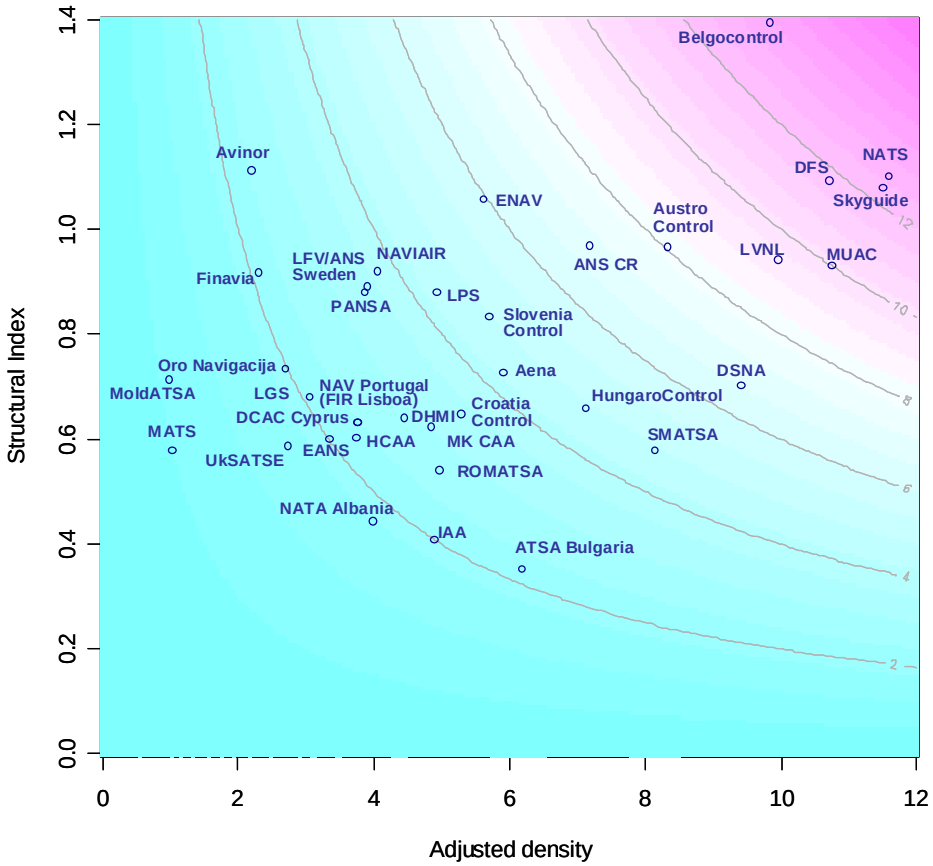

Figure 4.6: Traffic complexity metrics for ANSPs, 2008

[44] See Annex 3 for a table displaying the traffic complexity indicators for each ANSP.

[45] As neither Estonia nor Latvia were part of the CFMU area in 2007, the CFMU does not record all the traffic crossing these countries. As a consequence since the traffic complexity metrics are based on CFMU data, the figures calculated for these two ANSPs and their ACCs (Tallinn ACC and Riga ACC) might be underestimated.

The ten most "complex" ANSPs (those with an overall complexity score higher than 5 minutes of interaction per flight-hour) comprise four of the five largest ANSPs (Aena being ranked 15th with an overall complexity score just above four minutes of interaction per flight-hour). It should be noted that the complexity score for Aena is made of a lower traffic complexity in the Canarias airspace and a higher traffic complexity for Spain continental (see also Figure 8.5 on p.99).

The map on Figure 4.7 displays five different groupings of ANSPs that have been identified according to the overall complexity scores.

Belgocontrol, DFS, NATS and Skyguide show the highest complexity score - more than 11 minutes of interaction per flight-hour. In other words, for each flight-hour controlled in these airspaces there are on average more than 11 minutes of potential interactions between aircraft.

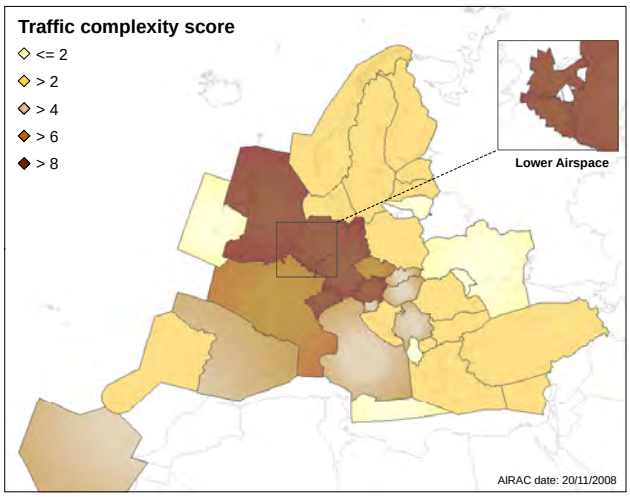

Figure 4.7: Overall complexity scores at ANSP level, 2008

The average complexity score for the European system is close to six minutes of interaction per flight-hour and corresponds to the boundary between the third and the fourth grouping in Figure 4.7.

Variability in traffic demand is another important factor in comparative ATM performance. If traffic is highly variable, resources may be underutilised, or made available when there is little demand for them – this is termed "allocative inefficiency". Variability in traffic demand is therefore likely to have an impact on productivity, cost-effectiveness, quality of service and predictability of operations. It is broadly recognised that the different types of variability in traffic demand can be characterized as follows:

Temporal	**Seasonal** variability	the difference in traffic levels between different times of the year.
	Within-week variability	the difference in traffic levels between different days of the week.
	Hourly variability	the variation of traffic through the day.
Spatial variability		variability within the ANSP airspace (e.g., variability in the tracks across the North Atlantic, caused principally by weather variation).

Conceptually, an index of traffic variability could be developed to capture each types of variability.

Different types of variability require different types of management practices, processes, and training to ensure that an ANSP can operate flexibly in the face of variable traffic demand. To a large extent, variability can be statistically predictable, and therefore adequate measures to mitigate the impact of variability could in principle be planned (for example, overtime, flexibility in breaks, and flexibility to extend/reduce shift length). When the degree of unpredictable variation, either temporal or spatial, is significant

additional flexibility might be required, with a clear trade-off between costs and quality of service.

Seasonal variability is particularly difficult for an ANSP to adapt to as working practices that are practically feasible have only a limited ability to deal with high seasonal variability.

A useful indicator of differences in seasonal variability is the ratio of traffic in the peak week to the average weekly traffic.

Seasonal traffic variability tends to be significantly higher in South-Eastern Europe (see Figure 4.8), where the "traffic complexity" score tends to be lower (see Figure 4.7).

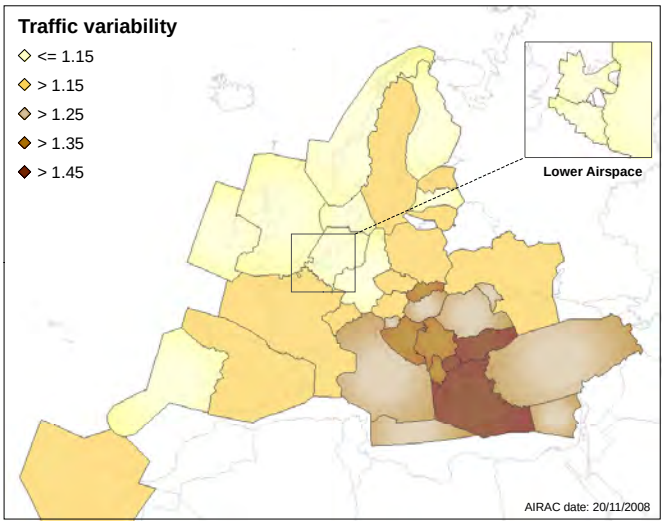

Figure 4.8: Seasonal traffic variations, 2008

4.4 Endogenous factors

In principle, once the impact of all exogenous factors has been allowed for, the performance differences that remain should comprise residual inefficiency which lowers performance below that obtained by best practice. Such residual inefficiency arises from a number of endogenous factors, under the direct control of ANSPs.

A better understanding of the endogenous factors would enable some progress in the analysis of benchmarking results, in the identification of best practices and in the process of target setting.

Endogenous factors – the way that an ANSP manages its business to optimise performance – are influenced by exogenous factors. "Best practice" in any given area will depend on the exogenous circumstances. ANSPs can take action to fully exploit the benefit of their environment or to minimize the impact of relative disadvantages. Therefore, the impact of an exogenous factor should not be analysed in isolation from an analysis of the degree to which this impact has been minimised or maximized through appropriate internal measures.

Different data and methodologies from those currently used in the ACE Benchmarking Report would be required to investigate endogenous factors in more depth. This section should be seen as a guide to support qualitative judgment, with no aim at providing a definite answer to what is "best practice" in any given area. Clearly, it is the job of the ANSP to determine how best to respond to the local conditions.

Endogenous factors fall into three groups:

- organisational factors;
- managerial and financial aspects; and,
- operational and technical setup.

Figure 4.9 lists the factors that would need to be considered in the scope of a comprehensive analysis of the impact of **ANSP organisation** on performance. They mainly relate to four issues which are typically addressed in the balanced scorecard methodology. These issues are:

- The internal organisation structure;
- The degree to which assets and activities are retained in-house;
- Human resources; and
- Relationship with customer.

Each issue is briefly described in the paragraphs below.

Figure 4.9: Organisational factors

Not all organisational factors will directly affect cost-effectiveness; some enable or facilitate the achievement of performance when they are set in conformity with the business objectives. It is likely that no single model should constitute "best practice" in all circumstances.

Figure 4.10 provides a list of factors that would need to be considered in the scope of a comprehensive examination of the influence of ANSP **managerial and financial arrangements** on performance. They mainly relate to the following three issues:

- The quality of management;
- The collective bargaining process; and
- Financial and accounting considerations.

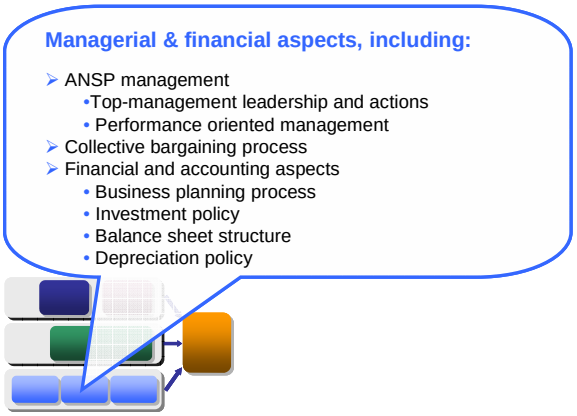

Figure 4.10: Managerial & financial aspects

Most of the managerial and financial aspects are expected to directly affect cost-effectiveness, since they have an impact, for example, on investment decisions, productivity and wage policies. The managerial and financial aspects are to some extent influenced by the ANSP organisational factors and by some of the exogenous factors (especially among the institutional and governance factors, and among the socio-economic factors).

Figure 4.11 provides a list of factors that would need to be considered in a comprehensive examination of the influence of **ANSP operational and technical setup** on performance. They mainly relate to the following three issues:

- Operational structure;
- Operational concepts and processes; and
- Operational flexibility.

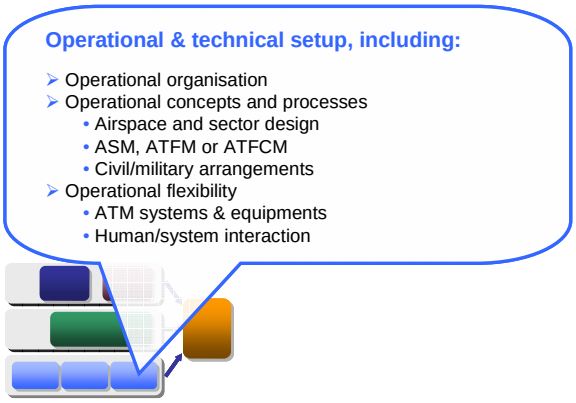

Figure 4.11: Operational & technical setup

The operational and technical setup of an ANSP is expected to be influenced by both exogenous factors (typically the operational environment) and other endogenous factors (such as internal organisation and investment policy). The operational and technical setup is expected to affect both labour and capital productivity and the level of support costs.

4.5 How should these factors be taken into account for benchmarking purposes?

The current cost-effectiveness benchmarking (next sections of the report) is a factual benchmarking of outputs and costs. It does not take account of exogenous and endogenous factors in a quantitative manner.

The ANS industry is characterised by a high level of heterogeneity. This heterogeneity can be linked to exogenous factors (e.g. different institutional arrangements and governance) and to endogenous factors (e.g. differences in operational structure and processes). A certain part of this heterogeneity is unobserved and can be mistakenly interpreted as cost-inefficiency.

There is therefore a need to understand and, as far as possible, distinguish the various exogenous and endogenous differences that underlie performance differences; and as far as possible to quantify the **exogenous** effects. Practically, however, the best hope is to identify the main ones, and to quantify the impact of some of them since exogenous factors are not all observables and measurables.

Exogenous factors related to operational conditions are, for the time being, those which have received greatest attention and focus. Several metrics are now being measured in a robust way. However, the extent and magnitude of their impact on performance is not straightforward to identify. Given the large diversity of ANSPs situations, there is no guarantee that a given operational condition will affect all ANSPs in the same way.

Where exogenous effects can be observed and measured (or at least a classification determined), their impact can be analysed using objective, and appropriate statistical techniques. Econometric tools exist to support such an analysis. They are extensively discussed in the economic literature[46] and are used, among other tools, in other regulated monopoly industries (such as water, electricity, gas supply, and surface transport) to support the regulators when setting targets. They are able to account for

[46] See for example:

Farsi, Mehdi, Massimo Filippini, and William Greene (2006). 'Application of Panel Data Models in Benchmarking Analysis of the Electricity Distribution Sector', *Annals of Public and Cooperative Economics*, 77 (3): 271-290.

Farsi, Mehdi, Massimo Filippini and Michael Kuenzle (2006). 'Cost Efficiency in the Swiss Gas Distribution Sector', forthcoming in *Energy Economics*.

measurable exogenous factors and also provide insight into the characteristics of the business (economies of scale, price elasticity of inputs, complementarity and substitutability of input factors) that influence performance. Recent advances in efficiency measurement provide insights on how to account for non-measurable exogenous factors in econometric modelling.

In the context of the SES II regulations, in September 2010 the PRC will propose EU-wide performance targets to the European Commission, including one for the cost-efficiency Key Performance Area. As part of this work, econometric modelling will be considered, along with other economic and operational analysis to determine a value for the EU-wide cost-efficiency target.

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PART II: FINANCIAL COST-EFFECTIVENESS

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5 FINANCIAL COST-EFFECTIVENESS (2008)

5.1 Introduction

This chapter examines and compares ANSPs' financial cost-effectiveness. Figure 5.1 shows the framework for the development of the financial cost-effectiveness indicator. As discussed in Chapter 3, costs outside the direct control of the ANSP are removed so that the focus is on the costs of providing ATM/CNS services to airspace users.

As identified in previous ACE reports, the allocation of costs between en-route and terminal ANS is not done consistently across the European ANSPs. This lack of consistency might distort performance comparisons carried out separately for en-route and terminal ANS. For this reason, the focus of the cost-effectiveness analysis in this report is "gate-to-gate" ANS.

The measure of output is the "composite flight-hour" as defined in Section 2.1, and the cost-effectiveness Key Performance Indicator (KPI) is the unit cost of ATM/CNS provision, expressed per unit of output (composite flight-hours), as shown in Figure 5.1.

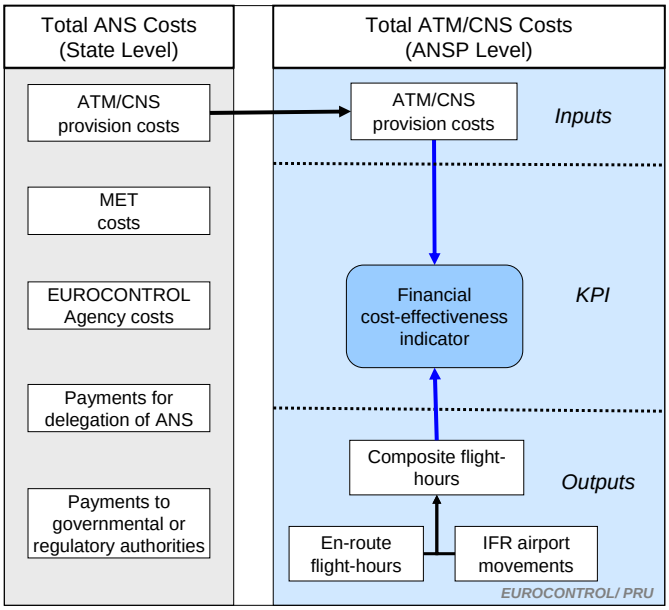


Figure 5.1: Conceptual framework for the analysis of financial cost-effectiveness

Because of their weight in the European system and their relatively similar operational and economic characteristics (size, scope of service provided, economic conditions, presence of major hubs), this ACE report places a particular focus on the results of the five largest ANSPs (Aena, DFS, DSNA, ENAV and NATS).

Section 5.2 compares the financial gate-to-gate cost-effectiveness KPI across ANSPs for the year 2008. It also highlights the en-route and terminal components of this KPI. Section 5.3 presents the analytical framework developed to break down cost-effectiveness into its main economic components. Section 5.4 gives the results obtained from applying this framework to the financial cost-effectiveness indicator, providing insights into differences in ATCO productivity, ATCO employment costs, and support costs.

Four main findings emerge from this analysis, concerning:

- the overall financial cost-effectiveness, expressed as the ATM/CNS cost per composite flight-hour (Figure 5.2);

and the components of this indicator, as demonstrated by:

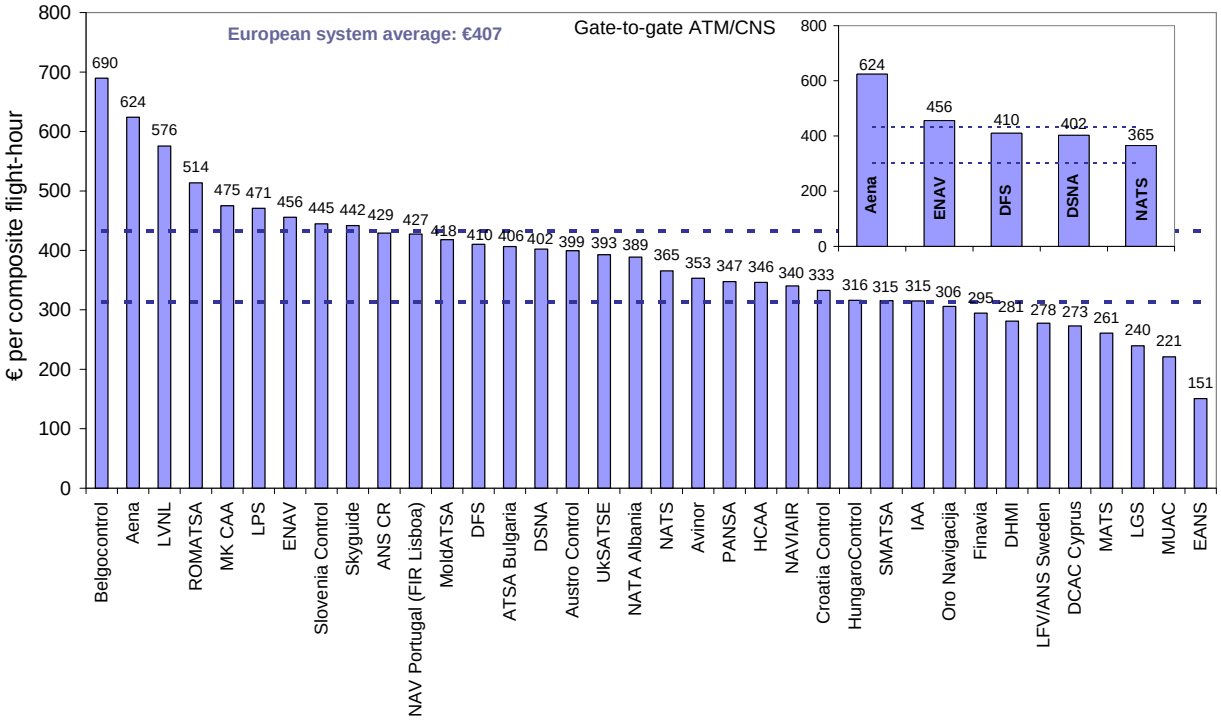
- the ATCO-hour productivity – the number of composite flight-hours per ATCO-hour on operational duty (Figure 5.6);
- the ATCO employment costs per ATCO-hour (Figure 5.7); and
- the support cost per composite flight-hour (Figure 5.13).

This chapter reports the result for the year 2008. Analysis of changes over time in financial cost-effectiveness is given in Chapter 6. A more detailed analysis of these changes in cost-effectiveness at ANSP level is presented in Chapter 10 of this report.

5.2 Overall financial cost-effectiveness

The European system ATM/CNS provision cost per composite flight-hour for 2008 was €407. The financial cost-effectiveness indicators for each ANSP are shown in Figure 5.2.

The financial cost per composite flight-hour varies between €690 for Belgocontrol and €151 for EANS, a factor of more than four. EANS, which is the ANSP with the lowest unit cost, has managed to consistently reduce unit costs for the fifth consecutive year. The two dotted lines in Figure 5.2 represent the top and bottom quartiles[47] and provide an indication of the dispersion of unit ATM/CNS provision costs across the sample of 36 ANSPs. The gap between Belgocontrol (€690) and the ANSP with the second highest unit economic costs (Aena, €624) has decreased in 2008 (€66 compared to €95 in 2007).



Note that this KPI is a factual indicator. A genuine measurement of **cost inefficiencies** would require full account to be taken of identified and **measurable** exogenous factors such as cost of living, traffic complexity, and traffic variability (as described in Chapter 4).

While some of the more detailed analysis of the components of costs presented later in the chapter may contain some inconsistencies due to different reporting and different interpretations of definitions, the gate-to-gate financial cost-effectiveness KPI itself is robust for each ANSP since, in most cases, it is based on financial numbers that are reconcilable with audited accounts from Annual Reports and output data collected by EUROCONTROL.

Figure 5.2: Comparison of the financial cost-effectiveness KPI, 2008

The unit costs for the five largest ANSPs are displayed in the top right corner of Figure 5.2. Although these ANSPs operate in relatively similar economic and operational environments, there is a substantial variation in unit cost, ranging from Aena (€624) to NATS (€365). In ACE 2007, NATS ranked third in terms of unit costs compared to the other largest ANSPs. In Figure 5.2, the **level** of NATS 2008 unit costs expressed in Euro has benefited from the

[47] 25% of observations lie below the bottom quartile, whilst 25% lie above the top quartile; the remaining 50% lie between the two quartiles. Thus in Figure 5.2, 75% of ANSPs have ATM/CNS costs per composite flight-hour lower than €432.

significant depreciation (14%) of the Pound compared to the Euro[48]. In 2008, Aena continued to have the second highest unit costs. The +50% unit costs difference for services rendered by Aena compared with the average of the four largest ANSPs is rather puzzling and deserves specific attention.

It should be noted that the unit ATM/CNS provision costs reported for MUAC in Figure 5.2 do not include costs of the infrastructure which is made available for joint use and provided free of charges by the ANSPs (Belgocontrol, DFS and LVNL) operating in the Four States[49] airspace.

To better assess the cost-effectiveness of ATM/CNS provided in each of the Four States national airspaces, MUAC costs and output are consolidated with the costs and outputs of the national providers.

The top of Figure 5.3 shows the figures which have been used for this "adjustment". The costs figures are based on the cost allocation keys used to establish the Four States cost-base, while the flight-hours (FH) are based on those controlled by MUAC in the three FIRs (Belgium, Netherlands and Germany).

The bottom of Figure 5.3 provides a view of this consolidated ANSP costs per flight-hour in the airspace of Belgium, the Netherlands and Germany (see blue bars).

MUAC	Belgium	Germany	Netherlands
Flight-hours allocated to:	146 141	266 712	167 965
Costs allocated to:	€37.9M	€58.7M	€31.2M

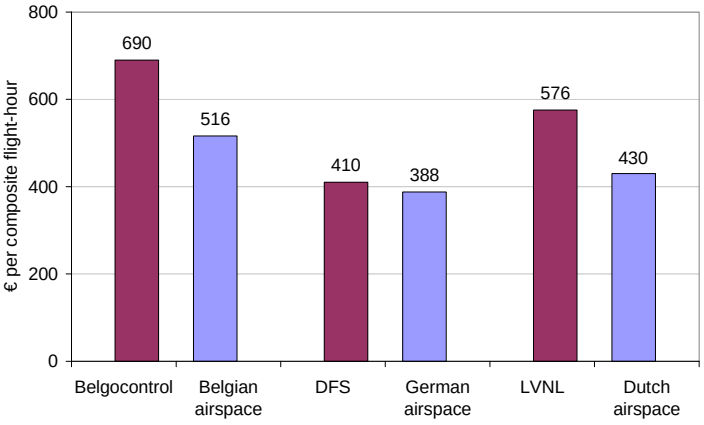


Figure 5.3: Adjustment of the financial cost-effectiveness KPI for ANSPs operating in the Four States airspace (2008)

Figure 5.3 shows that the gate-to-gate unit costs for ATM/CNS provision in the Belgian airspace would amount to €516 per composite flight-hour. While this is notably below Belgocontrol unit costs (-25%), gate-to-gate unit costs for ATM/CNS provision in the Belgian airspace would still be the second highest in Europe, just above ROMATSA (see Figure 5.2). Similarly, the gate-to-gate unit costs in the Dutch airspace would be at €430 (-25% compared to LVNL), a level close to ANS CR unit costs, and LVNL would rank ninth instead of third. Figure 5.3 also shows that the unit costs in German airspace (€388) would be very close to DFS unit costs (€410). This is not surprising since the size of MUAC operations in German airspace compared to the total en-route and terminal operations of DFS is smaller than for Belgocontrol and LVNL.

The gate-to-gate financial cost-effectiveness KPI in Figure 5.2 can be broken down into en-route and terminal components. This is shown in Figure 5.4 below. To facilitate the comparison and interpretation of the results, ANSPs are ranked according to the results obtained in the gate-to-gate financial cost-effectiveness KPI (Figure 5.2). The output units in Figure 5.4 are en-route flight-hours and IFR airport movements, respectively – compared to the gate-to-gate composite flight-hours used in Figure 5.2.

[48] It should be noted that the changes in unit costs analysed in this Report (see Chapter 6, 9 and 10) are not affected by changes in national currency against the Euro. Annex 5 comprises further information on the methodology used to express financial figures in real terms.

[49] Belgium, Germany, the Netherlands, and Luxembourg. Note that for the purposes of this report Luxembourg figures are not included as they amount to less than 1% of MUAC total costs.

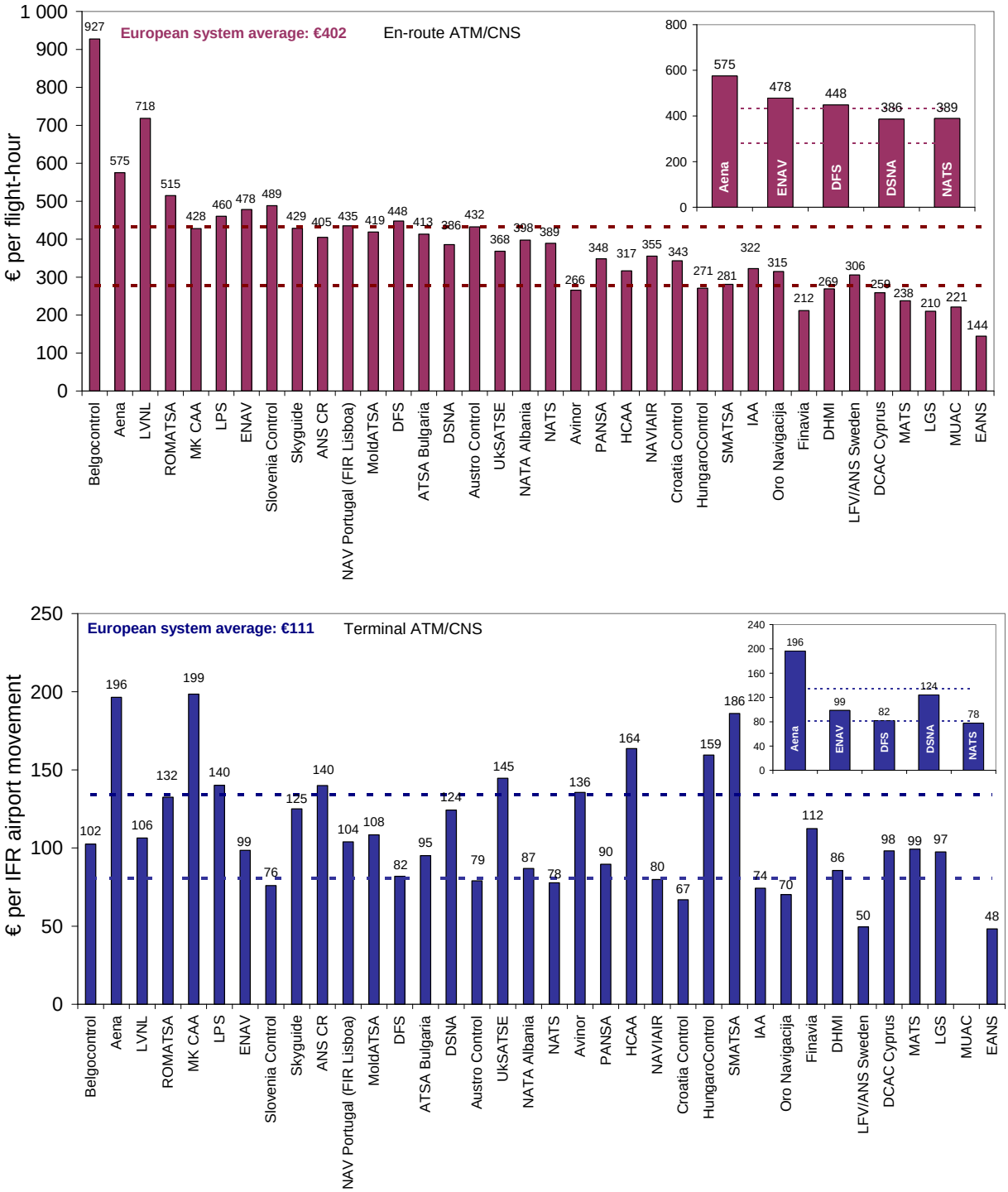


Figure 5.4: Breakdown of financial cost-effectiveness into en-route and terminal, 2008[50,51]

It is difficult to determine whether the differences shown in Figure 5.4 above are driven by economic and operational factors (for example, size of operations, economies of scale, or traffic complexity), or purely cost-allocation differences, which are known to exist across States/ANSPs.

There are cases where a high en-route cost per flight-hour (top graph) corresponds to a low terminal cost per IFR airport movement (bottom graph) and vice versa. For example:

[50] The dotted lines on the graphs represent the bottom and top quartiles.
[51] MUAC operates exclusively in upper airspace and therefore has no terminal ANS costs.

- SMATSA has a relatively high unit cost in terminal service provision but a relatively low unit cost in en-route;
- Belgocontrol has a relatively high unit cost in en-route service provision but a relatively low terminal unit cost.

The rather low terminal unit cost for LFV/ANS Sweden might illustrate the difficulty of fair terminal cost comparisons in the case where an ANSP owns, manages and operates airports. The difference between LFV/ANS Sweden and comparable ANSPs such as Avinor and Finavia (who also own and operate a large number of airports – see Table 1.1) seems to be mainly due to differences in cost allocation. Indeed, in Sweden most terminal ANS assets (TWR buildings, ILS) and capital-related costs are allocated to the airport division of LFV and not to the ANS department. As a result, these costs are mainly recovered through landing fees rather than terminal ANS charges.

Some ANSPs did not, historically, charge separately for terminal and en-route services, but are currently moving towards this practice. Croatia Control is in the course of gradually moving costs associated with terminal ANS, which were previously part of its en-route cost-base, into its terminal cost base. En-route costs have apparently risen in 2008 for LVNL, and terminal costs fallen, because costs relating to approach control which were previously reported as terminal ANS have been reassigned to en-route ANS.

5.3 Framework for gate-to-gate cost-effectiveness and productivity analysis

The PRU has developed an analytical framework that allows cost-effectiveness to be broken down into a number of key components. This framework helps in understanding differences in cost-effectiveness by allowing examination of the detailed factors underlying it. The framework is displayed in Figure 5.5 below.

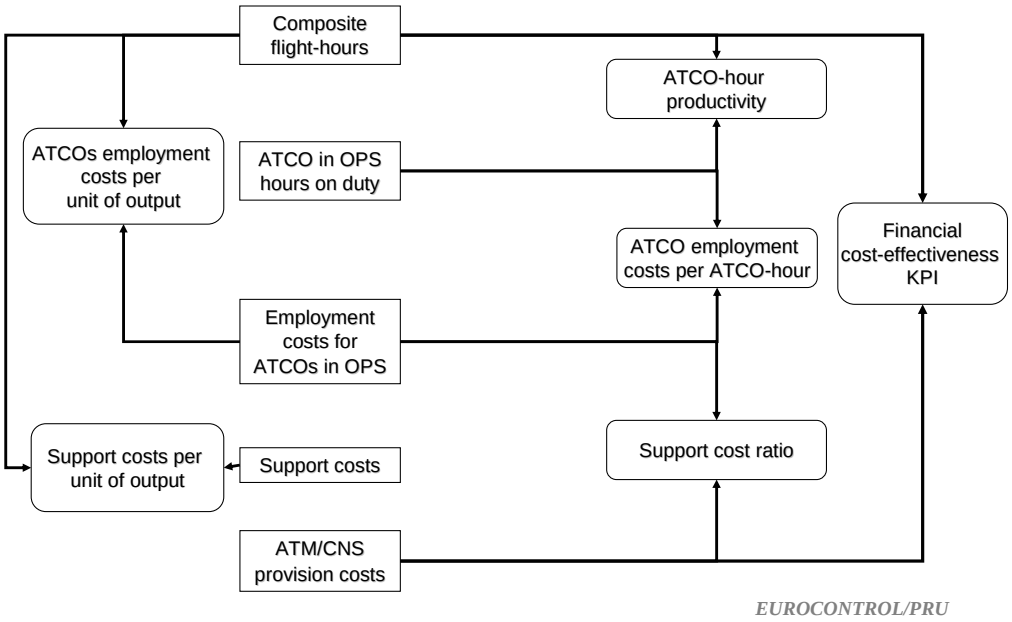


Figure 5.5: Performance framework for gate-to-gate cost-effectiveness analysis

The right-hand side of Figure 5.5 shows that the financial cost-effectiveness indicator (ATM/CNS provision costs per composite flight-hour) is made up of three component performance **ratios**:

- Higher ATCO-hour productivity (composite flight-hours per ATCO-hour) improves cost-effectiveness;
- Lower ATCO **employment costs per ATCO-hour** improve cost-effectiveness; and,
- All other things being equal, a lower **support cost ratio** improves cost-effectiveness.

These three ratios multiplied together give the overall financial cost-effectiveness KPI.

The financial cost-effectiveness indicator can also be broken down into two additive factors, as shown on left-hand side of Figure 5.5:

- **ATCO employment costs per unit of output** is the ratio of the employment costs for the ATCOs in OPS to the output (measured in composite flight-hours). All other things being equal, lower ATCOs in OPS employment costs per unit of output will improve financial cost-effectiveness. At European level, this component comprises some 31% of the overall financial cost-effectiveness indicator;
- **Support costs per unit of output** is the ratio of support costs[52] to the output. All other things being equal, lower support costs per unit of output will improve financial cost-effectiveness. At European level this component comprises some 69% of the overall financial cost-effectiveness indicator.

The latter indicator is complementary to the **support cost ratio** for two main reasons. First, the support cost ratio cannot be viewed in isolation since a low ratio may simply be a symptom of high ATCO employment costs. Second, given that there are fixed costs in the provision of ATM/CNS (such as infrastructure and ATM systems), "support costs per unit of output" can give additional insights into the analysis of support costs and scale effects.

Because of the critical importance of ATCOs in OPS in the provision of ATC services, the framework presented in Figure 5.5 puts a clear focus on this resource. Important support functions (with and without operational characteristics) are currently embedded in the so-called "support staff". The employment costs of these support staff represent the majority of support costs and should be seen as an important contributor for cost-effectiveness performance improvement.

5.4 Breakdown of gate-to-gate cost-effectiveness for individual ANSPs

The breakdown of the overall indicator illustrated in Figure 5.2 into the components discussed above is shown in Figure 5.6, Figure 5.7, Figure 5.9, Figure 5.11, and Figure 5.13. In some of the figures, two dotted lines represent the bottom and top quartiles[53] for the three components.

In the bottom right of each figure a miniature replica of Figure 5.5 is displayed to guide the reader through the framework.

Finally, to summarize and facilitate the interpretation of the results, the concept of the "performance ratio" has been introduced and presented in Section 5.4.6. Performance ratios are a simple way to capture the relative advantages and weaknesses of an ANSP compared to the European average.

5.4.1 ATCO-hour productivity (2008)

ATCO-hour productivity is the efficiency with which an ANSP deploys and makes use of its ATCOs. Productivity improvements can be achieved not only by optimising and rationalising the processes for ATM/CNS provision, but also by more effective OPS room management, making better use of existing resources, for example by adaptation of rosters and shift times, by effective management of overtime, and adaptation of sector opening times to traffic demand patterns.

[52] Support costs are defined as the sum of non-ATCO employment costs, non-staff operating costs and capital-related costs.

[53] 25% of observations lie below the bottom quartile, whilst 75% lie below the top quartile. (Thus, in Figure 5.6, 75% of ANSPs have ATCO-hour productivity less than 0.91).

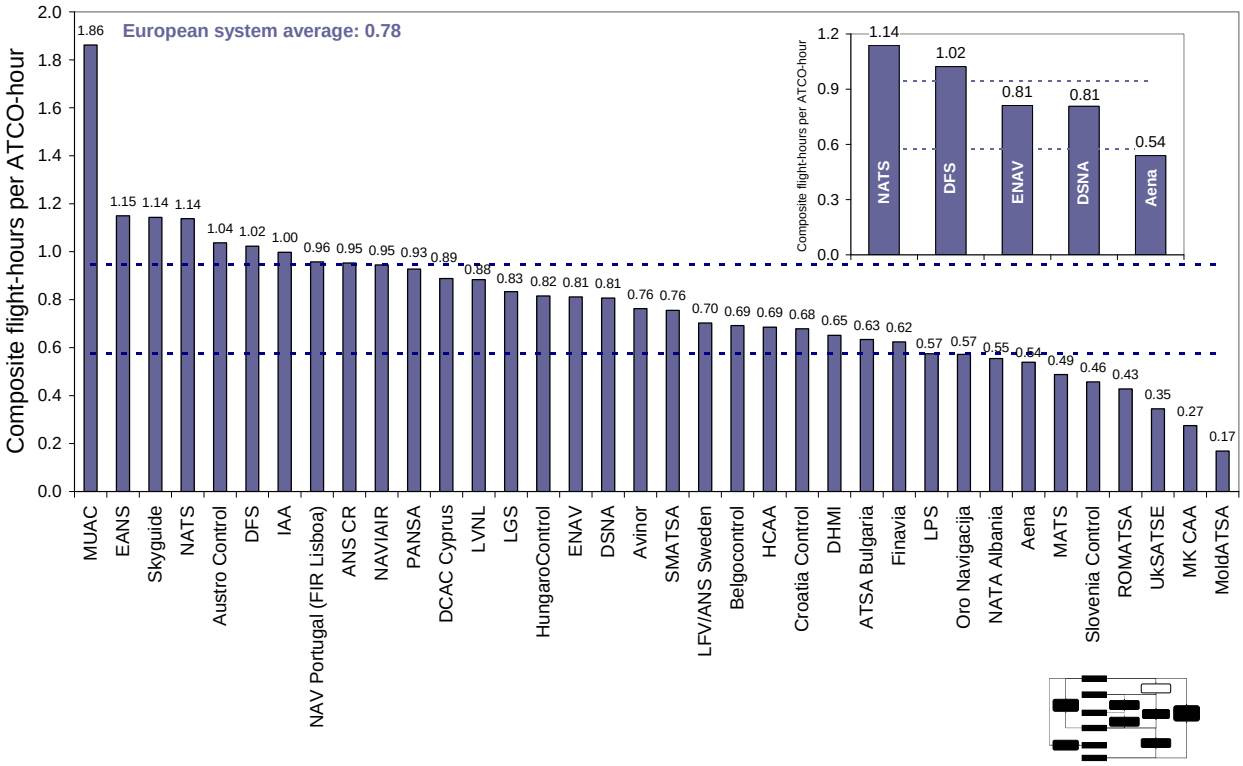


Figure 5.6: ATCO-hour productivity (gate-to-gate), 2008

In 2008, the European system as a whole handled 0.78 composite flight-hours per ATCO-hour (a figure 4% higher than in 2007), although there is a wide range of ATCO-hour productivity among individual ANSPs. Clearly, differences in ATCO-hour productivity should be seen in the light of exogenous factors such as traffic complexity or traffic variability (see Chapter 4), but also in the light of quality of service (such as ATFM delays) because of the potential trade-offs (see Section 8.12 and Chapter 9).

The ANSP with the highest ATCO-hour productivity is MUAC[54] (1.86) which only provides ATC services in upper airspace. Changes over time in ATCO-hour productivity for the European system and for individual ANSPs level are described in Section 6.5 and Part IV.

Most of the ANSPs that achieved top quartile ATCO-hour productivity (ANS CR, Austro Control, DFS, MUAC, NATS and Skyguide) are among the 15 most complex ANSPs (see Figure 4.6, p. 38). Understanding the practices that explain this higher performance (examples might include better rostering, advanced ATC tools, and OPS room management) would help identify and spread best practice.

MATS, UkSATSE and MoldATSA, which belong to the least complex grouping in Figure 4.6, show an ATCO-hour productivity which is lower than the bottom quartile. Low productivity in some of these ANSPs may be a consequence of their small size, and the consequent difficulty in adapting their available capacity to low traffic volumes and high seasonal variability. This is not, however, the case for all ANSPs in this category, and the productivity levels achieved by ANSPs below the bottom quartile remain low despite recent increases in traffic volume.

If the European average productivity (0.78) could be raised to the level of the top quartile (0.95), it would bring significant gains in cost-effectiveness. Some possible measures to help bring this about are described in Chapter 6. In the context of staff and capacity planning processes and contract renegotiation, it is important for ANSPs to monitor this indicator and to set quantitative objectives in terms of ATCO-hour productivity. Achieving productivity

[54] Chapter 8 further analyses productivity at ACC level, where MUAC is compared with similar ACCs.

improvements in a context of declining traffic is going to be a challenge. It will require a critical review of managing overtime and more effective use of the ATCO-hours on duty.

It should also be noted that achieving large improvements in ATCO-hour productivity could have an impact on the other components of cost-effectiveness (for example, if more sophisticated tools and technical solutions are required, support costs may rise).

5.4.2 ATCO employment costs per ATCO-hour (2008)

The average unit ATCO employment costs in the European system amount to €99 per ATCO-hour. Figure 5.7 shows the values for this indicator for all the ANSPs.

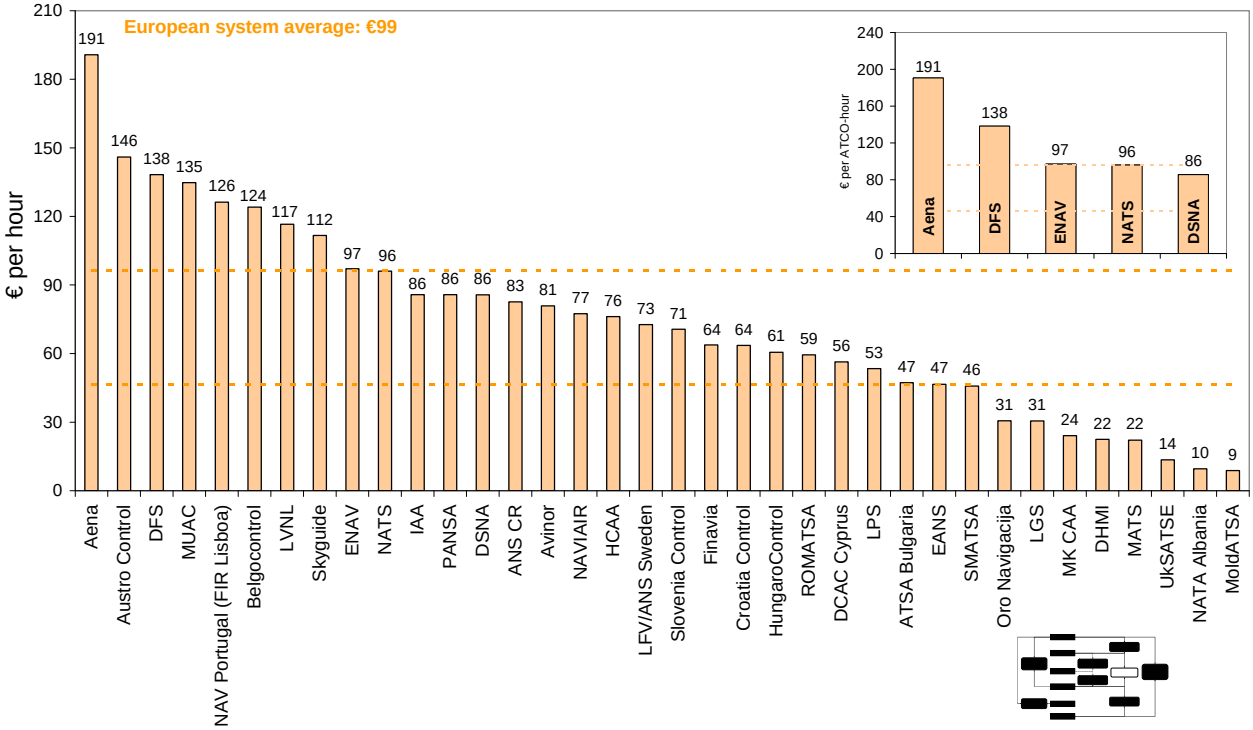


Figure 5.7: ATCO employment costs per ATCO-hour (gate-to-gate), 2008

There is a wide range of ATCO-hour employment costs across ANSPs, which is not surprising given the heterogeneity in the social and economic environments across Europe. The changes over time in ATCO employment costs at European system level and for individual ANSPs are described in Section 6.5 and Part IV.

A major exogenous factor that underlies differences in unit employment cost is the difference in prevailing market wage rates in the national economies in general. This is also associated with differences in the cost of living (see discussion in Chapter 4). To assess the influence of these exogenous differences, employment costs per ATCO-hour have been examined in the context of Purchasing Power Parity (PPP)[55]. Figure 5.8 below shows the ATCO employment costs per ATCO-hour both before and after adjustment for PPP. The adjustment reduces the dispersion of this indicator. After PPP adjustment, the average unit employment costs per ATCO-hour amounts to €104 (compared to €99 without adjustment). For many Central and Eastern European ANSPs, the PPP adjustment brings the unit costs close to those in Western Europe.

The unit costs in Aena are high both before and after adjustment for PPP. For Aena, more than 1/3 of the total hours on duty are accomplished as overtime, which is one of the

[55] The significance of PPP was discussed in Section 4.3 and footnote 41 and the PPP indices themselves are documented in Annex 5 of this report.

reasons behind the high ATCO employment costs. Clearly, the negotiating power of Aena's ATCOs enables them to have very favourable contractual arrangements. This has a significant impact on ATCO employment costs and on Aena's overall cost-effectiveness performance[56].

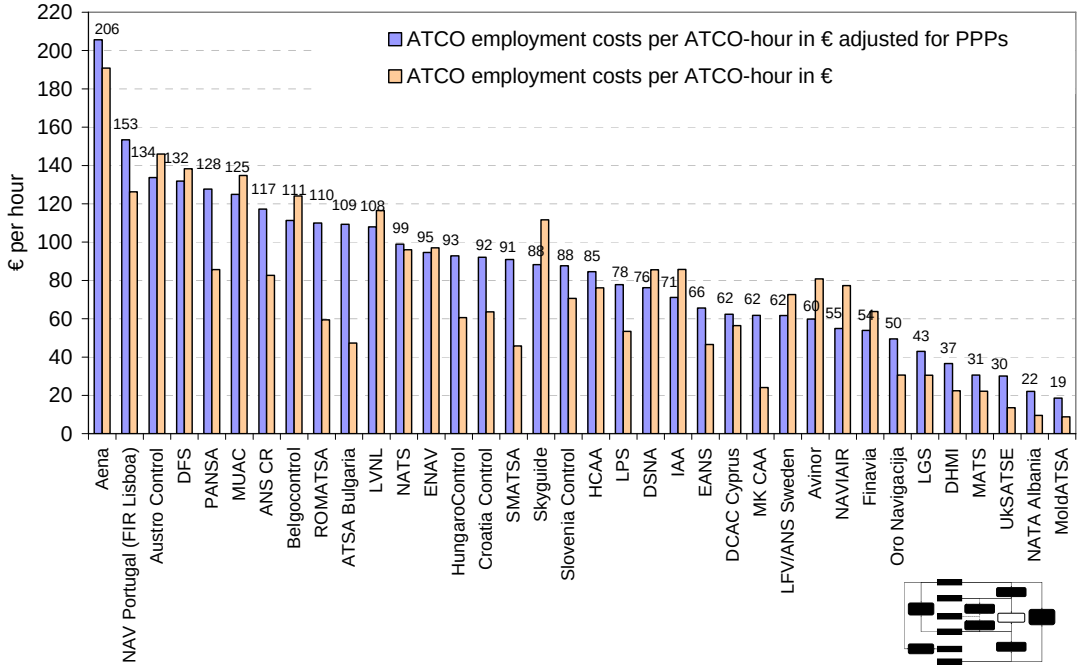


Figure 5.8: Employment costs per ATCO-hour with and without PPPs, 2008

5.4.3 ATCO employment costs per composite flight-hour (2008)

The ATCO employment costs per composite flight-hour result from the combination of the previous two components: ATCO-hour productivity and employment costs per ATCO-hour. All other things being equal, lower ATCO employment costs per unit output will contribute to greater financial cost-effectiveness. This indicator is displayed in Figure 5.9.

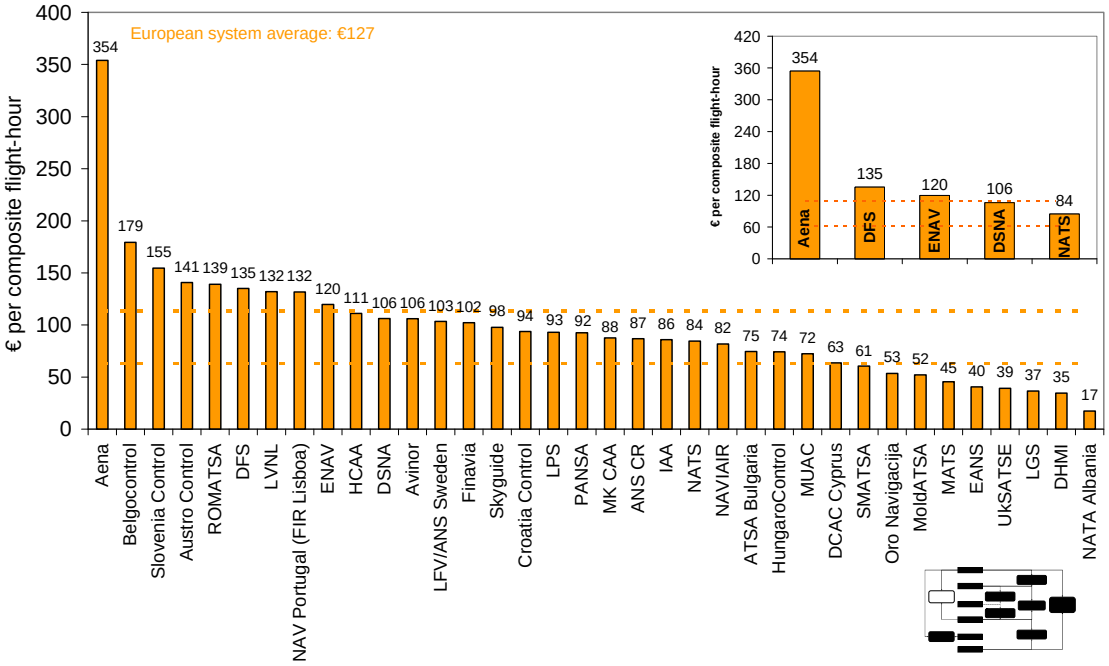


Figure 5.9: ATCO employment costs per composite flight-hour, 2008

[56] It should be noted that a specific law (Ley 9/2010) has been adopted in Spain on 15 April 2010 in order to address structural performance issues in Aena.

The ATCO employment costs per composite flight-hour for the five largest ANSPs are displayed in the top right corner of Figure 5.9. It is striking to note that there is a factor of almost three between Aena and the average of the four largest ANSPs which operate in relatively similar economic and operational environments. This is a clear indication of a serious performance issue in Aena.

In order to provide an insight into the relationship between ATCO-hour productivity and employment costs, Figure 5.10 below presents the ANSPs classified in four quadrants according to their level of ATCO productivity and employment costs. The quadrants are established on the basis of the European average values for these two metrics.

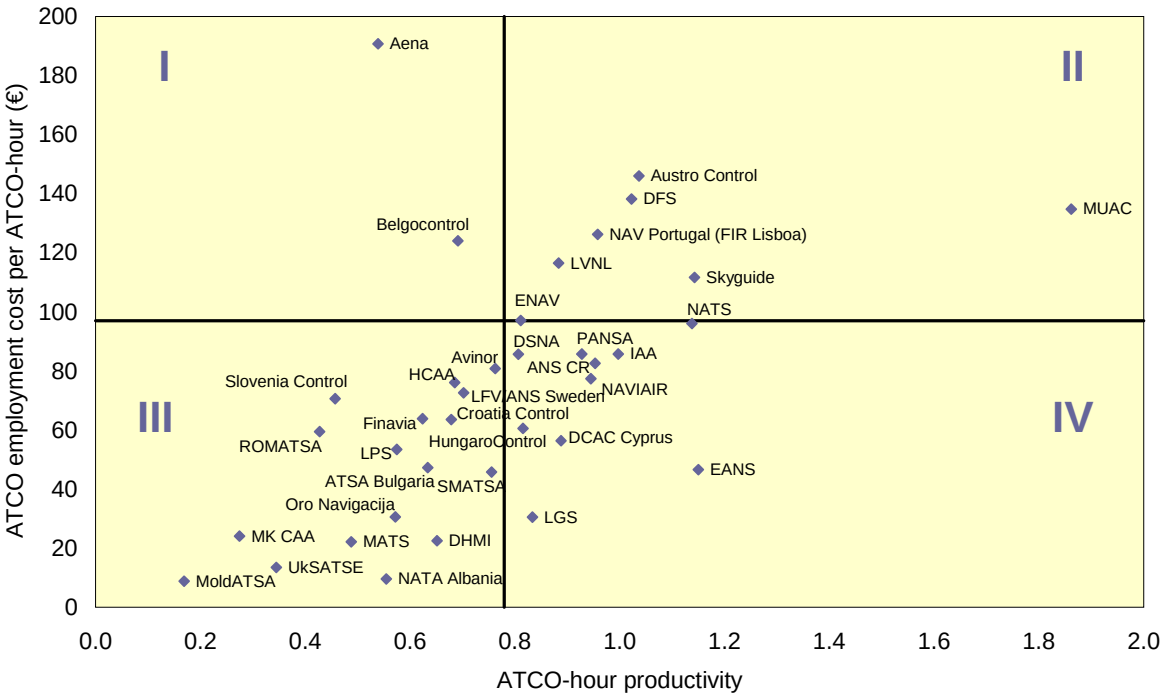


Figure 5.10: Components of ATCO employment costs per unit output, 2008

An ANSP may have high ATCO employment costs per ATCO-hour but if its ATCOs are highly productive then it will have lower employment costs per composite flight-hour. This is the case for the ANSPs in the top right (Quadrant II) of Figure 5.10 such as MUAC and to a lower extent Skyguide which shows high ATCO employment costs per ATCO-hour but mid-range ATCO employment costs per composite flight-hour (see also Figure 5.9 above).

Aena and to a lesser extent Belgocontrol (Quadrant I) combine higher ATCO employment costs with lower ATCO productivity, resulting in high ATCO employment costs per unit of output (see also Figure 5.9 above).

Some ANSPs such as EANS (Quadrant IV) have both high ATCO-hour productivity and lower ATCO employment costs per ATCO-hour.

Finally, ANSPs such as MoldATSA, MK CAA and UkSATSE (Quadrant III) show both lower ATCO-hour productivity and lower ATCO employment costs per ATCO-hour.

5.4.4 Support cost ratio (2008)

The support cost ratio shows the balance between money spent on ATCOs in OPS and all other expenditure, including capital costs, support staff and non-staff operating costs. The

average support cost ratio for the European system[57] is 3.2. In other words, for every euro spent on employing ATCOs in OPS in the European system, an additional €2.2 is spent on other costs.

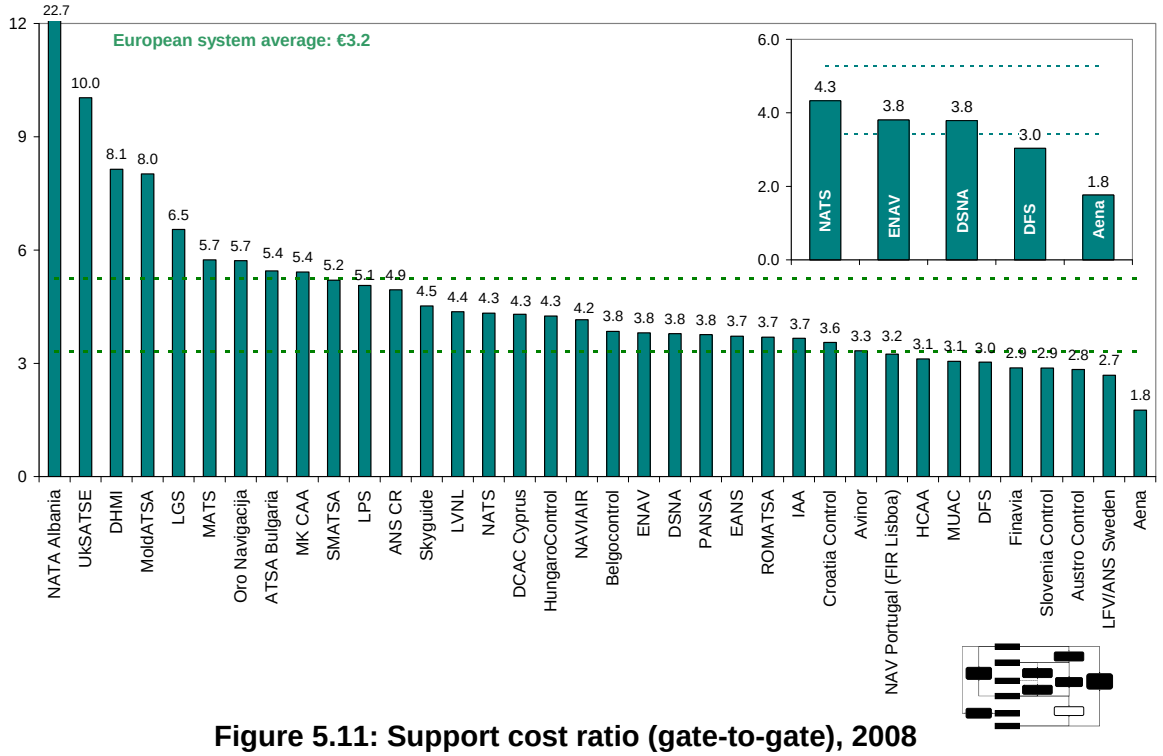


Figure 5.11: Support cost ratio (gate-to-gate), 2008

The support cost ratio cannot be viewed in isolation since a high (or low) ratio may simply be a symptom of low (or high) ATCO employment costs. High support cost ratios (see, for example, the top quartile in Figure 5.11) tend to be observed in ANSPs operating in Eastern European countries (such as NATA Albania) where ATCO employment costs remain low. However, Aena has the lowest support cost ratio in Europe (1.8). This value results from the combination of very high employment costs for ATCOs in OPS with genuinely lower support costs.

Even disregarding Aena, there are quite noticeable differences between the largest ANSPs (DSNA, DFS, NATS and ENAV) in terms of support cost ratio as shown on the top right corner of Figure 5.11.

Lower support cost ratios are observed for a number of ANSPs which are involved in airport management such as Finavia, Avinor, LFV/ANS Sweden and Aena[58]. The extent to which these lower support cost ratios might be affected by cost allocation issues (when part of terminal ANS support costs is allocated to the airport department of the ANSP and not to the ANS division) deserves further investigation. Greater transparency and enforcement by NSAs of the 2006 EC Charging Scheme Regulation requirements should contribute to improve comparability.

In order to further explore the reasons for differences in support costs, a complementary indicator to the support cost ratio, the "support costs per composite flight-hour" is discussed in the next section.

[57] The European system average is highly influenced by the low support cost ratio of Aena (1.8). Removing the latter from the sample would result in an increase of the average support cost ratio for the European system from 3.2 to 3.8.
[58] See Table 1.1 on p.3 of this Report.

5.4.5 Support costs per composite flight-hour (2008)

The SID V2.6 requires the disclosure of more information related to support costs and staff data so that a finer analysis of support costs is presented for the first time in this ACE Report.

Support costs amount to 69% of total ATM/CNS provision costs. Reducing these costs would have a major impact on cost-effectiveness. It is therefore important to understand the components of support costs, and what might drive changes in them. A study of ATM/CNS fragmentation throughout Europe suggested that fragmentation contributed to higher support costs[59]. Reducing the current level of fragmentation therefore has the potential to reduce support costs and improve cost-effectiveness. For the purposes of analysing differences in support costs, the part of the framework presented in Section 5.3 which is relating to support costs is further developed in Figure 5.12 below.

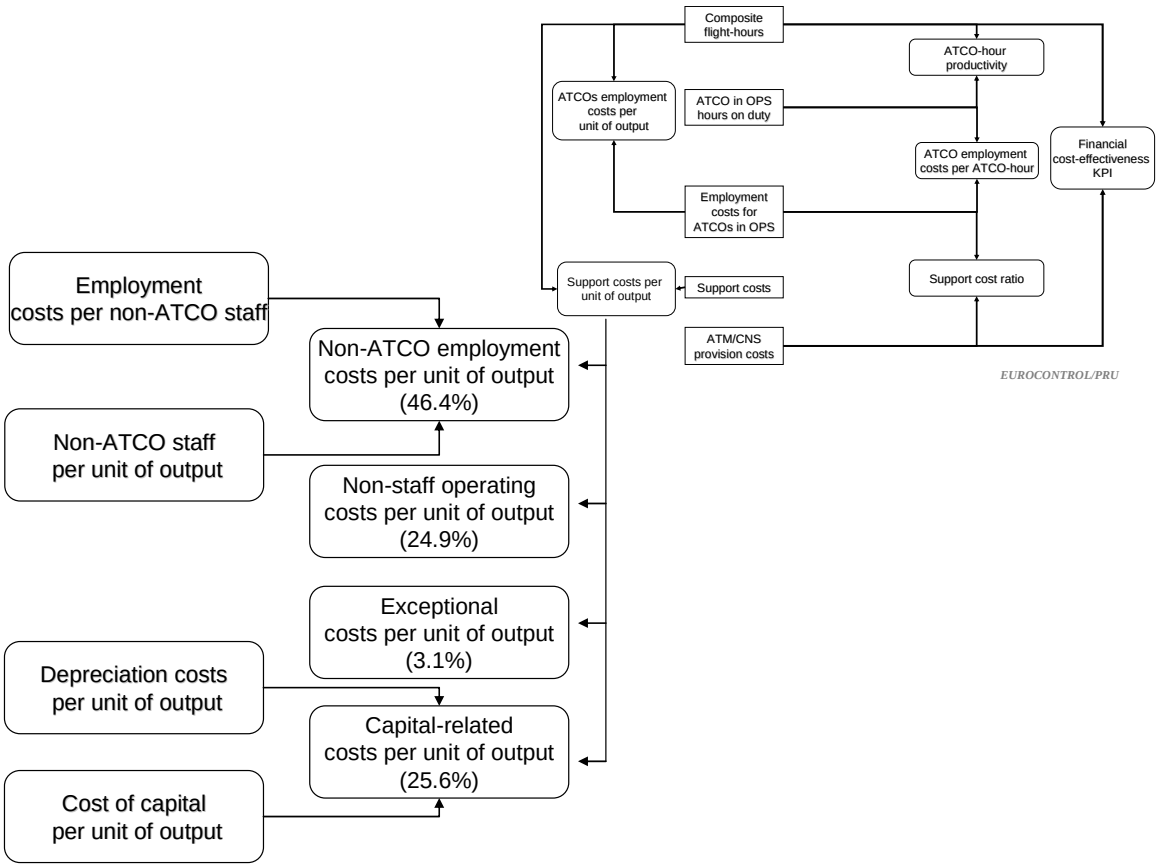


Figure 5.12: Framework for support costs analysis

As shown in Figure 5.12 support costs can be broken down into four separate components that provide further insight into the nature of support costs:

- **employment costs for non-ATCO in OPS staff**; these cover ATCOs on other duties, trainees, technical support and administrative staff (46.4% of support costs);
- **non-staff operating costs** mostly comprise expenses for energy, communications, contracted services, rentals, insurance, and taxes (24.9% of support costs);
- **exceptional costs** (3.1% of support costs); and,
- **capital-related costs**, comprising depreciation and financing costs for the capital employed (25.6% of support costs).

[59] The impact of fragmentation in European ATM/CNS, Report commissioned by the EUROCONTROL PRC, April 2006. The report is available on the PRC website at the following address: http://www.eurocontrol.int/prc/public/standard_page/doc_other_reports.html.

Employment costs for staff other than ATCOs in OPS account for 46% of total support costs. In the context of planning processes and contract renegotiation for support staff, it is important for ANSPs to monitor this indicator and to set quantitative objectives in terms of employment costs per output unit.

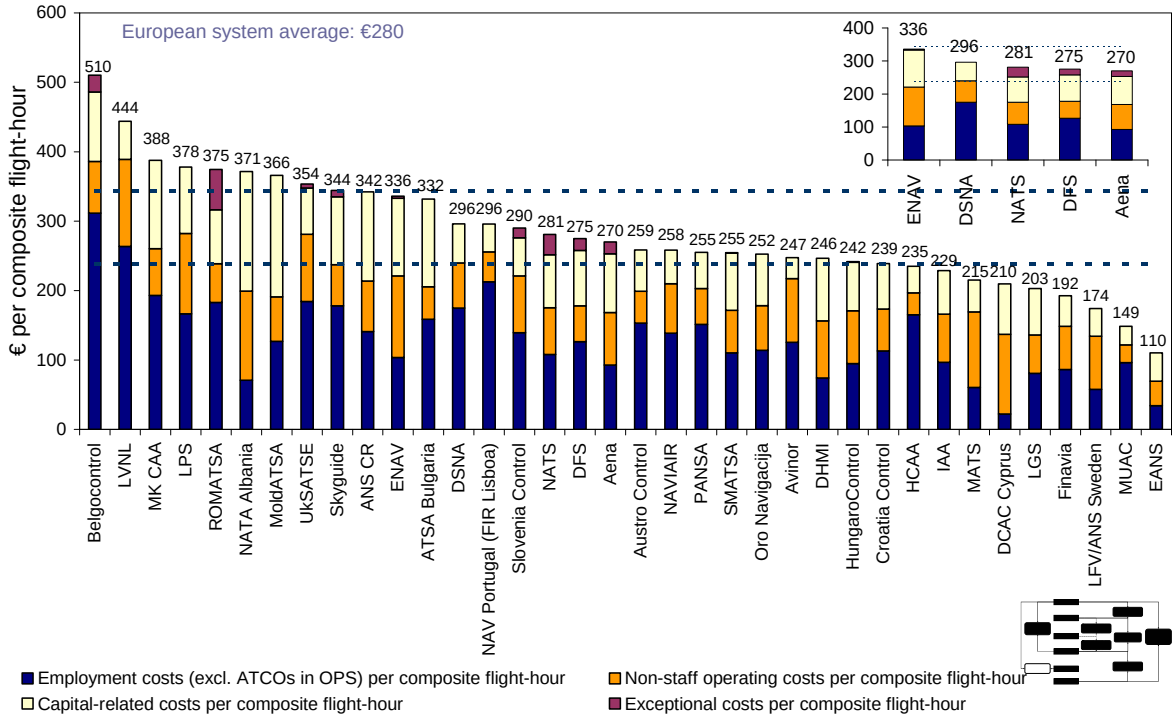


Figure 5.13: Support costs per composite flight-hour, 2008

The European average support cost per composite flight-hour is €280. Figure 5.13 shows that:

- the level of unit support costs varies significantly across ANSPs – a factor greater than four between Belgocontrol and EANS; and,
- there are important differences in the composition of support costs. In some instances this might indicate the substitution which can take place through the contracting out of support functions.

Focusing on the five largest ANSPs, some interesting features emerge. For ENAV, since the beginning of 2007 the maintenance of ATM systems has been carried out by Techno Sky - a subsidiary which is 100% owned by ENAV[60], corresponding costs are comprised in the non-staff operating costs[61] shown in Figure 5.13. For Aena, DSNA, DFS and NATS these activities are mainly carried out by internal staff. This is illustrated by a larger share of technical support staff for these ANSPs (i.e. more than 20% of the total staff compared to 11% for ENAV, see Figure 5.17 on p.62). Therefore, for Aena, DSNA, DFS and NATS the costs relating to the maintenance of ATM systems appear as employment costs in Figure 5.13, or as capital-related costs when labour is capitalised (which is done by some ANSPs and in particular NATS).

It is clear that the choice between providing some important operational support functions internally or externally has an impact on the proportion of support costs that is classified as employment costs, non-staff operating costs, or capital-related costs.

[60] This is a form of contract-out services but with a formal vertical integration relationship which improves the control and governance with the objective of reducing non-staff operating costs.

[61] Furthermore, it should be noted that a non negligible part of ENAV non-staff operating costs (some 20%) relates to ATC services provided by the Italian Air Force mainly at regional civil/military airports.

Non-ATCO employment costs per composite flight-hour

Like ATCO in OPS employment costs, employment costs for the support staff are also affected by the cost of living[62]. Using the same methodology as in Figure 5.8, Figure 5.14 shows the impact of adjusting the non-ATCO employment costs per composite flight-hour for PPPs. After PPP adjustment, the unit employment costs for non-ATCO staff per composite flight-hour amounts to €143 (compared to €130 without adjustment). As for ATCO employment costs, the dispersion is reduced by adjusting for PPPs, and the unit employment costs of many Central and Eastern European ANSPs are, after adjustment, higher or comparable to those in Western Europe.

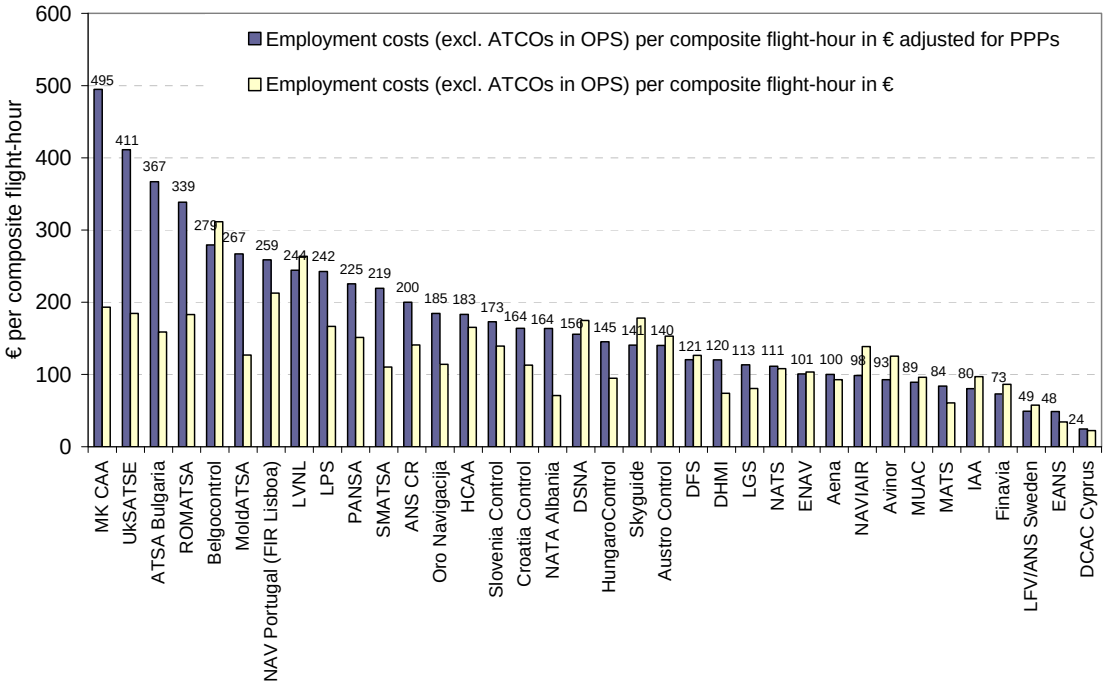


Figure 5.14: Non-ATCO employment costs with and without adjustment for PPPs, 2008

As economic conditions, both cost of living and general wage levels, are converging across Europe, there is a clear upward pressure on employment costs for these ANSPs. In order to sustain the current level of staffing and associated employment costs, it will be of great importance to effectively manage non-ATCO employment costs.

As shown in Figure 5.15. which comprises an extract of the framework presented in Figure 5.12, non-ATCO employment costs per composite flight-hour can be broken down into two indicators:

(1) the employment costs per non-ATCO staff; and,

(2) the number of non-ATCO staff required by unit of output.

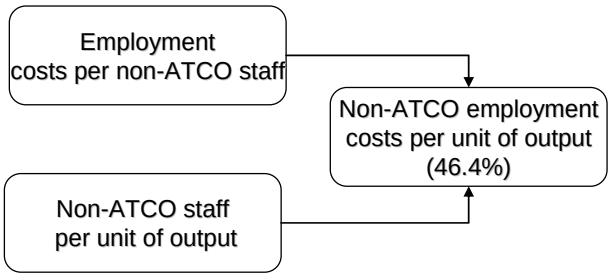


Figure 5.15: Breakdown of non-ATCO employment costs

In order to provide an insight into the relationship of these two indicators, Figure 5.16 below presents the ANSPs classified in four quadrants according to their level of employment costs per non-ATCO staff and the number of non-ATCO staff required per composite flight-hour.

[62] There may also be an impact on non-staff operating costs if support functions have been outsourced, particularly if outsourced staff are paid in local currency. However, this relationship is less clear and for the purposes of this analysis, the focus is on employment costs.

As explained in Chapter 3 of this Report, MET costs are not included in the ACE data analysis. Therefore to ensure consistency, for those ANSPs where MET services are provided internally, MET staff are deducted from the total non-ATCO staff reported in Figure 5.16.

In Figure 5.16, the quadrants are determined by the European averages i.e. 61 €'000 for the employment costs per non ATCO-staff and 2.1 non-ATCO staff for 1000 composite flight-hours.

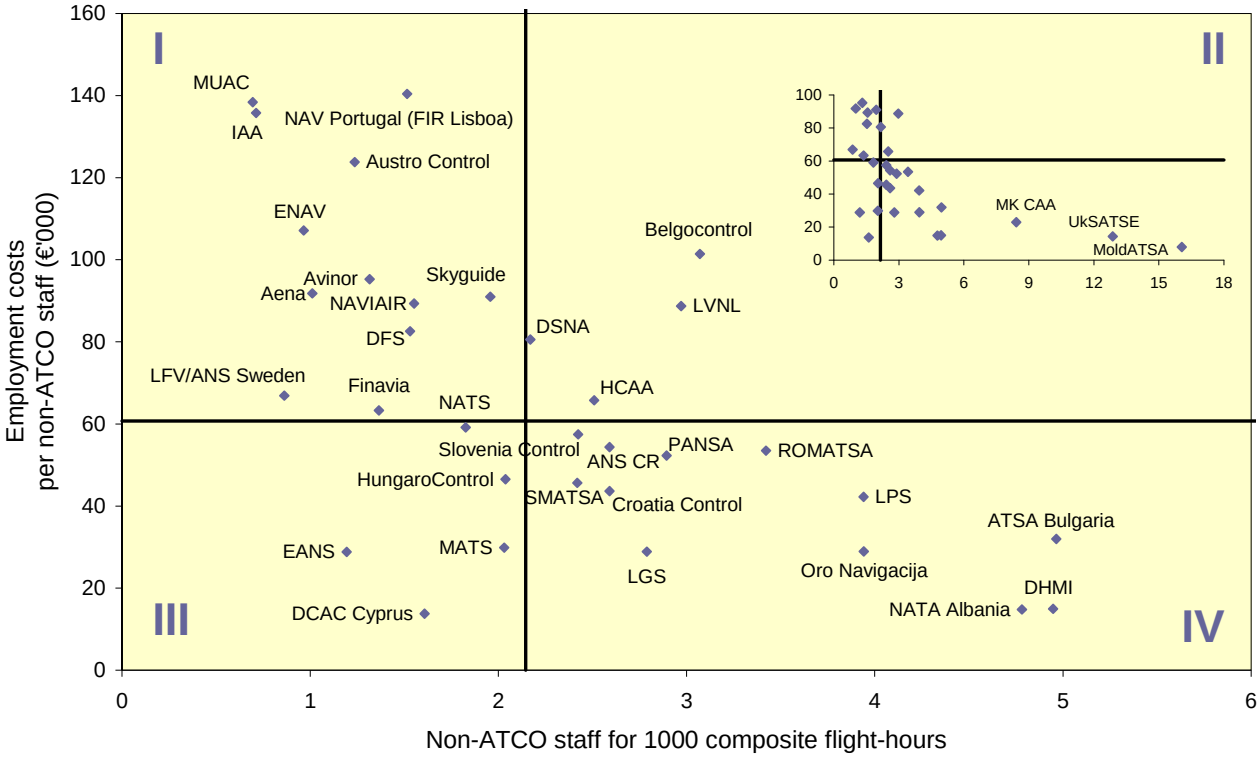


Figure 5.16: Employment costs per non-ATCO staff and non-ATCO staff per unit of output, 2008

An ANSP may have high employment costs per non-ATCO staff but if a low number of non-ATCO staff is required per unit of output it will have lower non-ATCO employment costs per composite flight-hour. This is the case for the ANSPs in the top left of Figure 5.16 such as MUAC and IAA (Quadrant I).

Belgocontrol and to a lesser extent LVNL (Quadrant II) combine relatively high employment costs per non-ATCO staff with a relatively high number of non-ATCO staff per composite flight-hour, resulting in high non-ATCO employment costs per unit of output (see also Figure 5.14 above). As already mentioned in Section 5.2, the costs of the maintenance of the infrastructure which is made available to MUAC are borne by these ANSPs. If MUAC flight-hours were reallocated to Belgocontrol and LVNL, these ANSPs would show a lower number of non-ATCO staff per composite flight-hour.

Some ANSPs such as EANS (Quadrant III) have both low employment costs per non-ATCO staff and a low number of non-ATCO staff per composite flight-hour.

Finally, for ANSPs such as ATSA Bulgaria, DHMI and NATA Albania (Quadrant IV) low employment costs per non-ATCO staff are combined with a high number of non-ATCO staff per unit output.

Figure 5.16 indicates that there is no clear-cut relationship between these two indicators. However, ANSPs where the employment costs per non-ATCO staff are low, tend to have a larger number of non-ATCO staff per unit of output. This is particularly the case for three

ANSPs, MK CAA, UkSATSE and MoldATSA which show a very large number of non-ATCO staff per unit of output. These ANSPs are shown in the miniature replica which is inserted in Figure 5.16 (see top-right corner). For these ANSPs, those large numbers of non-ATCO staff per unit output are the main driver for the high non-ATCO employment costs shown in Figure 5.14.

Figure 5.17 below shows for each ANSP the breakdown of non-ATCO staff in different categories.

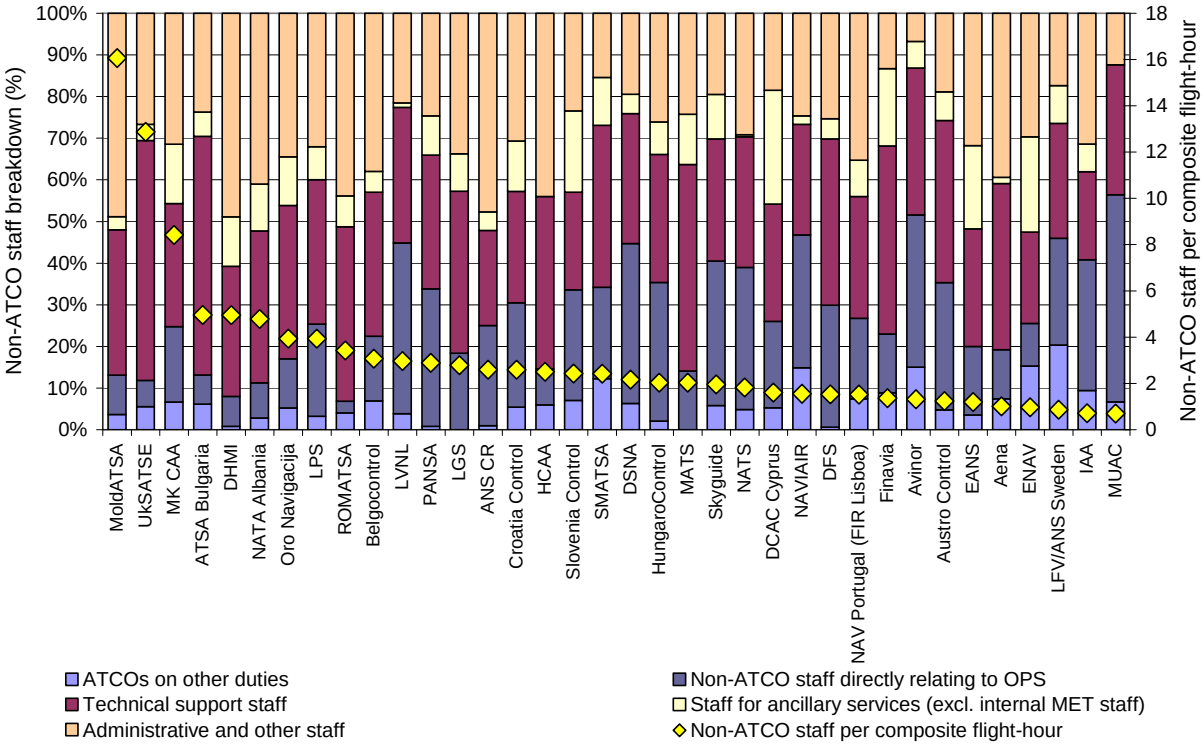


Figure 5.17: Breakdown of non-ATCO staff, 2008

UkSATSE is the second largest ANSP in terms of total staff, and is of intermediate size in terms of traffic. In 2008, UkSATSE employed 17% more staff than NATS, although controlling 5 times less traffic. The largest staff category is technical staff, which represents some 48% of UkSATSE total staff, while for other ANSPs technical staff typically amount for some 20%-25% of the total staff.

MoldATSA and MK CAA are among the two smallest ANSPs in terms of traffic and are also among the smallest in terms of total staff. The traffic controlled by each of these ANSPs represents some 1-2% of the traffic controlled by any of the five largest ANSPs. It is expected that for these two ANSPs, additional traffic volumes can be absorbed without significant increases in support staff, resulting in a decrease of their proportion of non-ATCO staff per unit of output.

In some cases, a low number of non-ATCO staff per unit of output might be associated with an ANSP involved in airport management activities (e.g. Aena, Avinor and LFV/ANS Sweden) illustrating potential staff allocation issues. It can also reflect the fact that maintenance activities are outsourced (e.g. ENAV) or even capitalised (e.g. NATS). For this reason, non-ATCO employment costs should not be treated separately but analysed along with the other components of support costs (i.e. non-staff operating costs and capital-related costs).

Capital-related costs per composite flight-hour

A further component of "support" cost which shows an important variation between ANSPs is the capital-related costs.

As shown in Figure 5.18 capital-related costs can be further broken down into depreciation costs per unit of output and cost of capital per unit of output.

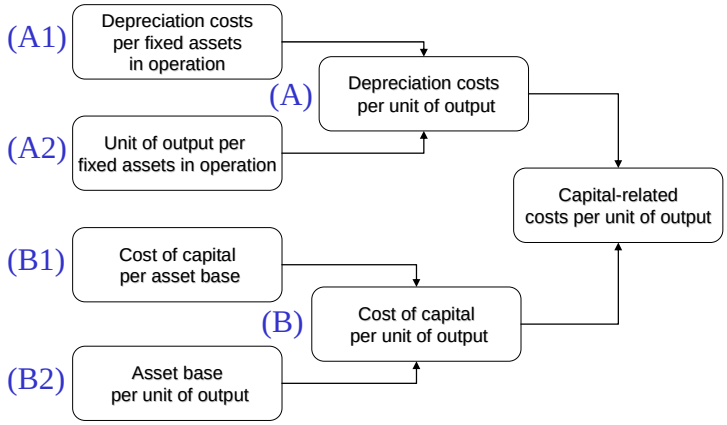


Figure 5.18: Breakdown of capital-related costs

Depreciation costs per unit of output (A) is the relationship between the **average depreciation rate of fixed assets** (see A1) with the **productivity of fixed assets** (see A2).

Cost of capital per unit of output (B) is the relationship between the **average rate of return** (see B1) with a measure of **capital intensity** (see B2).

These relationships are analysed in further details below.

(A) Depreciation costs per unit of output

Figure 5.19 below shows the average rate of fixed assets depreciation (see yellow dots) and the productivity of fixed assets (see blue bars measured on the left-hand scale). It should be noted that HCAA did not provide complete balance sheet information in its 2008 data submission. Therefore no data are shown for this ANSP in Figure 5.19.

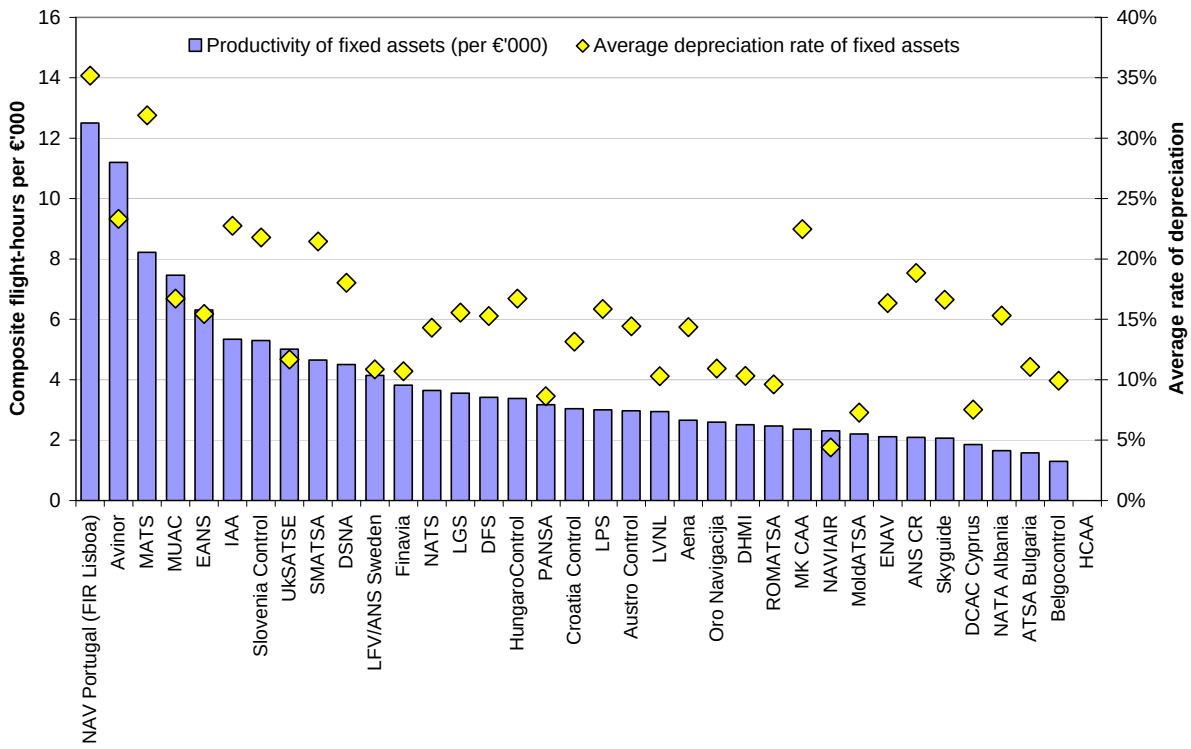


Figure 5.19: Components of depreciation costs per composite flight-hour, 2008

At European system level, some 5 661 107 €'000 of fixed assets are required to control 18 651 727 composite flight-hours. In other words, the productivity of fixed assets amounts to 3.3 composite flight-hours per 1 000 € worth of fixed assets. At ANSP level, this indicator ranges from 12.5 for NAV Portugal to 1.3 for Belgocontrol (see blue bars in Figure 5.19).

At European system level, the average rate of depreciation amounts to 15% for the year 2008. As shown in Figure 5.19 (see yellow dots), there is a wide range of average depreciation rates across ANSPs from 35% for NAV Portugal to 4% for NAVIAIR. NAV Portugal shows both the highest productivity of fixed assets and the highest average depreciation rate.

Several factors affect the productivity of fixed assets and could explain the differences across ANSPs that are highlighted in Figure 5.19:

- Not all ANSPs publish an Annual Report with a detailed balance sheet (see Section 1.5);
- Accounting practices relating to assets differ (e.g. use of different depreciation policies);
- ANSPs are at different positions in the investment cycle and therefore have different average ages of the assets;
- ANS-related assets are sometimes leased or owned by airport authorities rather than the ANSP (this is particularly the case for some terminal ANS related assets);
- The productivity being calculated from the NBV of fixed assets (and not the Gross Book Value - GBV), an ANSP applying relatively high depreciation rates will, all else being equal, show a lower NBV, which results in a higher capital productivity; and,
- Conversely, ANSPs with relatively old assets will show a lower NBV and a higher capital productivity.

Finally, it should be noted that any exceptional depreciation costs in 2008 would automatically over-estimate the average depreciation rate and the productivity of fixed assets displayed in Figure 5.19. As the information required in the SID V2.6 will be collected over the next years, it will become possible to calculate the productivity of fixed assets from the GBV of assets in operation, and to analyse changes over time for each ANSP.

(B) Cost of capital per unit of output

The SID V2.6 requires the disclosure of more detail on how the cost of capital is calculated, which provides further insights into performance. Each ANSP is required to report the rate of return used to calculate the cost of capital and to identify the asset base to which it was applied.

These two factors are examined in Figure 5.20. The bar, measured on the left-hand scale, shows the asset base to which the cost of capital is applied, divided by the composite flight-hours, to give a fair comparison across ANSPs. At a minimum, the asset base should comprise fixed assets that are employed to provide ATC services (the purple bar in the diagram). It is also reasonable to include some current assets which are shown as the blue bar. The sum of these two quantities (fixed assets and current assets) is the asset base to which an average rate (see red dots) is applied to compute the cost of capital[63]. ANSPs are ranked by their ratio of asset base per composite flight-hour.

It should be noted that EANS, DSNA, HCAA, and UkSATSE did not report complete information relative to the calculation of the cost of capital in their ACE data submission.

[63] The information provided in Figure 5.20 relates to the assumptions used to compute an economic cost of capital for the purposes of the ACE Benchmarking analysis. This may differ from the cost of capital that is part of the cost-base charged to airspace users.

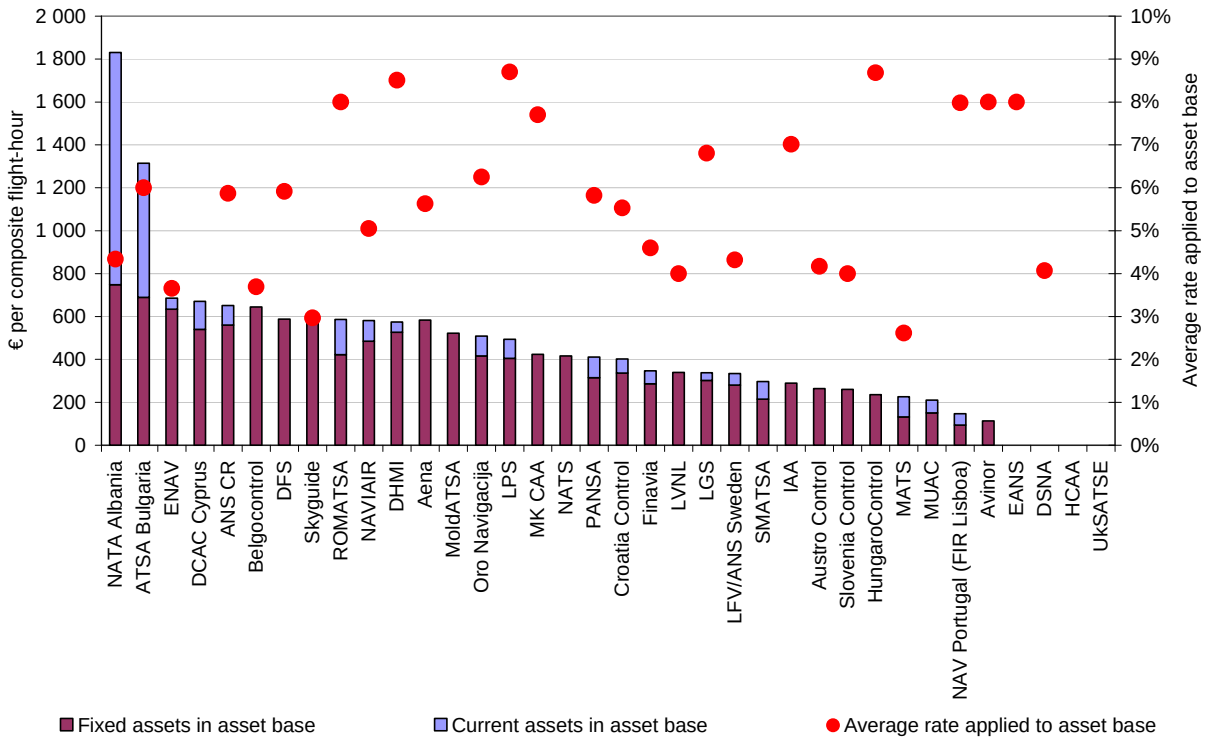


Figure 5.20: Asset bases and average rates used to compute the cost of capital, 2008

Figure 5.20 shows that out of the 32 ANSPs reporting data on the calculation of the cost of capital, 13 computed a cost of capital based only on the value of fixed assets. Of the remaining 19, most show current assets which represent on average 11% of the asset base. ATSA Bulgaria and NATA Albania show significantly higher proportions (48% and 59%, respectively). It appears that NATA Albania and ATSA Bulgaria have by far the highest asset base in Europe when it is expressed in terms of composite flight-hour. This would certainly deserve further attention[64].

The nominal rates of return used to calculate the finance cost are mostly in the range of 4-9% per year. The rate for MoldATSA and SMATSA are over 10% (26% and 12%, respectively) and are not shown in Figure 5.20. These higher rates must be viewed in the light of high inflation in Serbia (11.7%) and Moldova (13%) in 2008. However, some of the rates seem rather high considering the low-risk nature of the ANS activity, and the relatively low interest rates observed in the euro zone during the year 2008.

Both the magnitude of the asset base and the level of the rates of return would require further analysis in order to better understand the differences reported in Figure 5.20.

5.4.6 Performance ratios (2008)

Table 5.1 summarises the relationship between the three multiplicative components of financial cost-effectiveness (ATCO-hour productivity, employment costs per ATCO-hour and support cost ratio) and the two complementary components (ATCO employment costs per composite flight-hour and the support cost per composite flight-hour), described in Section 5.4. To facilitate the interpretation of the results, the concept of the "performance ratio" has been introduced.

The **performance ratios** represent the relationship between the value for an ANSP of an indicator and the value of that indicator for the European system as a whole. Performance

[64] It should be noted that the large asset base reported for NATA Albania in Figure 5.20 reflects an exceptional situation due to delays in the implementation of the National Airspace Modernisation Programme, where cash drawn from a bank loan to finance the investments is recorded as current asset by NATA Albania.

ratios are defined such that a value **greater than one** implies a performance **better** than the European average, in terms of the positive contribution it makes to cost effectiveness. An ANSP with the **same** performance as the European system will have a performance ratio of **one**.

ANSPs	Country	Financial cost-effectiveness KPI indexes*	Performance ratios			Performance ratios	
			ATCO-hour productivity	ATCO employment costs per ATCO-hour*	Support cost ratio*	ATCO employment costs per composite flight-hour*	Support costs per composite flight-hour*
Aena	ES	0.65	0.69	0.52	1.82	0.36	1.04
ANS CR	CZ	0.95	1.23	1.19	0.65	1.46	0.82
ATSA Bulgaria	BG	1.00	0.82	2.08	0.59	1.70	0.85
Austro Control	AT	1.02	1.33	0.68	1.13	0.90	1.08
Avinor	NO	1.15	0.98	1.22	0.96	1.20	1.13
Belgocontrol	BE	0.59	0.89	0.79	0.84	0.71	0.55
Croatia Control	HR	1.22	0.87	1.55	0.90	1.35	1.17
DCAC Cyprus	CY	1.49	1.14	1.75	0.75	2.00	1.34
DFS	DE	0.99	1.32	0.71	1.06	0.94	1.02
DHMI	TR	1.45	0.84	4.39	0.39	3.68	1.14
DSNA	FR	1.01	1.04	1.15	0.85	1.19	0.95
EANS	EE	2.70	1.48	2.11	0.86	3.13	2.55
ENAV	IT	0.89	1.04	1.02	0.84	1.06	0.83
Finavia	FI	1.38	0.80	1.55	1.11	1.24	1.46
HCAA	GR	1.18	0.88	1.30	1.03	1.14	1.19
HungaroControl	HU	1.29	1.05	1.63	0.75	1.71	1.16
IAA	IE	1.29	1.28	1.15	0.88	1.48	1.23
LFV/ANS Sweden	SE	1.47	0.90	1.36	1.20	1.23	1.61
LGS	LV	1.70	1.07	3.23	0.49	3.47	1.38
LPS	SK	0.86	0.74	1.84	0.63	1.36	0.74
LVNL	NL	0.71	1.14	0.85	0.74	0.96	0.63
MATS	MT	1.56	0.63	4.45	0.56	2.79	1.30
MK CAA	MK	0.86	0.35	4.09	0.59	1.45	0.72
MoldATSA	MD	0.97	0.22	11.20	0.40	2.43	0.77
MUAC		1.84	2.40	0.73	1.05	1.75	1.89
NATA Albania	AL	1.05	0.71	10.30	0.14	7.35	0.75
NATS	UK	1.11	1.46	1.03	0.74	1.50	1.00
NAV Portugal (FIR Lisboa)	PT	0.95	1.23	0.78	0.99	0.96	0.95
NAVIAIR	DK	1.20	1.22	1.27	0.77	1.55	1.09
Oro Navigacija	LT	1.33	0.74	3.22	0.56	2.37	1.11
PANSA	PL	1.17	1.19	1.15	0.85	1.37	1.10
ROMATSA	RO	0.79	0.55	1.66	0.87	0.91	0.75
Skyguide	CH	0.92	1.47	0.88	0.71	1.30	0.81
Slovenia Control	SI	0.92	0.59	1.40	1.12	0.82	0.97
SMATSA	RS/ME	1.29	0.97	2.15	0.62	2.09	1.10
UkSATSE	UA	1.04	0.44	7.30	0.32	3.24	0.79
Total European System		1.00	1.00	1.00	1.00	1.00	1.00

Table 5.1: The components of gate-to-gate cost-effectiveness, 2008[65]

In Table 5.1 ANSPs for which a given component makes a particularly positive contribution to its cost-effectiveness (more than 1.30) are highlighted in green – those where a given component makes a particularly low contribution (less than 1/1.30) are in orange.

Some ANSPs more than make up for a relatively low contribution from one component by a relatively high contribution from another and, as a result, are more cost-effective than the average (cost-effectiveness index greater than 1).

[65] For the ATCO employment costs per ATCO-hour, the support costs ratio, the ATCO employment costs per composite flight-hour and the support costs per composite flight-hour (asterisked in Table 5.1), the inverse ratio is used, since **higher** unit employment costs and **higher** support costs imply **lower** cost-effectiveness.

On the left-hand-side the three ratios are multiplicative; the product of the ratios for each of the components equals the performance ratio for overall financial cost-effectiveness (see financial cost-effectiveness index in Table 5.1). The following example for ANS CR illustrates the interpretation of the performance ratios:

0.95	ANS CR's gate-to-gate **ATM/CNS costs per composite flight-hour** are some **5% higher** (1/0.95 - 1) than the European average.
= 1.23 x 1.19 x 0.65	Its **ATCO-hour productivity** is **+23% higher** than the European average, and the **ATCO employment costs per ATCO-hour** of ANS CR are **-16% lower** (1/1.19 - 1) than the sample average. **This does not compensate for a higher support cost ratio**, which is **+54% higher** (1/0.65 - 1) than the sample average.

On the right-hand-side, the two complementary performance ratios are normalised using the European average (note that these ratios are neither multiplicative nor additive):

1.46 0.82	ANS CR's **ATCOs in OPS employment costs per composite flight-hour** are **-32% lower** (1/1.46 - 1) than the European average, **this does not compensates for** the **support costs per composite flight-hour** which are **+22% higher** (1/0.82 - 1) than the sample average.

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6 CHANGES IN FINANCIAL COST-EFFECTIVENESS (2004-2008)

6.1 Introduction

This chapter examines the changes in financial cost-effectiveness between 2004 and 2008, both for the European system level and for individual ANSPs. The indicators presented in this chapter will not be directly comparable to those in individual ACE reports (including this one), for the following reasons:

- The sample of ANSPs must be consistent; this has to be the 33 which disclosed consistent information over the period[66];
- The monetary values in previous years' calculations have been restated in 2008 prices and exchange rates in order to ensure consistency in time series comparison. At European system level for the period 2004-2008, price indexes increased by +11% (i.e. +2.7% per annum)[67];
- As part of the experience and understanding gained from the last data validation process, the PRU has made some data adjustments in order to ensure comparability over time. These adjustments have been made in a fully transparent way with the cooperation of the participating ANSPs.

2008 was a year in which a new challenge to ANSPs started to emerge. Traffic, which had grown steadily for a number of years, in some parts of Europe at very high rates, showed distinct signs of slackening growth in the year. Subsequent developments have shown that this slackening foreshadowed the first stages of an unprecedented downturn in traffic across the continent.

Section 6.2 below looks at the long-term relationship between ATM/CNS provision costs and traffic and considers the reactivity of ANSPs to significant downturns in traffic volumes. This section also analyses the cost structure of European ATM/CNS in general, and provide an insight on which elements can be considered fixed or variable depending on the time scale.

Section 6.3 looks at the medium-term developments in financial cost-effectiveness for 2004-2008 for the European sample, while Section 6.4 examines changes in financial cost-effectiveness at ANSP level.

Finally, Section 6.5 provides an analysis of the developments in the components of cost-effectiveness, namely ATCO-hour productivity, ATCO employment costs per ATCO-hour, and unit support costs, between 2004 and 2008.

[66] This is not a serious limitation. Only three ANSPs disclosing information today are omitted from the historical analysis. PANSA and SMATSA did not start disclosing information until after the start of the period, and HCAA only started disclosing terminal costs in 2006. Those included constitute 96% of the 2008 sample in terms of output (composite flight-hours). See also Figure 2.2 on p.12.

[67] Source: Inflation rates (average consumer prices) from IMF database available at http://www.imf.org/external/pubs/ft/weo/2009/02/weodata/index.aspx.

6.2 ATM/CNS costs structure and reactivity of the European ATM industry to significant decreases in traffic demand

6.2.1 Fixed and variable costs components in the provision of ATM/CNS services

In the very long run, all ATM/CNS provision costs are in principle variable. If there were no demand for air navigation services, there would be no need to provide them and incur any costs. In the very short run, virtually all ATM/CNS costs are fixed. However, on practical timescales, there are degrees of variability of costs to demand.

Over the period 2002-2008, a period of positive business cycle, the industry has enjoyed an average traffic increase of some +3.7% per year (+24% during the period). Some insight can be gained into the variability of ATM/CNS costs by examining the medium-term relationship between the rises in demand, and the concomitant rises in costs.

Figure 6.1 illustrates this empirical trend at European system level for the years 2002-2008 using a very simple regression analysis which assumes a linear relationship between costs and demand/output.

The regression line displayed in Figure 6.1 indicates that the fixed costs of ATM/CNS provision would amount to some €3 000M. This represents some 40% of the total ATM/CNS provision costs (€7 596M) in 2008.

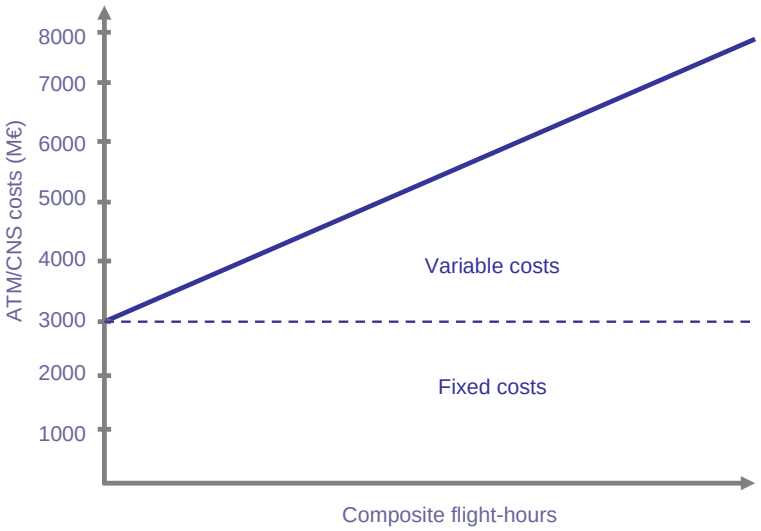

Figure 6.1: Relationship gate-to-gate ATM/CNS provision costs and composite flight-hours at European system level (2002-2008)

This result should be interpreted carefully given that this simplistic regression analysis is only based on seven observations and since other influences may be causing costs to rise besides demand.

The left-hand side of Figure 6.2 below shows the proportion of the components of ATM/CNS provision costs[68] (ATM, Communication, Navigation and Surveillance).

[68] These figures only relate to en-route costs and refer to the data submitted by EUROCONTROL Member States for the purposes of the Enlarged Committee for Route Charges. However, terminal ANS costs have a similar cost structure.

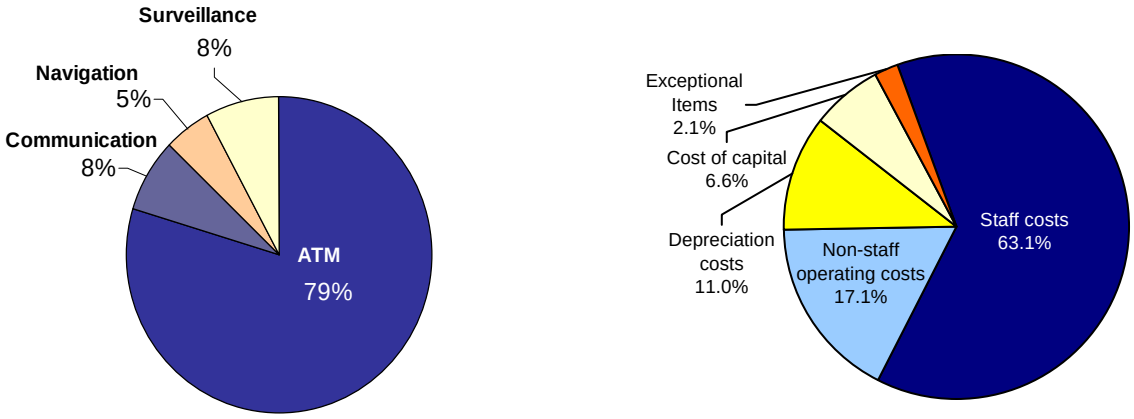

Figure 6.2: Breakdown of ATM/CNS costs (2008)

Figure 6.2 indicates that more than 20% of ATM/CNS costs are related to the provision of CNS services (including support staff costs, non-staff operating costs and capital-related costs). From an economic point of view, it is expected that CNS infrastructure costs are not directly linked to traffic demand, and could be considered as fixed costs in the medium-term.

Similarly, a share of the ATM costs is likely to be relatively fixed in the medium term (e.g. capital-related costs associated with the development of ATM systems and some maintenance-related costs).

The right-hand side of Figure 6.2 above also shows that staff costs represent more than 60% of ATM/CNS provision costs. In the ACE data analysis, ANSPs total staff numbers are broken down into two main categories: ATCOs in OPS and all the other operational, technical and administrative support staff.

ATCOs in OPS are directly related to the provision of ATC services. Their staffing requirements are by and large linked with the traffic growth in the medium and long-term[69]. In case of temporary decrease in demand it is neither sensible nor economical to reduce the number of ATCOs in OPS given the costs and the lead time for recruitment and training (typically 3-4 years). Moreover, ATCOs salaries and wages are typically sticky downwards but quite flexible upwards[70]. For this reason, the degree of **downwards** flexibility of ATCOs in OPS employment costs in the short and medium-term is very limited. In practice, short term measures which reduce the ATCOs in OPS employment costs are linked to the cutback of overtime hours and the relinquishment of financial bonuses and rewards related to productivity and traffic.

On the other hand, a large share of support staff is not expected to increase proportionally with the traffic. In fact, the analysis presented in Section 6.5.4 of this Chapter indicates that between 2004 and 2008, unit support staff costs decreased by -9.6% in real terms (see Figure 6.14 below). This means that support staff costs increased slower than traffic volumes. For some ANSPs support staff numbers remained constant or even decreased between 2004 and 2008, this is particularly the case for the five largest ANSPs. This indicates a certain degree of **downwards** flexibility for support staff costs.

It is not straightforward to precisely determine the proportion of fixed and variable costs in the provision of ATM/CNS services. In the medium-term, a major share of costs (mainly support costs which comprise around 70% of total ATM/CNS provision costs) are not expected to increase in line with traffic volumes. Although, these costs could be considered

[69] Over the long run this link can be altered by the technological progress which affects the extent of labour versus capital intensity.
[70] ATCOs wages conditions are frequently negotiated (every year in some ANSPs) and revised **upwards**.

as “fixed”, they have a certain degree of flexibility (both downwards and upwards). On the other hand, ATCOs in OPS employment costs which represent some 30% of total ATM/CNS provision costs are to be considered as variable, but in practice they show a very limited degree of downwards flexibility.

6.2.2 Reactivity of the European ATM industry to significant decreases in traffic demand

Figure 6.3 shows the long-term trend in costs, traffic and unit costs between 1990 and 2014. Since the ACE data collection process only started in 2001, the figure below refers to en-route ANS costs and traffic data submitted by EUROCONTROL Member States for the purposes of the Enlarged Committee for Route Charges[71]. En-route costs represent a major share (around 75%) of gate-to-gate costs.

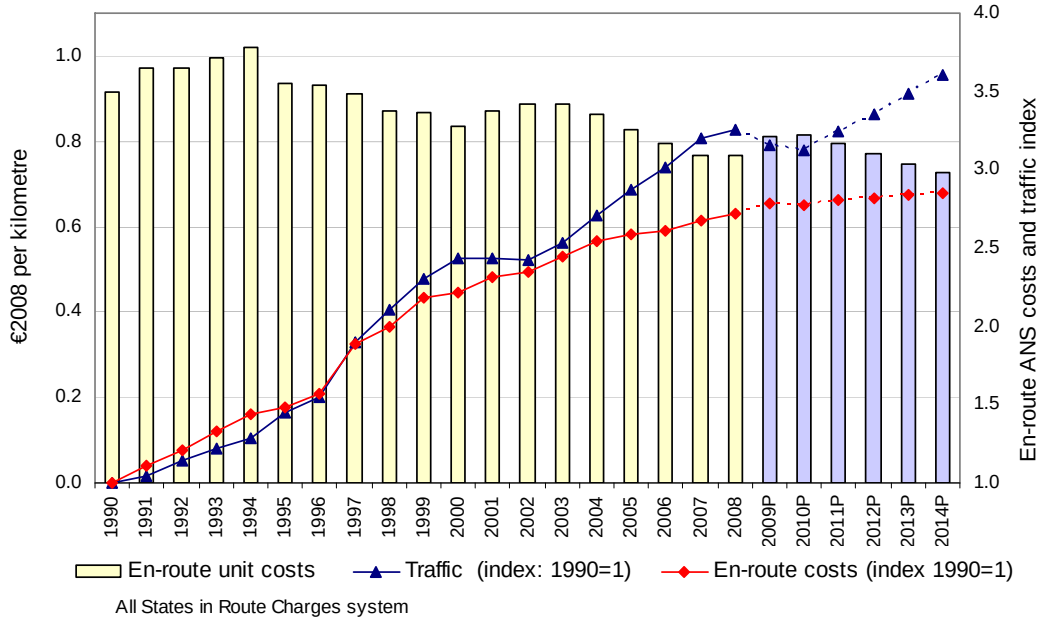

Figure 6.3: The development of en-route ANS costs, traffic and en-route ANS unit costs (1990-2014), real terms

Figure 6.3 indicates that between 1990 and 2000, a period of sustained traffic growth, costs rose broadly in line with traffic. As of 2003 and in the following years, there seems to have been a decoupling between costs and traffic. Following the 11 September 2001 terrorists events, traffic growth slowed down in 2002 and then bounced back in 2003 and 2004. During this period, the increase in costs was not commensurate, as it had been in the previous decade. This may be due to the fact that ANSPs could use the capacity already available in 2001-2002 to absorb the traffic growth in 2003 and 2004. However, Figure 6.3 also shows that between 2003 and 2007, the increase in en-route costs has been systematically lower than the traffic growth, while maintaining a satisfactory quality of service level. This indisputable performance improvement is due to greater cost-effectiveness awareness among European ANSPs. It also demonstrated the ability of the ATM industry to reduce its unit cost in a context of robust and continuous traffic growth.

On the other hand, Figure 6.3 shows that although traffic is expected to decrease in 2009, costs are planned to increase at a similar pace as between 2006 and 2007. This indicates that the flexibility to adjust costs downwards in the short-term is still not a feature of the ATM industry in general. The limited degree of downwards flexibility is linked to the characteristics of the costs structure outlined above (Section 6.2.1), but this may also

[71] The costs differ from the ATM/CNS costs used in ACE because they include EUROCONTROL, MET and, where charged to users, regulatory costs. The units of demand are km, which are closely correlated with the en-route portion of the ACE demand indicator, flight-hours.

illustrate the lack of incentives for ANSPs to react to significant drops in traffic volumes. Clearly, under the full-cost recovery regime, ANSPs have no strong incentives to reduce costs. The introduction of incentives, as provided for in the second SES package, may help improve ANSPs reactivity to adjust costs downwards in case of traffic volumes decreases.

6.3 Medium term changes in financial cost-effectiveness (2004-2008)

Figure 6.4 shows how the financial cost-effectiveness KPI has varied over time for Europe as a whole. The blue bars show the cost per composite flight-hour, with all years expressed in the same price base (2008 prices), with the scale on the left-hand axis. To show how the indicator is influenced by growth in traffic and in costs, indexes of those variables are plotted as the orange and dark blue lines, with the scale on the right-hand axis.

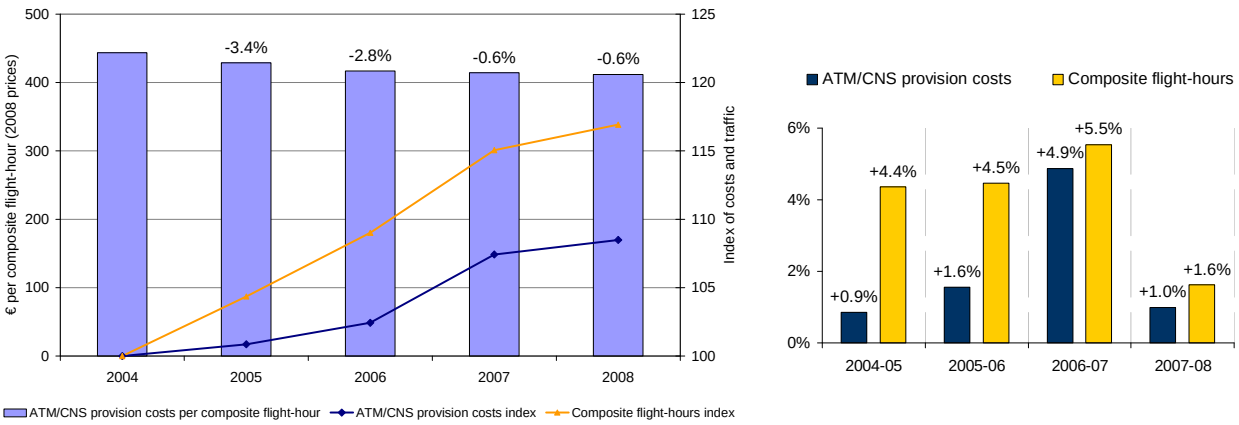

Figure 6.4: Changes in financial cost-effectiveness KPI (2004-2008, real terms)

At European system level, there has been an overall rise in cost-effectiveness, with the unit cost indicator falling by -7.2% over the period in real terms. However, Figure 6.4 indicates that, after two years of marked reductions in 2005 and 2006, unit costs remained fairly constant in 2007 and 2008. This means that in real terms, 2008 unit costs are close to 2006 levels. It should be noted that in nominal terms, unit ATM/CNS provision costs increased by some +4% between 2004 and 2008, given that at European system level, price indexes increased by +11%.

In 2007, the substantial increase in traffic volumes (i.e. +5.5%) was nearly matched by an increase in ATM/CNS provision costs (i.e. +4.9%). The story is rather different in 2008 since a much lower traffic increase (i.e. +1.6%) was accompanied by a small increase in ATM/CNS provision costs (i.e. +1.0%). The substantial rise in costs in 2007 was largely associated with substantial costs increases in large ANSPs.

The lower ATM/CNS provision costs increase in 2008 may be due to the fact that at the end of 2007, ANSPs were anticipating a traffic downturn resulting from high fuel prices and therefore implemented measures to contain costs in order to reduce the impact of the traffic downturn on airspace users. As it turned out, following the global economic crises a more substantial traffic downturn happened in 2008.

The fall in the real unit costs for Europe as a whole was accompanied by a reduction in the top quartile, while in the bottom quartile, unit costs remained fairly constant over the period.

This suggests that significant cost-effectiveness improvements were achieved by ANSP starting from high unit costs in 2004. Conversely, unit costs reductions might have been more difficult to achieve for ANSPs starting from a lower base in 2004, especially in a context of weak traffic growth in 2008.

Overall, the trends shown in Figure 6.5 indicate a degree of convergence in cost-effectiveness across ANSPs .

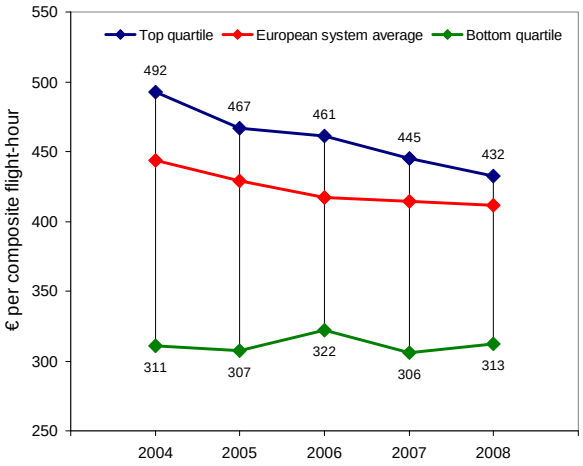

Figure 6.5: Cost-effectiveness improvement (2004-2008, real terms)

The contribution to this trend from individual ANSPs is described in Section 6.4 and Figure 6.6 below.

6.4 Changes in financial cost-effectiveness at ANSP level (2004-2008)

Figure 6.6 below shows that the fall in unit ATM/CNS provision costs for Europe as a whole (-7.2%) masks changes in different directions in individual ANSPs. Between 2004 and 2008, unit costs fell for 26 out of 33 ANSPs.

Among the largest five ANSPs, constituting 60% of ATM/CNS provision costs in 2008, unit costs fell in real terms for DSNA (-2%), DFS (-17%), ENAV (-11%) and NATS (-2%). On the other hand, unit costs rose for Aena (+7%), despite benefiting from traffic growth of +17% during the 2004-2008 period.

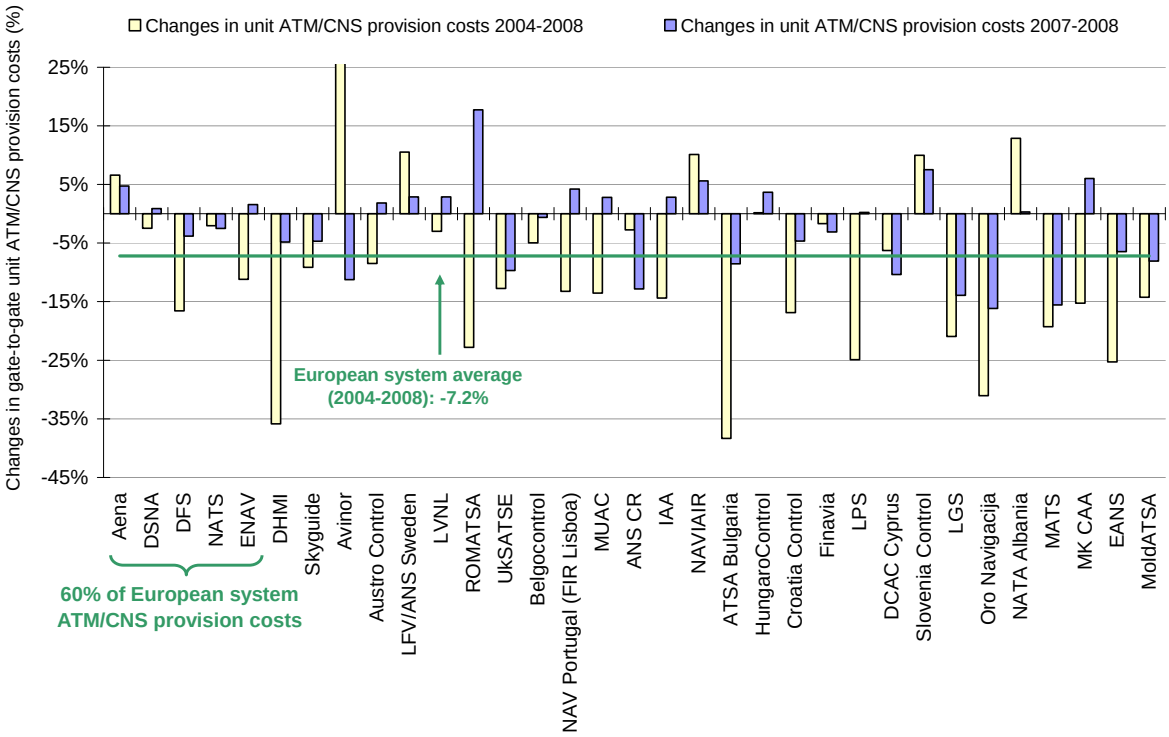

Figure 6.6: Changes in gate-to-gate ATM/CNS provision costs per composite flight-hour, 2004-2008 (real terms)

Figure 6.6 also shows changes in unit ATM/CNS provision costs between 2007 and 2008 (see blue bars). For some ANSPs, the short-term change (2007-2008) significantly differs from the medium-term trend (2004-2008).

Among the five largest ANSPs, unit costs rose slightly in 2008 for ENAV (+2%) and DSNA (+1%). This contrasts with the falls in unit costs observed for these two ANSPs over the 2004-2008 period. It should be noted that the financial difficulties of Alitalia in 2008 had a negative impact on the traffic growth for ENAV. Similarly, the downward trend in unit costs over the five-year period is reversed in 2008 for Austro Control, LVNL, ROMATSA, NAV Portugal, IAA, MUAC and MK CAA. This may indicate that unit costs reductions are becoming more and more difficult to maintain for these ANSPs.

As for the European indicator, the change in each ANSP's cost-effectiveness indicator can be broken down into a "cost effect" and a "traffic effect". This is shown in Figure 6.7 below.

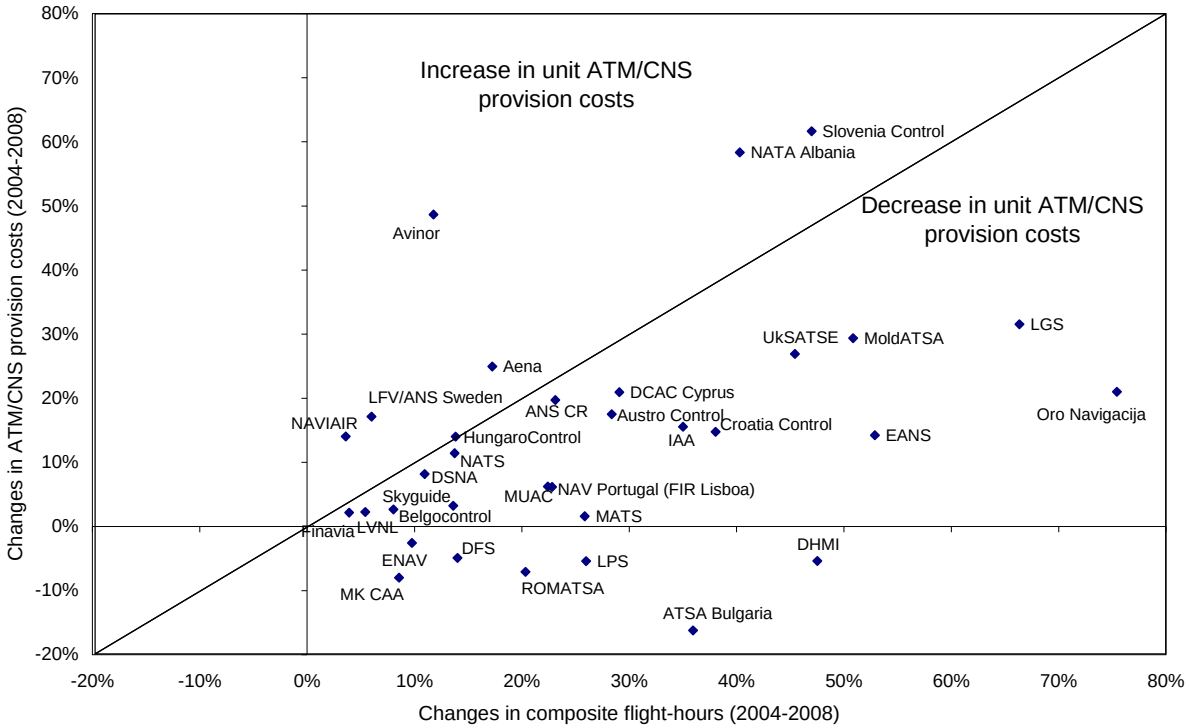

Figure 6.7: Changes in ATM/CNS provision costs and traffic volumes (2004-2008)

For seven ANSPs, ATSA Bulgaria, DHMI, ENAV, LPS, MK CAA, DFS and ROMATSA, the total ATM/CNS provision costs have fallen in real terms despite an increase of traffic. A clear indication of tighter cost control there. For many ANSPs, costs have risen, but this rise has been outweighed by the growth in demand, so unit costs have fallen.

In some cases, notably Avinor, NAVIAIR, LFV/ANS Sweden, Slovenia Control, NATA Albania and Aena, the rise in costs outweighed the increase in demand, leading to reduced financial cost-effectiveness.

More details in the changes in cost-effectiveness for individual ANSPs are reported in Part IV of this report.

6.5 Changes in the components of financial cost-effectiveness (2004-2008)

This section compares changes in the components of financial cost-effectiveness between 2004 and 2008 for the 33 ANSPs that have reported ACE data consistently since 2004.

Year-on-year changes that can be observed in the charts could be due to:

- genuine changes in performance;
- changes in ANSPs data reporting; and,
- known errors that were made in data submissions in earlier years and identified during the extensive data validation process carried out by the PRU. Where possible the PRU has made retrospective adjustments to ensure data consistency.

The maturity in reporting has improved since 2004. Some, but not all, ANSPs have been able to revise their 2004-2007 data to be consistent with the data definitions used in 2008. Therefore some caution is needed with the interpretation of these comparisons, since the results can be affected by changes in data reporting.

As more data is now becoming available, the time series analysis is becoming more robust and is able to better account for the typical business/investment cycle for each ANSP. A five-year period forms a solid basis to derive medium-term trends.

6.5.1 Changes at European system level (2004-2008)

Figure 6.8 shows how the various component ratios have contributed to the overall unit cost reduction of -7.2% at European level:

- The left-hand side indicates that the increase in ATCO employment costs (+21.3%) was greater than the increase in ATCO-hour productivity (+12.7%). This resulted in higher ATCO employment costs per composite flight-hour (+7.6%);
- The right-hand side indicates that support costs rose (+2.1%), but that this was outweighed by substantial traffic growth (+16.9%), resulting in a fall in the support costs per composite flight-hour (-12.7%);
- The central part shows that, given the weights of ATCO costs (31%) and support costs (69%), the overall unit costs fell (-7.2%).

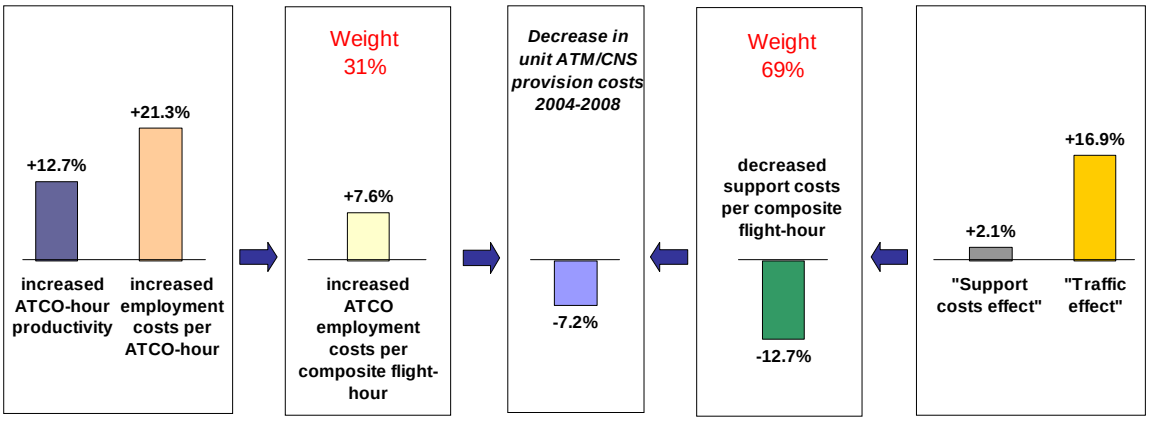

Figure 6.8: Breakdown of changes in financial cost-effectiveness, 2004-2008 (real terms)

The substantial fall in unit support costs has outweighed the increase in unit ATCO employment costs.

The following sections provide an analysis of the changes in the three main components of the cost-effectiveness KPI: ATCO-hour productivity (Section 6.5.2), ATCO employment costs per ATCO-hour (Section 6.5.3), and support costs per composite flight-hour (Section 6.5.4).

6.5.2 Changes in ATCO-hour productivity at ANSP level (2004-2008)

For the 33 ANSPs for whom data has been consistently available, there has been a +12.7% improvement in productivity since 2004, resulting from +16.9% more traffic being served by only +3.8% more ATCO-hours.

The productivity increase at European system level was accompanied by an increase in both top and bottom quartiles (see Figure 6.9).

This indicates that the rise at European level reflects not just improvements in a minority of ANSPs but rather a more general trend of ATCO-hour productivity improvements across ANSPs.

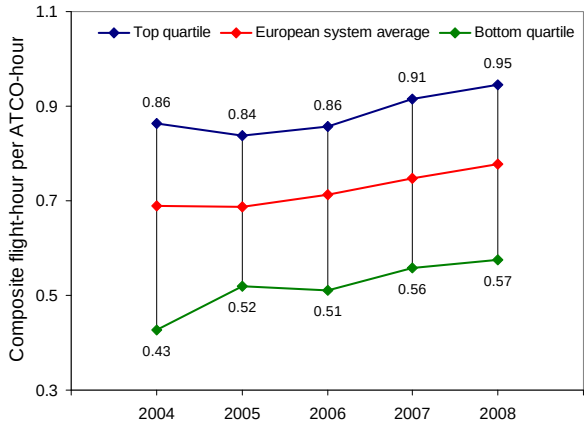

Figure 6.9: Improvement in ATCO-hour productivity (2004-2008)

Figure 6.10 shows the changes in ATCO-hour productivity for each ANSP, between 2004 and 2008 (yellow bars) and between 2007 and 2008 (blue bars). It also shows the ATCO-hour productivity achieved in 2004 (blue dots).

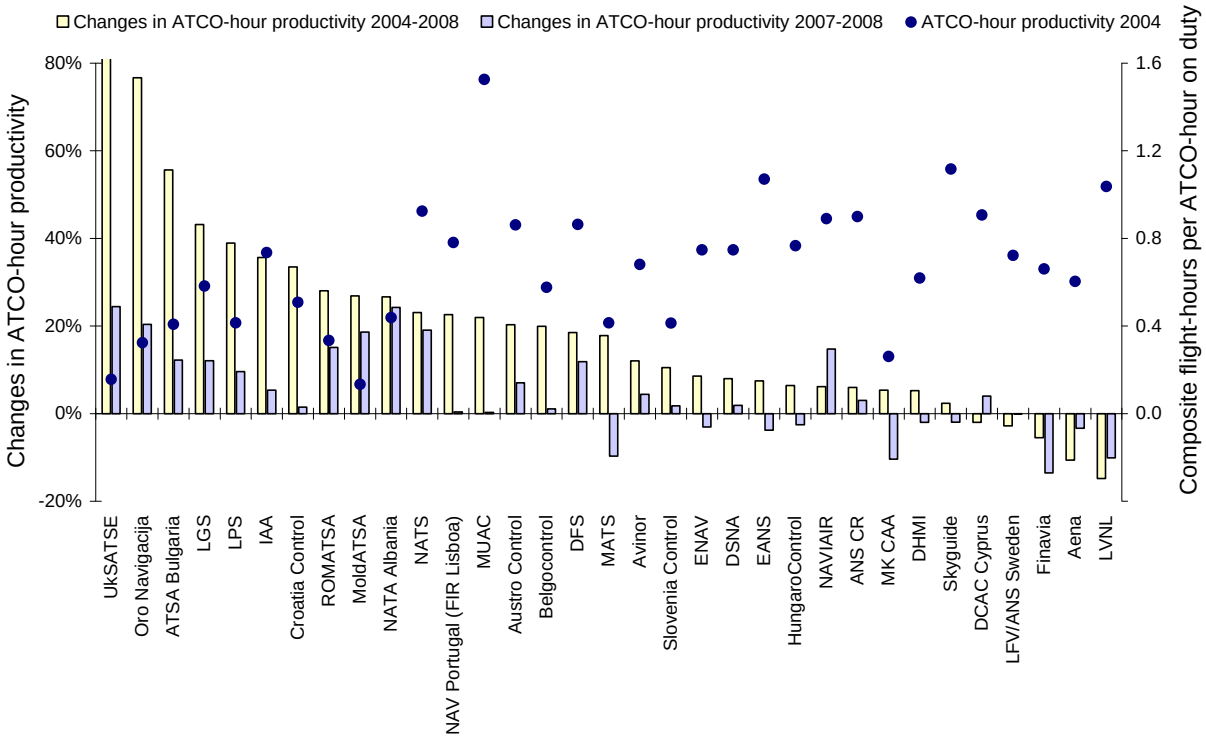

Figure 6.10: Trends in ATCO-hour productivity at ANSP level (2004-2008 and 2007-2008)

Between 2004 and 2008, ATCO-hour productivity rose for 28 out of 33 ANSPs. This arises mainly from high traffic growth and more effective use of spare capacity and existing resources. However, in the same period, ATCO-hour productivity fell for five ANSPs.

Strong productivity increases were achieved by small Central and Eastern Europe ANSPs benefiting from high traffic growth (see the left-hand side of Figure 6.11) and more effective

use of spare capacity and existing resources. However, significant improvements in productivity were also achieved by some ANSPs which started from a higher base in 2004 (IAA, NATS[72], NAV Portugal, MUAC, Austro Control and DFS).

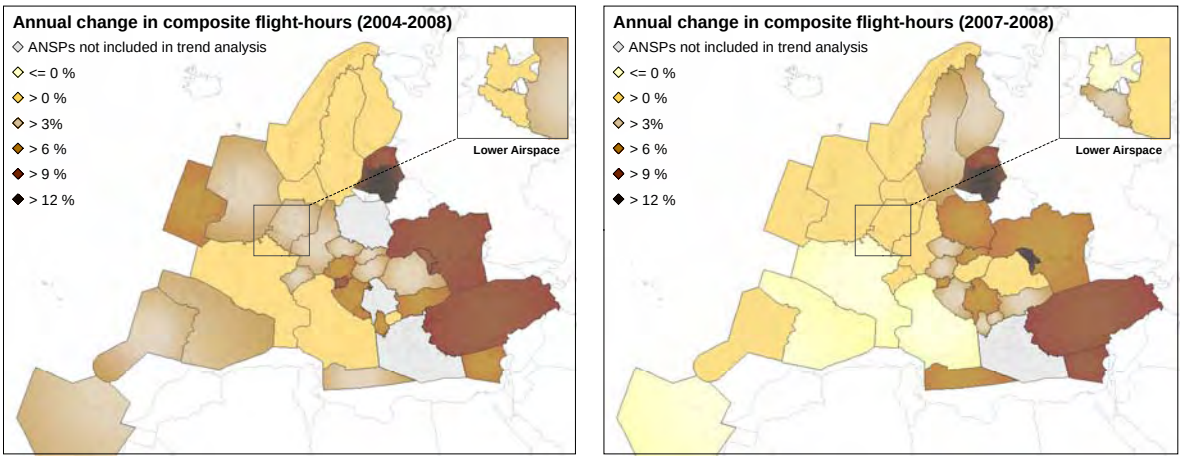

Figure 6.11: Traffic growth for the medium-term (2004-2008) and for the short-term (2007-2008)

The right-hand side of Figure 6.11 shows that in 2008 traffic growth was negative for Aena, DSNA, ENAV and LVNL. Achieving productivity improvements in a context of declining traffic is going to be a challenge. It will require a critical review of managing overtime and more effective use of the ATCO-hours on duty.

ATCO productivity is affected by a number of factors:

- Advanced ATM systems, tools and procedures, with increased ATM system functionality and reliability, allowing greater ATCOs confidence in using them.
- Flexible deployment of operational staff to meet demand through the optimisation of roster cycles and the use of overtime. Manning per sector and rating policies have an impact on the flexibility to change the sector configuration and to adapt to changes in operational conditions.
- Operational concepts and processes affecting the airspace and sector designs, the ASM, ATFM and ATFCM processes and the civil/military arrangements.
- Adequate combination of technical, human and managerial tools such as training, and willingness to work flexibly.
- Enhancement of the cooperation with other ANSPs to achieve synergies (e.g. cross border sectorization and rating).

In order to understand what is behind productivity changes in the period 2004-2008, the change in each ANSP's productivity indicator has been broken down in Table 6.1 below, into a traffic volume effect and an ATCO-hours effect.

[72] The increase in ATCO-hour productivity for NATS in 2008 is mainly due to a change in the methodology to report ATCO working hours in the ACE data submission.

ANSPs	Country	(A) Changes in ATCO-hour productivity 2004-2008	(B) "Traffic effect"	(C) "ATCO-hour effect"
UkSATSE	UA	121%	45%	-34%
Oro Navigacija	LT	77%	75%	-1%
ATSA Bulgaria	BG	56%	36%	-13%
LGS	LV	43%	66%	16%
LPS	SK	39%	26%	-9%
IAA	IE	36%	35%	0%
Croatia Control	HR	33%	38%	3%
ROMATSA	RO	28%	20%	-6%
MoldATSA	MD	27%	51%	19%
NATA Albania	AL	27%	40%	11%
NATS	UK	23%	14%	-8%
NAV Portugal (FIR Lisboa)	PT	23%	22%	0%
MUAC		22%	23%	1%
Austro Control	AT	20%	28%	7%
Belgocontrol	BE	20%	8%	-10%
DFS	DE	18%	14%	-4%
MATS	MT	18%	26%	7%
Avinor	NO	12%	12%	0%
Slovenia Control	SI	11%	47%	33%
ENAV	IT	9%	10%	1%
DSNA	FR	8%	11%	3%
EANS	EE	8%	53%	42%
HungaroControl	HU	6%	14%	7%
NAVIAIR	DK	6%	4%	-2%
ANS CR	CZ	6%	23%	16%
MK CAA	MK	5%	9%	3%
DHMI	TR	5%	48%	40%
Skyguide	CH	2%	14%	11%
DCAC Cyprus	CY	-2%	29%	32%
LFV/ANS Sweden	SE	-3%	6%	9%
Finavia	FI	-6%	4%	10%
Aena	ES	-11%	17%	31%
LVNL	NL	-15%	5%	24%
Total European System (33 ANSPs)		12.7%	16.9%	3.8%

Positive values in column (A) mean that productivity improved between 2004 and 2008.

Positive values in column (B) mean that traffic volumes rose between 2004 and 2008.

Positive values in column (C) mean that the number of ATCO-hours rose between 2004 and 2008.

Productivity improves if traffic grows more than the increase in hours worked.

For example: DFS's 2008 productivity is +18% better than in 2004 because the traffic rose by +14% while the number of recorded ATCO-hours decreased by -4%.

Note: By mathematical construction, the % variation in productivity (A) can be approximated as the difference between the "traffic effect" (B) and the "ATCO-hour effect" (C). The larger the % variations, the less accurate the approximation. This explains why in some cases (A) is not exactly equal to (B) - (C).

Table 6.1: Changes in ATCO-hours on duty and traffic volumes (2004-2008)

This table suggests that the largest increases in productivity are likely to arise from serving increased traffic with the same or a reduced number of ATCOs, although in some of the cases the number of ATCO-hours has risen, but not as fast as traffic growth. Altered ATCO-hour numbers could arise from:

- Changes in the number of FTE ATCOs in OPS (caused by such factors as newly licensed ATCOs, normal retirement, activation of an early retirement scheme);
- Changes in the number of hours on duty, through:
  - Modification of the contractual working hours following a new labour agreement;
  - Changes in the number of hours not on duty (for example, through an increase in average sickness or in refresher training time); or,
  - Changes in overtime (where applicable).

It is possible that some of the ANSPs showing particularly large productivity changes have recorded ATCO-hours on duty inconsistently across the years. The figures for ATCO-hours on duty are often estimated figures, or figures used for planning purposes, which could deviate from actual hours on duty. This is an area where the revised SID (version 2.6) is expected to bring further clarity and enhance comparability (see Section 1.3).

Changes in ATCO-hour productivity should also be seen in the context of changes in ATCO-hour employment costs, as discussed in Section 6.5.3 below.

6.5.3 Changes in ATCO employment costs at ANSP level (2004-2008)

For Europe as a whole, ATCO employment costs per ATCO-hour rose by +21.3% in real terms between 2004 and 2008 (a yearly increase of +4.9%). Figure 6.12 shows the changes for each ANSP between 2004 and 2008 (yellow bars), and between 2007 and 2008 (blue bars).

Between 2004 and 2008, ATCO employment costs per ATCO-hour rose for 29 out of 33 ANSPs; in one ANSP this increase was more than 50%. Some of the ANSPs showing the highest increases were starting from a low base in 2004 – see orange dot in Figure 6.12.

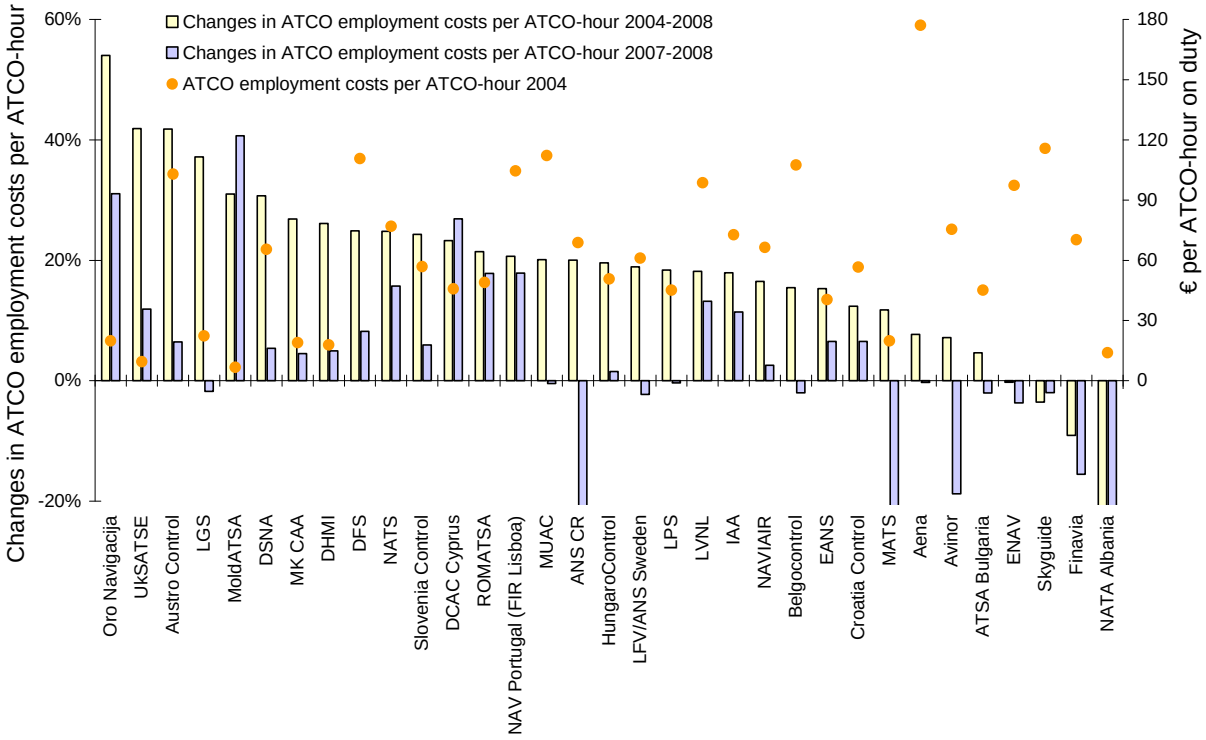

Figure 6.12: Changes in ATCO employment costs per ATCO-hour, 2004-2008 (real terms)

The convergence of unit employment costs between Central and Eastern European economies and Western Europe, because of deepening economic interaction and enhanced labour mobility appears to be continuing. Figure 6.12 indicates that ATCO employment costs per ATCO-hour also substantially increased for Austro Control (+42%), DFS (+25%), NAV Portugal (FIR Lisboa) (+21%) and MUAC (+20%) despite employment costs above the top quartile in 2004. The significant increases in ATCO employment costs for DSNA (+31%) and NATS (+25%) are also noteworthy.

Employment costs are typically subject to complex bargaining agreements between management and staff which usually are embedded into a collective agreement. The duration of the collective agreement, the terms and methods for renegotiation greatly vary across ANSPs. In many cases salary conditions are negotiated every year.

Employment costs can be profoundly affected by pension arrangements, and particularly whether the pension scheme is defined benefit or defined contribution. In recent years there has been increasing recognition that traditional methods of accounting for the costs of providing for future pensions tend to under-represent costs. New methods, now mandated

by IFRS, make a fairer provision for these costs. In the cases where this has been fully applied, recognition of the true costs has resulted in very substantial increases in employment costs, as well as exceptional costs. The impact of this is likely to spread as it is recognised in more and more ANSPs.

Figure 6.13 compares changes in ATCO-hour productivity and employment costs between 2004 and 2008. Over time[73], it is expected that changes in unit ATCO employment costs be increasingly linked to improvements in productivity. When ATCO employment costs per ATCO-hour rise more than productivity, then, all other things being equal, cost-effectiveness falls. In fact, in several cases, employment costs per ATCO-hour rose by far more than ATCO-hour productivity.

Although some caution is needed with the interpretation of these comparisons, since the results can be affected by changes in data reporting, they are nevertheless informative.

Figure 6.13 shows that in some cases, there have been large increases in ATCO employment costs per ATCO-hour accompanied by much smaller increases or decreases in productivity (this is particularly the case of Aena, Austro Control, ANS CR, DCAC Cyprus, DSNA, DHMI, HungaroControl, LFV/ANS Sweden, LVNL, MK CAA, Slovenia Control and NAVIAIR).

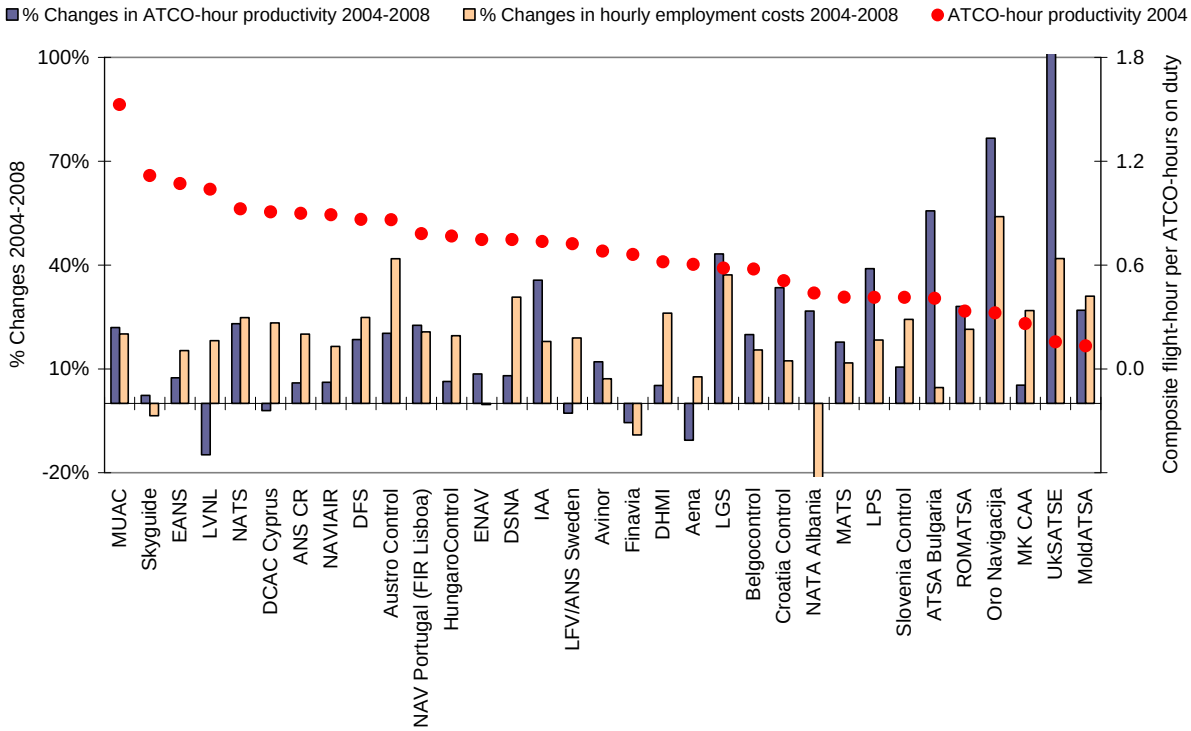

Figure 6.13: Changes in ATCO productivity and employment costs, 2004-2008 (real terms)

Employment costs for ATCOs in OPS represent on average a third of the total ATM/CNS provision costs. Therefore, when planning staff and renegotiating contracts, it is important for ANSPs to effectively manage the employment costs of ATCOs in OPS and to set quantitative objectives for ATCO productivity. This typically entails defining and optimizing arrangements to adapt rosters, shift times and sector opening times to traffic demand patterns and to effectively make use of overtime.

More details on changes in ATCO-hour productivity and ATCO employment costs for individual ANSPs are reported in Part IV of this report.

[73] Typically medium-term, especially for multi-annual collective agreements (e.g. 4 years).

6.5.4 Changes in support costs per composite flight-hour (2004-2008)

Figure 6.8 showed that the fall in unit ATM/CNS provision costs at European level is mainly caused by a fall in unit support costs (-12.7%).

It is therefore worthwhile to examine in more detail what lies behind the fall in support costs. Figure 6.14 below shows how the -12.7% fall in support costs per composite flight-hour was made up. For Europe as a whole, reductions in all three components contributed to the overall reduction in support costs per composite flight-hour[74]. This is shown in the left-hand-side of Figure 6.14. The right-hand-side indicates that the fall in support costs per unit output arises from the combination of growth in traffic (+16.9%) while overall support costs remained rose in real terms (+2.1%). This is consistent with expectations of scale effects; support costs are generally fixed costs, and therefore will not rise proportionally with traffic volumes.

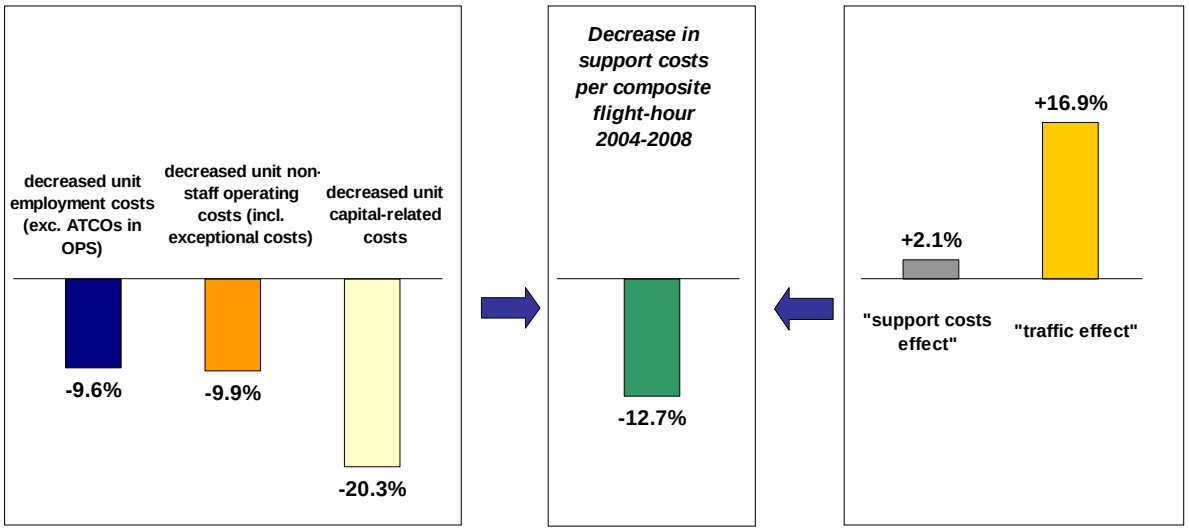

Figure 6.14: Changes in the components of support costs per composite flight-hour, 2004-2008 (real terms)

The fall in support costs per composite flight-hour for Europe as a whole was mostly accompanied by a fall in the top quartile while the bottom quartile remained fairly constant during the period (see Figure 6.15).

More detailed analysis below shows that the decrease observed at European system level is not just driven by significant improvements in a minority of ANSPs which started from a higher base in 2003, but rather reflects a more general trend of falling unit support costs across ANSPs.

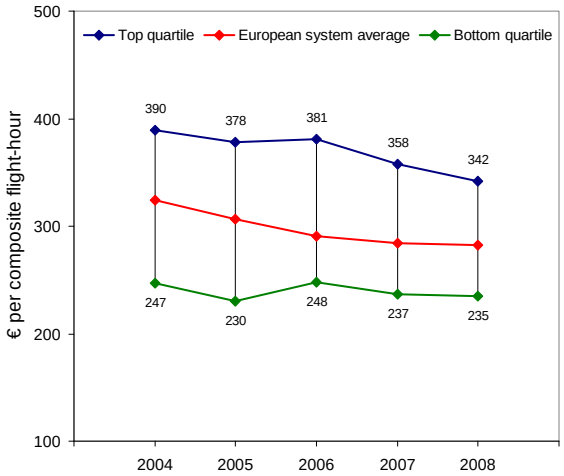

Figure 6.15: Improvement in support costs per composite flight-hour (2004-2008, real terms)

Figure 6.16 displays the changes in unit support costs for each ANSP between 2004 and 2008 (yellow bars). Unit support costs fell for 28 ANSPs, and for four ANSPs the fall was

[74] Note that, whilst the values of these components in any one year can be added to give the value for overall support costs, the percentage changes in the components are not additive.

more than 30% (ATSA Bulgaria, DHMI, EANS and Oro Navigacija). On the other hand, increases in unit support costs larger than 20% are observed for Avinor.

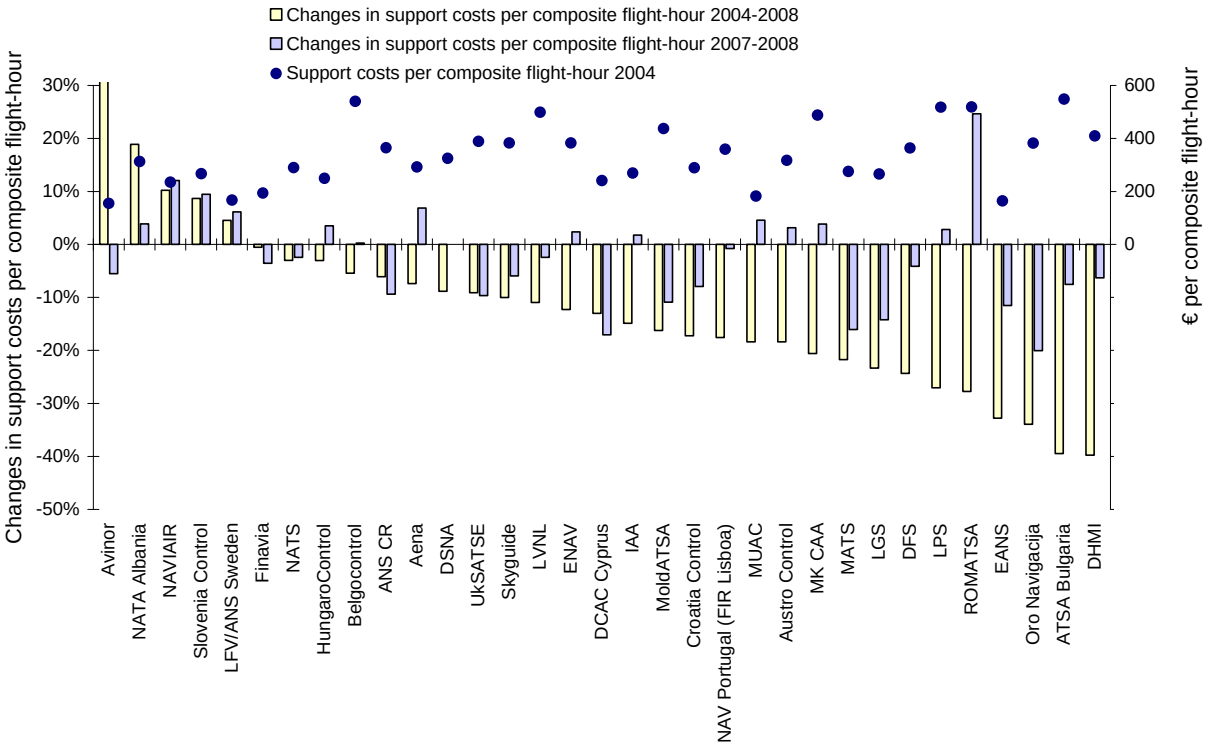

Figure 6.16: Change in support cost per composite flight-hour at ANSP level, 2004-2008 and 2007-2008 (real terms)

Support costs are made of non-ATCO employment costs, non-staff operating costs and capital-related costs. A number of factors have an impact on these costs:

Non-ATCO employment costs can be affected by:

- Outsourcing of non-core activities such as maintenance of technical equipment, professional training could transfer costs from this category to non-staff costs.
- Research and development policies may involve ATM systems either being developed in-house, on the one hand, or purchased off-the-shelf, on the other. In principle, either solution could lead to the most cost-effective outcome, depending on circumstances; this would depend on whether there were, for example, significant economies of scale, or major transaction costs.
- Arrangements relating to the collective agreement and the pension scheme for non-ATCOs.

Non-staff operating costs can be affected by:

- The terms and conditions for renegotiation of contracts for outsourced activities.
- Enhancement of the cooperation with other ANSPs to achieve synergies in the context of a FAB (sharing training of ATCOs, joint maintenance, and other matters).

Capital-related costs can be affected by:

- The extent of the investment programme.
- Accounting life of the assets.
- The degree to which assets are owned or rented.

There are trade-offs among all the components of support costs. For example, outsourcing maintenance activities will reduce non-ATCO in OPS staff costs but increase non-staff operating costs. Similarly, renting rather than owning an asset will reduce capital-related costs but increase non-staff operating costs. Each ANSP should seek opportunities for change and evaluate them rigorously, taking into account all elements of support costs.

Table 6.2 shows the changes in the various components of support costs for individual ANSPs. The right-hand-part of Table 6.2 shows how the three components of support costs per unit of output (employment costs for "support" staff, non-staff operating costs (including exceptional costs) and capital-related costs) have changed over time for individual ANSPs.

ANSPs	Country	Changes in support costs per composite flight-hour 2004-2008	Unit staff costs (exc. ATCOs in OPS) 2004-2008	Non-staff operating unit costs (incl. exceptional costs) 2004-2008	Unit capital related costs 2004-2008
Avinor	NO	59.7%	231%	31%	-36%
NATA Albania	AL	18.9%	36%	34%	5%
NAVIAIR	DK	10.2%	27%	50%	-38%
Slovenia Control	SI	8.7%	42%	26%	-41%
LFV/ANS Sweden	SE	4.5%	-8%	0%	44%
Finavia	FI	-0.5%	30%	-29%	11%
NATS	UK	-3.0%	-5%	29%	-25%
HungaroControl	HU	-3.1%	0%	-14%	8%
Belgocontrol	BE	-5.4%	-13%	0%	23%
ANS CR	CZ	-6.1%	4%	-25%	-2%
Aena	ES	-7.4%	-15%	-12%	10%
DSNA	FR	-8.9%	0%	0%	-34%
UkSATSE	UA	-9.1%	26%	-16%	-45%
Skyguide	CH	-10.0%	-16%	-32%	40%
LVNL	NL	-11.0%	-15%	57%	-50%
ENAV	IT	-12.3%	-10%	-27%	9%
DCAC Cyprus	CY	-13.0%	-65%	16%	-7%
IAA	IE	-14.9%	-6%	-26%	-12%
MoldATSA	MD	-16.2%	-3%	-51%	0%
Croatia Control	HR	-17.2%	-28%	-36%	79%
NAV Portugal (FIR Lisboa)	PT	-17.6%	-9%	-27%	-39%
MUAC		-18.4%	-19%	-18%	-17%
Austro Control	AT	-18.4%	-12%	-18%	-31%
MK CAA	MK	-20.6%	102%	-44%	-53%
MATS	MT	-21.7%	-36%	-18%	-1%
LGS	LV	-23.3%	-9%	-47%	-5%
DFS	DE	-24.3%	-32%	1%	-27%
LPS	SK	-27.0%	-6%	-42%	-32%
ROMATSA	RO	-27.8%	16%	-44%	-50%
EANS	EE	-32.8%	-21%	-12%	-49%
Oro Navigacija	LT	-33.9%	-31%	-11%	-49%
ATSA Bulgaria	BG	-39.5%	-29%	-60%	-39%
DHMI	TR	-39.8%	-29%	-31%	-52%
Total European System (33 ANSPs)		-12.7%	-9.6%	-9.9%	-20.3%

Table 6.2: Breakdown of changes in unit support costs, 2004-2008 (real terms)

Over the period, unit support costs fell for the five largest ANSPs. Except DSNA, all were able to significantly reduce non-ATCO staff employment costs per unit output, the largest component of support costs (46%). This was achieved in a context of traffic growth ranging from +10% for ENAV up to +17% for Aena.

Except for NATS, these falls were mainly caused by a reduction in the number of non-ATCO staff, as illustrated in Figure 6.17.

The largest reductions in the non-ATCO workforce were achieved by:

- DSNA: 635 fewer FTEs (-9.5%).
- ENAV: 230 fewer FTEs (-12.9%).

Except for ENAV, the number of ATCOs in OPS of the five largest ANSPs has gradually risen.

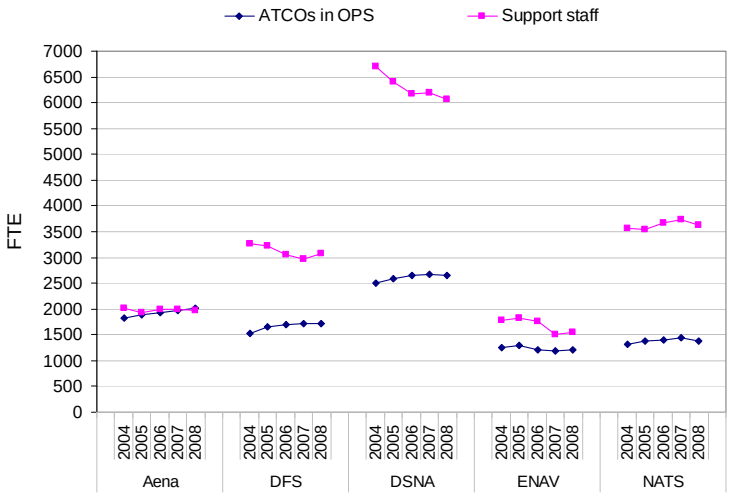

Figure 6.17: Changes in ATCOs in OPS and "support" staff for the five largest ANSPs

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7 FORWARD-LOOKING FINANCIAL COST-EFFECTIVENESS (2009-2013)

7.1 Introduction

Besides the disclosure of 2008 data, the SID requires ANSPs to report five years forward-looking data on plans and projections of traffic demand, costs, staff, capital expenditure and ATC capacity.

The objective of this chapter is to aggregate ANSP forward-looking plans and projections in order to assess the cost-effectiveness of the European ATM system as a whole over the 2009-2013 period. Additional details for each ANSP are provided in Part IV of this Report.

Unfortunately, several ANSPs did not provide complete forward-looking data covering the 2009-2013 period limiting the ability to compute the forward-looking gate-to-gate financial cost-effectiveness KPIs until 2013, and/or the factors affecting future economic performance, namely the planned capital expenditures (capex) and the planned staff and capacity. The maps displayed in Figure 7.1 show the status of data submission to compute the gate-to-gate ATM/CNS provision costs per composite flight-hour[75].

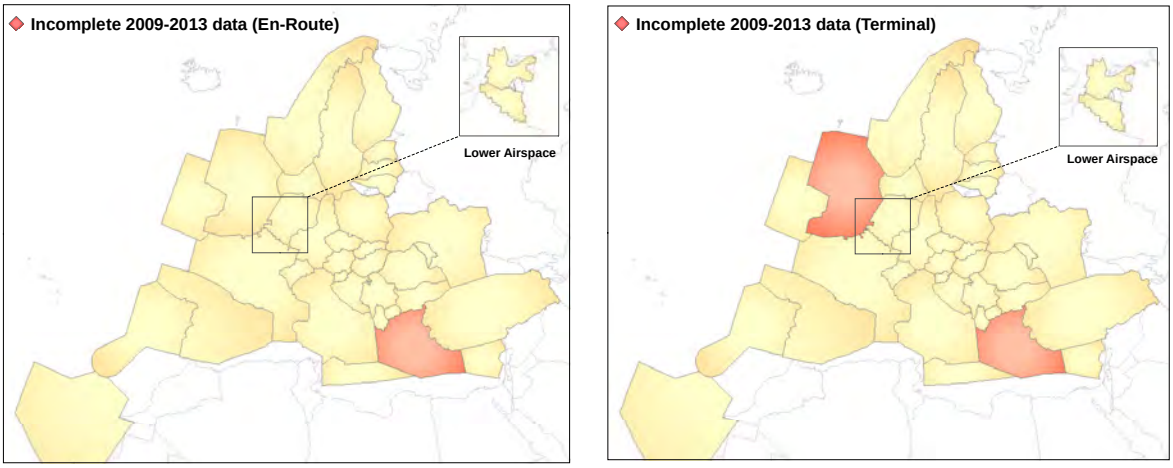

Figure 7.1: Status of ANSPs planned costs and traffic data submission

The production of realistic and complete plans is an important element of ANSPs' performance. Disclosure of complete and consistent forward looking plans is certainly an area where there is still room for improvement. In addition, EC Regulation 2096/2005 (20 December 2005) on Common Requirements for provision of ANS (which requires ANSPs to produce a Business Plan covering a minimum period of five years and comprising performance objectives in terms of cost-effectiveness) and the recent EC Regulation 070/2009 on SES II (21 October 2009) in respect to the Performance Scheme should effectively contribute to enhance the level of maturity of ANSPs planning processes.

7.2 Forward-looking financial cost-effectiveness at European system level

This section describes the aggregate situation for the 34 ANSPs that consistently reported planned gate-to-gate forward-looking information until 2013 (see Figure 7.1), but also takes into account the planned en-route data provided by NATS. For this reason, the gate-to-gate unit ATM/CNS provision cost reported in Figure 7.2 for 2008 (i.e. €412 per composite flight-

[75] HCAA did not provide complete planned costs, nor output data for en-route and terminal ANS. NATS was not in a position to provide the **terminal** ANS-related data (see right-hand side of Figure 7.1) on the grounds that such information is "commercial in confidence" even if it remains at an aggregated level.

hour) slightly differs from the figure presented in Chapter 5 (i.e. €407 per composite flight-hour).

Figure 7.2: Forward-looking cost-effectiveness at European system level (2008-2013, real terms)

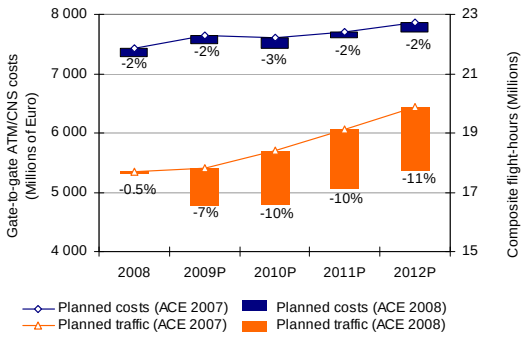

Figure 7.3: Changes in planned costs and traffic at European system level (2008-2012, real terms)

At European system level, between 2008 and 2013, real costs are planned to rise by +8% while traffic is expected to increase by +4%, resulting in an increase in real unit ATM/CNS provision costs of +4% (i.e. an average annual increase of +0.7%). This profile significantly differs from previous years plans (i.e. -0.4% yearly average fall in unit costs, between 2007 and 2012).

Actual 2008 unit costs were -2% lower than planned in ACE 2007 for the year 2008 (see Figure 7.3). This is mainly because 2008 actual ATM/CNS provision costs were -2% lower than planned, while actual traffic was in line with the forecast. All else equal, this means that the actual 2008 unit costs are lower than projected in ACE 2007 plans.

Unit ATM/CNS provision costs are then planned to increase by +10% in real terms between 2008 and 2009 (see Figure 7.2). This is the result of a planned increase in ATM/CNS provision costs of +3% in 2009 in real terms, against a planned decrease of traffic of -6%. Clearly, this diverging trend between, on the one hand, an increasing cost base and, on the other hand, a sharp decrease in traffic will significantly affect the 2009 cost-effectiveness performance. As it can be observed in Figure 7.3, the plans in ACE 2008 for the year 2009 show a significant downwards revision of 2009 traffic compared to the plans in ACE 2007 (-7%), while the 2009 costs which were planned to increase in the ACE 2007 plans, have been revised downwards (-2%) in ACE 2008, but nevertheless remain set to increase.

A majority of ANSPs is planning to implement a number of cost containment measures for the years 2009 and 2010 (see Table 7.1 below). These measures certainly contribute to the -2% revision of planned costs for 2009 and -3% for 2010 compared to ACE 2007 plans (some €370M in the two years).

A number of these measures (in the blue column on the left) are not directly focused on costs reduction, but rather on reducing or stabilizing the unit rate that will be charged to airspace users. Across the board measures for ANSPs include critical reviews of plans, and reviews of processes to identify areas of potential savings. Given the severe economic downturn, it is important that these planned cost-containment measures materialise into genuine cost-savings for airspace users for 2010 and subsequent years.

Cross-subsidies and transfers	ATCO productivity	ATCO employment costs	Other operating costs	Capital-related costs
ANSP seeks additional revenue for inadequately funded services State funds specific elements of the cost base Use stabilisation fund or other reserves to smooth unit rate fluctuations Reduced requirement for return on State-owned equity	Improved shift planning	Enhanced management of overtime Change pension scheme for new recruits Increase retirement age	Review staffing needs for support functions Pay freeze for top executives Postpone recruitment Curtail travel Postpone training	Review property needs. Sell surplus assets. Improved procurement processes Extend life of technical systems Review investment plan

Across-the-board areas of improvement for ANSPs	
Critical review of plans Critical review of operational processes Rationalise ACCs and other operational units	Seek improvements through cooperation (FABs) More rigorous budgetary control

Table 7.1: Summary of cost-containment measures

Overall, a lack of reactivity to adjust the cost base in line with the sharp 2009 traffic decrease is observed. Due to the fixity of costs in the short term this can be conceivable. From 2011 onwards, traffic growth is expected to resume at a pace of +3% per year. Since costs are also planned to increase, unit costs are planned to remain well above 2008 levels until 2013. The challenge for ANSPs in the coming years will be to reverse this increasing unit costs trend and adapt to reduced traffic growth, by controlling and adjusting costs, while retaining the flexibility to deal with traffic levels that will return when growth is restored.

7.2.1 Changes in planned unit ATM/CNS provision costs at ANSP level

The overall trend in planned ATM/CNS unit cost at European level (see graph in Figure 7.2) is not uniform across Europe. Planned changes in real ATM/CNS unit costs at ANSP level for the period 2008-2013 are displayed in Figure 7.4 for the 35 ANSPs that reported planned unit ATM/CNS provision costs until 2013.

Unit costs are planned to rise for 17 ANSPs, which represents a more pessimistic situation compared with last year's plan, when the real unit costs were planned to increase for 15 ANSPs. Moreover, these increases are mostly driven by a rise of the ATM/CNS provision costs, rather than a decrease in traffic. Significant increases are expected for 8 ANSPs, which plan unit costs increases higher than +15%

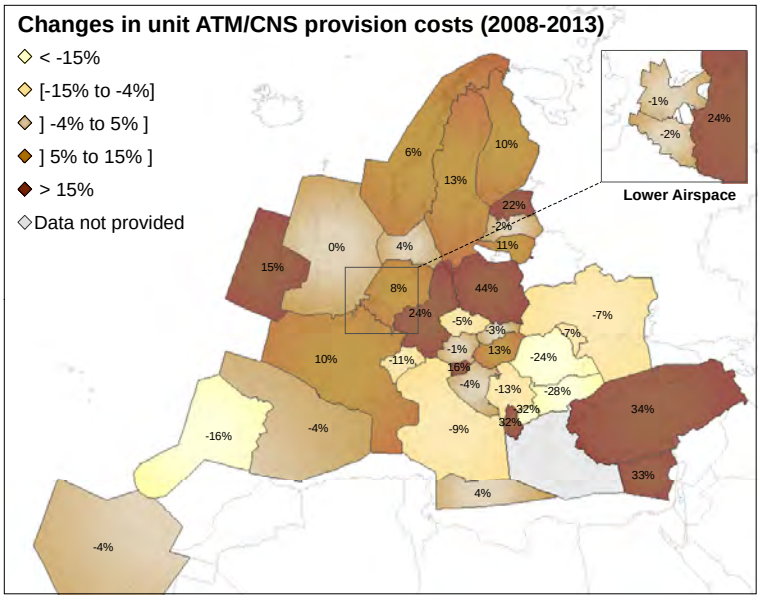

Figure 7.4: ANSPs planned changes in gate-to-gate unit costs (2008-2013, real terms)

On the other hand, 18 ANSPs are planning reductions in unit costs between 2008 and 2013.

This is particularly the case for MK CAA (-32%), ATSA Bulgaria (-28%) and ROMATSA (-24%).

Amongst the five largest ANSPs, real unit costs increases are planned for DSNA and DFS between 2008 and 2013. While NATS plans to maintain the unit costs constant in real terms, ENAV and Aena plan for a decrease over the period.

Changes in planned unit costs are further examined at ANSP level in Part IV of this Report, where more detailed projections are analysed.

7.3 Changes in fixed assets and capital expenditure (capex)

Figure 7.5 shows the proportion of fixed assets which are in operation and the average remaining accounting life of the asset base, for the ANSPs that consistently reported information on the net book value (NBV) of their fixed assets, between 2004 and 2008. The share of assets under construction continuously fell from 24% in 2004 to 20% in 2006 and remained fairly stable in 2007 and 2008.

The value of the assets under construction in 2008 amounts to some €1 417M at European system level, a value which is of the same order of magnitude as the 2008 capex. Among the five largest ANSPs, NATS and ENAV are those with the largest share of assets under construction (34% and 31% respectively). In the context of the significant investment program related to SESAR, it will be important to identify the magnitude of these investments and their impact on ANSPs performance, given that capex is typically required to:

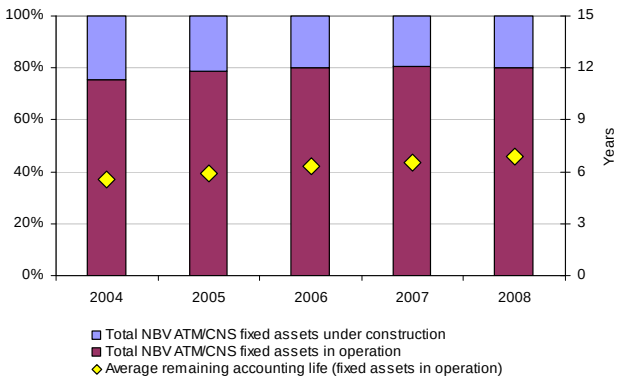

Figure 7.5: Asset structure at European system level (2004-2008)

- Improve safety;
- Replace/upgrade ageing assets which are becoming obsolete;
- Provide new ATC capacity and improve quality of service; and
- Bring cost-effectiveness and productivity improvements.

The average remaining accounting life of fixed assets is 7 years in 2008, at European system level. This value is highly dependent on the depreciation policy: a more rapid depreciation of new investment and/or write-offs of previous investments tend to depress the remaining accounting life of fixed assets.

Figure 7.6 shows the capital expenditure (capex) and depreciation costs at European system level, between 2004 and 2013 for the 34 ANSPs that consistently reported information on their capex over this period. In 2008, capex amounted to €1 185M. It is noteworthy that 60% of this capex originated from the five largest ANSPs. Overall, the planned cumulative capex for the period 2009-2013 amounts to some €6 314M and represents some 76% of the 2008 total ANS revenues (see also Section 7.3.1). Capex exceeds depreciation throughout the period, suggesting a growing asset base.

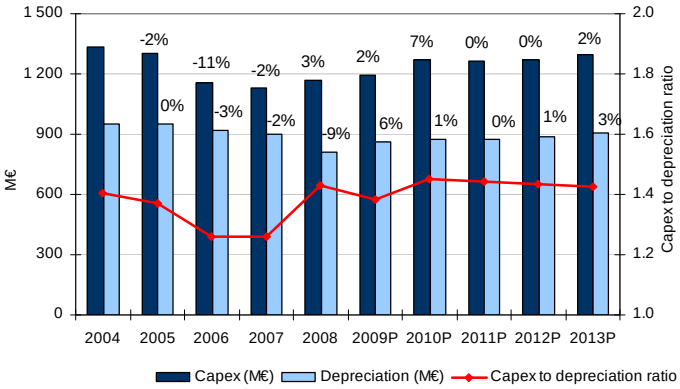

Figure 7.6: Forward-looking capex and depreciation costs at European system level (2004-2013, real terms)

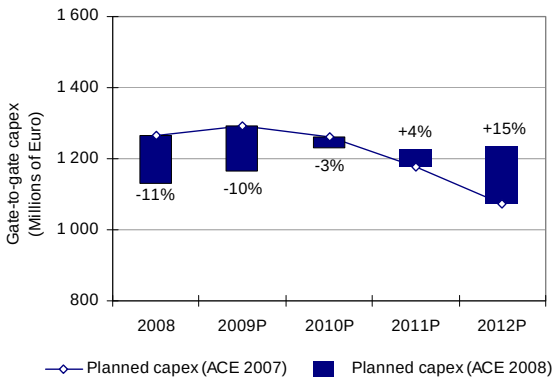

Figure 7.7: Changes in planned capex at European system level (2008-2012, real terms)

Figure 7.7 compares the capex planned in ACE 2007 with the plans provided in ACE 2008 for the years 2008-2012. Compared to ACE 2007 plans, the actual 2008 capex and the planned capex for 2009 and 2010 have been revised downwards; conversely, the planned capex for 2011 and 2012 have been revised upwards.

At face value, this indicates that as a consequence of the severe traffic downturn, ANSPs have reviewed their investment plans by postponing some capital expenditures to the future[76]. The downwards adjustment in 2008 (-11% or some €139M) is quite striking, suggesting that several ANSPs swiftly revised their investment plans as the economic outlook was worsening. However, if one considers the cumulative 2008-2012 capex, the plans in ACE 2008 show an outlook fairly in line with last year's forward-looking projections.

7.3.1 Cumulative capex (2009-2013) to 2008 revenues ratio at ANSP level

The ratio between the cumulative planned capex over 2009-2013 to the actual 2008 revenues is a measure of the magnitude of planned investments. If it represents some 76% of the 2008 total ANS revenues at European level, it is certainly not uniform across Europe.

The cumulative capex (2009-2013) to 2008 revenues ratio is displayed in Figure 7.8.

The ratio is higher than 100% for 10 ANSPs. Five ANSPs show ratios higher than 150%, namely DHMI (181%), NATA Albania (180%) EANS (166%), IAA (151%) and LPS (136%).

This undoubtedly indicates substantial investments over the 2009-2013 period for these ANSPs, either as an extension of the present investment cycle (e.g. NATA Albania, DHMI), or the start of

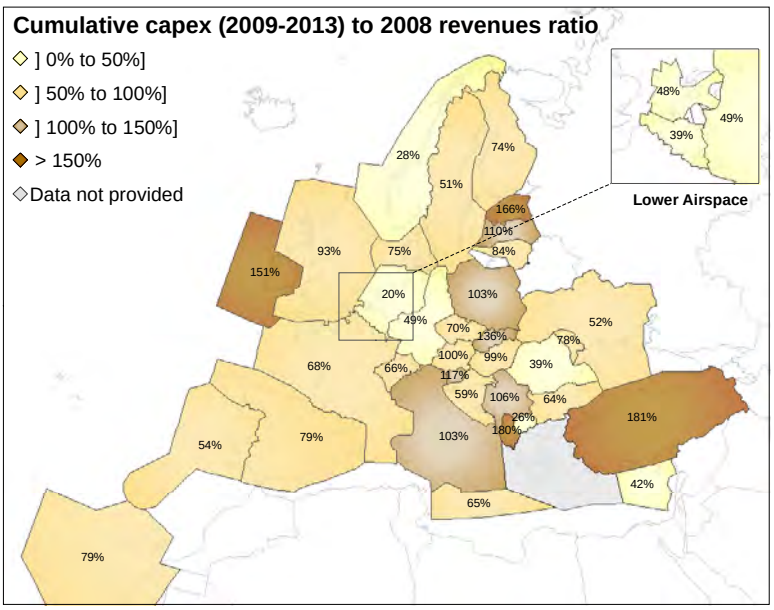

Figure 7.8: ANSPs cumulative capex (2009-2013) on 2008 revenues ratio

[76] See also details provided in the Performance Review Report 2009 (PRR2009, §8.2.11 – p.90) of the EUROCONTROL Performance Review Commission.

a new investment cycle (e.g. IAA and EANS).

It is noteworthy that four ANSPs which are part of the FAB Central Europe (FAB CE) stand among the ANSPs with the highest cumulative capex to revenue ratio: LPS (136%), Slovenia Control (117%), Austro Control (100%) and HungaroControl (99%). In fact, all these ANSPs are planning, or have recently put into operation, significant investments, in particular:

- LPS: new ACC in Bratislava (i.e. new building and new ATM systems) planned to be commissioned in 2012;
- Slovenia Control: new ACC in Ljubljana (i.e. new building and new ATM systems) planned to be commissioned in 2011;
- HungaroControl: new building for the ACC/APP OPS room, planned to enter in operation in August 2011. Old OPS room to be used as contingency centre and hosting a simulator (€11M, operational in December 2010). Installation of MATIAS in the new centre (€18.4M, operational in December 2011);
- Austro Control: upgrades to the ATM system by 2014 as part of COOPANS (Austro Control joined the association on March 2010). Significant extension of Multilateration (MLAT) surveillance stations;
- Bosnia & Herzegovina ANS provider (BH ANSP)[77]: new ACC in Sarajevo (new building and new ATM systems) planned to be commissioned in 2010. This investment amounts to some €22M;
- ANS CR: new ACC in Prague (new building and new ATM systems) put into operation in 2007; and
- Croatia Control: new ACC in Zagreb (new building and new ATM systems) put into operation in 2005.

It is clear that all these individual initiatives to build new ACCs within a few 100-km radius are not going to alleviate the fragmentation of the European airspace and the related impact on cost-effectiveness and productivity performance of the different ANSPs[78].

Given that several ANSPs plan very substantial capital expenditures, and in order to better understand the specific investment cycles, it is particularly important that ANSPs reveal the nature and extent of the planned capex. Additional details on the capex profile for each ANSPs are provided in Part IV of this Report.

7.4 Changes in ATCOs in OPS and en-route ATC capacity

The graph in Figure 7.9 shows the forward-looking projections for ATCOs in OPS until 2013, with a breakdown into those that are operational in ACCs and those that are working in terminal operational units (APPs+TWRs). It should be noted that the apparent decrease for ACCs and APPs+TWRs ATCOs in 2009 (i.e. -10% and -15%, respectively) are due to the fact that (1) Aena did not report the planned number of ACC and APP+TWR ATCOs, (2) NATS only provided planned data for ACC and (3) HCAA did not report planned ATCO data from 2010 onwards.

[77] BH ANSP was not requested to report data according to the SID in 2008 since the area control services in BH's airspace are provided by Croatia Control and SMATSA.

[78] See also details provided in the Report "The impact of fragmentation in European ATM/CNS" (p.28, 45 and 65) of the EUROCONTROL Performance Review Commission, April 2006.

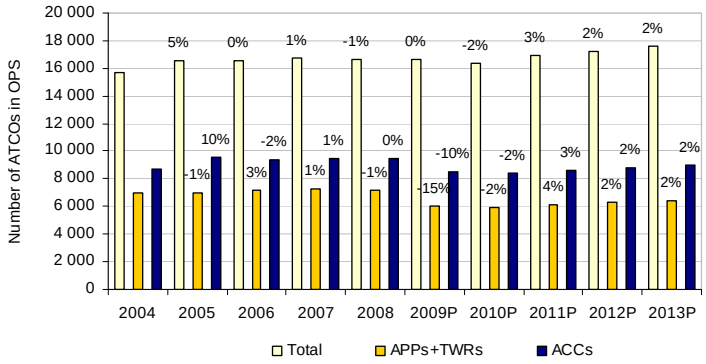

Figure 7.9: Planned number of ATCOs in OPS at European system level (2004-2013)

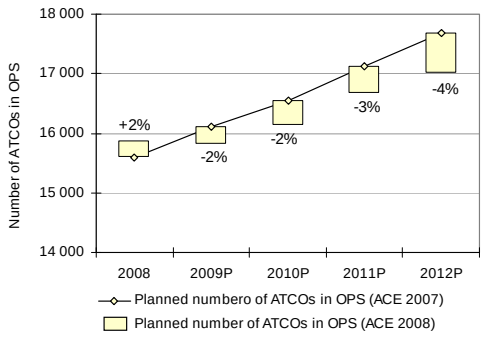

Figure 7.10: Changes in planned number of ATCOs in OPS at European system level (2008-2012)

At European system level, the total number of ATCOs in OPS is planned to increase by +6% between 2009 and 2013 (i.e. an average annual increase of +1.5%), below the traffic forecast (i.e. +11%) during the same period.

The graph in Figure 7.10 compares the number of ATCOs in OPS planned in ACE 2007 with the projections in ACE 2008 for the years 2008-2012. In 2008, the number of ATCOs in OPS is some +2% higher (+277 FTEs) than planned in ACE 2007. On the other hand, the number of ATCOs in OPS planned for the period 2009-2012 has been revised downwards. This downward revision remains, however, smaller than the downward revision of traffic volumes (see Figure 7.3). It is important to note that the ACE 2008 plans still indicate that the total number of ATCOs in OPS is planned to increase until 2012, albeit at a slower rate than presented in the ACE 2007 plans.

Finally, the graph in Figure 7.11 shows the number of en-route sectors and corresponding sector-hours planned to be opened between 2009 and 2013. This information provides an insight into the planned level of ATC capacity until 2013. It should be noted that the apparent decrease in 2009 (i.e. -20% sector-hours and -4% sectors) and the changes planned for the years 2010-2013 are due to the fact that 8 ANSPs (in particular, Aena and DFS) did not report complete information on the planned number of en-route sectors and/or sector-hours for the period 2009-2013.

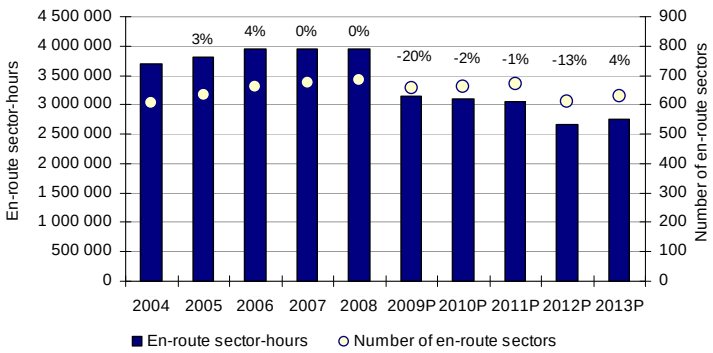

Figure 7.11: Planned number of en-route sectors and sector-hours at European system level (2004-2013)

Additional details on the planned number of ATCOs in OPS and planned ATC capacity data are displayed for each ANSP in Part IV of this Report.

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8 COMPARISON OF ATCO PRODUCTIVITY AT ACC LEVEL

8.1 Introduction

This section examines ATCO productivity at Area Control Centre (ACC) level. It also attempts to classify ACCs quantitatively to determine whether productivity can be related to generic variables describing the ACCs and, in particular, variables that are linked to the traffic complexity metrics introduced in Chapter 4.

Figure 8.1 shows the areas controlled from each of Europe's ACCs. Because some ACCs are confined to upper or lower airspace in part or all of their area of control, the map below also shows lower airspace areas when necessary.

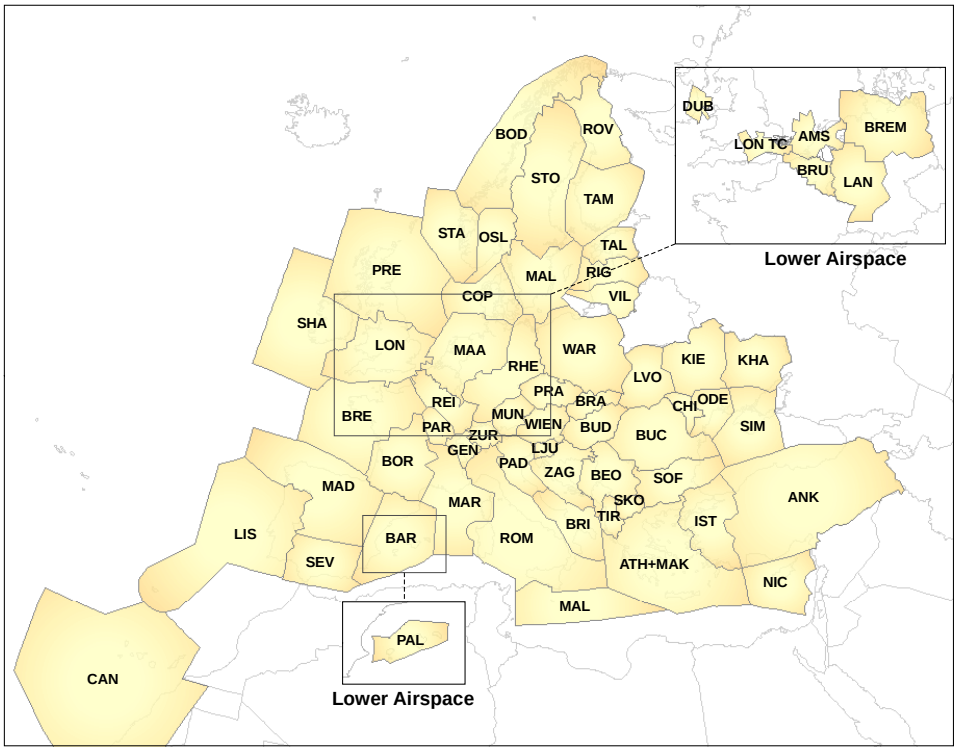

Figure 8.1: Areas controlled by the European ACCs in the ACE 2008 data set

8.2 ACC data for 2008

Table 8.1 presents the ACC data collected under the SID (Table E).

For comparability purposes, it is desirable to include only area control sectors and area control ATCOs. However, in particular cases[79], it was not possible to split the data into area control and approach control. For those ACCs, data from the SID related to approach control have been included in the figures for ATCOs, ATCO-hours, sectors, sector-hours, and also in the output figure (flight-hours controlled). This ensures consistency between the output and the input used to calculate performance ratios.

Data were obtained for 64 ACCs in 2008, compared to 66 in 2007 due to the transfer of Varna area control sectors to Sofia ACC and the reporting of Manchester and Scottish ACCs as a single ACC, namely Prestwick ACC. Although the merging is due to be completed end of 2010, NATS internal data reporting is already based on two sites (Swanwick and Prestwick) at the time of providing ACE 2008 data to the PRU.

[79] Sevilla, Canarias, Madrid, Barcelona, Palma, Bremen, Langen, München, Istanbul, Ankara, Milano, Padova, Roma, Malmö, Oslo, London TC, Tirana, and Ljubljana ACCs.

ANSPs	ACC Code	Size of the controlled area (km²)	ATCOs in OPS	ATCO-hours on duty	Number of sectors	Sum of sector-hours	IFR ACC Movements	Average transit time in minutes	Flight-hours controlled
Aena	Canarias	1 370 000	145	258 970	8	55 479	307 362	35	178 151
Aena	Barcelona	267 000	301	537 586	18	101 410	823 453	24	334 105
Aena	Madrid	440 000	414	739 404	26	164 689	1 046 936	32	557 225
Aena	Palma	50 700	126	225 036	7	42 196	268 420	14	63 855
Aena	Sevilla	179 000	145	258 970	8	47 366	390 349	25	164 104
ANS CR	Praha	78 800	86	137 583	8	35 969	652 157	18	190 585
LFV/ANS Sweden	Malmo	226 000	138	229 080	12	62 000	530 003	25	225 014
LFV/ANS Sweden	Stockholm	478 000	97	161 020	10	57 000	412 989	21	144 832
ATSA Bulgaria	Sofia	145 120	90	117 450	6	36 996	449 792	20	147 802
Austro Control	Wien	79 600	116	179 661	13	56 210	771 432	18	226 980
Avinor	Bodo	399 000	37	62 604	4	29 748	193 931	19	62 596
Avinor	Oslo	115 000	86	145 512	8	60 567	340 194	20	112 741
Avinor	Stavanger	205 000	30	50 760	3	17 800	204 096	19	65 347
Belgocontrol	Brussels	39 500	85	124 367	7	33 000	587 760	9	90 405
Croatia Control	Zagreb	158 000	77	103 257	7	26 330	380 181	23	143 396
DCAC Cyprus	Nicosia	174 000	43	105 780	3	19 710	270 641	26	116 426
DFS	Langen	108 000	449	503 416	33	223 771	1 309 300	18	395 927
DFS	Munchen	110 000	335	377 065	24	163 468	1 471 550	16	395 796
DFS	Rhein	200 000	311	352 188	25	135 363	1 468 386	19	468 553
DFS	Bremen	174 000	247	275 583	17	118 938	644 789	17	182 787
DHMI	Ankara	755 930	186	343 728	10	83 220	564 929	44	416 596
DHMI	Istanbul	226 168	165	304 920	11	87 600	573 505	24	224 890
DSNA	Bordeaux	210 000	263	342 718	18	114 229	861 933	31	439 898
DSNA	Reims	96 200	198	258 016	13	87 723	859 263	16	233 009
DSNA	Paris	169 000	373	486 060	20	126 731	1 281 167	14	304 064
DSNA	Marseille	291 000	309	402 661	26	124 940	1 048 010	22	379 211
DSNA	Brest	402 000	230	299 715	16	94 507	877 220	31	449 892
EANS	Tallinn	77 102	18	30 168	3	10 710	161 908	20	55 120
ENAV	Brindisi	244 000	98	143 988	6	28 835	316 599	23	122 428
ENAV	Milano	68 000	211	324 984	18	114 610	652 625	17	187 536
ENAV	Padova	95 700	168	252 685	12	68 620	658 378	18	199 448
ENAV	Roma	503 000	323	438 343	26	124 672	987 878	33	539 687
Finavia	Tampere	246 000	54	74 088	4	16 060	173 422	23	66 899
Finavia	Rovaniemi	169 000	8	10 976	1	8 760	33 522	16	8 795
MK CAA	Skopje	24 800	32	46 848	3	9 610	123 088	9	19 105
HCAA	Athinai+Macedonia	537 000	235	345 450	12	59 400	621 735	40	410 847
HungaroControl	Budapest	93 000	93	144 057	7	25 539	586 484	18	179 113
IAA	Dublin	23 500	38	59 622	2	15 006	226 791	10	39 226
IAA	Shannon	449 000	119	186 711	11	56 364	440 669	31	229 794
LGS	Riga	94 000	33	51 447	3	18 220	195 232	17	56 017
LPS	Bratislava	48 700	58	77 912	5	17 080	326 018	13	71 743
LVNL	Amsterdam	51 100	69	114 057	6	29 458	526 545	9	83 078
MATS	Malta	230 000	27	52 859	2	11 680	84 629	25	35 336
MoldATSA	Chisinau	33 800	33	48 015	2	17 520	40 441	14	9 279
MUAC	Maastricht	260 000	221	311 955	16	74 164	1 608 454	22	580 818
NATA Albania	Tirana	35 900	29	46 255	3	19 572	148 246	13	32 052
NATS	Prestwick	637 200	263	333 484	24	109 789	1 233 262	21	425 871
NATS	London AC	282 000	358	453 944	20	92 248	1 986 190	17	562 650
NATS	London TC	39 600	280	355 040	33	173 755	1 383 440	14	313 808
NAV Portugal (FIR Lisboa)	Lisboa	665 000	83	151 226	7	42 359	415 866	34	233 789
NAVIAIR	Kobenhavn	158 000	100	173 220	7	35 308	533 026	18	161 353
Oro Navigacija	Vilnius	75 409	31	46 162	2	14 600	178 000	15	45 058
PANSA	Warszawa	334 000	114	142 362	8	35 411	570 195	30	282 793
ROMATSA	Bucuresti	254 000	297	410 494	17	85 369	443 435	34	252 549
Skyguide	Geneva	35 200	107	140 707	8	33 745	663 726	12	134 991
Skyguide	Zurich	39 000	94	124 138	8	43 248	789 252	11	144 779
Slovenia Control	Ljubljana	18 400	46	66 056	3	14 629	245 627	9	38 321
SMATSA	Beograd	144 676	153	203 184	8	42 230	481 063	24	193 324
UkSATSE	Kyiv	181 399	186	219 480	11	70 080	199 085	29	96 037
UkSATSE	Dnipropetrovs'k	46 500	71	83 780	2	17 520	21 793	16	5 863
UkSATSE	Simferopol	209 337	134	158 120	7	61 320	174 344	29	83 619
UkSATSE	Kharkiv	165 509	55	64 900	6	52 560	129 142	23	49 901
UkSATSE	L'viv	138 365	59	69 620	5	43 800	156 293	26	67 934
UkSATSE	Odesa	81 832	56	66 080	5	43 800	80 246	19	24 772
European system			9 436	13 405 526	684	3 944 611	36 186 397		12 757 919

Table 8.1: ACC 2008 data

There are wide variations in the area controlled among the 64 ACCs (see Table 8.1). The largest, Canarias ACC, controls 1.37M km², whereas Ljubljana ACC controls around 0.02M km² - a factor of nearly 75. The average ACC surface is around 0.2M km², and the average volume is around 80M km² x 100 feet. The average transit time varies between 44 minutes for Ankara ACC and 9 minutes for Skopje, Brussels, Ljubljana and Amsterdam ACCs. The average transit time for a European ACC is some 21 minutes, a similar value to 2007.

8.3 ATFM FDP and RDP systems

The new version of the SID requests information on the main ATM softwares for the Flight Data Processing (FDP) and Radar/Surveillance Data Processing (RDP) systems. Most FDP systems are provided by a small number of suppliers as shown in Figure 8.2. A number of ACCs use "bespoke" systems, developed in-house specifically for the ACC or the ANSP. This is the case for DSNA, Skyguide and NAV Portugal (FIR Lisboa) as illustrated in Figure 8.2. The pie chart on the right-hand side of Figure 8.2 shows how systems from different suppliers serve Europe's flight-hours.

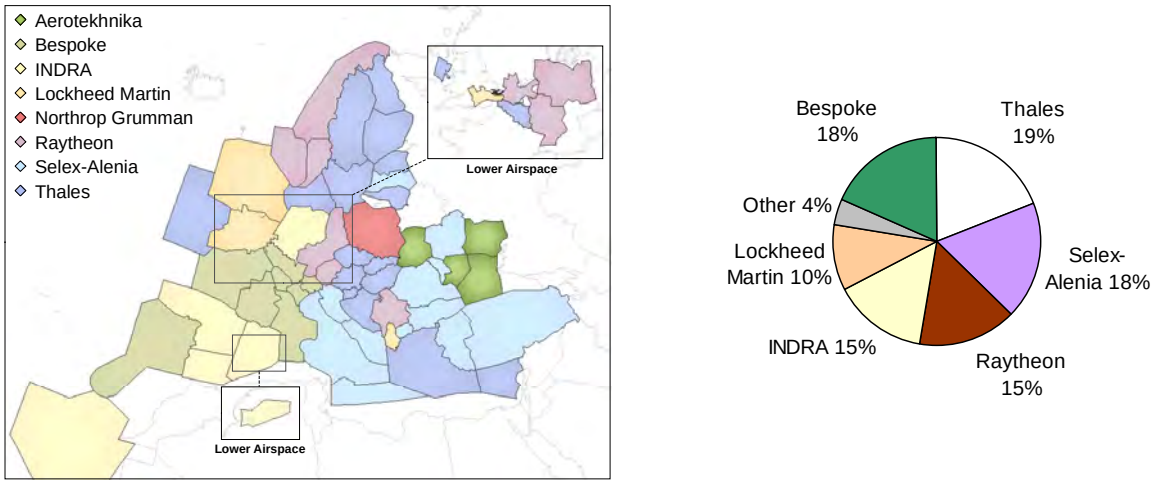

Figure 8.2: FDP systems suppliers, 2008

Figure 8.3 below indicates that 16 ACCs performed major upgrades of their FDP systems in 2008 which is significantly more than in any of the five preceding years. It is also noteworthy that more than 40 ACCs plan to replace their current FDP systems between 2009 and 2015. This will lead to substantial capital expenditure in the next five years. It will be a challenge for ANSPs to deploy these new systems without negatively impacting the quality of service provided.

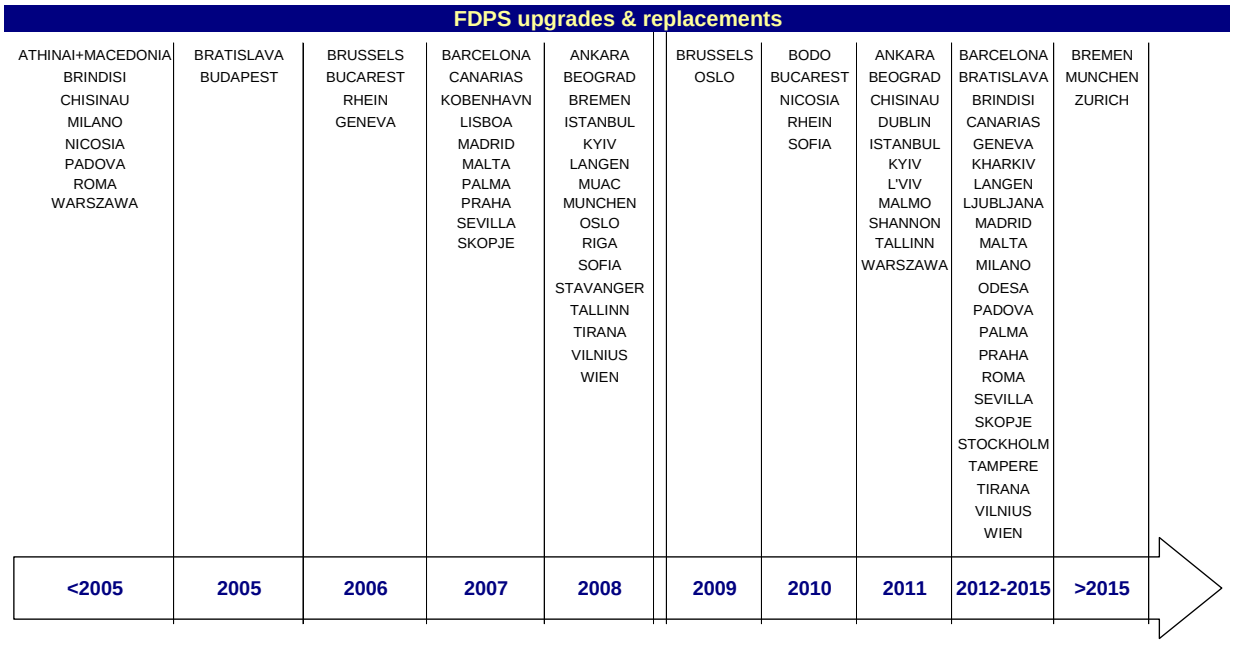

Figure 8.3: FDP systems upgrades and replacements (2005-2015)

SESAR represents the technological pillar of the SES, its objective is to develop the new generation of ATM systems for the next 30 years. It is essential that the SESAR initiative

significantly contributes to reduce the fragmentation and increases the interoperability between ATM systems.

8.4 Changes in key ACC data between 2004 and 2008

Figure 8.4 displays the development of key data for all European ACCs taken together between 2004 and 2008[80].

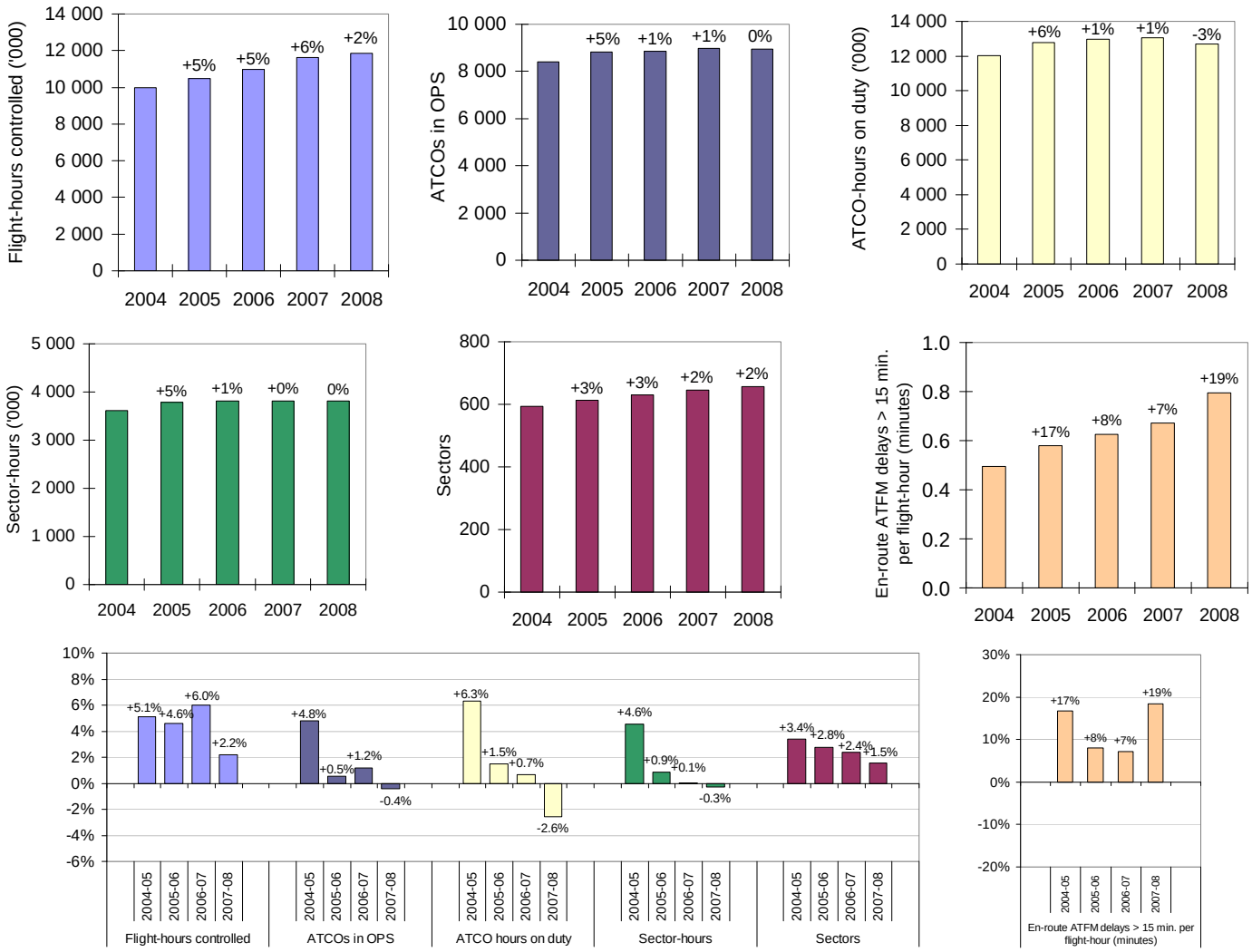

Figure 8.4: Key ACC data at European system level (2004-2008)

Between 2004 and 2008, the traffic volumes controlled by the European ACCs grew by +19.1%. This growth was served by +5.9% more ATCOs in OPS hours on duty and +5.3% more sector-hours. En-route ATFM delays per flight-hour, however, rose by +60%. In other words, between 2004 and 2008 at European system level, ACC productivity rose but in parallel the quality of service significantly fell.

Figure 8.4 shows that en-route ATFM delays per flight-hour rose for the fourth consecutive year in 2008. The significant increase in ATFM delays (+19%) in 2008 is disappointing given the low traffic growth (+2.2%). In 2008, extremely high levels of ATFM delays were recorded for Kobenhavn ACC following the implementation of the DATMAS system. This was also the case for Warszawa, Zagreb, Wien and Nicosia ACCs where ATFM delays have been a recurrent issue over the period.

[80] In order to ensure the consistency of time comparisons, Figure 8.4 comprises data relating to ACCs for which information was available since 2004. For this reason, the information provided in Figure 8.4 for 2008 slightly differs from the data reported in Table 8.1. (PANSA and SMATSA are excluded).

It is noteworthy that the average ATFM delay in Figure 8.4 is expressed in minute of en-route ATFM delay per flight-hour, rather than per flight. As a flight lasts on average about 1.5 hours (90 minutes), the 2008 value of 0.8 minute delay per flight-hour is roughly equivalent to 1.2 minute per flight, which is a significant deviation (+20%) from the 1 minute delay per flight (considered as the economic optimum) observed in 2007.

The relationship between traffic, productivity and ATFM delays is examined for individual ACCs in Section 8.12 below.

8.5 Exogenous factors: traffic variability and complexity measures for ACCs

As noted in Chapter 4, ANSPs and ACCs face very different operational environments across Europe. For a fair comparison to be made of ACCs' performance, due account must be taken of (exogenous) differences in traffic complexity. This includes both the spatial complexity of the traffic and its variability over time. A measure of the latter is the seasonal variability, defined as the ratio of traffic in the peak month to average traffic.

Table 8.2 below displays the different measures of complexity and traffic variability that were derived for each ACC. It should be noted that the calculations showed in this report are based on yearly data, a methodology similar to that used for the ACE 2005, 2006 and 2007 data analysis. For the purposes of this analysis, the three structural indicators (horizontal, vertical and speed interactions) have been summed (with equal weight) and the resultant indicator is termed the structural complexity index. Multiplying this by the adjusted density gives an overall complexity score at ACC level (see column 6 in Table 8.2). The indicator varies from 39.6 for London TC to 0.5 for Malta ACC, a factor of 77 (although London TC is an outlier in this sample, removing it would still leave a factor of 28 between most and least complex).

The map on the left-hand side of Figure 8.5 below displays how traffic complexity, as measured by the above score, is geographically distributed across ACCs. It is in the "core area" of Europe that traffic complexity is the highest and, in particular, in lower airspace ACCs. Similarly, the map on the right-hand side of Figure 8.5 shows how seasonal traffic variability is geographically distributed across ACCs. It is in the South Eastern part of Europe that seasonal variability is highest. The last column of Table 8.2 shows the seasonal traffic variability metric for each ACC.

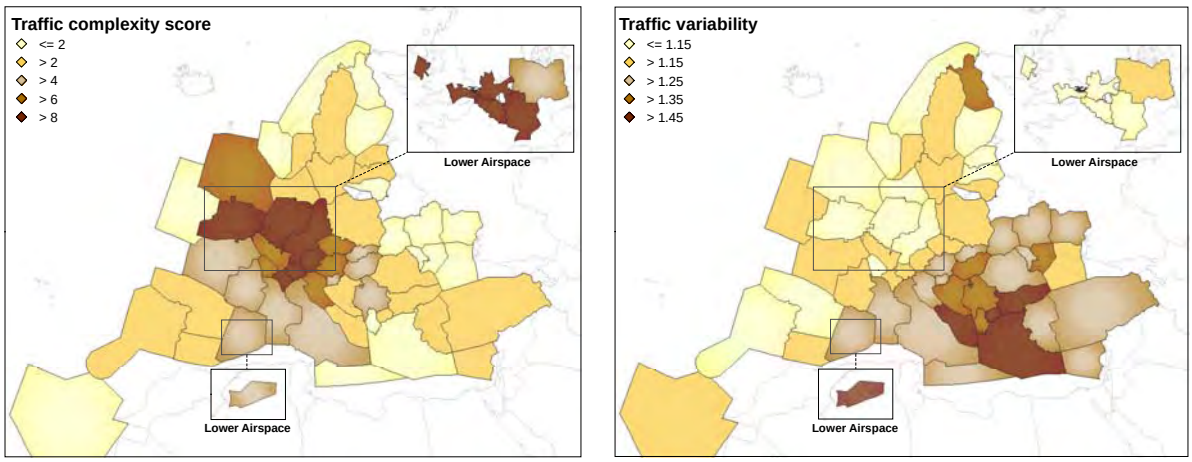

Figure 8.5: Overall complexity score per ACC and seasonal traffic variability (2008)

Finally, Table 8.2 also shows the average flight level for each ACC. This metric provides information on where the traffic actually flew. Indeed, even if the flight levels available within each ACC are similar, the prevalent use of the flight levels by aircraft can be significantly different. This metric provides further insights for the comparison between ACCs above and beyond the overall complexity score, and it is therefore used for clustering ACCs (see Section 8.9 below).

ANSPs	ACC name	[1] Adjusted density	[2] Vertical interactions	[3] Horizontal interactions	[4] Speed interactions	[5] = [2]+[3]+[4] Structural complexity	[6] = [1]x[5] Aggregated complexity score	Average used flight level	Seasonal traffic variability
Aena	Barcelona	6.1	0.24	0.44	0.13	0.80	4.9	271	1.3
Aena	Canarias	2.3	0.22	0.28	0.12	0.61	1.4	232	1.2
Aena	Madrid	6.2	0.13	0.39	0.08	0.60	3.7	326	1.1
Aena	Palma	5.9	0.23	0.37	0.26	0.86	5.1	118	1.7
Aena	Sevilla	4.4	0.22	0.36	0.10	0.68	3.0	278	1.2
ANS CR	Praha	7.1	0.20	0.53	0.22	0.95	6.7	309	1.2
ATSA Bulgaria	Sofia	6.5	0.04	0.24	0.06	0.34	2.2	342	1.5
ATSA Bulgaria	Varna	3.2	0.09	0.23	0.09	0.41	1.3	340	1.1
Austro Control	Wien	8.3	0.20	0.49	0.19	0.89	7.4	319	1.3
Avinor	Bodo	0.9	0.40	0.48	0.30	1.18	1.0	185	1.1
Avinor	Oslo	3.4	0.36	0.48	0.21	1.05	3.6	194	1.2
Avinor	Stavanger	0.9	0.31	0.51	0.31	1.13	1.1	189	1.1
Belgocontrol	Brussels	9.8	0.44	0.54	0.42	1.39	13.7	158	1.1
Croatia Control	Zagreb	5.5	0.06	0.48	0.09	0.64	3.5	338	1.4
DCAC Cyprus	Nicosia	3.8	0.15	0.39	0.09	0.63	2.4	317	1.3
DFS	Bremen	4.5	0.35	0.51	0.38	1.24	5.6	132	1.2
DFS	Langen	10.7	0.41	0.53	0.39	1.34	14.3	148	1.1
DFS	Munchen	10.5	0.33	0.49	0.29	1.11	11.6	225	1.2
DFS	Rhein	11.7	0.22	0.58	0.16	0.96	11.2	343	1.1
DHMI	Ankara	4.2	0.10	0.40	0.09	0.59	2.5	337	1.3
DHMI	Istanbul	4.6	0.20	0.30	0.13	0.64	2.9	290	1.3
DSNA	Bordeaux	10.0	0.11	0.40	0.09	0.59	5.9	332	1.2
DSNA	Brest	9.3	0.10	0.43	0.08	0.60	5.6	344	1.2
DSNA	Marseille	8.1	0.17	0.41	0.14	0.73	5.9	312	1.3
DSNA	Paris	8.9	0.23	0.28	0.28	0.79	7.0	240	1.1
DSNA	Reims	10.1	0.22	0.40	0.17	0.79	8.0	320	1.2
EANS	Tallinn	3.4	0.15	0.28	0.17	0.60	2.0	306	1.1
ENAV	Brindisi	3.7	0.12	0.49	0.11	0.72	2.6	312	1.5
ENAV	Milano	7.2	0.43	0.59	0.39	1.41	10.1	169	1.2
ENAV	Padova	6.3	0.32	0.63	0.23	1.17	7.4	292	1.3
ENAV	Roma	5.4	0.25	0.51	0.16	0.92	5.0	278	1.3
Finavia	Rovaniemi	0.5	0.41	0.40	0.28	1.09	0.6	243	1.4
Finavia	Tampere	2.0	0.25	0.24	0.28	0.77	1.5	255	1.1
HCAA	Athinai+Macedonia	3.7	0.10	0.36	0.07	0.53	2.0	309	1.5
HungaroControl	Budapest	7.2	0.08	0.43	0.12	0.64	4.6	329	1.4
IAA	Dublin	7.7	0.33	0.38	0.33	1.05	8.0	124	1.1
IAA	Shannon	4.6	0.06	0.19	0.04	0.28	1.3	331	1.2
LFV/ANS Sweden	Malmo	4.3	0.15	0.47	0.17	0.80	3.5	310	1.2
LFV/ANS Sweden	Stockholm	2.7	0.33	0.38	0.32	1.03	2.8	235	1.2
LGS	Riga	3.3	0.09	0.43	0.13	0.66	2.1	340	1.1
LPS	Bratislava	5.0	0.17	0.51	0.19	0.87	4.3	313	1.3
LVNL	Amsterdam	10.0	0.25	0.37	0.32	0.94	9.4	156	1.1
MATS	Malta	1.0	0.09	0.34	0.10	0.53	0.5	331	1.3
MK CAA	Skopje	4.5	0.12	0.46	0.08	0.66	3.0	315	1.6
MoldATSA	Chisinau	1.0	0.10	0.45	0.16	0.71	0.7	311	1.3
MUAC	Maastricht	10.8	0.26	0.51	0.16	0.93	10.0	339	1.1
NATA Albania	Tirana	4.0	0.06	0.33	0.05	0.44	1.8	317	1.4
NATS	London AC	9.6	0.32	0.34	0.22	0.88	8.5	305	1.1
NATS	London TC	30.7	0.49	0.51	0.29	1.29	39.6	112	1.1
NATS	Prestwick	5.9	0.33	0.39	0.37	1.10	6.5	230	1.1
NAV Portugal (FIR Lisboa)	Lisboa	3.8	0.16	0.40	0.07	0.62	2.4	303	1.1
NAVIAIR	Kobenhavn	3.7	0.16	0.54	0.18	0.88	3.3	296	1.1
Oro Navigacija	Vilnius	2.7	0.12	0.45	0.17	0.73	2.0	300	1.2
PANSA	Warszawa	3.9	0.12	0.54	0.18	0.84	3.3	328	1.2
ROMATSA	Bucuresti	5.0	0.06	0.35	0.12	0.53	2.7	328	1.3
Skyguide	Geneva	11.5	0.23	0.56	0.19	0.98	11.2	307	1.2
Skyguide	Zurich	10.5	0.33	0.54	0.25	1.11	11.7	282	1.2
Slovenia Control	Ljubljana	5.7	0.17	0.50	0.17	0.83	4.8	267	1.3
SMATSA	Beograd	8.3	0.05	0.45	0.07	0.57	4.8	345	1.4
UkSATSE	Dnipropetrovs'k	0.4	0.44	0.37	0.54	1.36	0.6	195	1.2
UkSATSE	Kharkiv	2.5	0.04	0.31	0.13	0.48	1.2	336	1.3
UkSATSE	Kyiv	2.4	0.12	0.32	0.21	0.65	1.5	313	1.3
UkSATSE	L'viv	2.7	0.02	0.50	0.18	0.69	1.9	329	1.3
UkSATSE	Odesa	1.9	0.05	0.46	0.10	0.61	1.1	318	1.4
UkSATSE	Simferopol	3.7	0.01	0.35	0.10	0.46	1.7	342	1.2
European system average		7.3	0.2	0.4	0.2	0.9	6.3	286	

Table 8.2: Traffic complexity and traffic variability indicators at ACC level, 2008

8.6 Framework for ATCO productivity analysis at ACC level

No cost data are available at ACC level. It was therefore not possible to apply in full the cost-effectiveness framework presented in Chapter 5. Figure 8.6 displays the framework used for the productivity analysis at ACC level. This shows that ATCO productivity, defined as (en-route) flight-hours controlled per ATCO-hour on duty, can be split into two further components:

- **Sector productivity**: This is the ratio of the output, measured by the flight-hours controlled by the ACC, to (area control) sector-hours open. This indicator shows, on average, how many aircraft are simultaneously in a sector for a given ACC. All else being equal, higher sector productivity will improve ATCO-hour productivity.

- **Staffing per sector**: This is the ratio of ATCO-hours on duty to sector-hours open. This indicator shows, on average, how many ATCOs are used to man a sector. All else being equal, a reduction in the staffing per sector will increase ATCO-hour productivity.

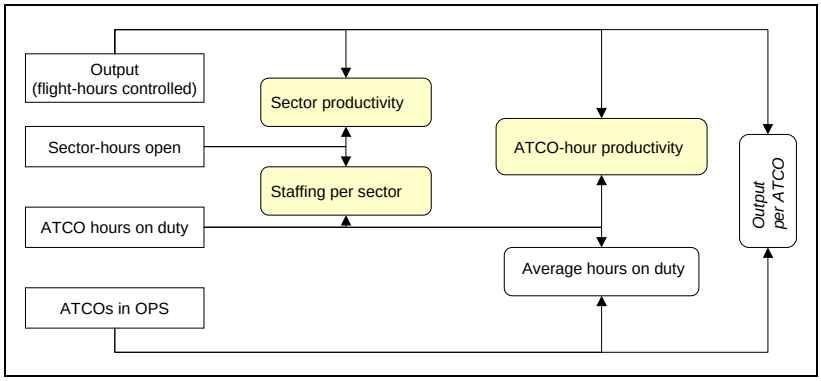

Figure 8.6: Performance framework for ACC productivity analysis

ATCO-hour productivity can be more easily compared in an international benchmarking environment. The **average number of hours on duty** is not a performance indicator per se and is mostly determined by the social bargaining and regulatory framework that prevails in each ANSP and State. Moreover, average hours on duty should be seen in the context of the employment costs.

8.7 Changes in productivity for ATCOs at European ACCs (2004-2008)

Figure 8.7 below shows that, for the 33 ANSPs for whom ACC data has been consistently available since 2004, there has been a +12.5% improvement in ACC ATCO-hour productivity since 2004.

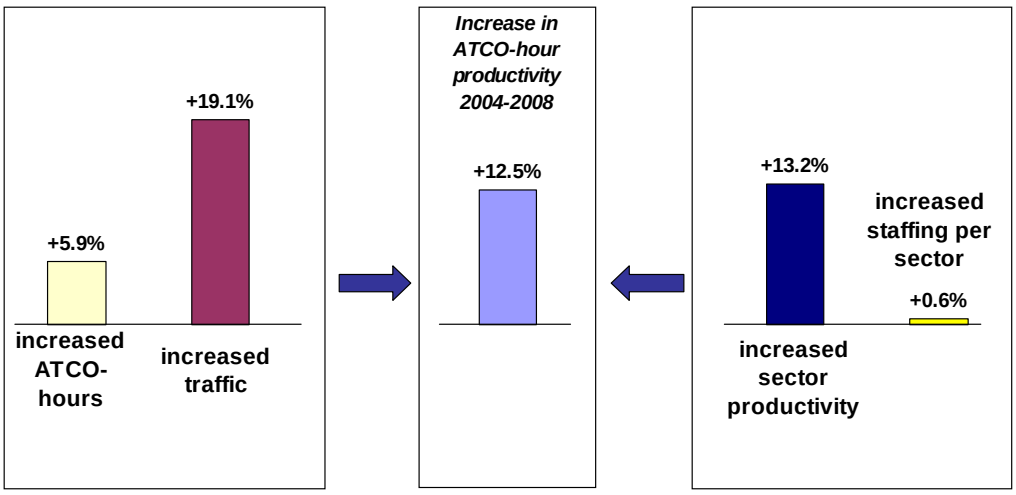

Figure 8.7: Breakdown of changes in ACC ATCO productivity, 2004-2008

The left-hand side of Figure 8.7 indicates that the increase in ACC ATCO-hour productivity results from a +19.1% increase in traffic, served by only +5.9% more ATCO-hours on duty. The right-hand side of Figure 8.7 shows that the rise in productivity results from the combination of a +13.2% rise in sector productivity (flight-hours per sector-hour) while the staffing per sector remained constant.

8.8 ATCO-hour productivity results at ACC level (2008)

Figure 8.8 below shows the ATCO-hour productivity for each ACC, ordered with the most productive on the top. Note that this includes only data on ACCs, and is therefore not comparable with the ANSP gate-to-gate productivity data given in Section 5.4.1. The average ATCO-hour productivity value for the European system amounts to 0.95 flight-hours per ATCO-hour.

The results range from 1.99 flight-hours per ATCO-hour for Warszawa ACC to 0.07 flight-hour per ATCO-hour for Dnipropetrovs'k ACC. There is a factor of almost 30 between the highest and the lowest ATCO-hour productivity. This wide dispersion among ACCs, and the fact that at European system level ATCO-hour productivity is less than one (0.95), suggest that overall there is still scope for ACC productivity improvements.

For 40 ACCs out of 64, the average ATCO-hour productivity is less than one. In other words, for about 60% of the European ACCs, there is, on average, less than one aircraft in the air per ATCO on duty in OPS.

Subsequent sections examine the productivity of ACCs with similar traffic complexity characteristics, and assess whether these factors could be behind some of the observed productivity differences highlighted in Figure 8.8.

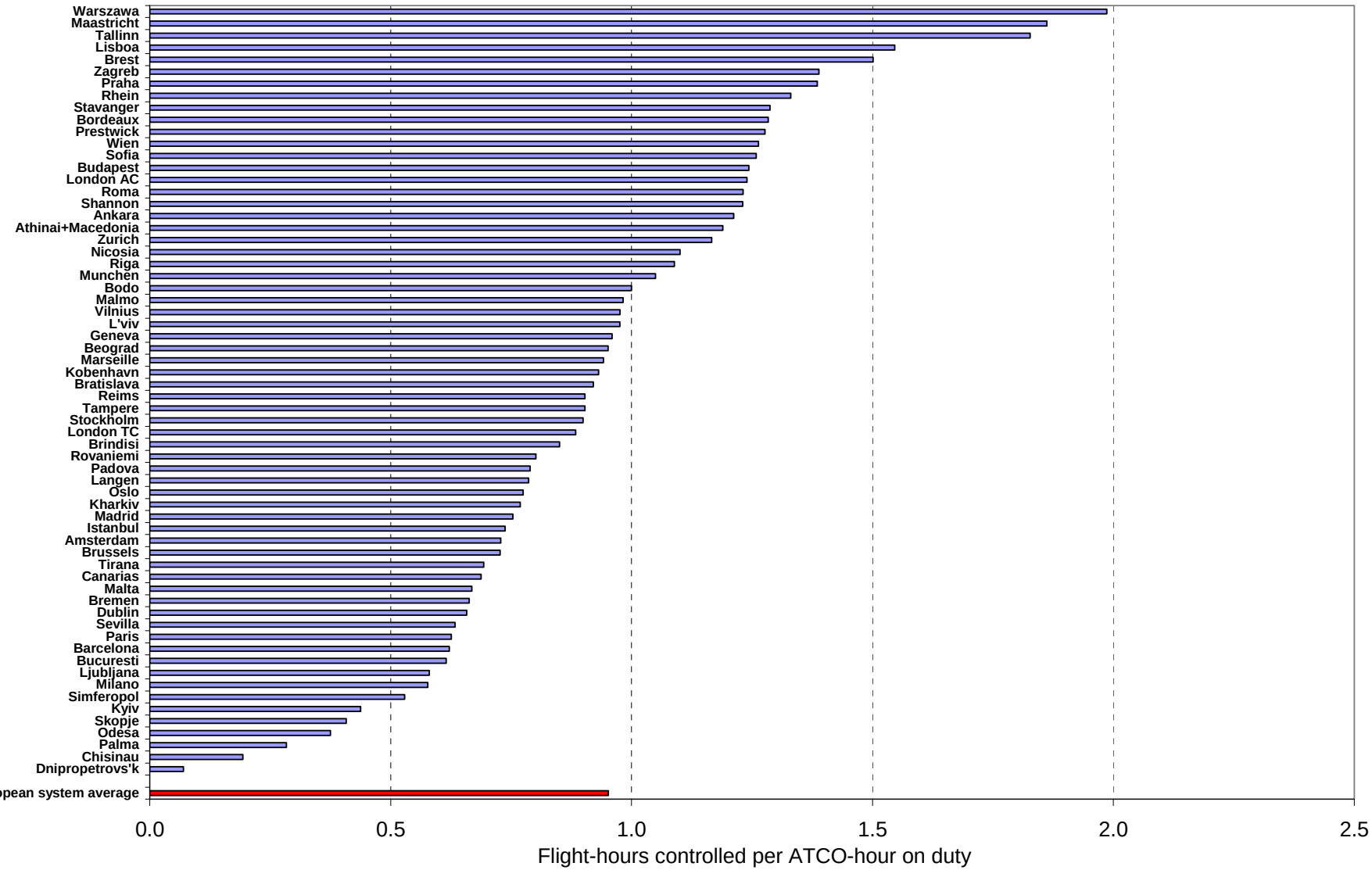

Figure 8.8: ATCO-hour productivity indicator at ACC level, 2008

8.9 ATCO-hour productivity for the different clusters (2008)

Figure 8.8 shows that there is a significant variation in ATCO-productivity between ACCs. at the same time, there are considerable differences in traffic complexity and in traffic variability (see Figure 8.5). So far, no clear-cut statistical relationship between ATCO productivity, traffic complexity and traffic variability could be inferred because the relationships are not directly causal or straightforward. Nevertheless, it is useful to compare the ATCO productivity of ACCs that share similar "operational" characteristics.

Therefore, for the purpose of this analysis, and in order to remain consistent with previous years' reports, ACCs have been clustered (i.e. grouped in more or less similar families) on the basis of two operational characteristics[81]: the **overall complexity score** and the **average flight level used**. The results are shown in Figure 8.9 below. The average flight level used provides an indication of the nature of the traffic controlled. ACCs with a lower average flight level tend to handle more flights involving vertical movement and fewer overflights. The overall complexity score for London TC (39.6) is very much higher than any of the others, for this reason it could not be accurately displayed in Figure 8.9.

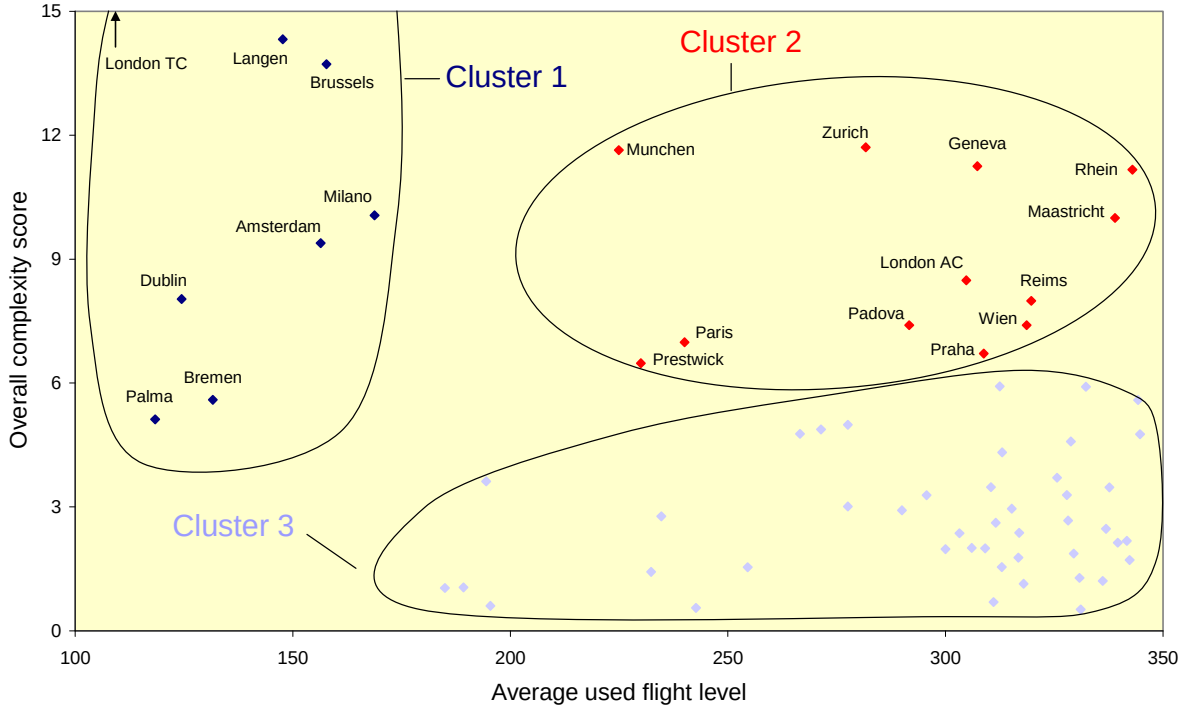

Figure 8.9: The complexity classification of ACCs, 2008

- **Cluster 1** comprises eight ACCs: Amsterdam, Brussels, Bremen, Dublin, Langen[82], London TC, Milano and Palma. These ACCs provide services predominantly in lower airspace. Cluster 1 has the highest average structural complexity (1.3). Its average adjusted density is 13.0 (8.4 if London TC is excluded). Its resulting overall complexity score (around 16.7 minutes of interaction per flight-hour) is significantly higher than the European average (around 6.3 minutes of interaction per flight-hour).

- **Cluster 2** comprises twelve ACCs: Geneva, London AC, Maastricht, München, Padova, Paris, Praha, Prestwick (formerly Manchester and Scottish), Reims, Rhein, Zürich, and Wien ACC with an overall complexity score (9.0 minutes of interaction per flight-hour)

[81] Several additional dimensions could be conceptually added to the cluster analysis (such as traffic variability, etc), however the additional complication would not allow for a simple and clear-cut two-dimension representation as in Figure 8.9.
[82] Formerly Düsseldorf and Frankfurt, combined since 2004.

higher than the European average. This cluster has adjusted density comparable to Cluster 1 (9.5), but its structural complexity is lower (0.95).

- **Cluster 3** comprises the remaining 44 ACCs; those with relatively low overall complexity. This cluster varies widely, particularly with regard to the size of the controlled area, so for analysis purposes it was further divided into two sub-clusters: Cluster 3a, 24 relatively large ACCs with seven[83] sectors or more, and Cluster 3b, 20 small ACCs with six sectors or fewer. Both Cluster 3a and Cluster 3b have markedly lower adjusted density and lower structural complexity than Clusters 1 and 2. Cluster 3a has higher adjusted density (5.7) than Cluster 3b (3.5), and both have similar structural complexity (0.66 and 0.61, respectively).

Figure 8.10 below shows the ATCO-hour productivity for the ACCs in each cluster.

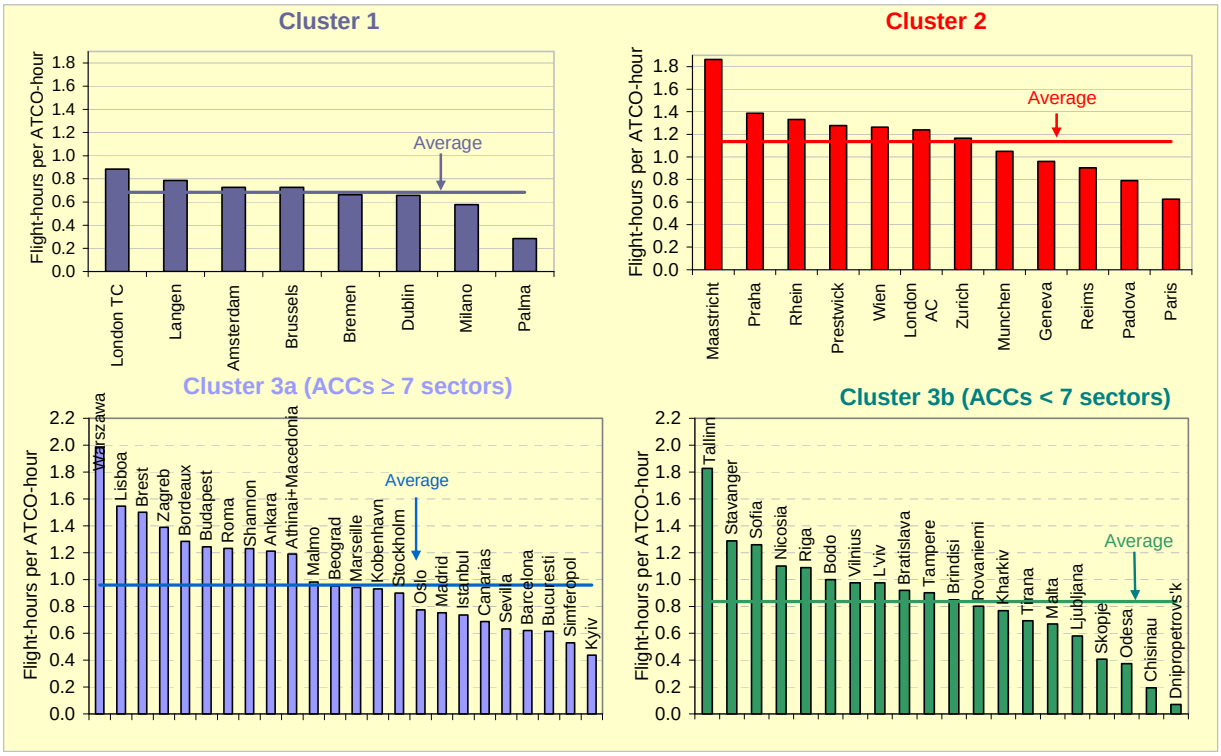

Figure 8.10: Summary of productivity results for each cluster, 2008

- **Cluster 1** has the lowest average productivity of any of the clusters (0.68 flight-hour per ATCO-hour). Palma (with the lowest productivity) has also the lowest overall complexity score but the highest seasonal traffic variability of Cluster 1;
- **Cluster 2** has the highest overall productivity, at around 1.14 flight-hour per ATCO-hour. Within this cluster, Maastricht has significantly higher productivity (around 1.86 flight-hours per ATCO-hour, some +64% above the average in Cluster 2). Factors that could explain Maastricht's higher productivity (in particular advanced ATC systems and procedures) are detailed in p.128 of the ACE 2006 Benchmarking Report[84];
- **Cluster 3a** has an average productivity of 0.96 flight-hour per ATCO-hour. Within Cluster 3a, Marseille and Bordeaux have the highest overall complexity, and Canarias, Shannon and Kyiv the lowest.

[83] Compared to previous ACE reports, a limit of 7 sectors has been used in ACE 2008 to separate Cluster 3a and 3b. Since the number of sectors tends to increase in all ACCs as traffic develops, keeping the previous limit of 5 sectors would lead to a large disequilibrium between the two clusters' population.

[84] Report available on the PRC web site at the following address: http://www.eurocontrol.int/prc/public/standard_page/doc_ace_reports.html.

- **Cluster 3b** has an average productivity of 0.84 flight-hour per ATCO-hour. While Chisinau and Dnipropetrovs'k show the lowest productivity, they also have among the lowest overall complexity. On the other hand, Tallinn (with the highest productivity) has an intermediate overall complexity.

The analysis of ATCO-hour productivity at ACC level would seem to indicate that, whilst complexity measures are helpful in providing a way of clustering ACCs into broadly consistent groups, within these clusters there are still large differences in productivity performance across individual ACCs.

Several factors are likely to affect ATCO productivity in the various clusters and in particular its capability to adapt its resources to handle the traffic. Low productivity might be due to spare capacity and low utilisation of the available resources, especially in the less dense/complex ACCs. Another explanation might be due to higher seasonal traffic variability.

Other factors as yet unidentified (and not measured) such as the impact of different operational concepts and processes, the operational flexibility, could also affect ATCO productivity performance and further work would be needed to establish an empirical relationship between productivity and its drivers.

The ACE 2007 Benchmarking Report presented a first attempt analysis of ATCO-hour productivity in relation to the overall complexity scores for ACCs operating within the same ANSP. Within the same ANSP, lower flight level appeared to be associated, on several occurrences, with lower ATCO productivity. However, no straightforward and unambiguous associations could be inferred from this first analysis. Typically, tools and systems at different ACCs within the same ANSP are often of different vintages. There may also be cultural and managerial differences. These elements would deserve further analysis in order to provide some “explanation” of the differences in ATCO-productivity and identify best practice.

Differences in quality of service are examined in Section 8.10 and an analysis of the two sub-components of ATCO-hour productivity (average sector productivity and average staffing per sector) is provided in Section 8.11.

8.10 ATCO-hour productivity and quality of service

Figure 8.11 below shows ATCO-hour productivity and en-route ATFM delays higher than 15 minutes per flight-hour for each ACC, grouped by clusters. For presentation purposes, only ACCs generating more than one minute of ATFM delays per flight-hour are labelled in Clusters 3a and 3b.

Clusters are divided into quadrants based on the 2008 European ACC average ATCO-hour productivity (0.95) and average en-route delay per flight-hour (0.88).

Within clusters, a wide range of situations is observed, both in terms of productivity and in terms of en-route delays. Overall no clear relationship between productivity and ATFM delays emerges within the clusters. It is however noteworthy that in Cluster 1, the relatively low ATCO-productivity (0.68) is associated with relatively low ATFM delays per flight-hour (i.e. 0.49). On the other hand, in Cluster 2, the higher ATCO-hour productivity (1.14) is associated with higher en-route ATFM delays per flight-hour (1.39).

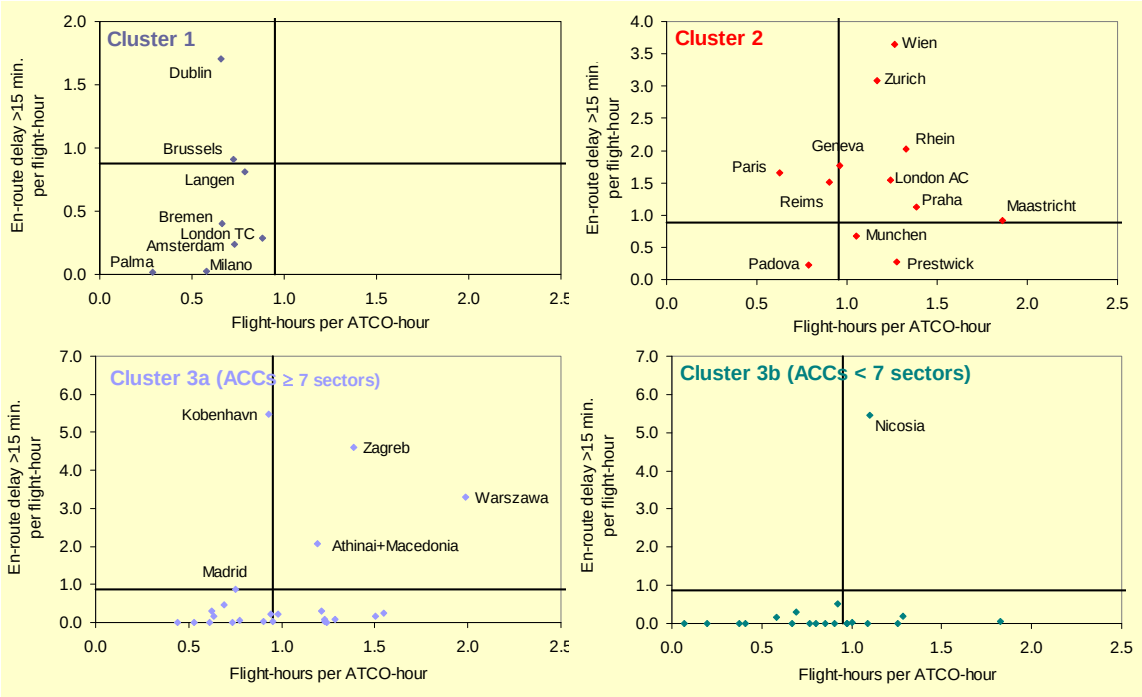

Figure 8.11: ATCO-hour productivity and quality of service for each cluster, 2008

With the exception of Palma (where traffic variability is much higher) productivity is relatively homogeneous in Cluster 1, but great differences are observed in terms of quality of service. In most cases, ATFM delays in Cluster 1 are due to staffing issues (Dublin and Langen ACCs) and exceptional events (implementation of new ATM system at Brussels ACC).

Most of the ACCs which are part of Cluster 2 operates in dense areas and tend to handle high traffic volumes. It is likely that the trade-offs between productivity and quality of service are higher in Cluster 2 than in any other cluster.

Clusters 3a and 3b comprise ACCs operating in relatively less complex areas. Overall, there seem to be significant room for productivity improvements for most of the ACCs grouped in these clusters where low productivity is often associated with low traffic volumes and with an absence of significant delays.

ATFM delays in Cluster 3a and 3b are mainly caused by a few ACCs. Delays generated by Kobenhavn ACC in 2008 were concentrated on four months and were mainly due to transition problems linked with the implementation of the new ATM system (DATMAS). The situation went back to normal in 2009, with only marginal ATFM delays. For the other four ACCs (Athinai+Macedonia, Nicosia, Warszawa and Zagreb) generating a significant level of ATFM delays in Clusters 3a and 3b, the lack of capacity is a recurrent issue.

8.11 The breakdown of ATCO-hour productivity (2008)

Figure 8.12 below displays the breakdown of ATCO-hour productivity into sector productivity and staffing per sector (see also framework in Figure 8.6) for each cluster. It also displays a line showing the average ATCO-hour productivity achieved by the ACCs in the cluster: the greater the slope of the line, the higher the average ATCO-hour productivity. ACCs below the line have a worse than average ATCO-hour productivity for the cluster and ACCs above the line have a better than average ATCO-hour productivity.

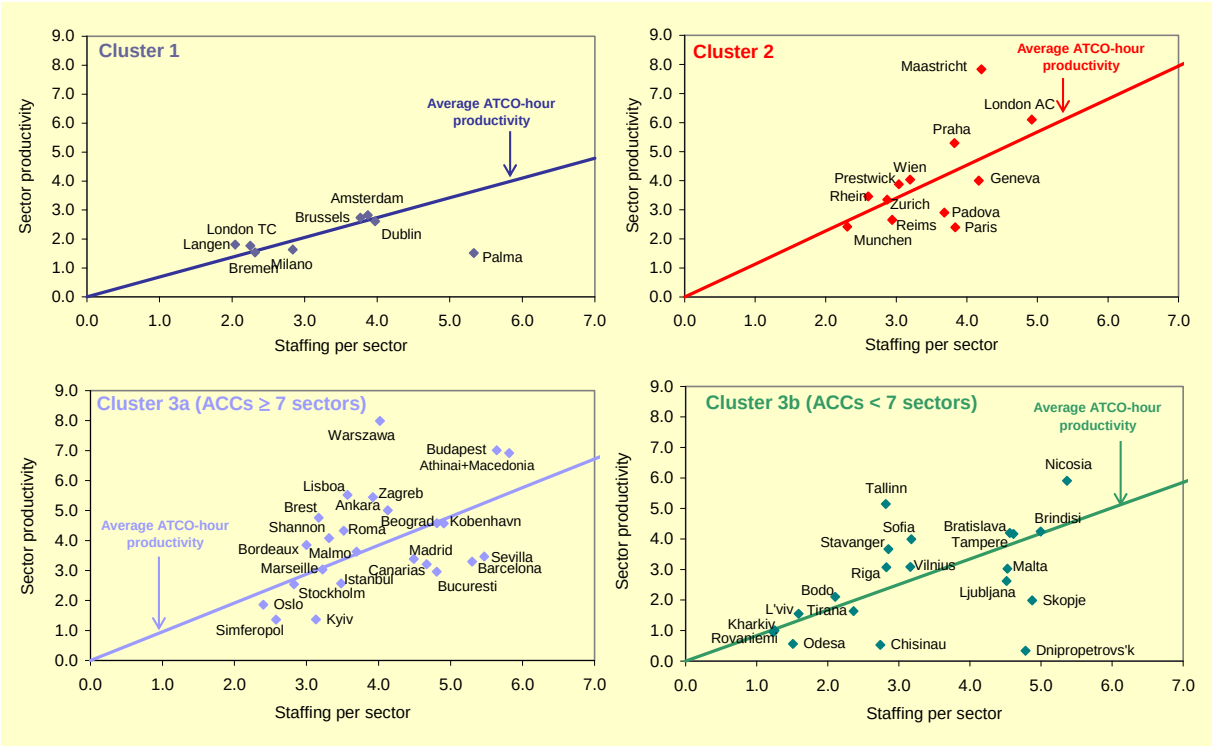

Figure 8.12: Sector productivity and staffing per sector, 2008

The graphs for Cluster 1 and Cluster 2 give an indication of the range of possible staffing configurations and practices that can deliver the same ATCO productivity, in ACCs with similar characteristics.

Figure 8.12 indicates that the greater ATCO-hour productivity in Maastricht (Cluster 2) and in Warszawa (Cluster 3a) are mainly the result of significantly higher sector productivity (almost eight aircraft on average simultaneously present in a sector). It is noteworthy that MUAC sector productivity is two to four times the productivity achieved by ACCs with a similar staffing per sector in Cluster 2 (i.e. Padova and Paris).

On the other hand, the graphs for Cluster 3a and Cluster 3b show that in these clusters, similar levels of sector productivity are achieved with very different staffing configuration and practices, or alternatively similar levels of staffing are delivering a wide range of sector productivity. Several factors are likely to affect ATCO productivity in these clusters. One explanation might be due to spare capacity and low utilisation of the available resources. Another explanation might be due to higher seasonal traffic variability or other factors, as yet not clearly identified. In any case, the analysis of the two sub-components of ATCO-hour productivity provide useful insights into the different productivity performance achieved by the various ACCs and are a tool to identify where potential improvements are possible.

8.12 Changes in ATCO-hour productivity at ACC level (2004-2008)

Changes in productivity should be seen in the light of the quality of service provided by the ACC. Therefore Figure 8.13, Figure 8.14, Figure 8.15 and Figure 8.16 show changes in ATCO-hour productivity between 2004-2008 for the ACCs within each cluster along with changes in ATFM delays per flight-hour. Some caution is needed with these results since it is not always clear whether these changes are due to genuine productivity variations or improved data reporting that is part of the learning process. Moreover, as part of the experience and understanding gained from the data validation process the PRU has made some data adjustment, where relevant, in order to ensure comparability over time.

For Cluster 1, ATCO-hour productivity rose by +13.0% between 2004 and 2008. Figure 8.13 suggests the following comments for Cluster 1:

- For Brussels, Bremen and Langen ACCs, both ATCO-hour productivity and ATFM delays increased between 2004 and 2008.

- London TC and Dublin show significant increases in ATCO-hour productivity over the period (+43% and +59%). It is noteworthy that for London TC[85] this increase has been achieved while containing en-route ATFM delays to fairly low levels. On the other hand, after a significant reduction between 2004 and 2007, ATFM delays increased in 2008 for Dublin ACC.

- Between 2004 and 2008, ATCO-hour productivity decreased for Palma ACC (-16%), but ATFM delays remained marginal throughout the period.

- For Milano and Amsterdam ACCs, both ATCO-hour productivity and ATFM delays per flight-hour decreased between 2004 and 2008. In 2008, Milano and Palma were the ACCs that generated the lowest amount of ATFM delays in Cluster 1.

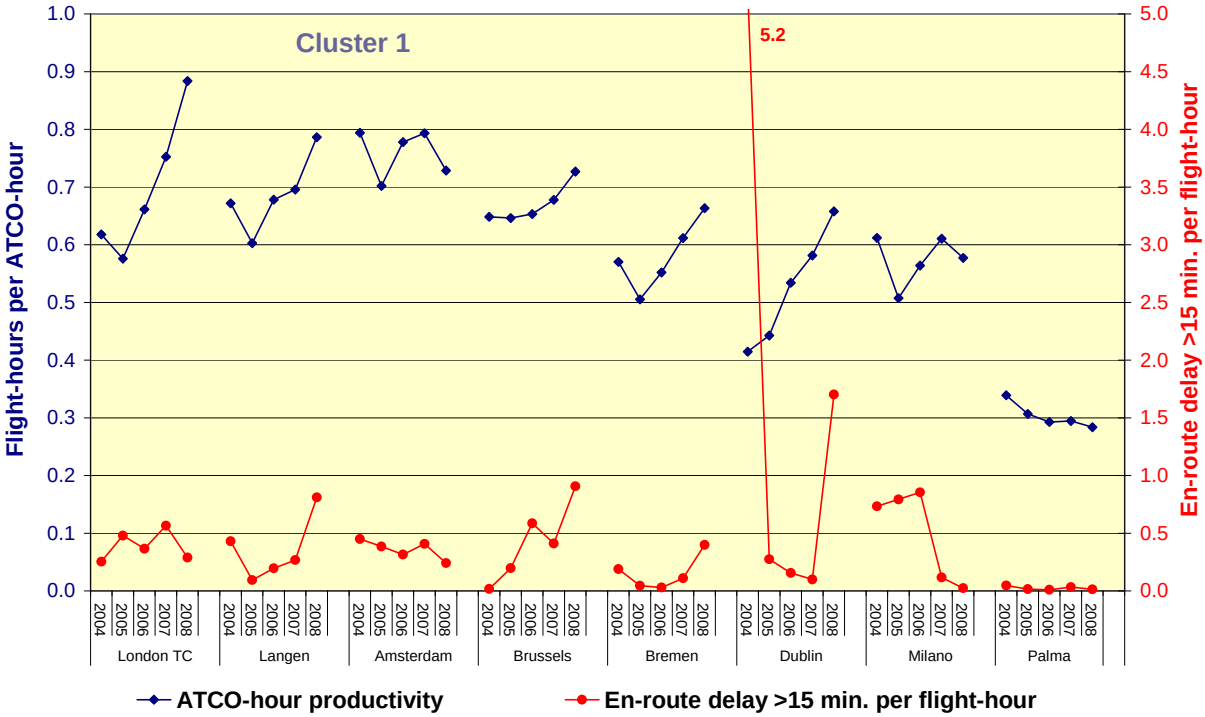

Figure 8.13: Changes in ATCO-hour productivity and ATFM delays per flight-hour (Cluster 1)

For Cluster 2 the overall change in ATCO-hour productivity over the 2004-2008 period was +14.1%.

[85] The increase in ATCO-hour productivity for London TC in 2008 is mainly due to a change in the methodology used by NATS to report ATCO working hours in their ACE data submission.

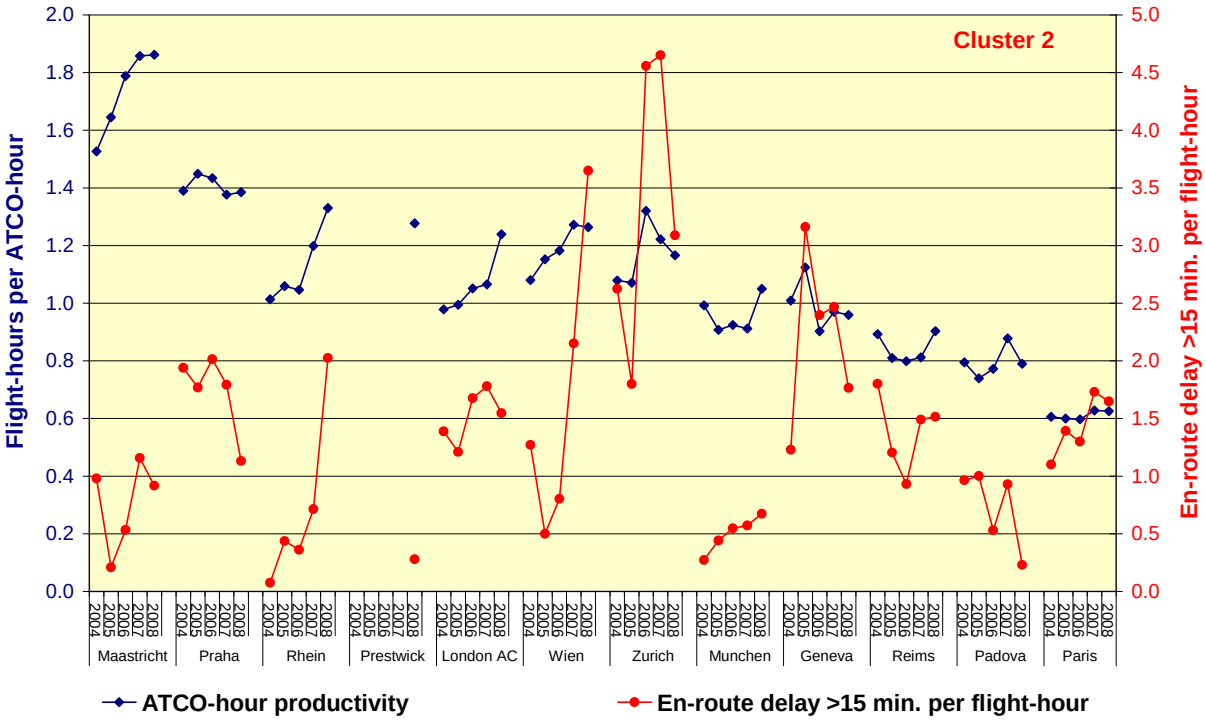

Figure 8.14: Changes in ATCO-hour productivity and ATFM delays per flight-hour (Cluster 2)

Figure 8.14 suggests the following comments for Cluster 2:

- Increases in ATCO-hour productivity greater than +15% are observed for Wien (+17%), MUAC (+22%), London AC[86] (+27%) and Rhein (+31%). However these significant productivity increases are accompanied by substantial rises in ATFM delays per flight-hour for Wien, Rhein, and to a lesser extent, London AC.

- For Padova, Reims and Praha, ATCO-hour productivity remained fairly constant between 2004 and 2008 while ATFM delays per flight-hour significantly decreased.

- For Paris and München, ATCO-hour productivity slightly rose over the period while ATFM delays per flight-hour significantly increased.

- Finally, changes in ATCO-hour productivity between 2004 and 2008 for Geneva and Zurich reflect the move of ATCOs between Zurich to Geneva ACCs in anticipation of the UAC-CH programme (2005-2006) which was abandoned in Spring 2006.

[86] The increase in ATCO-hour productivity for London AC in 2008 is mainly due to a change in the methodology used by NATS to report ATCO working hours in their ACE data submission.

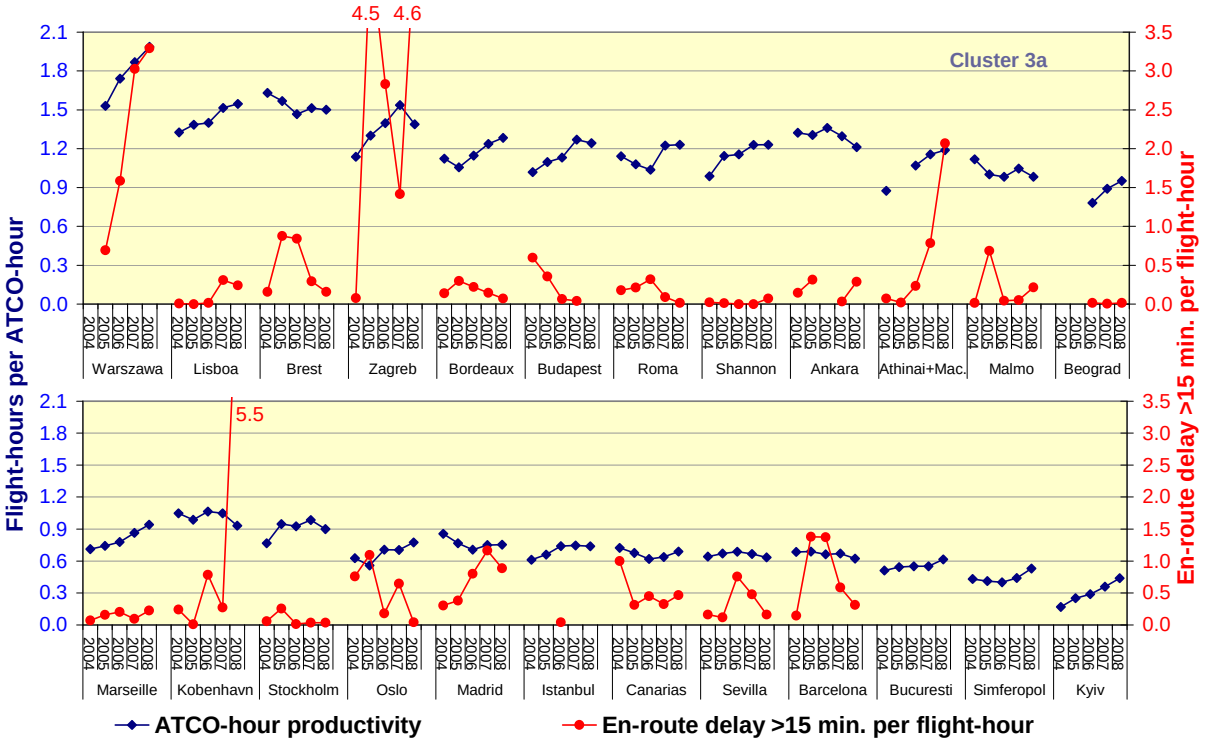

Figure 8.15: Changes in ATCO-hour productivity and ATFM delays per flight-hour (Cluster 3a)

For Cluster 3a, ATCO-hour productivity increased by +8.9% between 2004 and 2008. Figure 8.15 below indicates that in Cluster 3a:

- ATCO-hour productivity increased for 14 ACCs between 2004 and 2008;
  - o Several ACCs in this cluster managed to increase productivity for the fifth consecutive year;
  - o Increases in ATCO-hour productivity greater than 20% are observed for 10 out of those 14 ACCs (Kyiv (+159%), Athinai+Macedonia (+36%), Marseille (+32%), Simferopol (+23%), Shannon (+25%), Oslo (+24%), Budapest (+22%), Zagreb (+22%), Istanbul (+21%) and Bucuresti (+21%). By and large, these ACCs have experienced strong traffic growth which resulted in an increase of ATCO-hour productivity through a more effective use of spare capacity and existing resources.
  - o Increases in productivity were however accompanied by significant increases in ATFM delays per flight-hour for Warszawa, Zagreb and Athinai+Macedonia. Delays have been recurrent over the last five years in these ACCs.
  - o The high ATFM delays observed for Kobenhavn in 2008 (i.e. 5.5 min per flight-hour) were due to the transition to the new ATM system (DATMAS).
- Finally, ATCO-hour productivity decreased for Malmo (-12%), Madrid (-12%), Kobenhavn (-11%), Barcelona (-9%), Ankara (-8%), Brest (-8%) and Canarias (-5%). It is noteworthy that for Madrid ACC, the decrease in productivity is accompanied by a significant increase in ATFM delays per flight-hour (reaching 0.9 minute per flight-hour in 2008).

For Cluster 3b, ATCO-hour productivity increased by +33.0% between 2004 and 2008. Figure 8.16 below shows that in Cluster 3b:

- Sofia, L'viv and Vilnius managed to increase productivity for the fifth consecutive year;
- ATCO-hour productivity increased for 16 ACCs out of 20 (Bodo, Bratislava, Brindisi, Chisinau, Kharkiv, L'viv, Ljubljana, Malta, Odessa, Riga, Rovaniemi, Skopje, Sofia, Stavanger, Tirana and Vilnius) between 2004 and 2008. Except Malta (+15%), Ljubljana (+11%), Tirana (+16%), Stavanger (+7%) and Skopje (+1%), all these ACCs recorded productivity increases greater than +20%;

- Sofia ACC recorded a 49% increase in ATCO-hour productivity in 2008. It should be noted that this increase occurs in the context of the transfer of Varna area control sectors to Sofia, possibly leading to some rationalisation in the utilisation of resources.
- Despite the magnitude of these productivity increases, 4 ACCs in Cluster 3b have in 2008 an ATCO-hour productivity below 0.5 flight-hour per ATCO hour;
- Between 2004-2008, ATCO-hour productivity decreased for four ACCs (Tallinn (-15%), Tampere (-10%), Nicosia (-6%), and Dnipropetrovs'k (-2%);
- In this Cluster, a majority of ACCs did not record any ATFM delays (or only marginal delays) between 2004 and 2008. This suggests that there is still room for productivity improvements for most ACCs in Cluster 3b as additional traffic volumes could be absorbed through spare capacity and existing resources.
- Over the 2004-2008 period, only three ACCs (Nicosia, Bratislava and Ljubljana) have generated delays above 1 minute per flight-hour. ATFM delays are a recurrent issue for Nicosia ACC, which has been continuously on the list of most en-route ATFM delay generating ACCs since 2005.

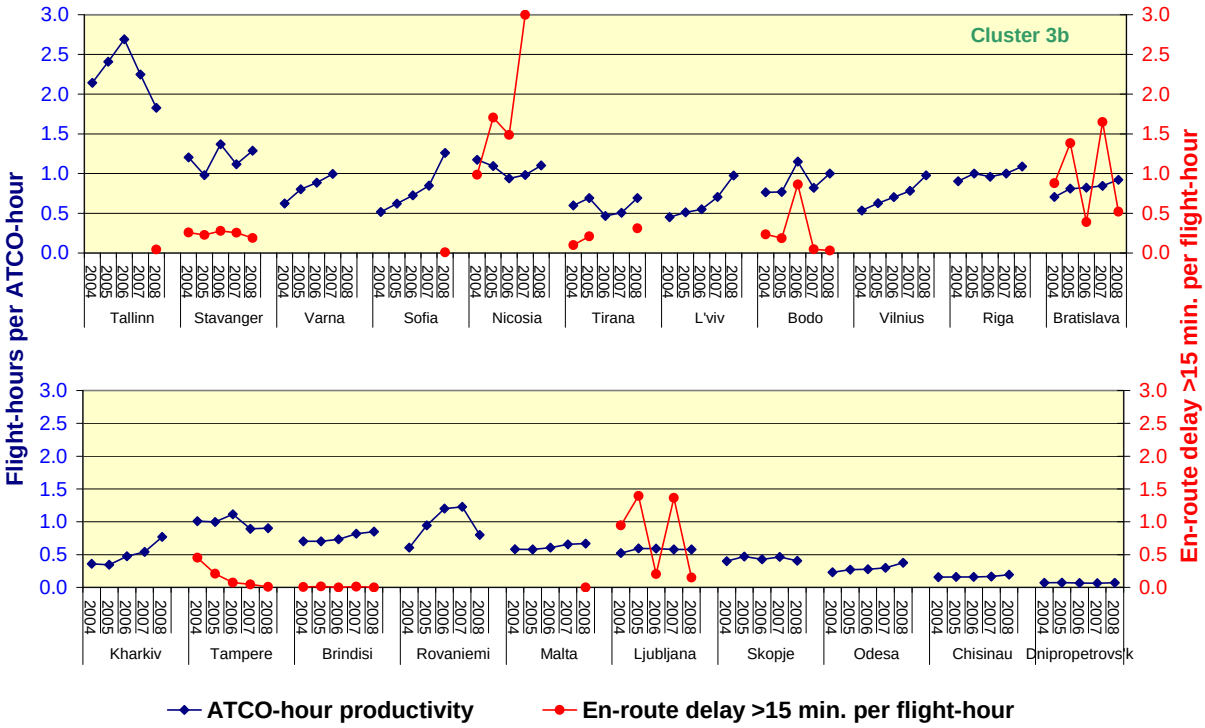

Figure 8.16: Changes in ATCO-hour productivity and ATFM delays per flight-hour (Cluster 3b)

The preliminary findings of this section show a mitigated picture, with an overall increase in ATFM delay per flight-hour, mainly driven by a small number of ACCs experiencing either exceptional situations or showing a structural capacity gap. In the current context of slowdown in traffic growth (+2% in 2008 compared to +6% in 2007), the increase in ATFM delays is disappointing.

PART III: ECONOMIC COST-EFFECTIVENESS

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9 ECONOMIC COST-EFFECTIVENESS

9.1 Introduction

An assessment of the overall performance of an ANSP should take into account all the areas related to the economics of ANS - not only financial cost-effectiveness but also the **quality of service** provided, such as efficient routings and adequate levels of ATC capacity while ensuring ANS safety. There is to some extent a trade-off between financial cost-effectiveness and quality of service. Measures to expand capacity and reduce delays may impose financial costs on airspace users. If sole emphasis is placed on financial cost-effectiveness, it could disincentivise such measures, even when the benefits of delays saved outweigh the financial costs to the ANSP.

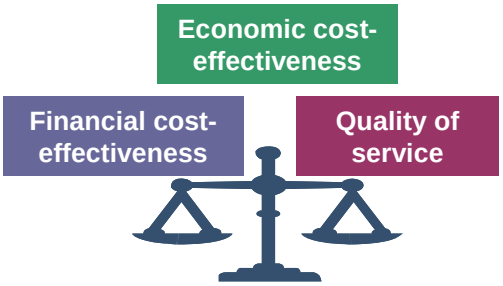


Figure 9.1: Trade-off between cost-effectiveness and quality of service

ACE therefore introduced the concept of “economic” cost-effectiveness, which includes the costs of ground ATFM delays. This concept is detailed in this chapter.

9.2 The measures of quality of service

The analysis of financial cost-effectiveness is based on the ATM/CNS costs provided by the ANSPs, and is reported in Part II of this report (Chapters 5-7).

These costs are not, however, the only way in which the service provided by an ANSP affects airspace users. The quality of service provided by ANSPs has an impact on the efficiency of aircraft operations; inefficient routings or lack of adequate ATC capacity carry with them additional costs that need to be taken into consideration for a full economic assessment of ANSP performance. To reflect those additional costs, the concept of “economic" cost-effectiveness is detailed in this chapter.

A number of factors affect aircraft operations and contribute to the quality of service that is provided to airspace users by an ANSP. These include:

- ATFM ground delays;
- Airborne holding (although these are mostly a consequence of airport constraints);
- Horizontal flight-efficiency and the resulting route length extension;
- Vertical flight-efficiency and the resulting deviation from optimal vertical flight profile.

The last three factors have also an environmental impact in terms of additional green house gases emissions (CO_2, N_2O, etc) and emissions affecting local air quality (NO_x, CO, PM, etc), hence external costs to society at large.

As both delays and flight-efficiency have a cost, there are internal trade-offs between these measures of quality of service. Moreover, it is likely that these trade-offs are exacerbated in particularly dense and congested airspaces.

Data and methodology are currently being developed by the PRU to compute flight-inefficiencies at ANSP level. It is therefore expected that future ACE reports will include a horizontal flight-efficiency component as part of the economic cost-effectiveness

indicator. This would contribute to better reflect the quality of service associated with ATM/CNS provision, although it is important to bear in mind that local flight-efficiency improvements within a given ANSP can be limited as they might depend on civil/military coordination issues and European wide improvements in route and airspace designs: two issues which are not necessary under the full control of an ANSP.

For the present report, however, this analysis is not sufficiently mature to permit inclusion of flight inefficiency within the economic costs. The economic costs are therefore defined as comprising the financial costs, as analysed in Part II, and the cost of ATFM ground delay.

As a consequence of these limitations, the quality of service associated with ATM/CNS provision by ANSPs is, for the time being, assessed only in terms of ATFM ground delays, which can be measured consistently and expressed in monetary terms.

The indicator of economic cost-effectiveness is therefore defined as ATM/CNS provision costs plus the costs of ATFM ground delay, all expressed per composite flight-hour[87]. The conceptual framework is illustrated in Figure 9.2.

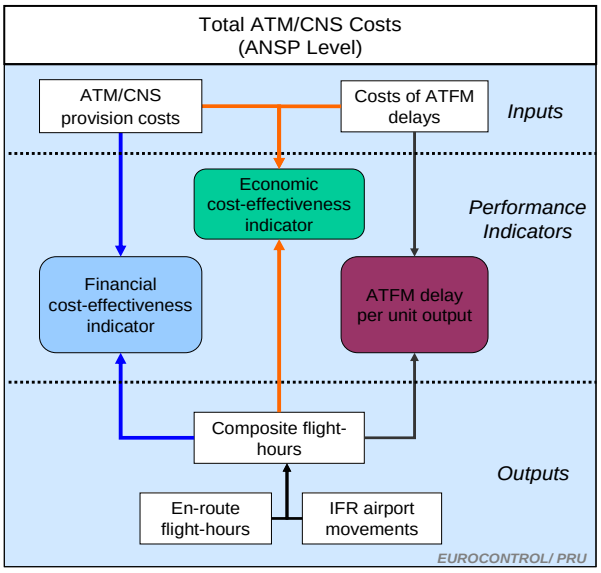


Figure 9.2: Conceptual framework for the analysis of economic cost-effectiveness

In order for delays to be added to the measure of financial cost-effectiveness, a value must be assigned to the cost of delays. In the ACE 2002 Benchmarking Report, the cost of ATFM delays (on the ground – engine off) **longer** than 15 minutes was assessed at €71 per minute on average[88], and that of delays **less** than 15 minutes at zero[89]. Unavoidably, there is some uncertainty in this estimate and, hence, corresponding cost estimates should be viewed with care. For the purpose of this report the same assessment has been used but the figure has been adjusted to €82 to take inflation into account. This will enhance comparability of results over time.

ATFM delays (and the associated costs for the users) can arise from both en-route and terminal service provision. The results should be interpreted with a degree of caution, especially in cases where ATFM delays largely arise in the terminal environment. Terminal-related ATFM delays, and associated costs, can arise from airport constraints, which are outside the direct control of the respective ANSP (such as compliance with environmental constraints or lack of airport infrastructure).

[87] As defined in Section 2.1 and Annex 1 of the ACE 2002 Benchmarking Report.
[88] These costs mainly arise from crew costs, passengers' compensation and passengers' opportunity costs.
[89] This was based on a report commissioned by the PRC on the cost of delay (cf. University of Westminster "Evaluating the true cost to airlines of one minute of airborne or ground delay" (2003). This report can be found on the PRC web site.

9.3 The measure of economic gate-to-gate cost-effectiveness

Table 9.1 shows how the economic cost-effectiveness indicator has been calculated; the costs of ATFM delay are added to the ATM/CNS costs of service provision to give the economic costs of service provision (see column 8). The indicator of economic cost-effectiveness is the economic cost per gate-to-gate unit of output[90].

Estimates of delay are based on CFMU figures. For a number of ANSPs ATFM delays figures are very low. For LGS, the CFMU does not record ATFM delays and therefore no estimates of delay are available. For the purposes of this analysis, it has been assumed that delays in this ANSP are zero.

ANSPs	Country	(1) Gate-to-gate ATM/CNS provision costs (in €'000)	(2) ATFM delays < 15 min. ('000 minutes)	(3) ATFM delays > 15 min. ('000 minutes)	(4)=(3)x€82 Costs of ATFM delays > 15 min. (in €'000)	(5) Composite flight-hours (in '000)	(6)=(1)/(5) Financial gate-to-gate cost-effectiveness	(7)=(4)/(5) Cost of delay per composite flight-hour	(8)=(6)+(7) Economic cost per composite flight-hour
Aena	ES	1 213 782	529	1 343	110 128	1 945	624	57	681
ANS CR	CZ	117 711	81	248	20 334	274	429	74	503
ATSA Bulgaria	BG	75 881	0	2	201	187	406	1	407
Austro Control	AT	169 251	343	1 268	103 968	424	399	245	645
Avinor	NO	169 578	23	84	6 863	480	353	14	368
Belgocontrol	BE	149 059	48	280	22 998	216	690	106	796
Croatia Control	HR	61 491	146	662	54 320	185	333	294	626
DCAC Cyprus	CY	38 533	87	653	53 562	141	273	380	653
DFS	DE	823 544	742	2 995	245 606	2 008	410	122	533
DHMI	TR	237 036	130	679	55 708	844	281	66	347
DSNA	FR	1 125 370	467	1 752	143 675	2 798	402	51	453
EANS	EE	10 727	1	2	190	71	151	3	153
ENAV	IT	652 414	182	711	58 310	1 432	456	41	496
Finavia	FI	55 119	5	18	1 463	187	295	8	302
HCAA	GR	184 850	132	1 259	103 217	534	346	193	539
HungaroControl	HU	73 631	2	9	719	233	316	3	319
IAA	IE	112 531	46	308	25 248	358	315	71	385
LFV/ANS Sweden	SE	163 100	30	96	7 879	588	278	13	291
LGS	LV	20 103	n/a	n/a	n/a	84	240	n/a	240
LPS	SK	42 825	17	37	3 049	91	471	34	504
LVNL	NL	161 969	142	429	35 154	281	576	125	701
MATS	MT	12 707	0	0	2	49	261	0	261
MK CAA	MK	11 858	0	0	0	25	475	0	475
MoldATSA	MD	5 752	0	0	0	14	418	0	418
MUAC		128 429	245	533	43 711	581	221	75	296
NATA Albania	AL	14 468	2	10	814	37	389	22	411
NATS	UK	725 952	494	2 292	187 985	1 987	365	95	460
NAV Portugal (FIR Lisboa)	PT	148 636	40	142	11 628	348	427	33	461
NAVIAIR	DK	105 819	384	1 024	83 941	311	340	270	610
Oro Navigacija	LT	19 053	0	0	0	62	306	0	306
PANSA	PL	148 871	269	971	79 647	429	347	186	533
ROMATSA	RO	160 445	0	1	66	312	514	0	514
Skyguide	CH	211 545	360	1 003	82 260	479	442	172	614
Slovenia Control	SI	23 478	2	7	612	53	445	12	456
SMATSA	YU	70 109	0	3	230	222	315	1	316
UkSATSE	UA	150 480	0	0	0	383	393	0	393
Total European System		7 596 106	4 949	18 823	1 543 488	18 652	407	83	490

Table 9.1: Economic cost-effectiveness KPI, 2008

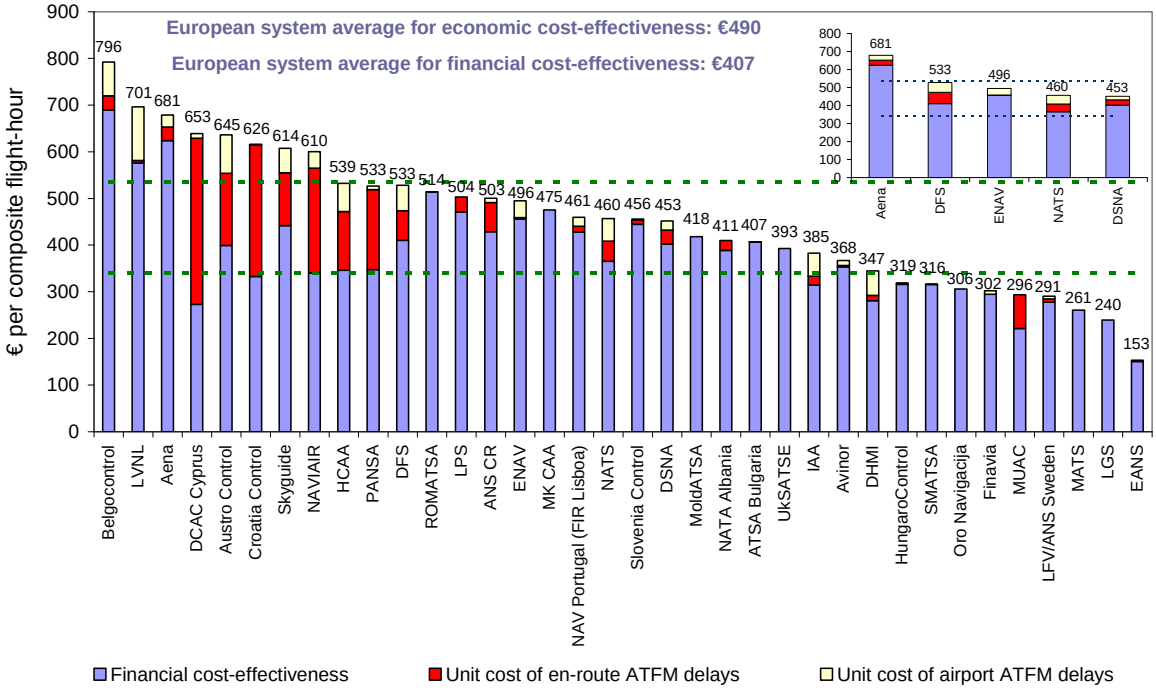
9.4 Comparison of economic cost-effectiveness (2008)

Figure 9.3 displays the comparison of the economic gate-to-gate cost-effectiveness indicator (economic cost per composite flight-hour) between ANSPs.

[90] As defined in Section 2.1.

The economic cost-effectiveness indicator for the European system is €490 per composite flight-hour. The two dotted lines displayed in Figure 9.3 represent the bottom and top quartiles[91] and provide an indication of the dispersion. There is a difference of some €195 between the bottom and top quartile, which is higher than in 2007. This difference is higher than for the financial cost-effectiveness KPI; the introduction of the ATFM delays exacerbates the dispersion of results across ANSPs.

The economic cost-effectiveness indicator ranges from €796 (Belgocontrol) to €153 (EANS), a factor greater than five. Costs reported for MUAC do not include the costs of the CNS infrastructure which is made available free of charge by Belgocontrol, LVNL, and DFS.



Note that this economic cost-effectiveness KPI is a factual indicator. A genuine measurement of **cost inefficiencies** would require full account to be taken of identified and **measurable** exogenous factors such as cost of living, traffic complexity, and traffic variability (as described in Chapter 4).

Figure 9.3: Economic gate-to-gate cost-effectiveness KPI, 2008

[91] See footnote 47, p. 49.

Across Europe, ATFM delays contributed 17% to the total economic cost in 2008. Figure 0.10 shows that the number of ANSPs which experienced significant lack of ATC capacity in 2008, indicated by ATFM delays contributing more than 20% to their economic cost of ATM/CNS provision, rose to ten. Austro Control, Croatia Control, DCAC Cyprus, HCAA, MUAC, PANSA, and Skyguide were joined in 2008 by DFS, NAVIAIR and NATS. On the other hand, ANS CR is no longer on this list as ANS CR's delays significantly reduced in 2008.

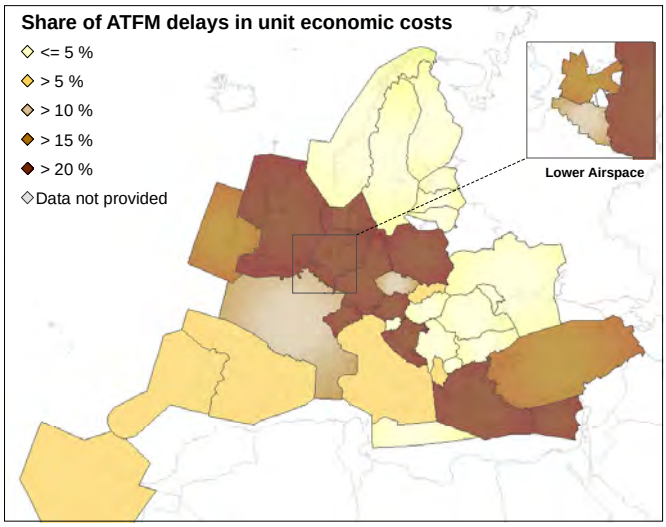


Figure 9.4: Share of ATFM delays in unit economic costs, 2008

Among the five largest ANSPs, DSNA and ENAV managed to improve both the quality of service and the financial cost-effectiveness over the period. On the other hand, Aena experienced both a rise in unit ATM/CNS provision costs and a rise in the costs of ATFM delays per unit output.

The level of ATFM delays mainly depends on the extent to which the ATC capacity provided by an ANSP is in line with the traffic demand. In the medium-term, the level of capacity provided can be gradually increased through a variety of measures including the recruitment of additional ATCOs and capital investment (e.g. ATM systems with higher capabilities, etc.).

During the period 2004-2008 ANSPs invested over €6 000M with different investment cycles and magnitudes across ANSPs. Average ANSPs "capex to revenue" ratios – a measure of the magnitude of the investment - for the period 2004-2008 are shown in Figure 9.5. For 13 ANSPs, the "capex to revenue" ratio is higher than 20% indicating substantial investments on the period. Figure 9.5 indicates that for Croatia Control, NAVIAIR, NATS and Skyguide, these large capex are associated with higher levels of ATFM delays in 2008.

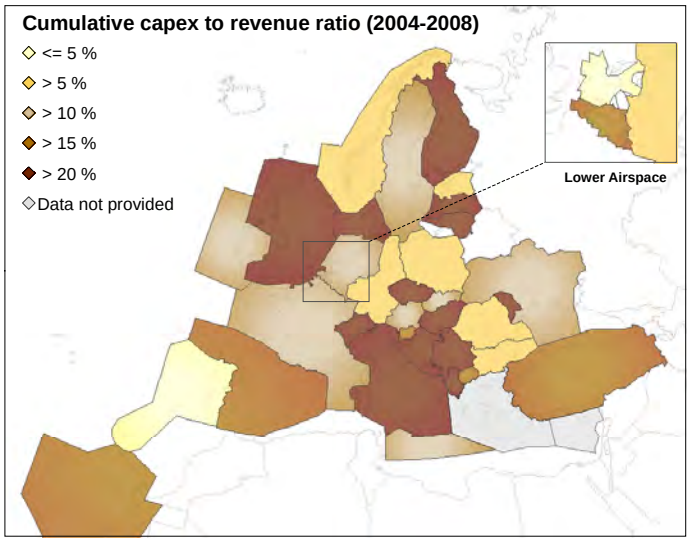


Figure 9.5: ANSPs cumulative capex (2004-2008)

There is certainly a lag between capital expenditure and the time when investments are effectively put in operation and contribute to provide additional ATC capacity. However, further analysis is required to better understand why the quality of service has not improved for these ANSPs.

Figure 9.6 shows that airport ATFM delays represent 40% of the total cost of ATFM delays. Overall, 46% of all airport ATFM delays are caused by weather and environment issues which may be difficult for the ANSP to influence. However, another 35% of airport delays result from aerodrome or ATC capacity problems, and this can rise to more than 80% in individual ANSPs (see Figure 9.7 below).

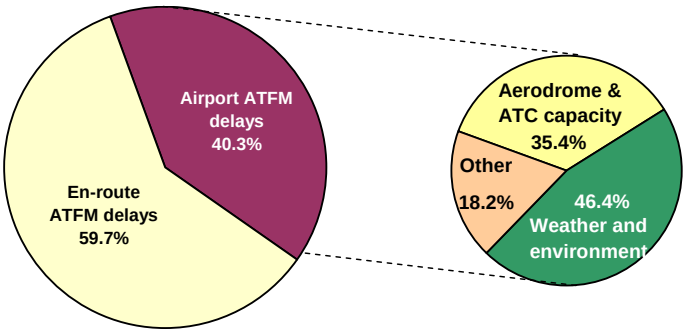


Figure 9.6: Breakdown of ATFM delays, 2008

Figure 9.7 shows the distribution of delays by cause for those ANSPs with more than 100 000 minutes of ATFM delays greater than 15 minutes.

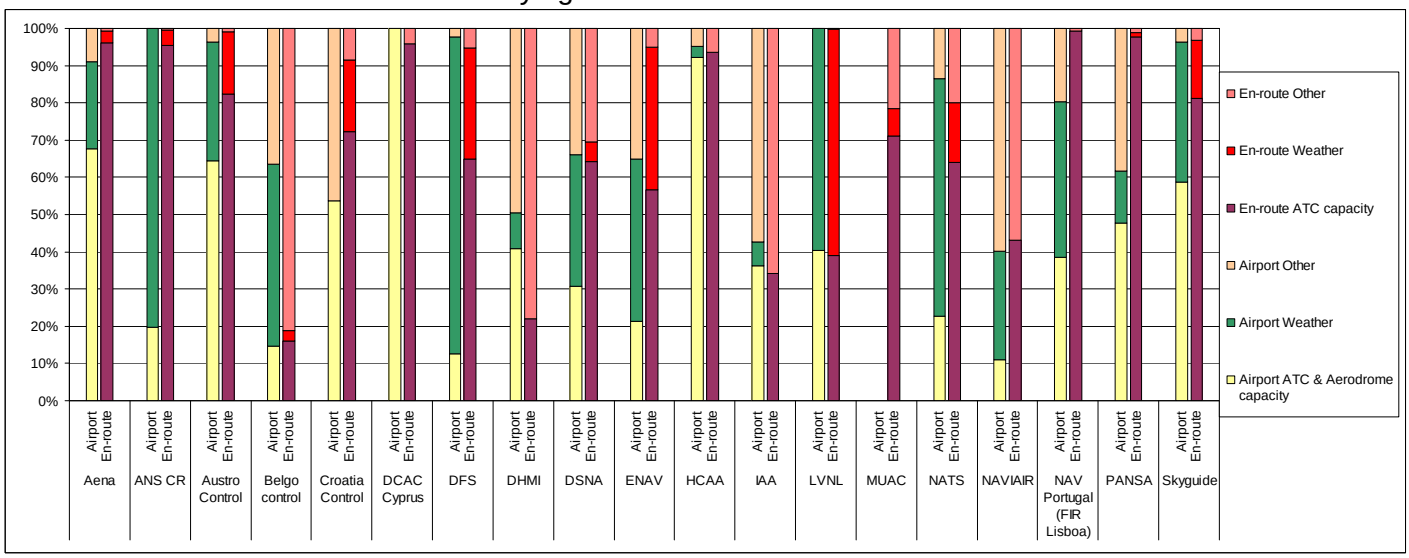


Figure 9.7: Causes of en-route and airport ATFM delays, 2008)

Figure 9.7 indicates that the airport ATFM delays for Aena, Austro Control, Croatia Control, DCAC Cyprus, HCAA, PANSA and Skyguide are mostly associated with aerodrome capacity issues (see light yellow bar).

On the other hand, the airport ATFM delays for ANS CR, Belgocontrol, DFS, LVNL, and NATS are mainly due to bad weather conditions (see green bar). The issue of the extent to which certain delays, such as weather-related ATM delays and delays caused by environmental constraints due to noise management practices are outside the ANSP control deserves further investigation.

9.5 Trends in economic cost-effectiveness (2004-2008)

This section analyses the changes in economic cost-effectiveness between 2004 and 2008 at European system level. Note that (for the reasons given in Section 6.1) the indicators presented in this section are not directly comparable to those in previous ACE reports.

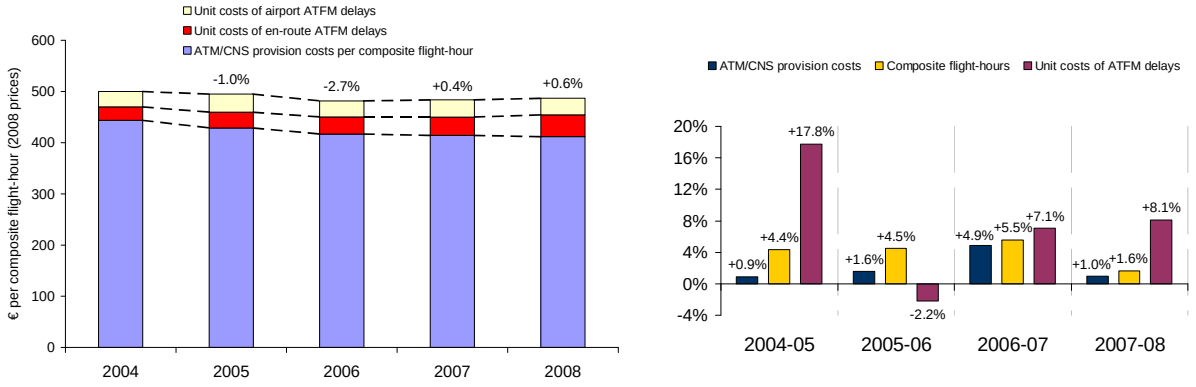


Figure 9.8: Trend in gate-to-gate economic cost-effectiveness KPI (2004-2008, real terms)

Figure 9.8 shows how the economic cost per composite flight-hour has changed since 2004. The economic cost per composite flight-hour fell steadily until 2006, stabilised in 2007 and worsened in 2008 (left-hand side of Figure 9.8). Compared to 2004, the economic cost-effectiveness KPI shows only marginal improvement in 2008 (-2.6%). While costs continued to rise, this rise was no longer counterbalanced by traffic whose growth slowed from 4-6% a year to only 1.6% in 2008. As a result, the financial cost-effectiveness KPI (see blue bar in Figure 9.8) remained fairly constant. At the same time, the unit costs of ATFM delays increased substantially, which is disappointing given the relatively low traffic growth in 2008. The result was an overall rise in 2008 of +0.6% in the economic cost per composite flight-hour.

Average consumer prices increased by 11% (+2.7% per year) between 2004 and 2008, this means that the economic unit costs at system level increased by 8% in nominal terms.

The changes in the economic cost per unit output at European level between 2004 and 2008 mask contrasting levels and trends across the 33 ANSPs that consistently reported ACE data since 2004. Economic costs per composite flight-hour fell for 22 ANSPs. It is important to note that differences in the investment cycle can affect the economic cost-effectiveness either through high levels of delay **prior** to a major ATM investment, or through high capital-related costs (depreciation, cost of capital) **after** the major ATM investment.

For the purpose of illustration and building on the analysis of exogenous factors affecting performance (see Chapter 4), Figure 9.9 below shows:

- In the top chart, the changes in economic cost-effectiveness for both the 15 most "complex" ANSPs (those with an overall complexity score **higher** than 4 minutes of interaction per flight-hour); and
- In the bottom chart, the changes for the 21 less "complex" ANSPs (those with an overall complexity score **lower** than 4 minutes of interaction per flight-hour).

The top chart in Figure 9.9 suggests:

- All these ANSPs experienced some ATFM delays throughout the 2004-2008 period (albeit these were insignificant for SMATSA), but 10 out of 15 ANSPs improved their economic cost-effectiveness;
- Among the five largest ANSPs, ENAV, DFS and DSNA reduced their unit economic costs, by improving the financial cost-effectiveness (DFS) or both the financial cost-effectiveness and the quality of service or (DSNA and ENAV). However, for Aena, the combination of a rise in unit ATM/CNS provision costs and a rise in ATFM delays led to a rise in economic unit costs (+7%). For NATS, the decrease in unit

ATM/CNS provision costs was not sufficient to compensate for the increase in ATFM delays.

- Skyguide's economic cost per composite flight-hour is adversely affected by a more or less constant high level of ATFM delays.
- ATFM delays increased in 2008 for Belgocontrol, LVNL, Austro Control and DFS. These increases should be seen in the light of the low (or even negative in some places) traffic growth in 2008.

Of the less complex ANSPs (see bottom chart of Figure 9.9), six experienced no ATFM delays throughout the 2004-2008 period, despite high traffic growth in many of these ANSPs. All these six ANSPs achieved a reduction in unit ATM/CNS provision costs, while maintaining zero delay. It will be important for these ANSPs to continue to provide ATC capacity in line with a growing demand before ATFM delays start to diminish their economic cost-effectiveness.

Figure 9.9 also indicates that in 2008 ATFM delays rose significantly for DCAC Cyprus, Croatia Control, HCAA, NAVIAIR, DHMI and IAA.

More details on the changes in economic cost-effectiveness for individual ANSPs are reported in Part IV of this report.

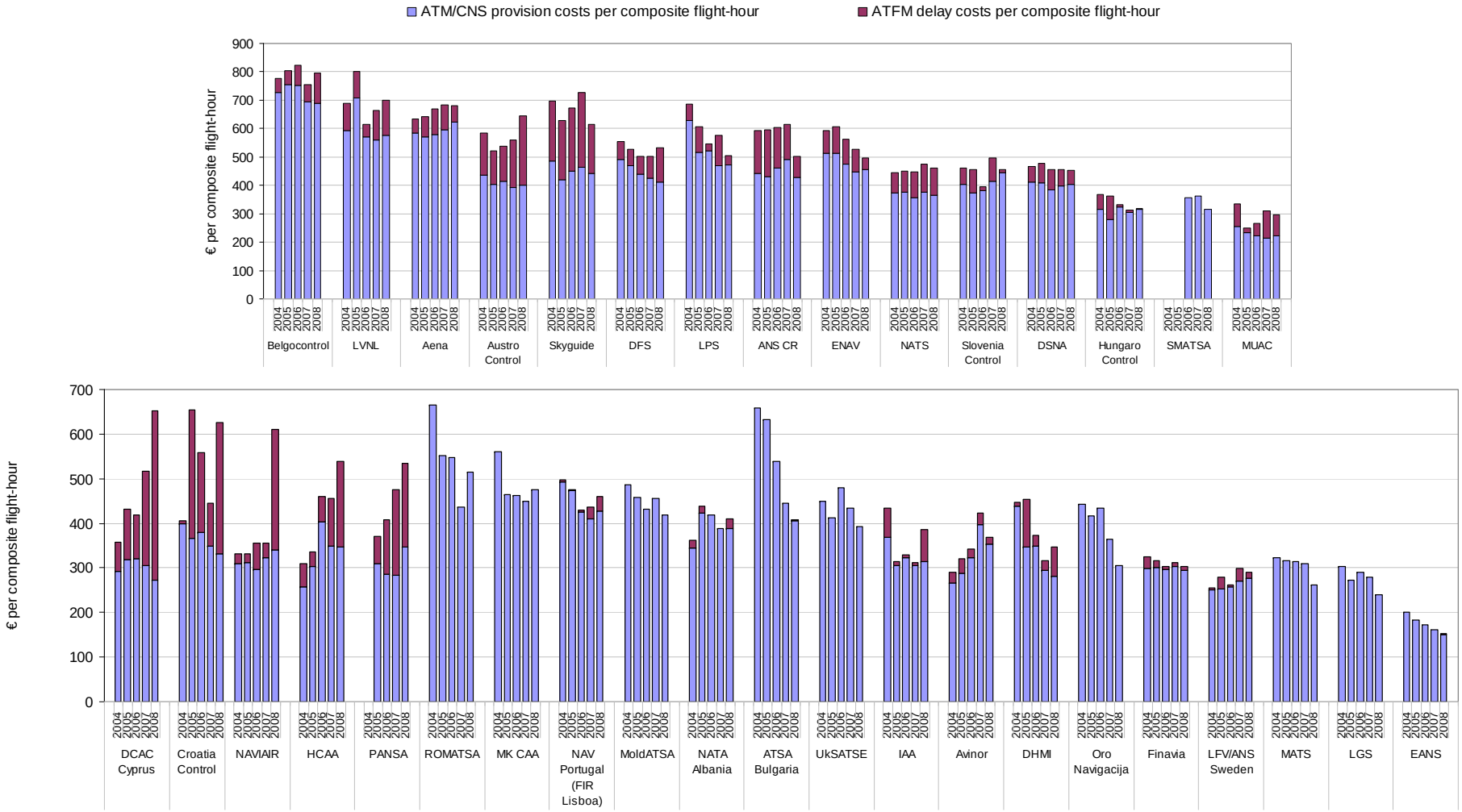


Figure 9.9: Changes in economic cost-effectiveness for the 15 most "complex" and the 21 less "complex" ANSPs (2004-2008)

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PART IV: COST-EFFECTIVENESS PERFORMANCE FOCUS AT ANSP LEVEL

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10 COST-EFFECTIVENESS PERFORMANCE FOCUS AT ANSP LEVEL

10.1 Objective of this chapter

This chapter comprises two pages for each ANSP. The first page examines the historical development of the key performance indicators defined in Chapters 5 and 9 and makes an assessment of historical and current cost-effectiveness performance. The second summarises the projections and plans provided by each ANSP, which were examined at European level in Chapter 7.

10.2 Historical development of performance, 2004-2008

This page presents, for each ANSP, an assessment of its cost-effectiveness performance, and how it has developed over the five-year period 2004 to 2008. It examines the overall economic cost-effectiveness indicator and its two components (ATM/CNS costs per composite flight-hour, ATFM delay costs per composite flight-hour), and their evolution over the period (top left). It puts these in the context of the traffic growth observed in the ANSP's airspace (top right). In this page, financial data are all expressed in real terms (2008 prices).

Developments in the components of financial cost-effectiveness (ATCO-hour productivity, ATCO employment costs per ATCO-hour, and support costs per composite flight-hour) are also examined (middle left), to help understand the underlying causes of changes in overall cost-effectiveness. Changes in support costs are further broken down into employment costs of staff other than ATCOs in OPS; non-staff operating costs; capital-related costs (depreciation and the cost of capital); and exceptional items, where present.

The bottom set of graphs examine how the changes in the components over the whole period contribute to the change in the overall financial cost-effectiveness indicator. The left-hand graphs relate to ATCOs in OPS; the right-hand graphs to other elements of cost ("support costs"). The left-hand graphs show how the change in ATCO productivity combines with the change in unit ATCO employment costs to make a change in ATCO employment costs per unit output. The right-hand graphs show how the change in support costs combines with traffic growth to make a change in support costs per composite flight-hour. The relative contribution of these two effects to the change in the financial cost-effectiveness indicator depends on the relative weight of ATCO employment costs, on the one hand, and support costs, on the other, in the overall ATM/CNS provision cost.

The middle right panel presents an assessment of each ANSP's performance and its development over time, based on these indicators, viewed in the context of the traffic growth and other exogenous conditions (traffic complexity and seasonality, and the economic conditions in the country where the ANSP is based). The assessment notes any material exceptional circumstances that the PRU has been made aware of, and any other major factors contributing to the evolution of performance. Each ANSP's performance is, where possible, compared to that of ANSPs of similar size or external conditions.

10.3 The planned and projected development of performance, 2009-2013

This page presents the projections for each ANSP, including projected demand, and plans in terms of costs, capex, staff, and capacity. These are used to calculate the financial cost-effectiveness indicator (ATM/CNS costs per composite flight-hour). In this page financial data are all expressed in real terms (2008 prices).

The top box describes the projected development of the financial cost-effectiveness indicator in the plans provided in ACE 2008. It examines the changes that have been made from the plans in ACE 2007. It discusses any particular circumstances relating to the plans, such as specific major investments and other elements of planned cost. Any major difficulties in interpreting the ANSPs plans and projections are highlighted.

The graphs presented are as follows:

- The top-left graph shows how the planned financial cost-effectiveness performance indicator arises from the combination of planned costs with projected demand growth.
- The top-right graph compares the plans in ACE 2007 with those in ACE 2008.
- The middle graphs show the relationship between historical capital expenditure and asset values, and how capex is projected to continue. The left-hand graph shows how assets have been split between those in operation and those under construction, together with an indicator of the remaining asset life. This can be viewed in the context of the historical capital expenditure figures in the right-hand graph. The right-hand graph also shows the historical and planned evolution of capital expenditure and depreciation. The ratio of these quantities (usually greater than one) is an indication of the rate at which the overall asset base is being expanded. Expansion of the asset base should, in general, be associated with increased average asset life as new assets are brought into operation.
- The bottom graphs show historical and planned expansion of capacity, both in terms of numbers of ATCOs (on the left) and numbers of sectors and sector-hours (on the right). This graph permits the comparison of planned ATC capacity expansion with projected demand.

The presentation of financial time-series data

Presentation and comparison of historical series of financial data from different countries poses problems, especially when different currencies are involved, and inflation rates differ. There is a danger that time-series comparisons can be distorted by transient variations in exchange rates which happened to be particularly the case in 2008 in the wake of the financial crisis. In this chapter, the focus is on the historical development of financial performance indicators **in a given ANSP**.

For this reason, the following approach has been adopted for allowing for inflation and exchange rate variation. The financial elements of performance are assessed, for each year, in **national** currency. They are then converted to national currency in 2008 prices using national inflation rates. Finally, for comparison purposes in 2008, all national currencies are converted to euros using the 2008 exchange rate.

This approach has the virtue that an ANSP's performance time series is not distorted by transient changes in exchange rates over the period. It does mean, however, that the performance figures for any ANSP in a given year prior to 2008 are not the same as the figures in that year's ACE report, and cannot legitimately be compared with another ANSP's figures for the same year. Cross-sectional comparison using the figures in this report is only appropriate for 2008 data.

This differs from the approach to inflation and exchange rates used in previous ACE reports.

The historical inflation figures used in this analysis were obtained from the International Monetary Fund. For the projections, the ANSPs' own assumptions concerning inflation rates were used. Details of the figures used are given in Annex 5 to this report.

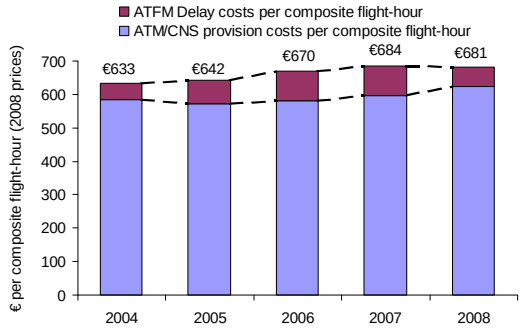
10.4 Cost-effectiveness performance focus at ANSP level

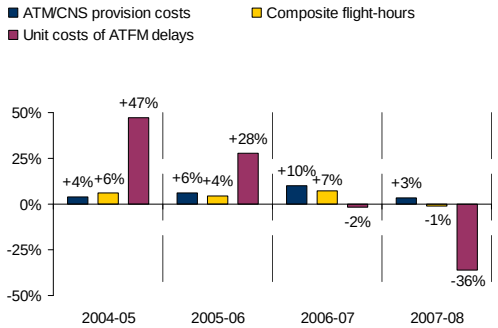
To facilitate the reading of this section, the table below displays the page number of the historical and forward-looking analysis of ANSPs cost-effectiveness performance.

ANSP name	Country	Page
Aena	Spain	130
ANS CR	Czech Republic	132
ATSA Bulgaria	Bulgaria	134
Austro Control	Austria	136
Avinor	Norway	138
Belgocontrol	Belgium	140
Croatia Control	Croatia	142
DCAC Cyprus	Cyprus	144
DFS	Germany	146
DHMİ	Turkey	148
DSNA	France	150
EANS	Estonia	152
ENAV	Italy	154
Finavia	Finland	156
HCAA	Greece	158
HungaroControl	Hungary	160
IAA	Ireland	162
LFV/ANS Sweden	Sweden	164
LGS	Latvia	166
LPS	Slovak Republic	168
LVNL	Netherlands	170
MATS	Malta	172
MK CAA	F.Y.R. Macedonia	174
MoldATSA	Moldova	176
MUAC		178
NATA Albania	Albania	180
NATS	United Kingdom	182
NAV Portugal (FIR Lisboa)	Portugal	184
NAVIAIR	Denmark	186
Oro Navigacija	Lithuania	188
PANSA	Poland	190
ROMATSA	Romania	192
Skyguide	Switzerland	194
Slovenia Control	Slovenia	196
SMATSA	Serbia and Montenegro	198
UkSATSE	Ukraine	200

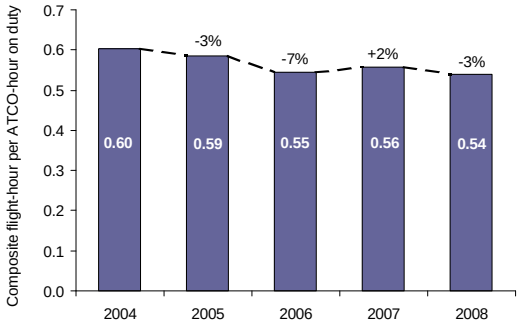
Aena (Spain)

Trend in gate-to-gate economic cost-effectiveness

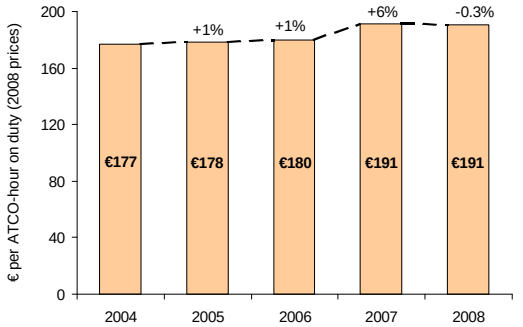




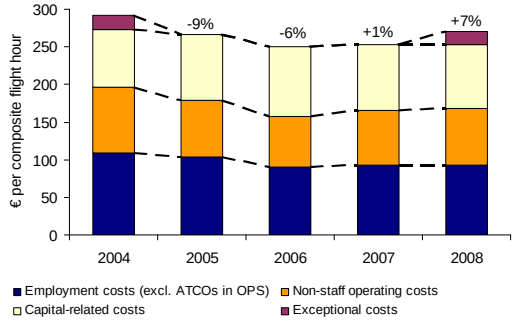
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

In terms of the cost base, Aena is the largest European ANSP, with costs amounting to around 16% of the European total (for a traffic representing 10% of the European total).

Over five years, its traffic has grown by +4% a year, but has slightly declined in 2008. Over the period Aena experienced the highest traffic growth among the five largest ANSPs (+17%). Overall, the complexity of its traffic is intermediate. Among the other four large ANSPs, Aena's traffic shows significantly less complexity.

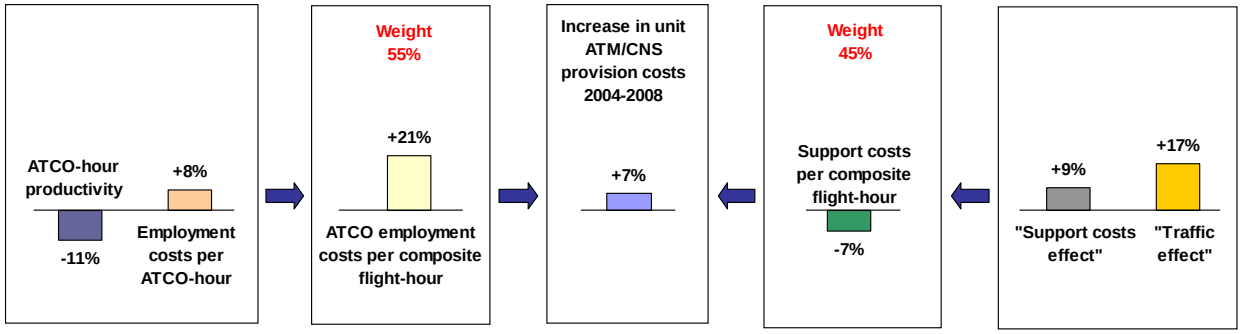
Unit ATM/CNS provision costs rose by +7% over the 2004-2008 period, while the other four largest ANSPs all managed to reduce their unit ATM/CNS costs. High unit costs have been exacerbated by recurrent ATFM delays, and Madrid ACC has been continuously on the list of most en-route ATFM delay generating ACCs since 2005. Aena unit economic costs are +31% higher than the average of the other four large ANSPs, and are the 3rd highest in Europe. The situation did not improve in 2009, illustrating the need for all parties concerned to properly address and act upon capacity issues.

The main contributors to the increased costs are a combination of increases in employment costs per ATCO-hour (+8%) and decreases in ATCO productivity (-11%). Aena employment costs per ATCO-hour on duty are the highest in Europe and the decrease in ATCO productivity is a unique situation among the five largest ANSPs.

Its exceptionally high ATCO employment costs are associated with the collective agreement. It should be noted that a specific law (Ley 9/2010) has been adopted in Spain in April 2010 to address this issue.

Unit support costs, by contrast, appear to be close to the European average, and the lowest among the five largest ANSPs. Over the period, a +9% rise in support costs has been outweighed by a +17% traffic increase. However, the transition to IFRS in 2008 has resulted in the recognition of additional liabilities associated with special paid leave and pre-retirement of ATCOs. These transition costs to IFRS will be charged to airspace users (through both the en-route and the terminal cost-bases) over a period of 15 years (2008-2022), and are reported as exceptional costs in ACE.

Changes in financial cost-effectiveness



Aena (Spain)

Comments on ANSP's forward-looking cost-effectiveness

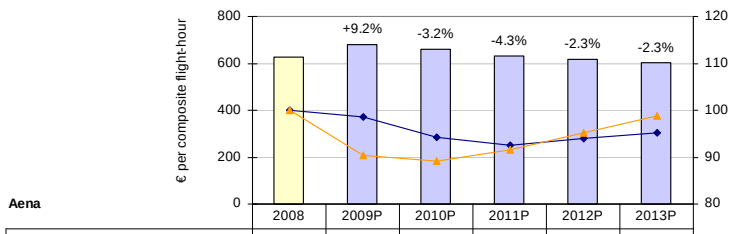
Gate-to-gate unit ATM/CNS costs are expected to decrease by -4% between 2008 and 2013, an average annual reduction of some -1.3%. ACE 2008 planned costs have been slightly adjusted but remain consistent with ACE 2007 plans, while traffic volumes have been revised downwards quite significantly to reflect the 2009 slump in the air transport sector. The planned profile for the cost-effectiveness improvement of AENA is in line with the law "Ley 9/2010" which aims at significantly improving cost-effectiveness and productivity so that Spanish unit rates charged to airspace users are consistent with the other large European ANSPs.

From a high level of capex back in 2004, annual capex has been on a declining trend between 2005 and 2007, resulting in a moderate decrease in the average remaining accounting life of the fixed asset until 2007. Although declining, investments were substantial in the period 2004-2008, and cumulated to €806M. 2008 marks the start of new cycle, with planned capex for the period 2009-2013 amounting to some €843M (79% of the 2008 gate-to-gate ANS revenues). Compared to ACE 2007, the investment plan has been revised upwards. Capex in the period 2008-2013 mainly relate to the following projects:

- Upgrade of ATM systems (i.e. €310M for 2009-2013);
- Construction of the new Valencia ACC building (i.e. €35M, between 2009 and 2013);
- Replacement of navigation aids (i.e. €68M for 2009-2013);
- Installation of communication equipments/infrastructure (i.e. €39M for 2009-2013); and
- Installation of MSSRs (i.e. €63M for 2009-2013).

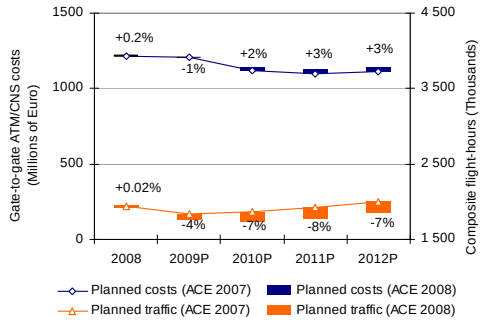
By 2013, traffic volumes are planned to come back to their 2008 level, after bottoming out in 2010 (-11% compared to 2008). In the meantime, the total number of ATCOs in OPS is planned to increase by +8%, implying that, all else being equal, Aena's productivity in terms of composite flight-hours per ATCO is planned to slightly decrease. It is expected that these trends allow for a reduction of ATFM delays in the coming years. The number of sector-hours are planned to increase at a steady rate of +2% from 2009 until 2011. Aena did not provide the planned number of en-route sectors and sector-hours for the years 2012 and 2013.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

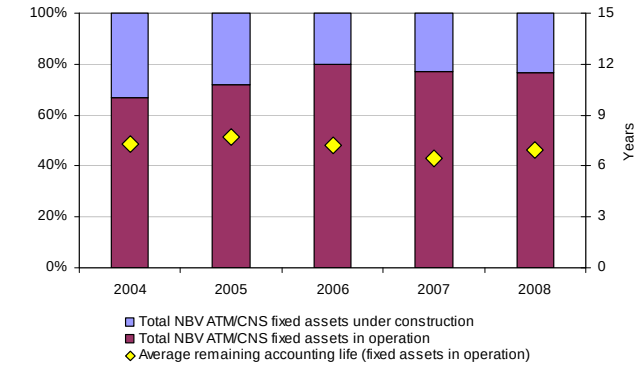


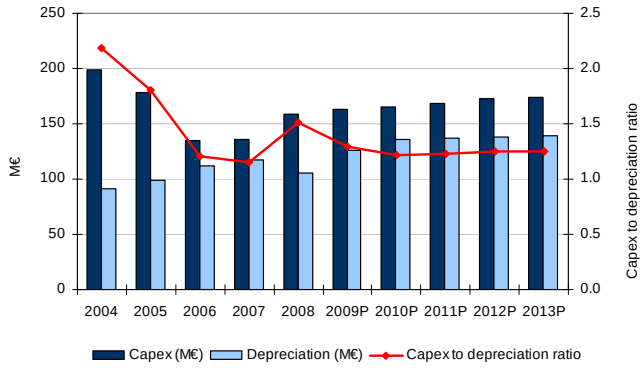
Aena

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	624	681	660	631	617	602
Gate-to-gate costs (index)	100	99	94	93	94	95
Composite flight-hours (index)	100	90	89	92	95	99

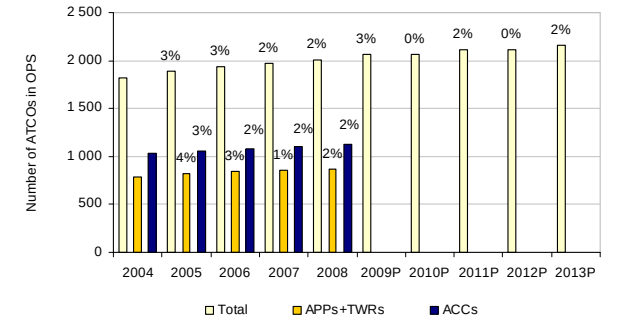


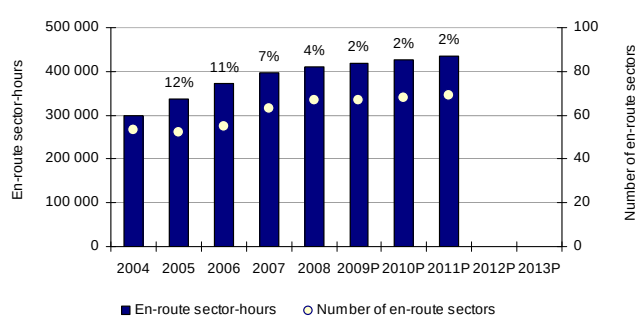
Assets structure and planned capital expenditure





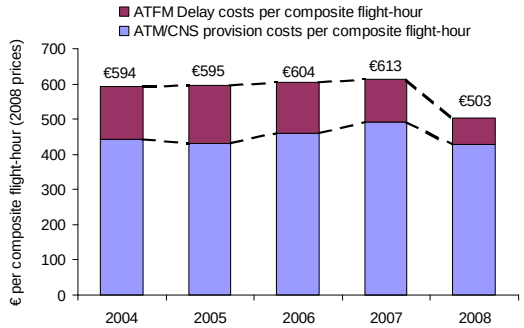
Planned staff and capacity data

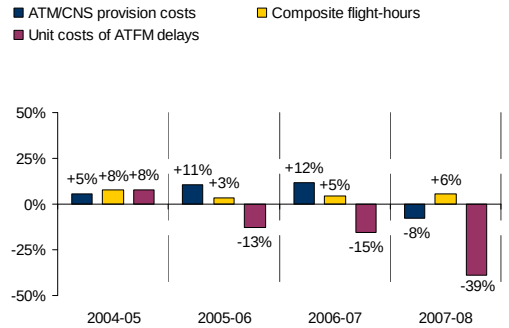




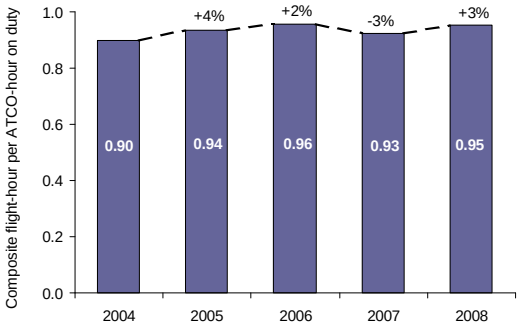
ANS CR (Czech Republic)

Trend in gate-to-gate economic cost-effectiveness

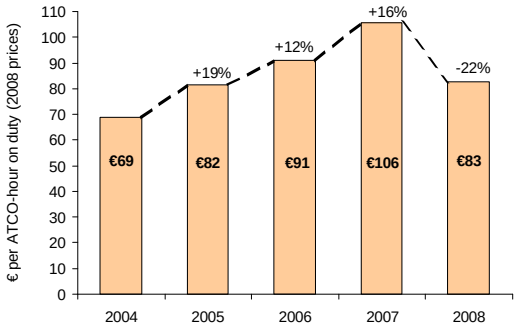




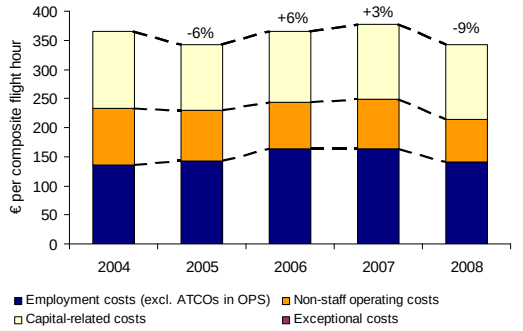
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

ANS CR is a medium-sized ANSP in the heart of Europe, with costs accounting for around 1.6% of the European total.

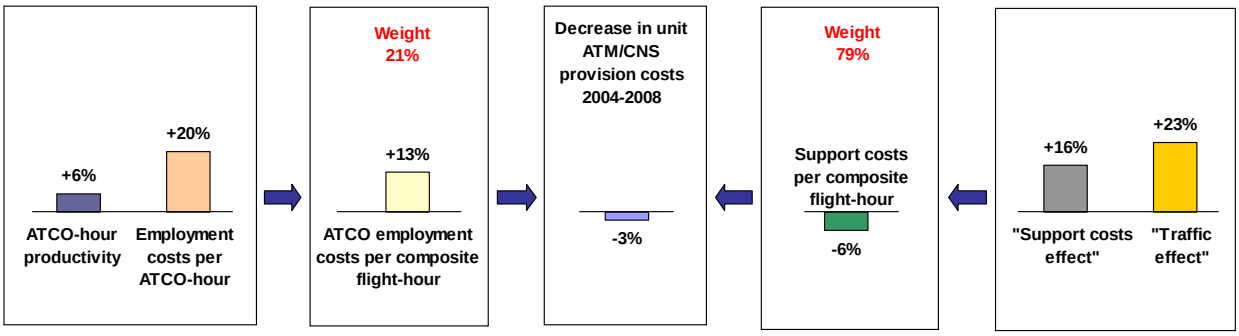
Its traffic over five years has increased by +5% a year. The complexity of its traffic is relatively high, above the top quartile.

After three years of growth, ATM/CNS provision costs fell by -8% in 2008, due to reductions in both employment costs per ATCO-hour and unit support costs. In fact, 2007 staff costs were affected by extra bonuses paid to ATCOs and technical staff. In addition, staff costs genuinely decreased in 2008 due to a national legislation introducing an upper limit to social contributions and a slight reduction in workforce. Combined with a significant fall of ATFM delays, it resulted in a -15% reduction in unit ATM/CNS economic costs over the period. The reduction in ATFM delays results from additional ATCOs in OPS and more effective operation of the new ACC, commissioned in 2007.

ATCO productivity rose by +6% over the period, which is significantly less than the +20% increase in employment cost per ATCO-hour, resulting in an increase in ATCO employment costs per unit of output of +13%. 2008 shows a break in the trend of fast rising of employment costs per ATCO-hour, mainly due to a reduction in ATCO bonuses and overtime.

The overall -3% decrease in unit ATM/CNS provision costs over the 2004-2008 period has been driven for the most part by lower unit support costs (-6%). The investment in the new ACC has resulted in a big expansion of the asset base and of capital-related costs, which contributes to the increases in overall support costs (+16%) and brings ANS CR to the third highest position in terms of unit capital-related costs. However, the +23% traffic increase over the period has outweighed the +16% increase in support costs. Compared to Austro Control, ANS CR has higher unit ATM/CNS costs, mainly due to lower productivity and higher unit support costs. In these two areas, the progresses achieved by ANS CR over the period, are lower than the progresses made by Austro Control. Delays are, however, less of a problem for ANS CR than for Austro Control. As a result its 2008 unit economic costs are significantly lower.

Changes in financial cost-effectiveness



ANS CR (Czech Republic)

Comments on ANSP's forward-looking cost-effectiveness

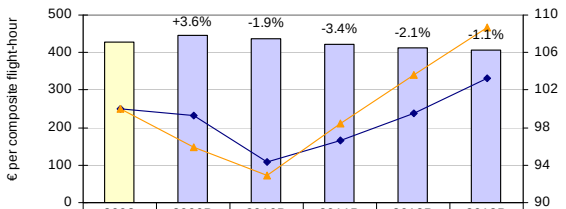
Gate-to-gate unit ATM/CNS costs are expected to fall by -5% between 2008 and 2013, an average annual reduction of some -1%, as costs are expected to rise in lesser proportions than traffic (i.e. +3% for costs vs +9% for traffic). Compared to ACE 2007 plans, ANS CR has revised both costs and traffic downward. Despite the planned increase in 2009 unit costs, the resulting cost-effectiveness profile shows signs of improvements, but less than in the previous year.

The new IATCC Prague was commissioned in February 2007, marking the end of a major investment cycle. As a result, the 2008 share of fixed assets under construction represents around 10% of the total fixed assets, its lowest point since 2004. The cumulative capex planned for the 2009-2013 period amount to some €86M. Although contrasting with the €171M invested between 2004 and 2008 it still represents some 70% of the 2008 gate-to-gate ANS revenues. Planned capex for the 2008-2013 period mainly relate to the following projects:

- Upgrade of the Thales EUROCAT system (i.e. €0.4M, 2009);
- Integration of Wide Area Multilateration system into surveillance infrastructure of ANS CR (i.e. €0.9M, 2010);
- Installation of a new 3D simulator for Prague TWR (i.e. €2.5M, 2010);
- Project of EFS (electronic flight strip i.e. €2.5M, planned to start in 2011);
- Replacement of ATM system (i.e. €40M, planned to be commissioned in 2016);
- Implementation of Mode S (i.e. €1.6M, 2012);
- Implementation of Voice over Internet Protocol (VoIP) communication (i.e. €1.5M, 2012); and
- New project OBR2010+ (radio-communication system, i.e. €8M, between 2010 and 2014).

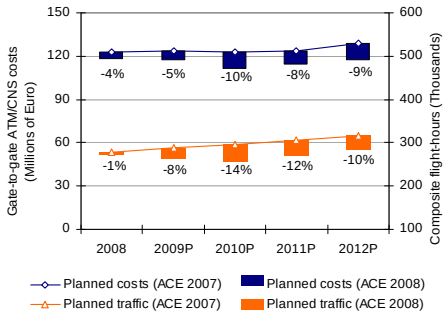
Traffic volumes are forecasted to rise by +9% between 2008 and 2013. This increase is planned to be absorbed by +19% more ATCOs in OPS, while the number of en-route sectors is planned to progressively rise from 8 to 11 in 2013. This implies that ANS CR productivity is planned to decrease between 2008 and 2013. On the other hand, it is expected that these trends allow for a significant reduction of ATFM delays in the coming years.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

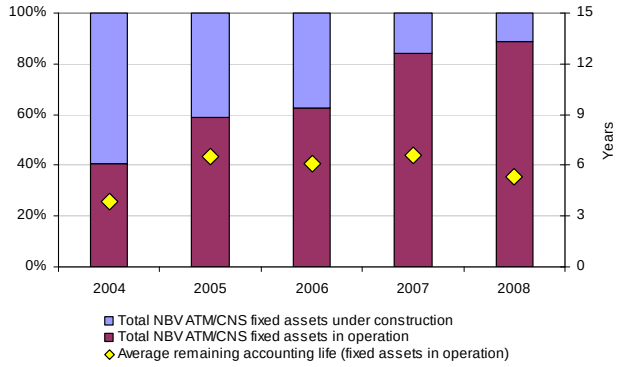


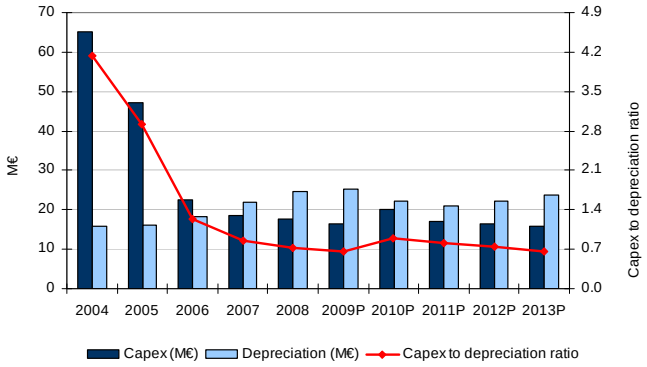
ANS CR

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	429	444	436	421	412	408
Gate-to-gate costs (index)	100	99	94	97	100	103
Composite flight-hours (index)	100	96	93	98	104	109

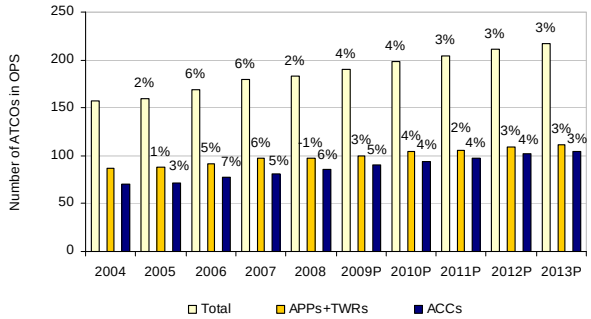


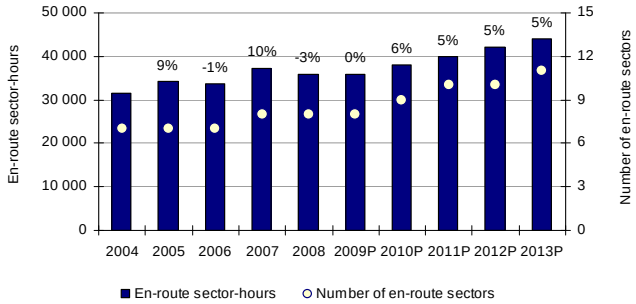
Assets structure and planned capital expenditure





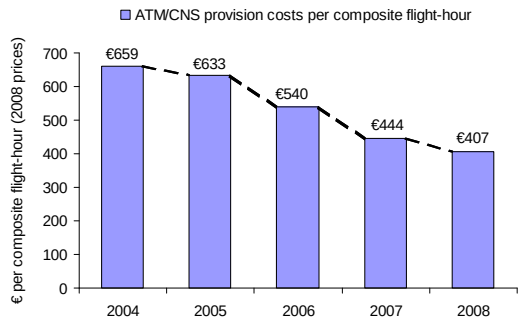
Planned staff and capacity data

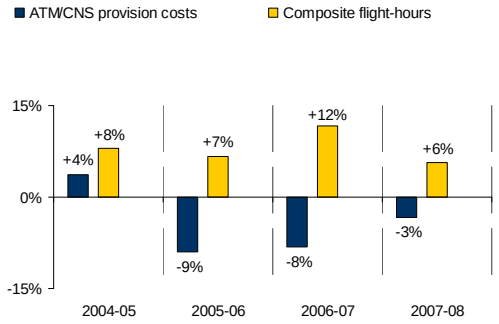




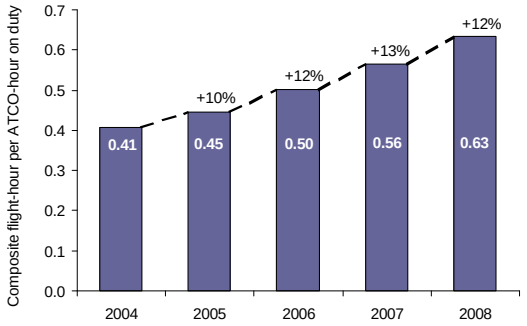
ATSA Bulgaria (Bulgaria)

Trend in gate-to-gate economic cost-effectiveness

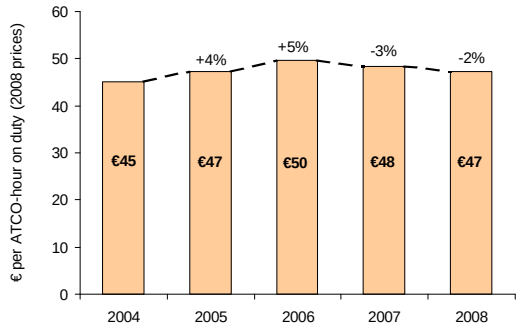




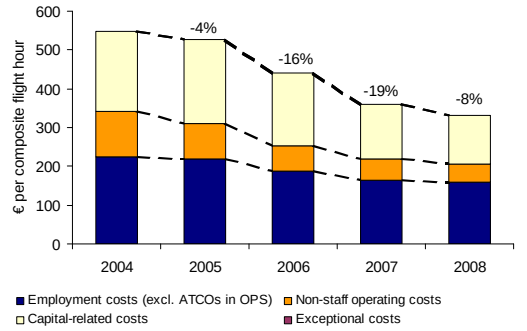
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

ATSA Bulgaria is a medium-sized ANSP, with costs amounting to around 1% of the European total.

Its traffic over five years increased rapidly, at +8% a year. Its traffic complexity, however, is relatively low, close to the bottom quartile, and seasonality of traffic among the highest.

Assisted by this rising traffic, ATSA Bulgaria has shown an impressive -38% fall in unit ATM/CNS costs over the period, the largest fall in Europe. From a position in 2004 where its unit costs were the third highest in Europe, they are now outside the top quartile and therefore more in line with the underlying economic and traffic demand fundamentals.

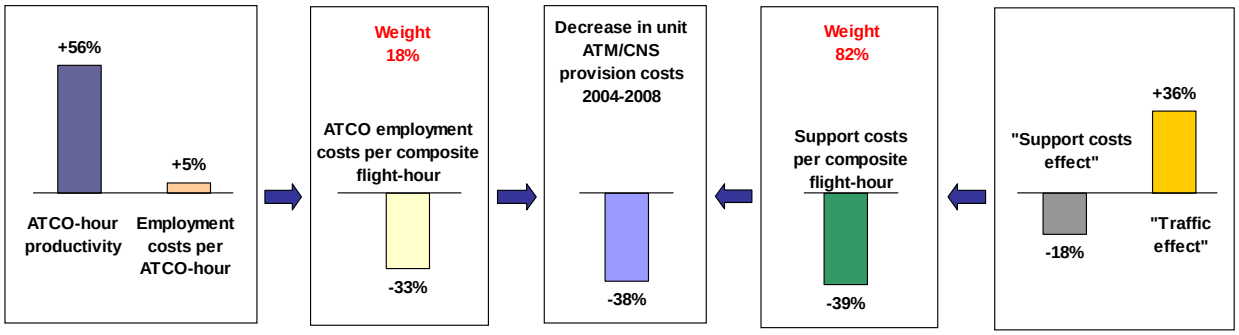
A new Sofia ACC was commissioned in 2004 and further upgrades to the FPD/RDP systems were commissioned in 2008. All area control sectors have also been merged in Sofia ACC in 2008 (Varna remaining an APP/TWR operational unit). Since 2004, its capacity has been more than adequate to serve its traffic without delays.

The cost reduction has been accomplished by impressive growth in productivity, around +12% a year. However, it is still below the European average. This productivity growth is mainly linked to the transfer of area control sectors from Varna ACC to Sofia ACC. Employment costs per ATCO-hour have been contained, with two years of consecutive reduction in 2007 and 2008, against a backdrop of rising employment costs in the Bulgarian economy as a whole.

All components of support costs have been contained and indeed total support costs have been reduced by -18% over the period, the largest fall in Europe. Unit capital related costs remain, however, among the highest in Europe. A noticeable feature of ATSA Bulgaria is that a large amount of cash reserves have been accumulated and in 2008 its liquidity ratio (current assets to current liability) was among the highest in Europe (6.2 compared to an average of 1.8).

Unit ATM/CNS costs are lower than ROMATSA but significantly higher than SMATSA. Productivity is higher than ROMATSA but lower than SMATSA. Employment costs are similar to SMATSA but lower than ROMATSA. ATSA Bulgaria was more successful than ROMATSA in reducing unit support costs.

Changes in financial cost-effectiveness



ATSA Bulgaria (Bulgaria)

Comments on ANSP's forward-looking cost-effectiveness

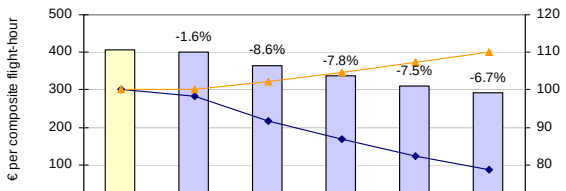
Gate-to-gate unit ATM/CNS costs are expected to fall by -28% between 2008 and 2013, an average annual reduction of -6%. This decrease is not uniform, since unit costs are planned to remain stable between 2008 and 2009, and to decrease by -27% between 2009 and 2013, as a result of the fall of planned ATM/CNS provision costs by -20% against a raise of planned traffic by +10%, during the same period. Compared to ACE 2007 plans, in ACE 2008 ATSA Bulgaria has revised its planned costs downwards. In particular, the 2008 actual costs are -3% lower than planned in ACE 2007, mainly due to a reduction of non-staff operating costs and depreciation costs. In the meantime, there are only marginal adjustments to the traffic forecasts. This results in a slightly more optimistic outlook than in ACE 2007.

The average remaining accounting life of the fixed assets has been continuously declining since 2004 but remains relatively high at 9 years, reflecting the significant investments made in years prior to 2004. The cumulative capex planned for the 2009-2013 period amount to some €57M, with a peak in 2010, mainly driven by a postponement of investments originally planned in 2009. It is noteworthy that the annual capex are planned to gradually decrease from 2010 to 2013, with the consequence of progressively reducing the capex to depreciation ratio, which indicates a decreasing asset base. The cumulative capex represent 64% of the 2008 gate-to-gate revenues and mainly relates to the following projects:

- Extension and upgrade of the SACTAS system (i.e. €9.1M, between 2008 and 2010);
- New tower at Sofia airport (i.e. €11M, between 2008 and 2012);
- Replacement of en-route MSSRs (i.e. €4M, between 2009 and 2010); and
- A-SMGCS at Sofia airport (i.e. €1.8M, between 2009 and 2010).

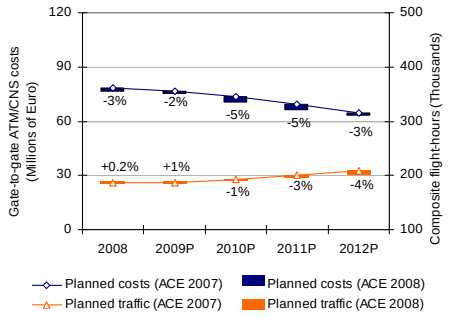
Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise by +8%, in line with traffic (+10%). The number of en-route sectors open at maximum configuration is planned to increase by +17%, in line with sector-hours (+15%).

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

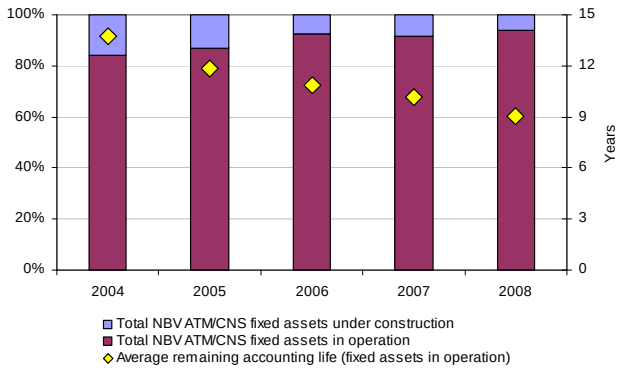


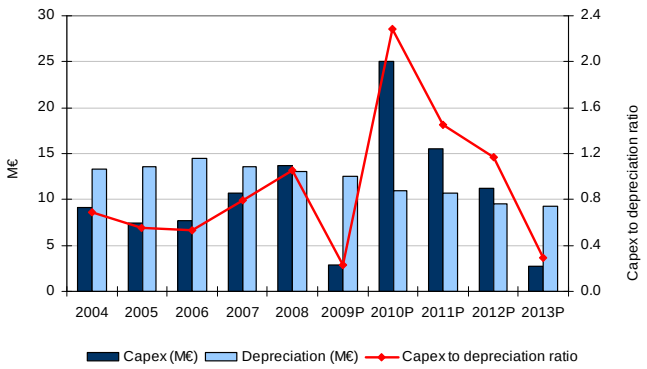
ATSA Bulgaria

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	406	400	365	337	311	291
Gate-to-gate costs (index)	100	98	92	87	82	79
Composite flight-hours (index)	100	100	102	105	107	110

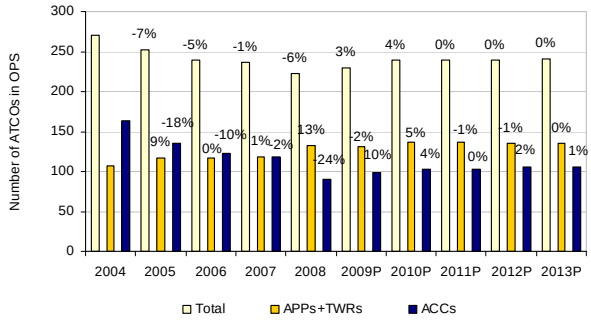


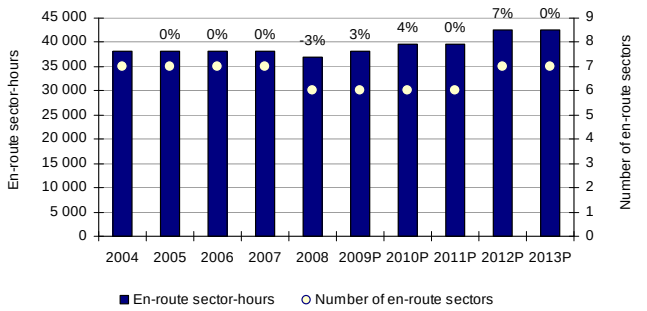
Assets structure and planned capital expenditure





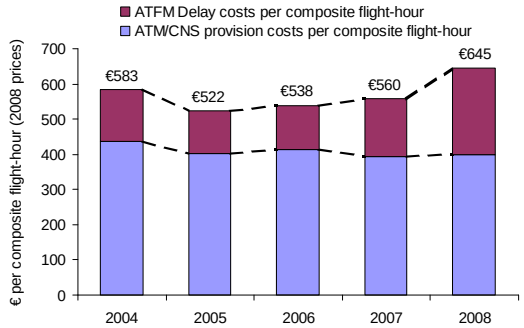
Planned staff and capacity data

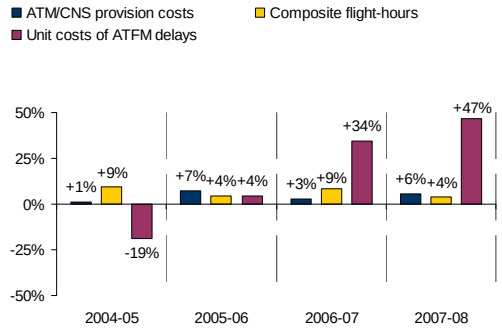




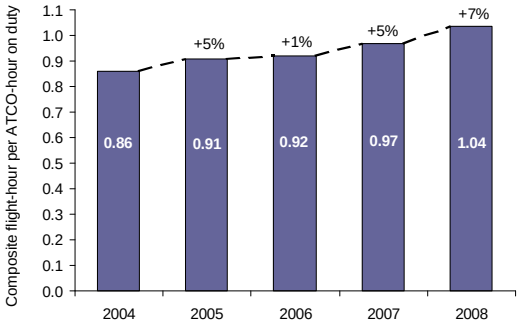
Austro Control (Austria)

Trend in gate-to-gate economic cost-effectiveness

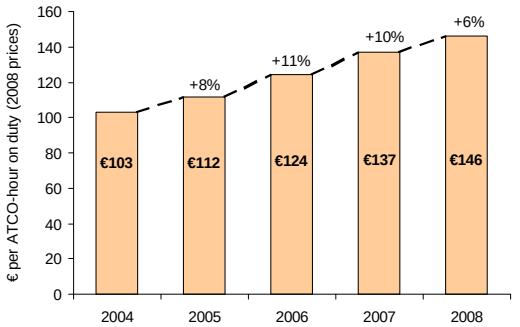




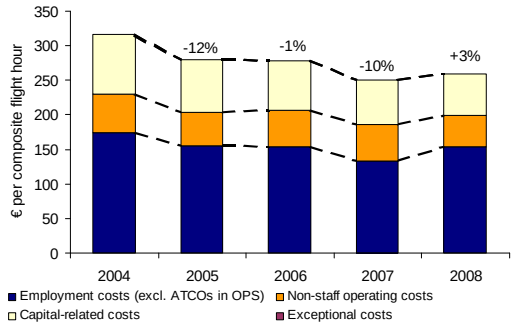
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

Austro Control is a medium-sized ANSP, with costs amounting to around 2% of the European total.

Its traffic over five years has increased at +6% a year. The complexity of its traffic is relatively high, above the top quartile.

Assisted by this rising traffic, Austro Control has shown a -8% fall in unit ATM/CNS costs over the period.

However, delays have been among the highest in Europe since 2004, and increased further in 2008, to represent 38% of Austro Control economic costs per composite flight-hour. Wien ACC remained one if the most congested ACC in 2009.

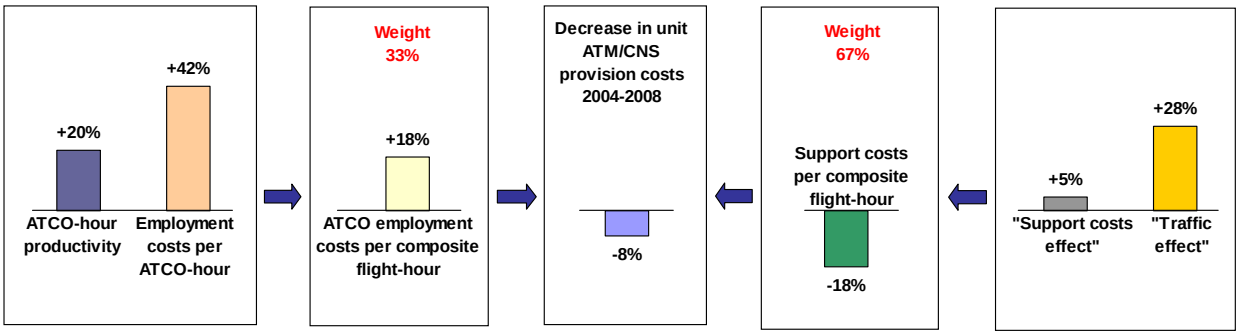
Austro Control has seen rises in employment costs per ATCO-hour of over +9% a year over the period, greatly outstripping the +2.5% annual growth in income per head. While Austro Control employment costs per ATCO-hour were well below those of Skyguide in 2004, they are more than +31% higher in 2008. They are also the second highest in Europe in 2008. The +20% increase in ATCO productivity has not been enough to offset the rise in employment costs. In 2008, productivity was among the highest in Europe, higher than that of its neighbour ANS CR, but below that of Skyguide.

The rises in employment costs arise chiefly from a new agreement implemented in 2006 at a time of acute recruitment difficulty, and from IFRS transition in 2008, leading to a revaluation of pension obligations and the set up of additional employee benefit provisions.

Support costs, by contrast, have been well controlled, particularly the capital-related costs, despite investments in 2008 to update the ATCO HMI and FDP/RDP systems. Total support costs have increased by only +5% over the period, mostly because of rising staff costs, while traffic has risen by +28%, resulting in a fall of -18% in unit support costs.

Overall, Austro Control has relatively high unit economic costs (4th highest in Europe), slightly higher than Skyguide and significantly greater than ANS CR and HungaroControl.

Changes in financial cost-effectiveness



Austro Control (Austria)

Comments on ANSP's forward-looking cost-effectiveness

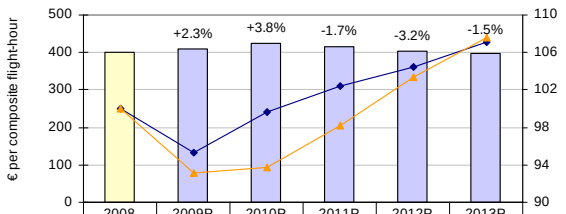
Gate-to-gate unit ATM/CNS costs are expected to decrease by -1% between 2008 and 2013, an average annual decrease of -0.1%, as costs and traffic are planned to increase at a very similar pace. This is a significant change compared to ACE 2007 plans that were showing a planned decrease of -2.2% a year between 2007 and 2012. Compared to ACE 2007 plans, Austro Control has revised its planned costs upwards. In the meantime, traffic forecasts have been revised downwards 7%-9% depending on years. The upwards revision of planned costs for years 2009 and onwards reflect extraordinary expenses arising from the transition to IFRS (to be spread across the next 15 years).

The average remaining accounting life of the fixed assets has been on a slight declining trend since 2005, and the 2008 share of fixed assets under construction represents a marginal share of the total fixed assets. The cumulative capex planned for the 2009-2013 period are historically high, amounting to €193M (100% of the 2008 gate-to-gate ANS revenues). Compared to ACE 2007, the investment plan has been revised upwards. It is much higher than the €127M invested between 2004 and 2008, although it included a large investment (€40M) in 2005 which reflected a new TWR in Vienna. 2009 clearly marks the start a new investment cycle, which will lead to the commissioning of following projects:

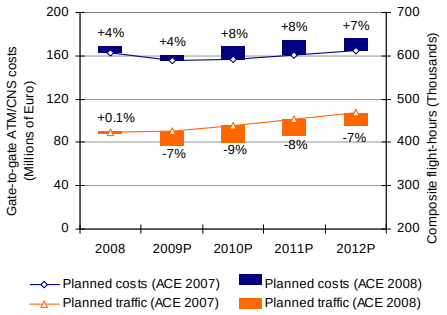
- Expansion of the multilateration network for approach and en-route traffic;
- Replacement of the VCSs in Klagenfurt (2010), Innsbruck (2011) and Salzburg (2012);
- New TWR in Salzburg to be operational in 2012 (cost estimated at €10M); and
- Upgrades to the ATM system as part of COOPANS (Austro Control joined the association on March 2010) (i.e. €68M, between 2010 and 2014).

Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise by +29%, which is much faster than traffic (+8%) while the number of en-route sectors and sector-hours are planned to fall in 2009 and stabilise until 2012. This indicates that Austro Control productivity is planned to decrease between 2008 and 2013. The profile for the capacity (sectors and sector-hours) does not seem consistent with the medium-term measures required to close the capacity gap, although the combination of additional ATCOs and reduced traffic in 2009-2011 should provide an opportunity to reduce the cost of ATFM delays which severely affected the 2008 unit economic costs of Austro Control.

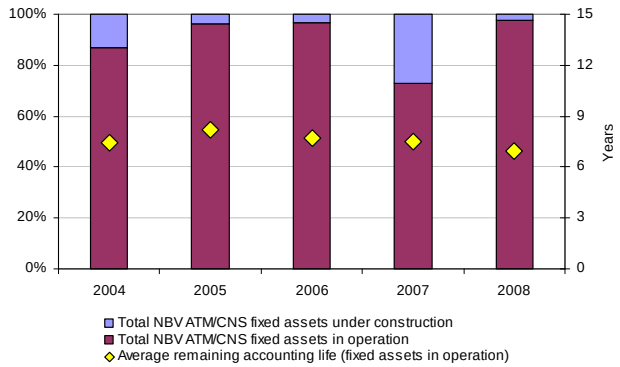
Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

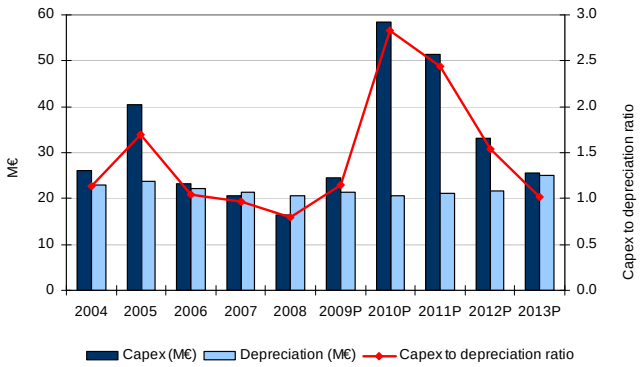


Austro Control	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	399	409	424	417	403	397
Gate-to-gate costs (index)	100	95	100	102	104	107
Composite flight-hours (index)	100	93	94	98	103	108

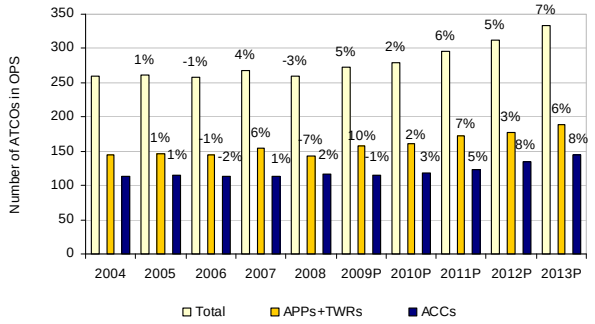


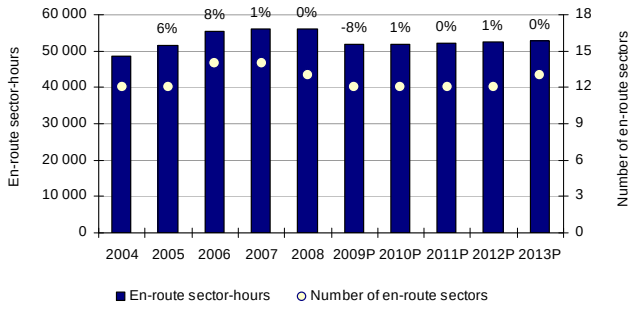
Assets structure and planned capital expenditure





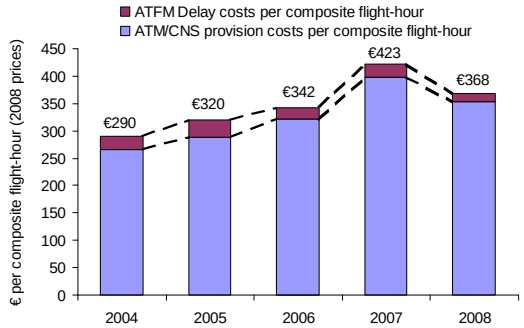
Planned staff and capacity data

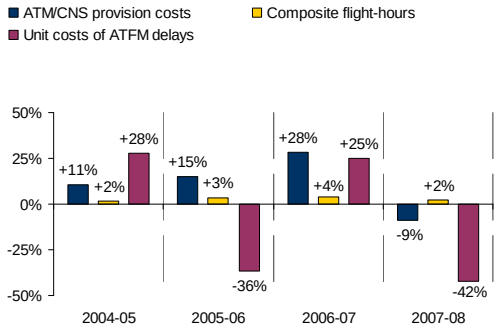




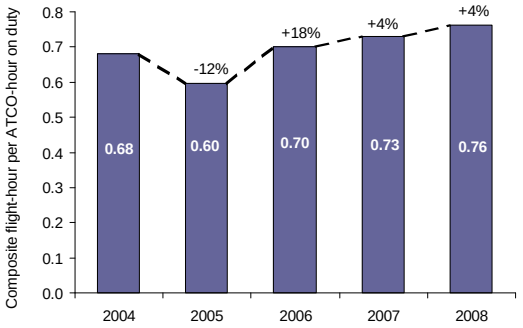
AVINOR (Norway)

Trend in gate-to-gate economic cost-effectiveness

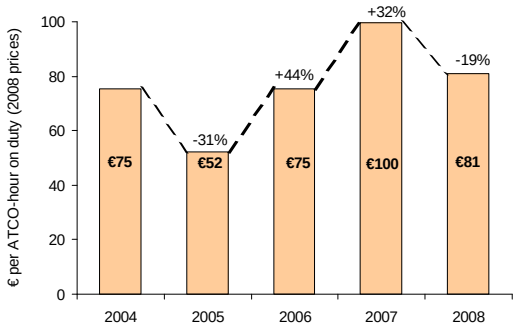




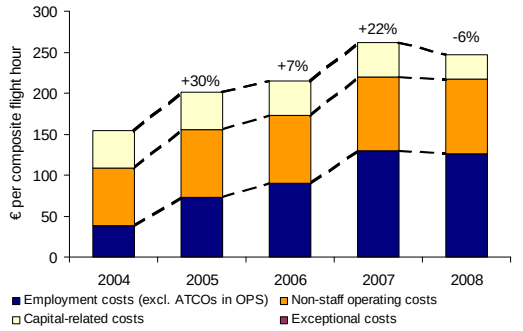
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

Avinor is a medium-sized ANSP, with costs amounting to around 2.2% of the European total.

Its traffic over five years has increased moderately, at +3% a year on average. The complexity of its traffic is relatively low.

Avinor has shown a substantial decline in cost-effectiveness over the period, with unit ATM/CNS costs rising by +33%. This represents a much higher increase than those of LFV/ANS Sweden or NAVIAIR, and contrasts with the slight reduction achieved by Finavia.

ATFM delays have been recurrent but represent a very small portion of the unit economic costs.

ATCO productivity rose over the period, in greater proportions than in the other Nordic ANSPs. In 2008, ATCO productivity was above LFV/ANS Sweden's and Finavia's, but still below that of NAVIAIR.

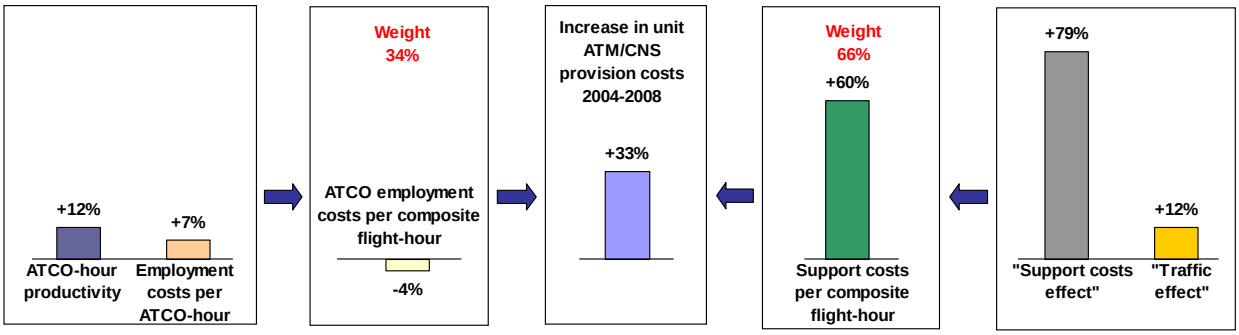
Over the period, there have been large variations in employment costs per ATCO-hour. A proposed restructuring programme, "Take-Off-05" precipitated a large number of ATCO resignations in 2005 and 2006, and costly new wage settlements were needed to restore required staffing levels, leading to a peak in 2007. Staff costs in general apparently fell in 2008, reflecting allocation changes for training costs and for non-ANS activities.

Support costs showed a substantial increase of +79% during the period, while traffic increased by +12%. This is mainly due to a three-fold increase in employment costs of support staff between 2004 and 2008. Unit capital-related costs fell by -36% over the period, mainly due to changes in the calculation of depreciation costs, following the implementation of IFRS in 2008. In 2008, Avinor unit capital-related costs are among the lowest in Europe.

Overall, Avinor's unit costs are substantially higher than those of its Nordic neighbours, LFV/ANS Sweden and Finavia. While ATCO productivity in Avinor is higher, employment costs per ATCO-hour are substantially higher, as are unit support costs.

Avinor's apparent performance has varied somewhat erratically over the period; this arises to some extent from inconsistency in reporting.

Changes in financial cost-effectiveness



AVINOR (Norway)

Comments on ANSP's forward-looking cost-effectiveness

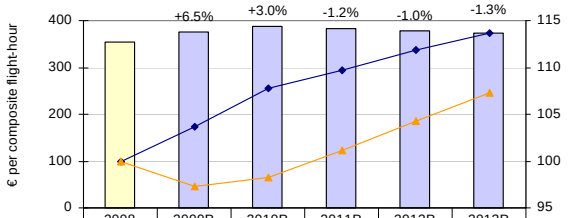
Gate-to-gate unit ATM/CNS costs are expected to increase by +6% between 2008 and 2013, an average annual increase of +1.2%. The significant increase of unit costs in 2009 (+6.5%) suggests a lack of reactivity to adjust the cost base in line with the decrease in traffic in 2009. Moreover, the ATM/CNS provision costs are planned to rise despite a revision of operational and capital expenditures announced in AVINOR Annual Report. The main driver is the staff costs, lead by an increase of the staff number and the implementation of a new wage agreement. Actual 2008 traffic volume is in line with ACE 2007 plan, while AVINOR has revised the traffic plan downwards for 2009-2012. In the meantime, costs have been revised downwards at higher proportions during the same period, resulting in a more optimistic outlook than presented in ACE 2007.

The average remaining accounting life of the fixed assets continued to fall in 2008, and the share of fixed assets under construction represented nearly 50% of the total fixed assets, a record value among European ANSPs. The cumulative capex planned for the 2009-2013 period amount to some €50M (28% of the 2008 gate-to-gate ANS revenues) and are in line with the depreciation throughout the period, suggesting a stable asset base. The planned cumulative capex represent an impressive downward revision of the ACE 2007 plans and mainly relates to the following projects:

- NATCON-N (radar and FDP systems) (i.e. €12.5M, between 2004 and 2009);
- NORAP (MSSR and PSR radars) (i.e. €48.6m, between 2006 and 2012);
- Oslo ATCC enhancement System (i.e. € 20.9m, between 2007 and 2010);
- Oslo ASAP (Advanced Sectorisation and Automation Project) which aims to redesign airspace and route structure in the Oslo area (i.e. €2.6M, between 2006 and 2011); and
- PANDA (Procedures for Air Navigation, Design and Aeronautical charting system) (i.e. €1.4M, between 2006 and 2009).

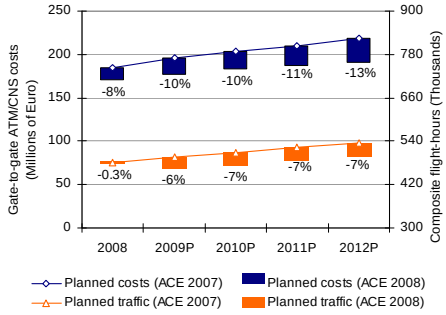
Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise faster (+20%) than traffic volumes (+7%). This indicates that AVINOR productivity is planned to decrease between 2008 and 2013. Finally, AVINOR did not provide the planned number of en-route sectors and sector-hours for the period 2009-2013.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

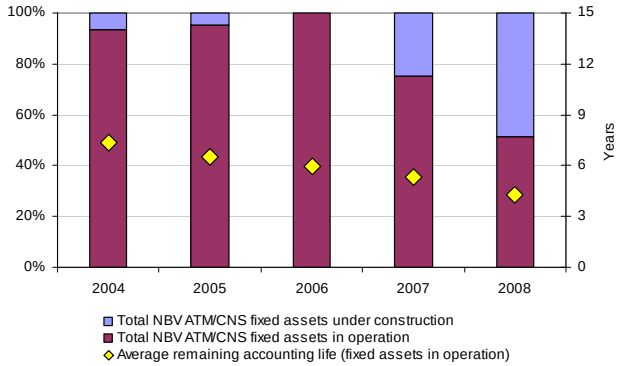


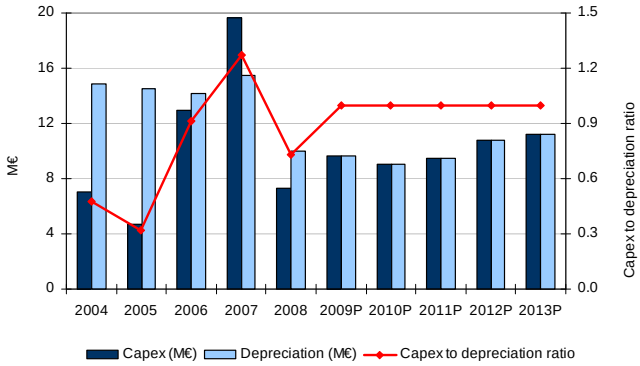
Avinor

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	353	376	387	383	379	374
Gate-to-gate costs (index)	100	104	108	110	112	114
Composite flight-hours (index)	100	97	98	101	104	107

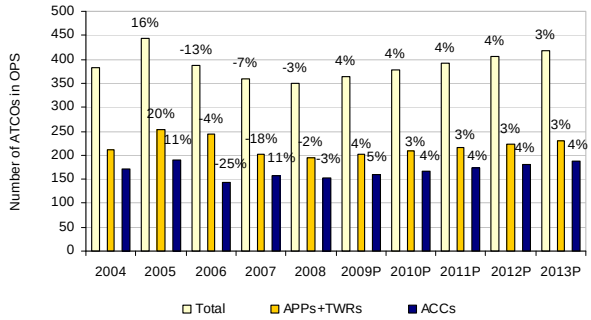


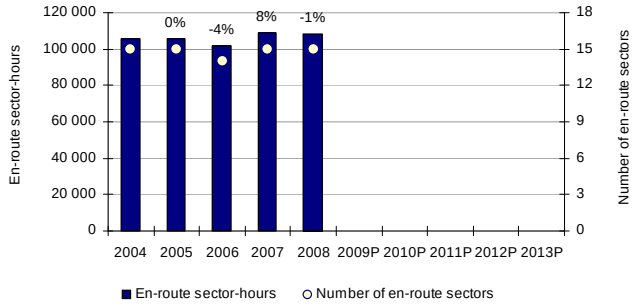
Assets structure and planned capital expenditure





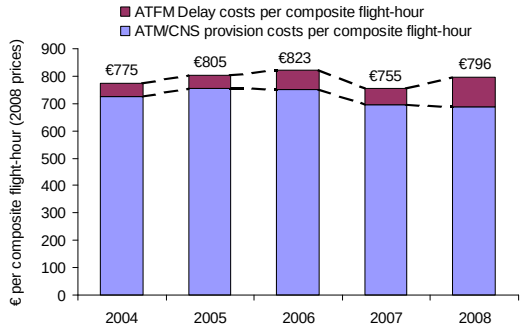
Planned staff and capacity data

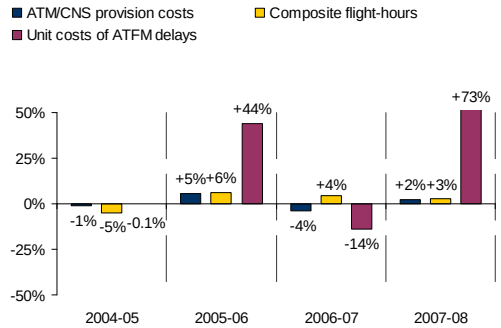




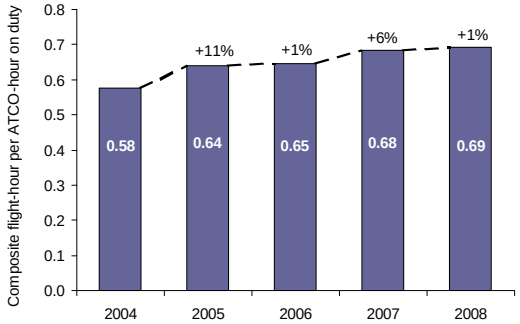
Belgocontrol (Belgium)

Trend in gate-to-gate economic cost-effectiveness

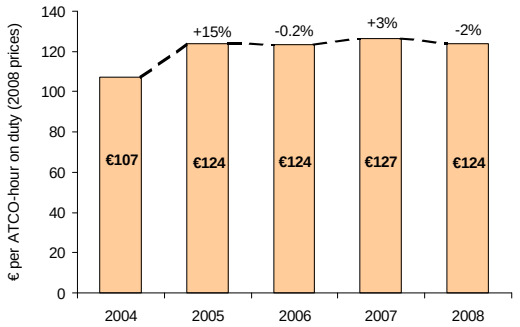




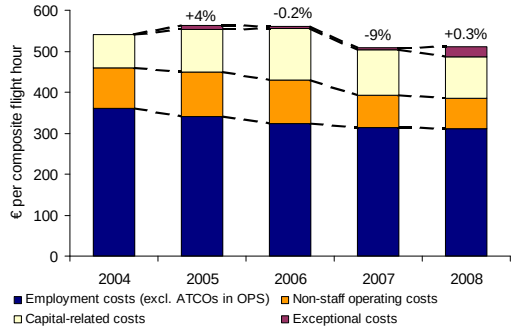
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

Belgocontrol is a medium-sized ANSP with costs amounting to around 2% of the European total.

Belgocontrol's responsibilities are confined to lower airspace, with Belgian upper airspace controlled by MUAC. Traffic has only increased by +8% over the period, with early declines in 2004-2005, reflecting difficulties with the national airline. The complexity of its traffic is the highest in Europe.

Delays have remained a non negligible additional element of costs since 2004. They further increased in 2008, outweighing the reductions in unit financial costs achieved since 2005. In 2008, unit economic costs are by far the highest in Europe. The 2008 increase in ATFM delays was chiefly due to the implementation of new ATC equipment (FDPS platform) reducing capacity. ATFM delays further increased in 2009.

Starting from record levels in 2004 and 2005, unit ATM/CNS costs have however been reduced for the 3rd consecutive year in 2008.

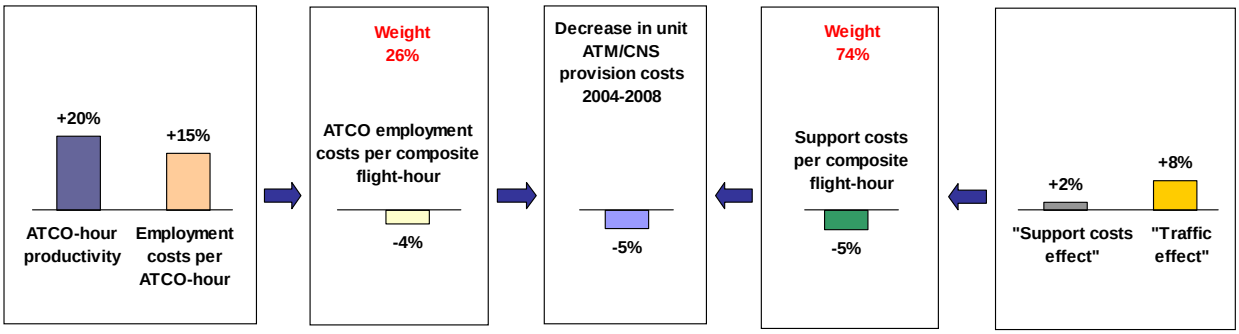
ATCO productivity rose by +20% over the period but remains below the European average. In fact, Belgocontrol's ATCO productivity is -22% below that of its neighbour LVNL, which also has solely lower airspace responsibility and had a lower traffic growth.

The productivity increase was more than the increase in employment costs per ATCO-hour, which enabled a -4% reduction in ATCO employment costs per unit of output. After a substantial one-off increase of +15% in 2005, employment costs per ATCO-hour remained fairly constant until 2008.

Support costs were driven up by exceptional write-offs (recorded as capital-related costs) caused by the rethink of the CANAC project in 2006 but fell in 2007 due to the fact that CANAC internal development through contractors was halted in favour of buying in an off-the-shelf system. They were also affected by the pension liabilities in 2005.

Overall, and despite encouraging signs of improvements in the last years of the period, Belgocontrol continued to have the highest unit ATM/CNS costs in Europe, mainly because it also has the highest unit support costs.

Changes in financial cost-effectiveness



Belgocontrol (Belgium)

Comments on ANSP's forward-looking cost-effectiveness

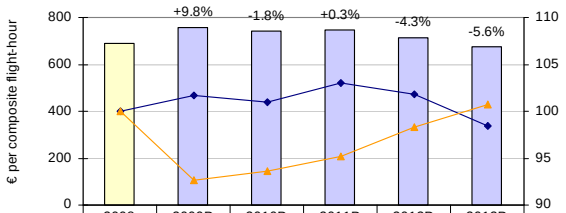
Gate-to-gate unit ATM/CNS costs are expected to decrease by -2% between 2008 and 2013, an average annual decrease of -0.4%. The ATM/CNS costs are planned to increase by +2% in 2009, against a -7% decrease in traffic, showing a lack of reactivity in adjusting costs to the traffic drop and resulting in a planned increase of unit costs by +10% in 2009. Compared to ACE 2007 plans, costs have been revised downward throughout the 2010-2013 period, but lower than traffic, resulting in a slightly more pessimistic outlook.

The average remaining accounting life of the fixed assets has been rising since 2006. After 5 years of sustained investments (€175M between 2004 and 2008) the entry in operation of the CANAC 2 project (new ATM system and new ACC ops room) at the end of 2009 marks the end of a cycle. Investments over the 2009-2013 period are planned to be much lower than in the 5 preceding years, with €79M (39% or the 2008 gate-to-gate ANS revenues). Major investments in 2008 related to the following projects:

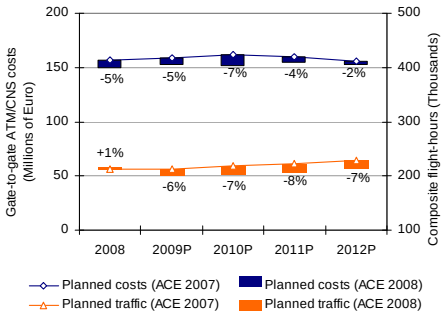
- CANAC 2 ATM system (EUROCAT-E) supplied by Thales (i.e. €60M, commissioned at the end of 2009);
- Implementation of Advanced Surface Movement and Guidance Control Systems (A-SMGCS) concept modules in Brussels ACC (i.e. €10,3M, 2008);
- Purchase of PSR/Mode S radars (i.e. €7,8M, between 2011 and 2012); and
- Replacement of radars at Oostende and Charleroi airports (i.e. €9,8M, 2012).

Between 2008 and 2013, the total number of ATCOs in OPS is planned to fall by -10%, showing that the ACE 2007 recruitment plans (i.e. planned increase of +8% between 2008 and 2012) have been revised downwards given (1) the new traffic prospects (2008 traffic levels are planned to be topped only in 2013) and (2) the expected productivity gains due to CANAC 2 (a manning reduction from 3 to 2 per work position). The number of en-route sectors is planned to remain constant until 2013, and sector-hours are planned to be adjusted to traffic variations. The -12% decrease in the number of sector-hours opened in 2007 results from the optimisation of the sectors configuration schemes.

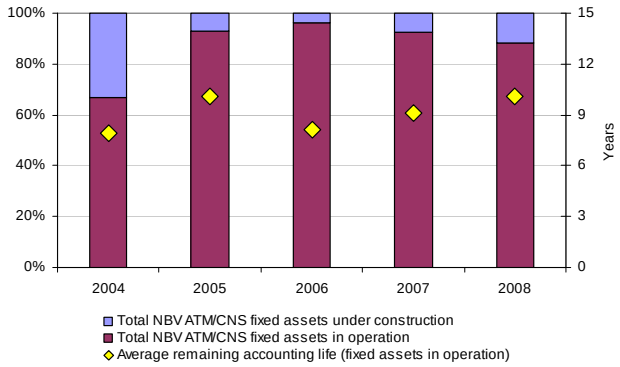
Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

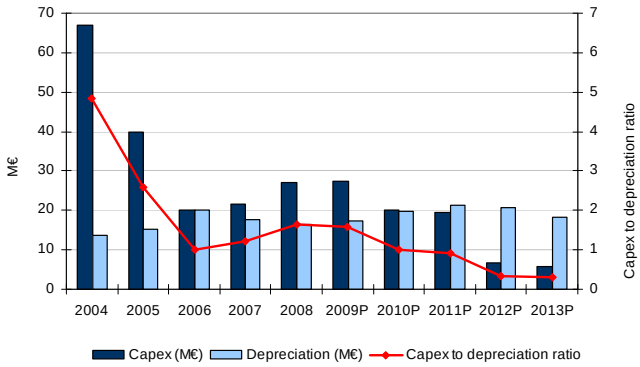


Belgocontrol	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	690	757	744	746	715	674
Gate-to-gate costs (index)	100	102	101	103	102	98
Composite flight-hours (index)	100	93	94	95	98	101

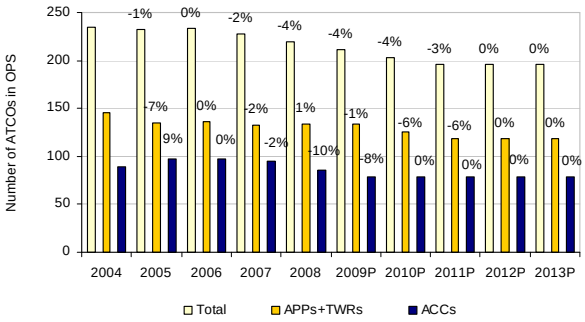


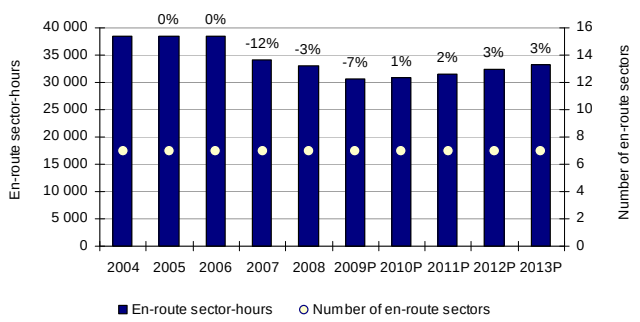
Assets structure and planned capital expenditure





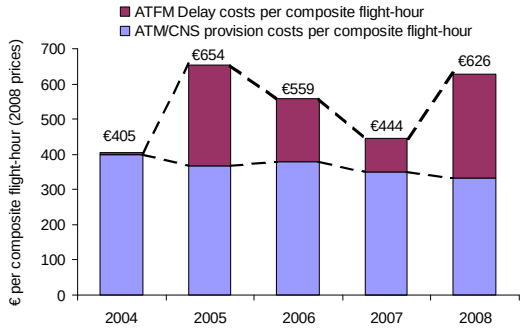
Planned staff and capacity data

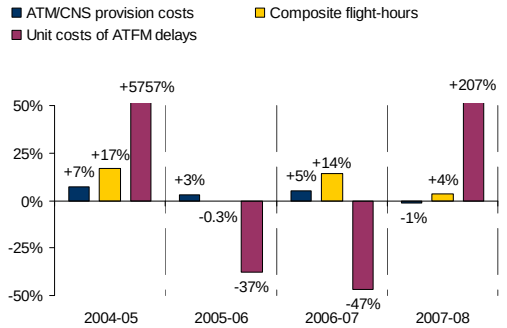




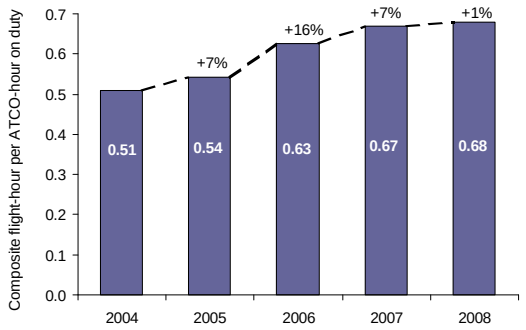
Croatia Control (Croatia)

Trend in gate-to-gate economic cost-effectiveness



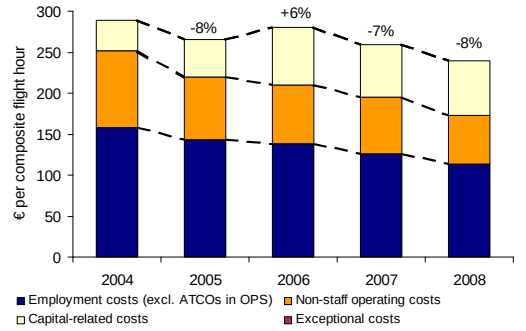


Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour

Trend in support costs per composite flight-hour



Assessment on ANSP performance

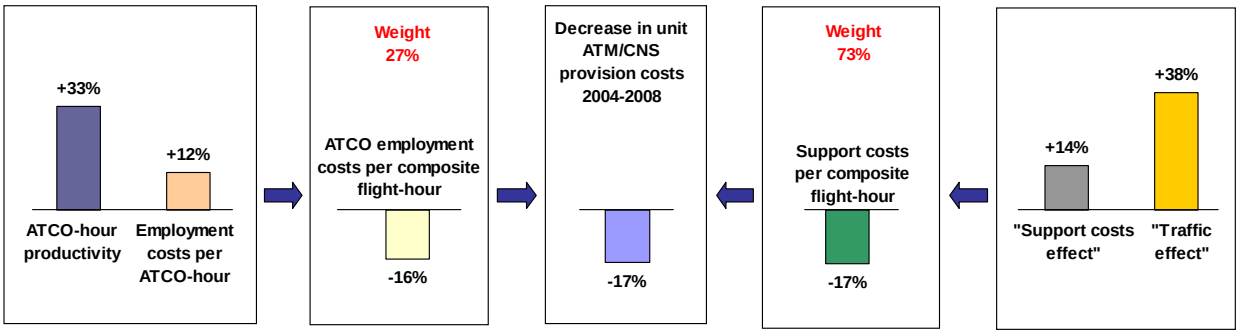
Croatia Control is a small ANSP with costs accounting for around 0.8% of the European total. Croatia Control is responsible for ANS in a substantial portion of the airspace of Bosnia and Herzegovina. The traffic complexity in Croatian airspace is of intermediate complexity, but the seasonality of Croatian traffic is very high.

Its traffic has grown rapidly over the period, at around +8% a year. Zagreb ACC was an old facility and found it difficult to service this rapidly increasing traffic .As a result, delays rose from essentially zero to one of the highest unit delay costs in Europe in 2005. A new ATM system and new Zagreb ACC with increased ATC capacity was commissioned in late 2005, which caused delays to fall substantially in 2006 and 2007. However, Zagreb ACC has been continuously on the list of most en-route ATFM delay generating ACCs since 2005. The 2008 unit economic costs are the 6th highest in Europe. The situation did not improve in 2009 (despite static traffic volumes), illustrating the need for all parties concerned to properly address and act upon capacity issues.

Financial unit ATM/CNS costs, however, have fallen consistently over the period (-17%), sustained by traffic growth (+38%). Starting from a low level in 2004, ATCO productivity rose by +33% over the period, while employment costs per ATCO-hour rose by +12%. Support costs have also risen over the period (+14%), but by less than traffic growth and therefore contributing to overall decrease in unit financial costs. The capital-related component of support costs, however, rose substantially over the period, with the commissioning of the new ATM system and Zagreb ACC.

Croatia Control's overall financial cost-effectiveness is similar to SMATSA and HungaroControl but higher than that of Slovenia Control. In terms of unit economic costs, however, Croatia control is significantly more expensive than its neighbours, for whom delays were not an issue in 2008.

Changes in financial cost-effectiveness



Croatia Control (Croatia)

Comments on ANSP's forward-looking cost-effectiveness

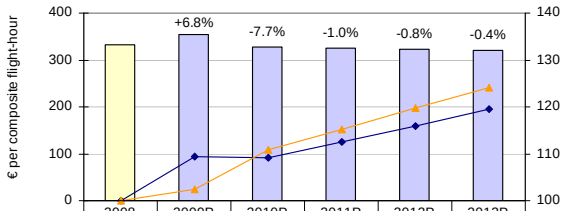
Gate-to-gate unit ATM/CNS provision costs are projected to slightly decrease by -4% between 2008 and 2013, an average annual decrease rate of -0.7%. In particular, the unit costs are planned to increase by +7% in 2009, as a result of an increase of the ATM/CNS provision costs (+9%) against a more contained increase in traffic (+2%), and to decrease in the following 4 years, particularly in 2010 (-7.7%). The increase of 2009 ATM/CNS provision costs is mainly due to higher costs for the maintenance of the new system and increased costs for training the new ATCOs, required on additional area control sectors. Compared to ACE 2007 plans, in ACE 2008 Croatia Control has revised both its planned traffic and planned costs downwards. The resulted outlook for 2009-2012 is more pessimistic than in ACE 2007, mainly influenced by the lack of reactivity to adjust the costs planned in 2009 (in line with ACE 2007 plan) in the light of the significant downward revision of the 2009 traffic volumes (-10%).

The average remaining accounting life of the fixed assets remained stable since 2006 at around 8 years, and the share of fixed assets under construction remains firmly below 10%, since 2005. Planned capex over the period 2009-2013 amount to about €38M (around 59% of 2008 gate-to-gate ANS revenues), with a peak in 2010, the only year when the capex has exceed depreciation. The cumulative 2009-2013 capex include, *inter alia*, the following projects:

- CroATMS Upgrade and Extension to Pula, Zadar, Split, Dubrovnik (i.e. €8M, between 2010 and 2011);
- New VOR/DME system (i.e. €4.98M, between 2009 and 2012);
- Radar Station Construction Project Pleso (i.e. €3.95M, between 2010 and 2011);
- Installation of a new software version for the Croatian Air Traffic Management System (CroATMS) in the Zagreb Flight Information (i.e. €0.6M, in April 2009); and
- Telecommunication terminal equipment modernisation (i.e. €0.42M, between 2009 and 2011).

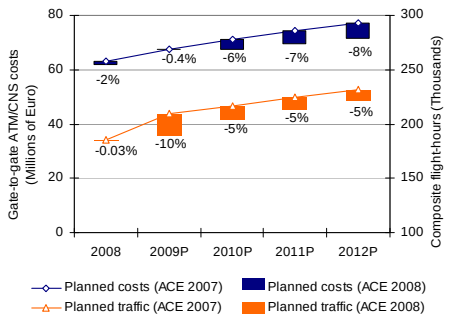
Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise by +17%, less than the planned increase of traffic (+24%). The number of area control sectors is planned to pass from 7 in 2008 to 12 in 2013. Croatia Control did not provide any sector-hours projections for the period 2009-2013.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

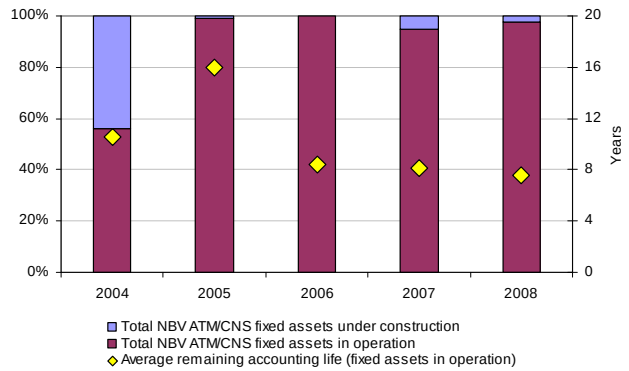


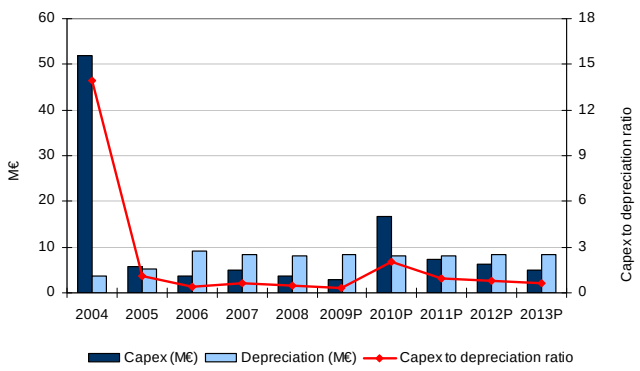
Croatia Control

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	333	355	328	324	322	320
Gate-to-gate costs (index)	100	109	109	112	116	120
Composite flight-hours (index)	100	102	111	115	120	124

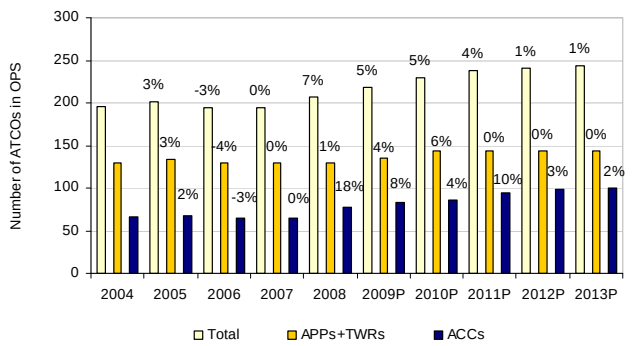


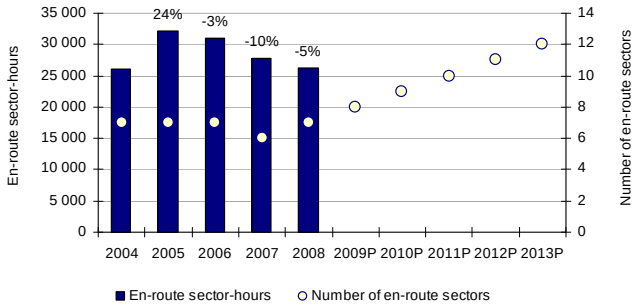
Assets structure and planned capital expenditure





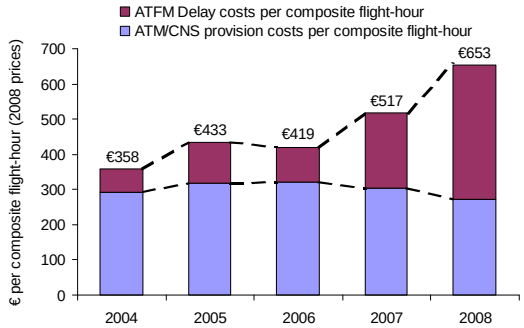
Planned staff and capacity data

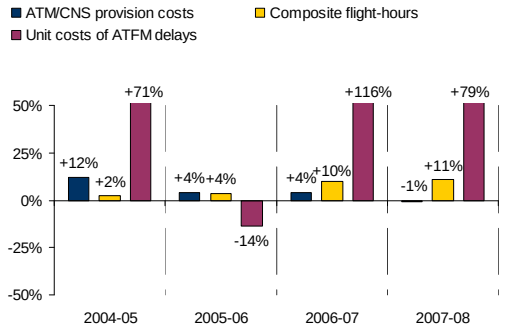




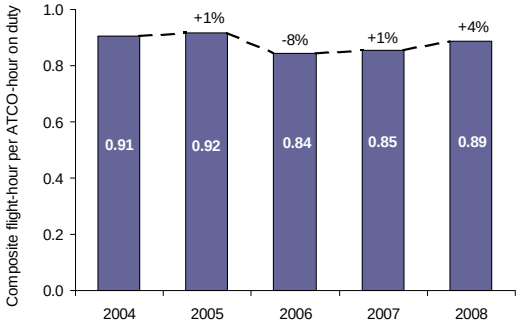
DCAC Cyprus (Cyprus)

Trend in gate-to-gate economic cost-effectiveness

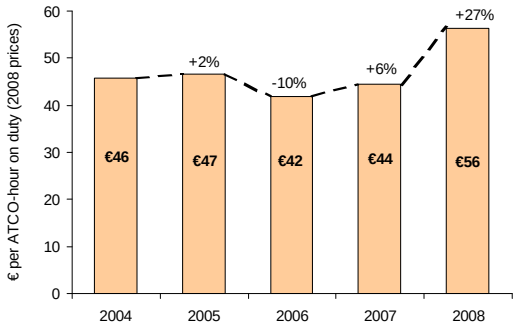




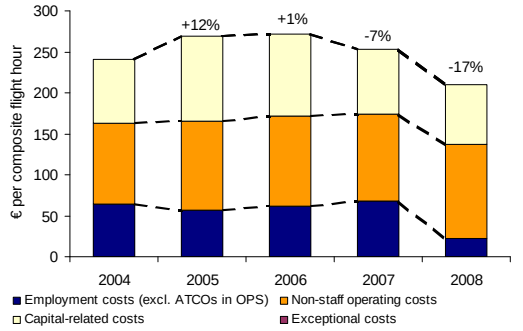
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

DCAC Cyprus is one of the smallest European ANSPs, with costs amounting to around 0.5% of the European total.

Its traffic over five years has increased rapidly, at +7% a year, with growth rates above +10% in both 2007 and 2008. Traffic complexity is relatively low, while traffic variability is lower than that of its neighbour HCAA.

The cumulated decrease of -6% in unit ATM/CNS costs has been largely offset by a spectacular rise in the unit cost of ATFM delays. In 2008, these represented up to 58% of DCAC Cyprus unit economic costs, and were by far the highest in Europe. Delays have been a recurrent issue over the period and Nicosia ACC has been continuously on the list of most en-route ATFM delay generating ACCs since 2005. The 2008 unit economic costs are the 4th highest in Europe. Delays remained an issue in 2009, illustrating the need for all parties concerned to properly address and act upon capacity issues.

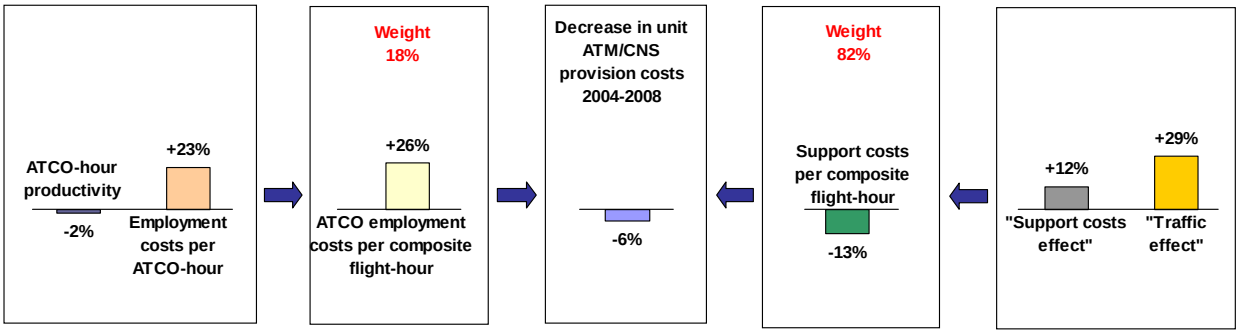
DCAC Cyprus has difficulty in adjusting to higher traffic levels. A new ACC, originally planned to be implemented in 2006, which will also include a new ATM system (LEFCO) which is planned to enter in operation in January 2010 and which is expected to provide the required ATC capacity. However, staff shortage might lead to a further worsening of the situation in 2009-2010.

Employment costs per ATCO-hour have increased by +23% over the period, in the meantime ATCO-hour productivity slightly decreased by -2%, resulting in a significant increase of ATCO employment costs per unit output (+26%).

Unit support costs fell by -13% over the period, since support costs increased (+12%) less than traffic volumes (+29%). Staff costs apparently fell in 2008 due to incomplete reporting of employer contributions to social security scheme and staff pensions.

DCAC Cyprus has no problem with reporting data on time to ACE, but some issues exist regarding consistency.

Changes in financial cost-effectiveness



DCAC Cyprus (Cyprus)

Comments on ANSP's forward-looking cost-effectiveness

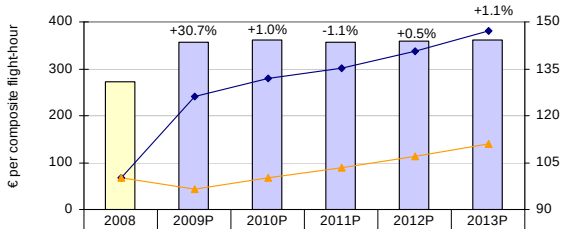
Gate-to-gate unit ATM/CNS costs are expected to rise by +33% between 2008 and 2013, an average annual increase of +5.8%. Compared to the ACE 2007 plans, DCAC Cyprus has revised its planned costs upwards in very significant proportions (+18% in 2009) while in the wake of the economic downturn, planned traffic has been revised downwards in substantial proportions (although it remains set to increase by +11% over 2008-2013). The resulting cost-effectiveness profile strongly contrasts with that of ACE 2007, which was showing a -2.5% annual reduction in unit costs. Planned cost increases contrast with many other ANSPs' plans, which responded to a declining traffic environment by planned cost reduction measures.

DCAC Cyprus is a governmental department and accounting information on the structure of its balance sheet is difficult to interpret. Assets under construction were reported for the first time in 2008, and mainly relate to the new ATM system – LEFCO. The large increase in the average remaining accounting life of fixed assets observed in 2008 should be interpreted with caution. It reflects a €58M increase in the NBV of land & buildings and in operation and a fall in depreciation costs. Capex data over the period 2004-2007 have not been reported consistently and are not available for analysis. Planned capex over the period 2009-2013 amount to about €23M (around 42% of 2008 gate-to-gate ANS revenues). The projects comprised in this investment plan include:

- New ACC building in Nicosia (i.e. €11M, planned to be achieved in 2009);
- New ATM system (LEFCO) and new equipments (i.e. €17.5M, planned to be in operation in January 2010);
- Introduction of radar approach control for Larnaca TWR (i.e. €6.8M, planned to be in operation in January 2010); and
- Introduction of ADS-B.

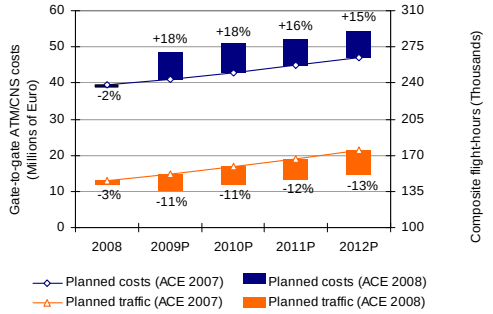
Traffic volumes are forecast to rise by +11% between 2008 and 2013. This increase is planned to be absorbed by +34% more ATCOs in OPS indicating that DCAC Cyprus productivity is planned to decrease. The additional ATCOs will be mainly assigned to APPs/TWRs operational units, while the number of ATCOs in the ACC is not planned to rise over the next 5 years. The number of en-route sectors is planned to increase from 3 to 4 in 2013 and sector-hours are also to increase by +10% between 2008 and 2013. Overall, the profile for en-route capacity (ATCOs in ACC, sectors and sector-hours) does not seem consistent with the medium-term measures required to close the capacity gap, which raises concerns about DCAC Cyprus ability to reduce the exceptionally high delays observed in the last years.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

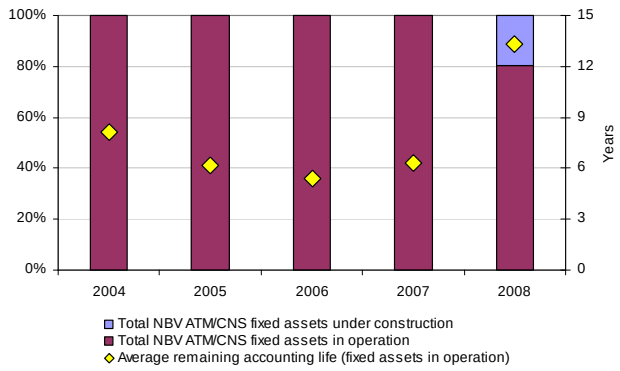


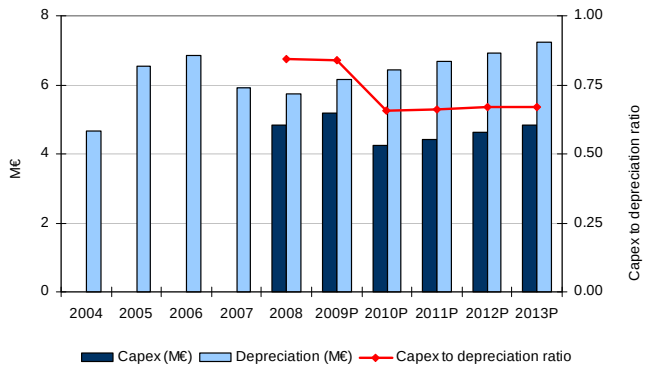
DCAC Cyprus

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	273	357	361	356	358	362
Gate-to-gate costs (index)	100	126	132	135	141	147
Composite flight-hours (index)	100	96	100	104	107	111

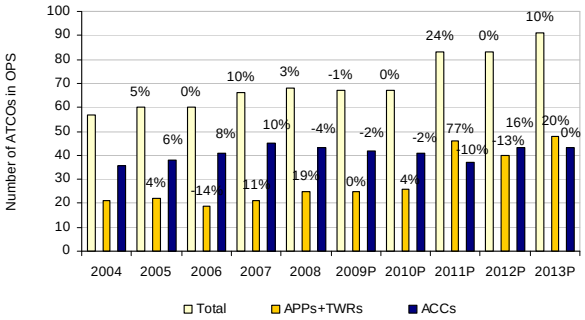


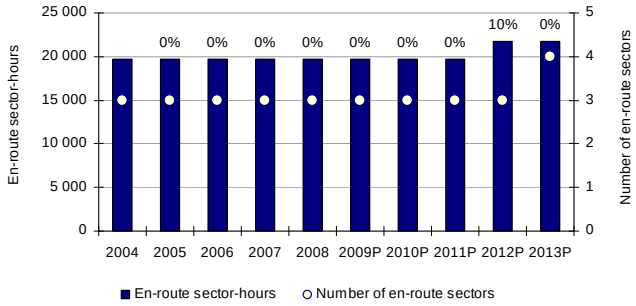
Assets structure and planned capital expenditure





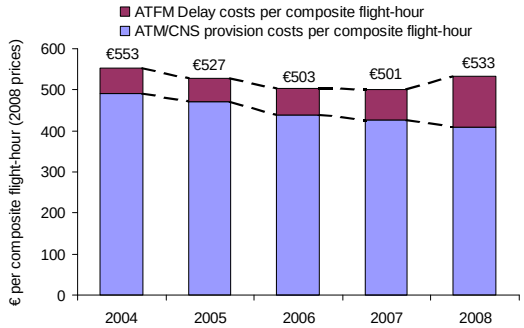
Planned staff and capacity data

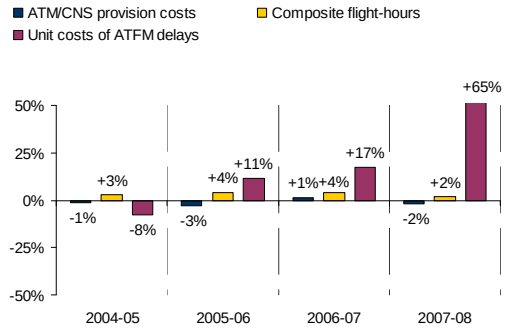




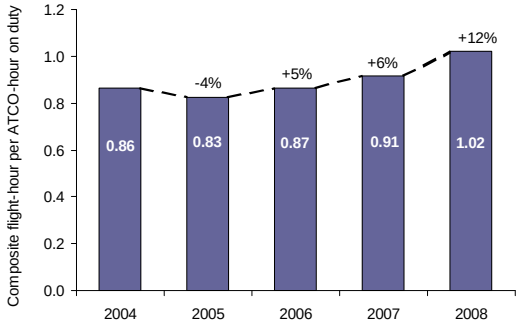
DFS (Germany)

Trend in gate-to-gate economic cost-effectiveness

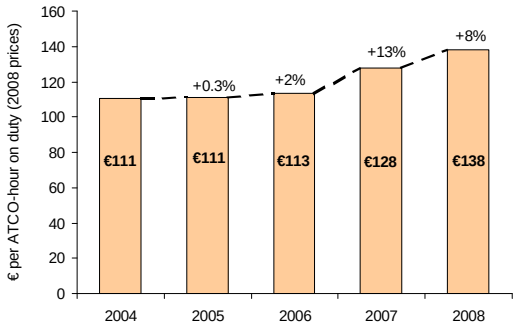




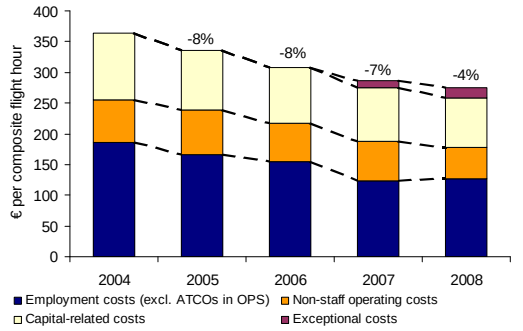
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

DFS is one of the largest European ANSPs, with costs amounting to around 11% of the European total.

Traffic has grown moderately over the period, at around +3.3% a year. Traffic complexity is the fourth highest in Europe. Among the other four largest ANSPs, only NATS shows a slightly higher traffic complexity.

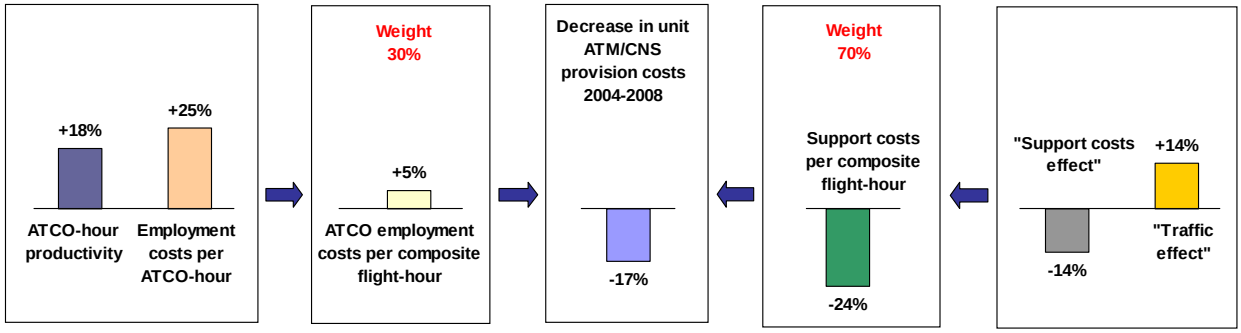
DFS has reduced its overall ATM/CNS costs over the period. Coupled with the growth in traffic, this has given rise to a -17% fall in unit ATM/CNS costs, the greatest fall among the five largest ANSPs. However, this declining trend has been outweighed by an impressive increase in ATFM delays in 2008. As a result, the 2008 costs of delays represent some 30% of the economic costs. In 2008 DFS unit cost of delays was by a long way the highest among the other four largest ANSPs. Delays remained an issue in 2009, despite a -7% fall in traffic volumes.

Through optimisation of roster practices and additional flexibility, ATCO productivity has risen over the period. However, there was a substantial rise in employment costs per ATCO-hour in 2007 and 2008 resulting from a new labour contract which reduced contractual working hours. In 2008, employment costs per ATCO-hour were the third highest in Europe, behind Aena and Austro Control.

There was an impressive success in reducing total support costs over the period (-14%), mostly through reductions in support staff and capital-related costs. Combined with traffic growth (+14%), this gave a decline in unit support costs of -24%, the biggest reduction among the five large ANSPs. Some of this reflects the benefits of a massive airspace restructuring and rationalisation of ACCs (the costs of which were provided for before the start of the period). In 2008, non-staff operating costs fell by -19% (partly due to renting leases being capitalised), and capital related costs fell as a result of reassessment of the useful live of major ATM assets.

Adoption of IFRS in 2007 resulted in the recognition that past costs, principally those of providing for future pensions, were understated. These costs will be recovered from users over 15 years. For benchmarking purposes this additional amount is treated as "exceptional cost" in 2007 and 2008.

Changes in financial cost-effectiveness



DFS (Germany)

Comments on ANSP's forward-looking cost-effectiveness

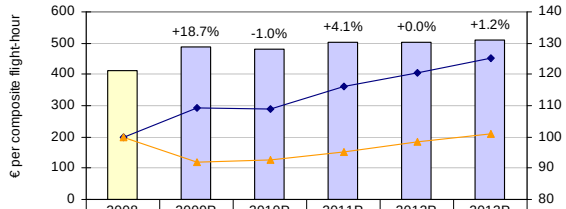
Gate-to-gate unit costs are expected to rise by +24% between 2008 and 2013, an average annual increase of +4.4%, as costs are planned to rise continuously while the 2008 traffic volumes are planned to be topped only in 2013. The actual 2008 costs are some -8% lower than those planned in ACE 2007, mainly due to significant savings in direct operating costs and capital-related costs. Although DFS made a downward revision to its planned cost profile, and although the downturn in traffic had already been partially captured in ACE 2007 plans, the overall outcome of the updated ACE 2008 plans shows a more pessimistic unit ATM/CNS costs profile. Due to the size of DFS, the unit costs planned increase, in particular in 2009 (+19%), will have a major impact on the European system level performance.

The average remaining accounting life of the fixed assets remained fairly stable over the period 2004-2008, at around six years. The cumulative capex for the period 2009-2013 are planned to be some €435M (49% of the 2008 gate-to-gate ANS revenues). Although it remains higher than the invested capex over the period 2004-2008 (€382M), it is less than what was planned in ACE 2007, reflecting DFS decision to postpone non-crucial investments in response to the new economic outlook. Capex, however, exceed depreciation throughout the period 2009-2013, suggesting a growing asset base. The main projects for this period include:

- The commissioning of P1/VAFORIT ATM system in Karlsruhe (i.e. €160M, planned to enter in operation in 2010-2011);
- Implementation of iCAS (iTEC Centre Automation System);
- RASUM 8.33 kHz (for lower airspace) (i.e. €76M, planned to be completed in 2018);
- Replacement of the ATCAS software (i.e. €15M - €20M, planned to be completed in 2012);
- Upgrade of system infrastructure in Langen and München ACCs (i.e. €65M, between 2010 and 2017);
- New building for the Berlin TWR (i.e. €26M, between 2007 and 2011) and for the Frankfurt TWR (i.e. €20M, planned to enter in operations in 2010); and
- Extension of Langen ACC (i.e. €16M).

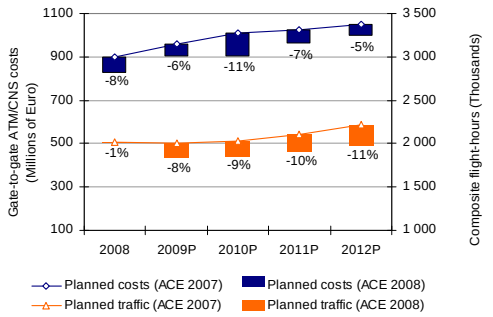
Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise by +12% while traffic is planned to remain constant compared to 2008. This indicates that DFS productivity is planned to decrease between 2008 and 2013.This profile should allow DFS to close the capacity gap, with a reduction of ATFM delay.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

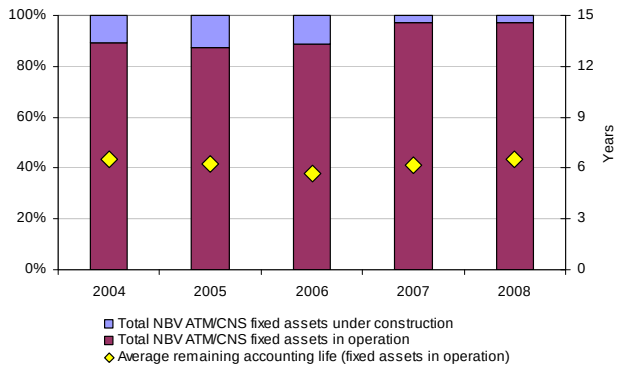


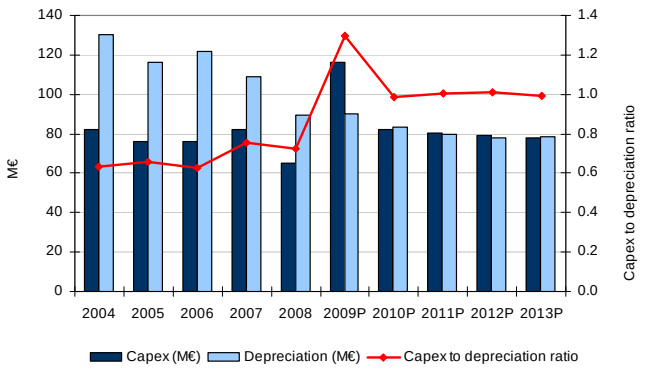
DFS

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	410	487	482	502	502	508
Gate-to-gate costs (index)	100	109	109	116	121	125
Composite flight-hours (index)	100	92	93	95	99	101

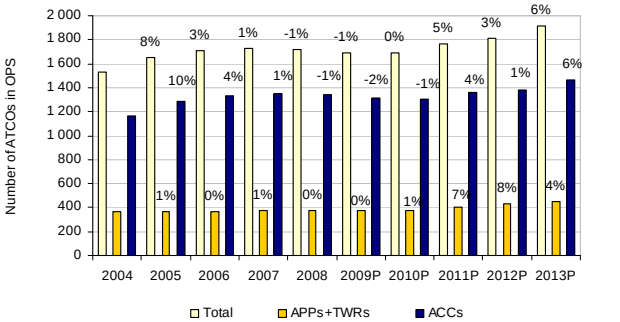


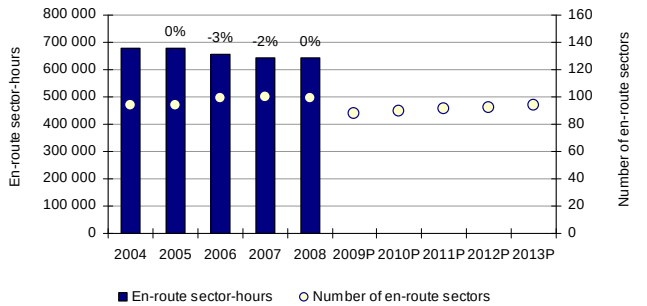
Assets structure and planned capital expenditure





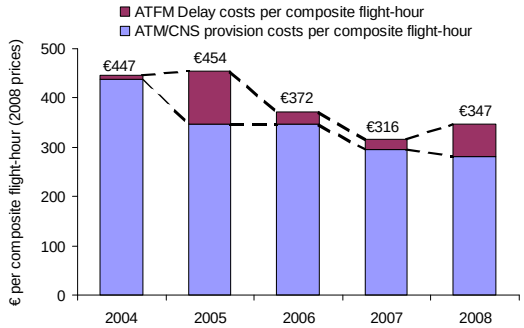
Planned staff and capacity data

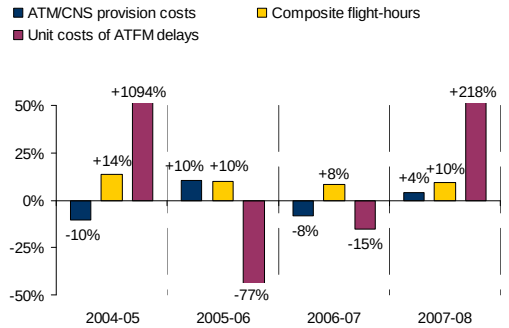




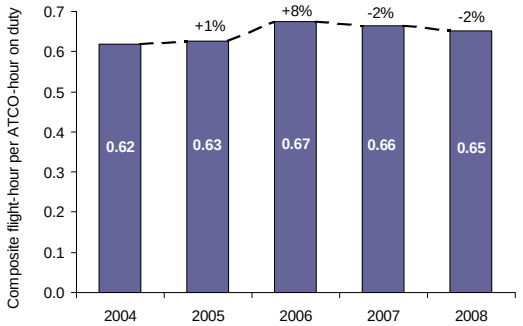
DHMİ (Turkey)

Trend in gate-to-gate economic cost-effectiveness

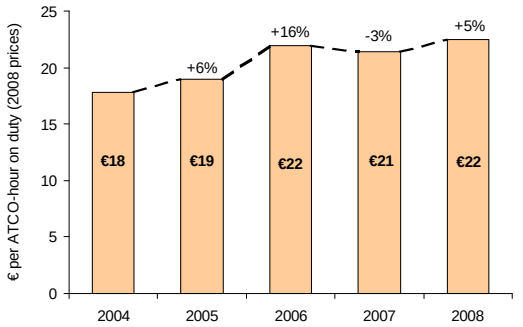




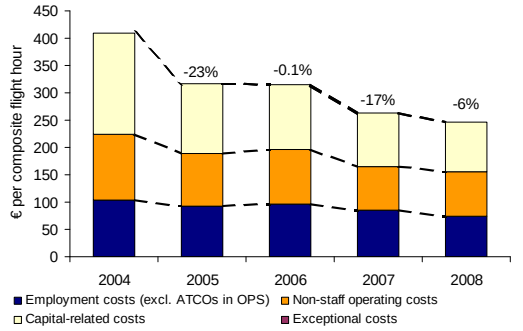
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

DHMİ is a medium-sized ANSP, with costs amounting to around 3% of the European total.

Traffic has grown very rapidly, averaging +10% a year. Traffic is highly seasonal in Turkish airspace and its complexity remains relatively low.

A rapid traffic growth helped the impressive decrease of its unit financial costs. DHMİ's -36% reduction in unit ATM/CNS costs is the second highest achieved in Europe between 2004 and 2008. In fact, from a position in 2004 where its unit ATM/CNS costs were about the median in Europe, they are now in the bottom quartile and more in line with the underlying economic and traffic demand fundamentals.

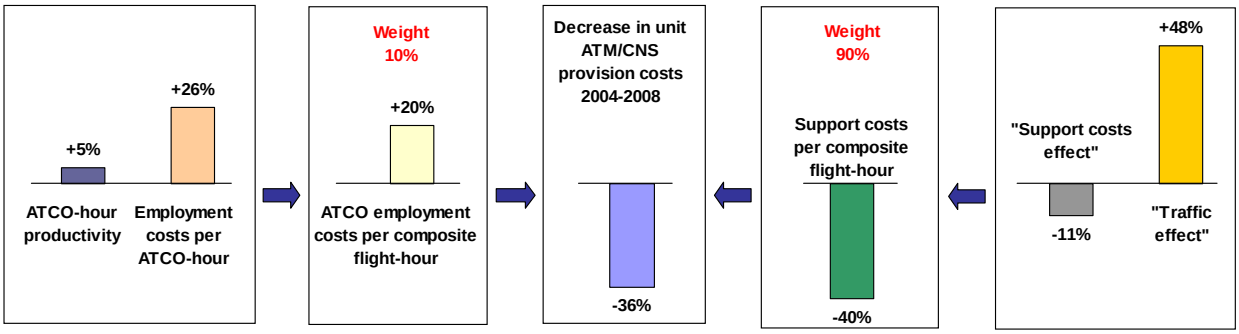
Delays vary from year to year and constitute a substantial additional element of cost in 2008. The 2008 increase in ATFM delays actually offsets the reduction in unit financial costs achieved since 2006. Delays continued to increase in 2009, demonstrating the need for a timely implementation of the modernization and rationalization project (SMART) which has started in 2005 and is planned to be fully implemented at the end of 2010.

Changes in employment costs per ATCO-hour and ATCO-hour productivity follow similar trends (except for 2008), with substantial increases between 2004 and 2006, followed by slight reductions in 2007. Productivity slightly declined in 2008 (-2%), while employment costs per ATCO-hour increased (+5%). Employment costs per ATCO-hour are still in 2008 among the lowest in Europe and productivity is just above the first quartile.

Reductions in unit support costs over the period have been driven by substantial reductions in all elements of support costs, despite the increase in traffic and increases in prevailing wage rates. The 2007 reduction in non-staff operating costs resulted from specific cost-containment measures. In 2008, unit capital-related costs fell by -9% mainly due to some reduction in depreciation costs as a number of assets have completed their useful life.

DHMİ's unit costs contrast in every respect with its neighbours, ROMATSA and ATSA Bulgaria, with much lower ATCO-hour employment costs and lower unit support costs.

Changes in financial cost-effectiveness



DHMİ (Turkey)

Comments on ANSP's forward-looking cost-effectiveness

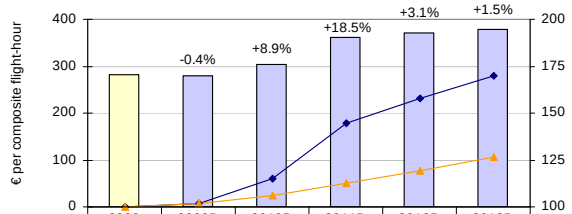
Gate-to-gate unit ATM/CNS costs are expected to increase by +34% between 2008 and 2013, an average annual increase of +6%. This increase is not uniform over the period, since the unit costs are planned to remain stable in 2009, to increase significantly in 2010 and in particular in 2011 (+18%) and finally to increase at more moderate rate in 2012 and 2013. The rise of the planned ATM/CNS provision costs is mainly due to the staff costs, planned to almost double between 2008 and 2013. Compared to ACE 2007 plans, in ACE 2008 DHMI has revised its planned traffic volumes downwards, while the costs are in line with previous year's plan in 2008 and 2009, and have been revised upwards in 2011 (+19%) and 2012 (+19%), thus revealing a more pessimistic outlook than last year.

The average remaining accounting life of fixed assets has been on a rising trend since 2005 reaching nearly 10 years in 2008, and the share of fixed assets under construction increased from 17% in 2007 to 24% in 2008 of the total fixed assets. Compared to ACE 2007, the investment plan for 2009-2012 has been very significantly revised upwards (+83%), and the cumulative capex planned for the 2009-2013 period amount to €548M (181% of the 2008 gate-to-gate ANS revenues). Capex is planned to significantly exceed depreciation throughout the period, suggesting possible inconsistencies between planned capex and planned depreciation. Capex mainly relate to the Modernisation of the ATM Resources in Turkey (SMART). This project will include, *inter alia*:

- The construction of operational units buildings for Ankara ACC/APP, Adnan Menderes APP, Dalaman APP and Atatürk APP (i.e. €43.4M, completed in 2009);
- Radar replacement programme (Mode S), the purchase of new Radar Data Processing and Flight Data Processing systems, new Human Machine Interface and Controller Working Positions (i.e. €44,4M, between 2009 and 2011);
- Airport Surface Management Guidance and Control System (A-SMGCS) (i.e. €8.2M, between 2008 and2011).

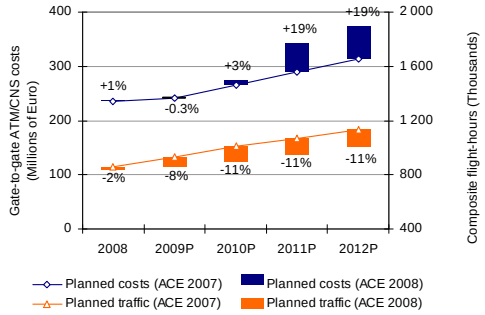
Between 2008 and 2013, the total number of ATCOs in OPS is planned to significantly rise by +47%, at almost double pace than the increase in traffic over the same period (+26%), indicating a planned decrease in productivity. The planned increase in ATCOs is consistent with DHMI recruitment program (+70 ATCOs per year). The number of area control sectors is planned to increase between 2008 and 2011 (+81%) and then to remain stable until 2013. At the beginning of 2011 Istanbul area control sectors will be transferred to Ankara ACC.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

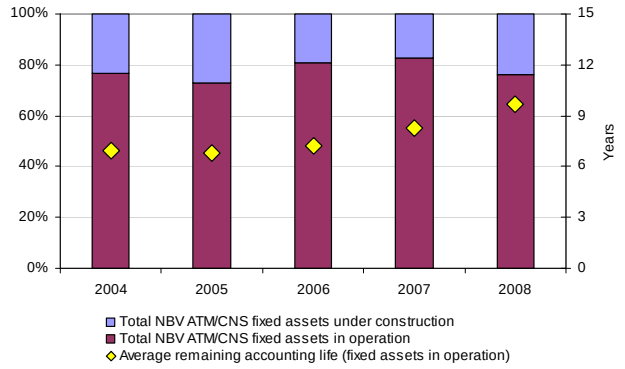


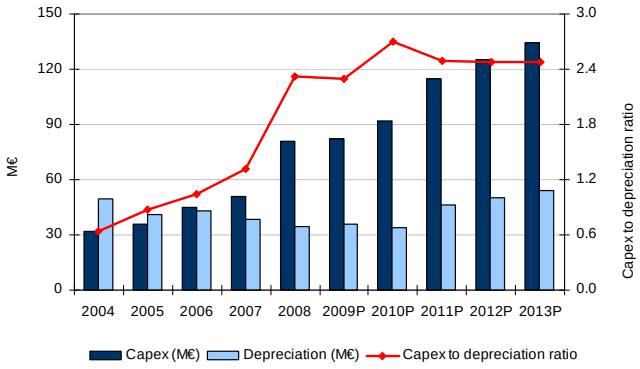
DHMI

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	281	280	305	361	372	378
Gate-to-gate costs (index)	100	102	115	144	158	170
Composite flight-hours (index)	100	102	106	112	119	126

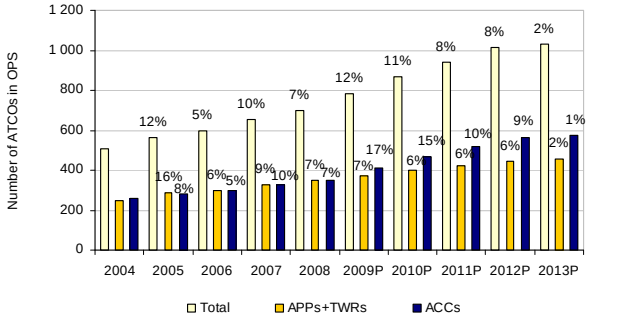


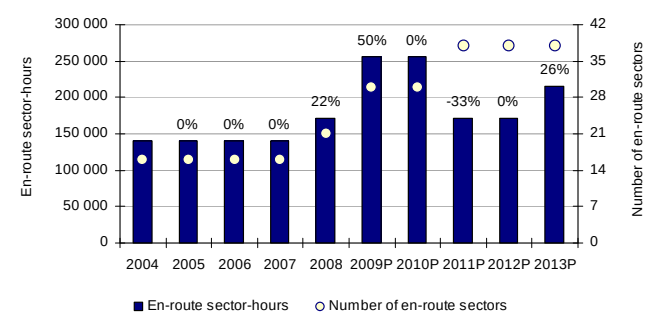
Assets structure and planned capital expenditure





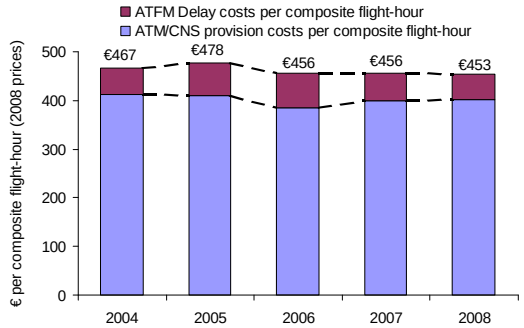
Planned staff and capacity data

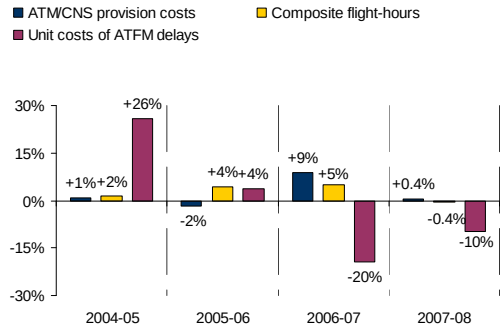




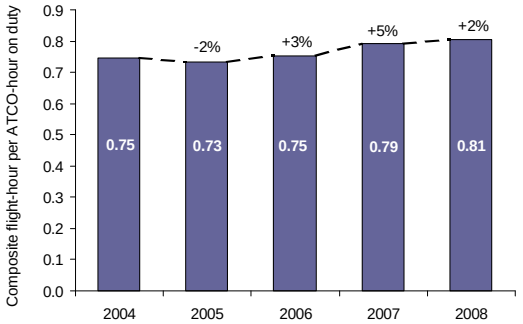
DSNA (France)

Trend in gate-to-gate economic cost-effectiveness

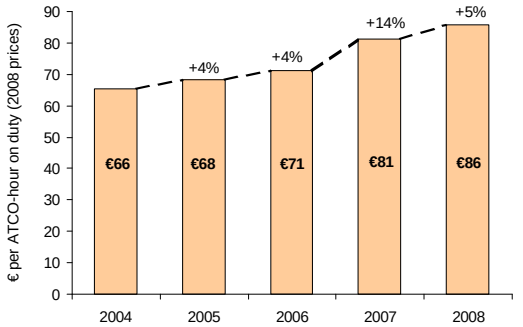




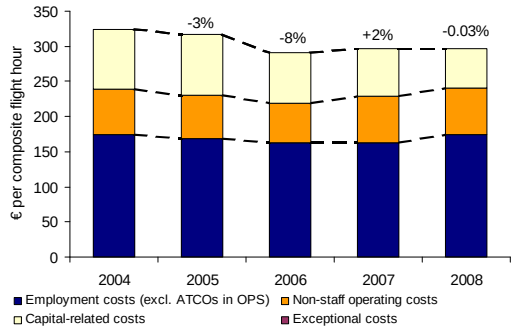
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

DSNA is one of the largest ANSP in Europe, with costs amounting to around 14.8% of the European total.

Traffic has grown moderately over the period, at around +3% a year, despite an absence of growth in 2008. DSNA controls a mixture of areas of very high and relatively low traffic complexity. Overall, its complexity is relatively high, slightly above the top quartile. Among the other four large ANSPs, DSNA's traffic shows similar complexity than ENAV, but definitively less than DFS and NATS.

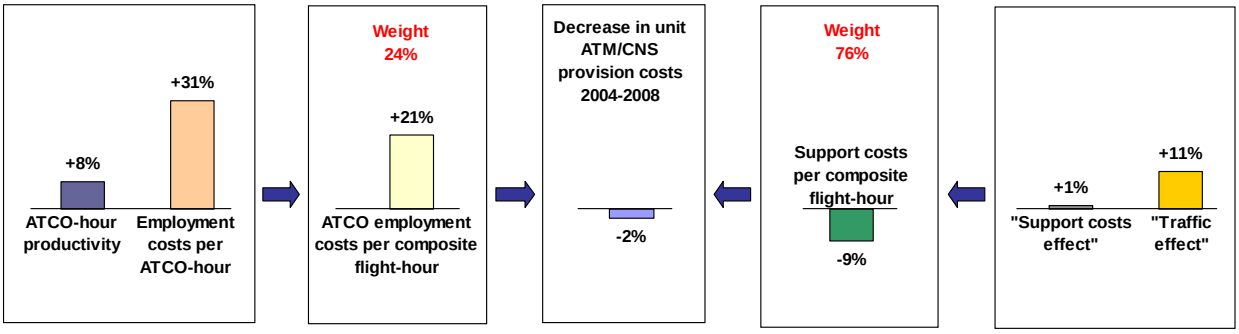
Despite the moderate traffic growth, there was a slight improvement in cost-effectiveness, with a fall in unit ATM/CNS costs of -2% over the period. Total ATM/CNS provision costs were contained at their 2007 level in 2008, in a context of traffic stagnation.

ATFM delays were recurrent over the period although improvements were achieved in 2007 and 2008. Helped by declining traffic volumes, delays became less of an issue in 2009.

Employment costs per ATCO-hour rose by +31% over the period, contrasting with the cumulated growth of only +4.5% in GDP per head over the same period. After moderate increases until 2006, employment costs rose very substantially in 2007 and 2008, reflecting a three-year (2007-2009) agreement signed in 2006, and increases in pension contributions. Despite showing the highest increase, DSNA employment cost per ATCO-hour remained the lowest among the 5 largest ANSPs. The overall rise in employment costs per ATCO-hour was not matched by growth in productivity (+8%). In 2008, ATCO-hour productivity is slightly above European average and similar to that of ENAV, but below the productivity of DFS and NATS.

Among the five largest ANSPs, unit support costs are the second highest in 2008, mainly because of higher non-ATCO employment costs. DSNA was, however, successful in reducing unit capital-related costs and in containing unit staff and non-staff support costs, resulting in a -9% fall in unit support costs.

Changes in financial cost-effectiveness



DSNA (France)

Comments on ANSP's forward-looking cost-effectiveness

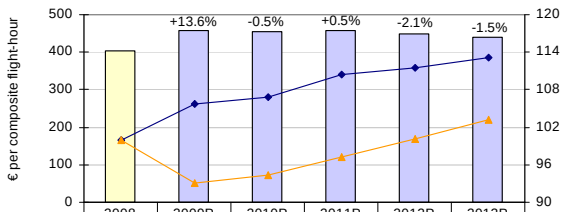
Gate-to-gate unit ATM/CNS costs are expected to rise by +10% between 2008 and 2013, an average annual increase of +1.9%, mainly due to costs that are planned to rise steadily until 2013, while the 2009 traffic downturn is not planned to be recovered before 2012. The actual 2008 costs are some -4% lower than those planned in ACE 2007, mainly due to savings in capital-related costs. Compared to ACE 2007, planned costs have been revised downwards by some -4% while traffic volumes have been revised downwards by -10%, thus resulting in a worsening of the cost-effectiveness profile, over the 2009-2013 period. Due to the size of DSNA, the unit costs planned increase, in particular in 2009 (+14%), will have a major impact on the European system level performance.

The average remaining accounting life increased by +35% in 2008, while the share of fixed assets under construction fell to 17% of the fixed assets, from a 21% in 2007. The cumulative capex for the period 2009-2013 are planned to be some €899M (68% of the 2008 gate-to-gate ANS revenues), and investments are progressively rising by more than +10% a year. Capex are increasingly exceeding depreciation costs between 2009 and 2013, suggesting a growing asset base. The main projects for 2009-2013 include:

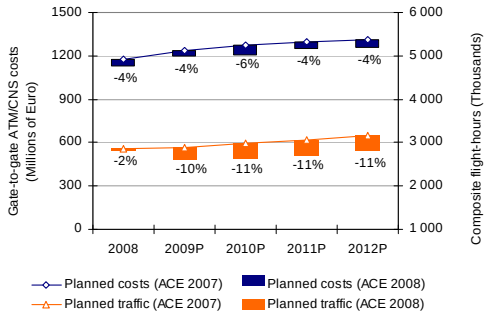
- Development and integration of the new E-FDP system (COFLIGHT i.e. € 156M, between 2003 and 2014);
- Implementation of a MTCD system (ERATO project) planned in Reims, Brest, Marseille, Bordeaux ACCs from 2011 (i.e. €86M, between 2002 and 2013);
- Implementation of IP support for flight data exchange and AMHS capability for message switching system (ISOCRATE program, i.e. €55M, between 2005 and 2012); and
- Purchase of Mode S radars (i.e. €43M, between 2003 and2012).

Traffic volumes are forecast to rise by only +3% between 2008 and 2013. This slight increase is planned to be absorbed by keeping the number of ATCOs in OPS almost constant. However, the situation between APPs and ACCs is contrasted since the planned increase at APP level is outweighed by a proportional fall at ACC level. Moreover, the number of en-route sectors and sector-hours are planned to increase by +4% and +3% respectively. Overall, the planned capacity profile has been adjusted downwards compared to ACE 2007.

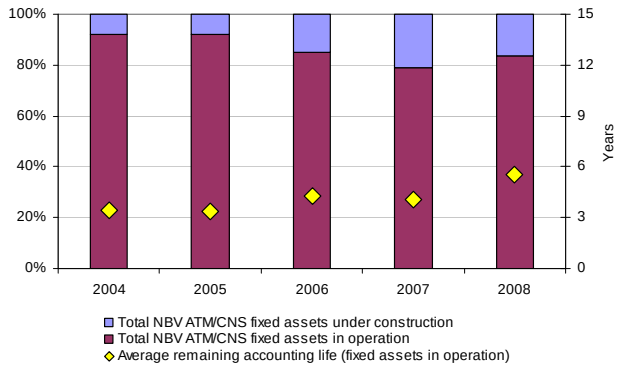
Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

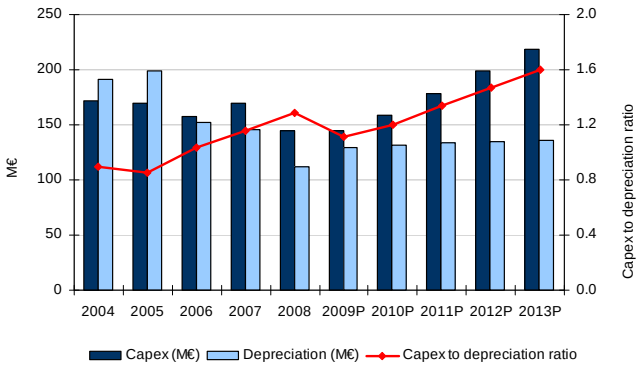


DSNA	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	402	457	455	457	448	441
Gate-to-gate costs (index)	100	106	107	111	111	113
Composite flight-hours (index)	100	93	94	97	100	103

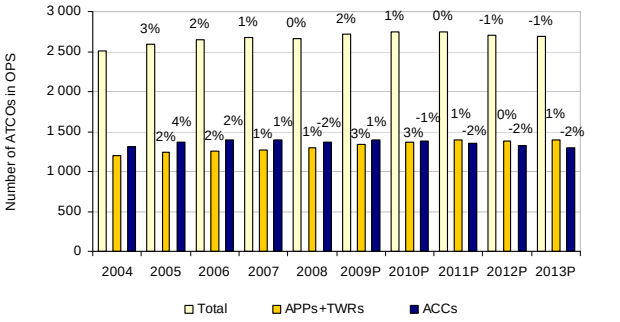


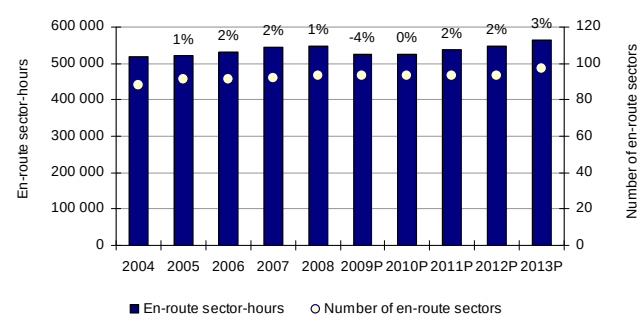
Assets structure and planned capital expenditure





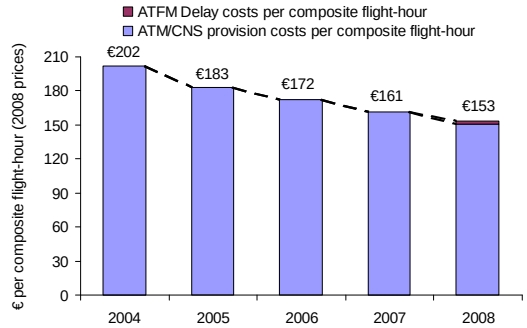
Planned staff and capacity data

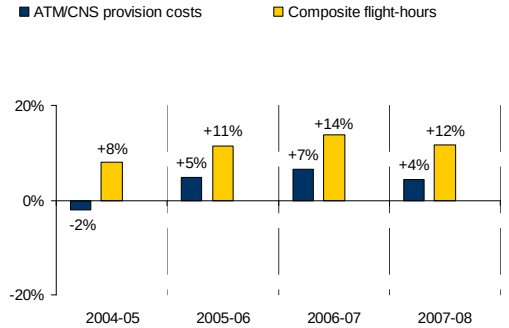




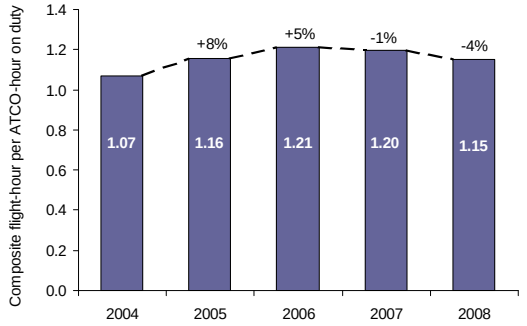
EANS (Estonia)

Trend in gate-to-gate economic cost-effectiveness

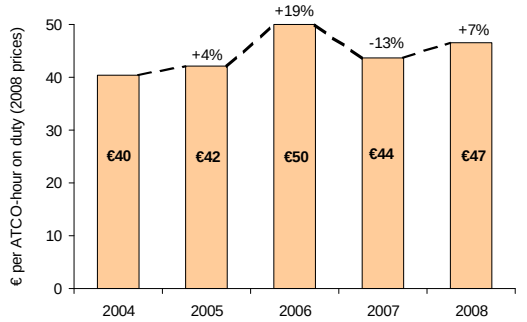




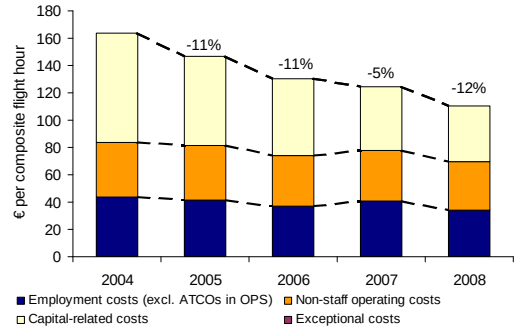
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

EANS is one of the smallest ANSPs in Europe, with costs amounting to around 0.1% of the European total.

Traffic has grown very rapidly over the period, at around +11% a year. Traffic growth was among the highest in Europe in 2008, with a +12% increase. Despite this increase, EANS's traffic remains among the least complex in Europe.

EANS has remained for the whole period the ANSP with the lowest unit ATM/CNS costs in Europe. Helped by the rapid traffic growth, unit costs fell by a remarkable -25%, despite starting from a very low base.

EANS does not operate under the EUROCONTROL full cost recovery and has a commercial objective of minimising its costs. Only LGS, Oro Navigacija (until 2007) and NATS share this feature for the period under review.

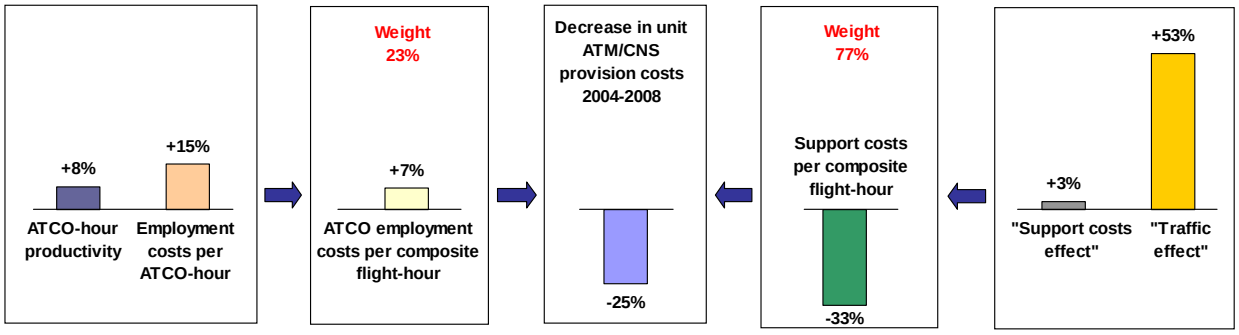
Capacity and delay are understood not to be a problem for EANS.

EANS's had historically the highest ATCO productivity in Europe in an ANSP that deals with both upper and lower airspace. This position was lost in 2008 following the introduction of a planning controller position in EANS East sector.

Employment costs per ATCO-hour rose by +15% over the period. This rise in employment costs per ATCO-hour is well above the +8% increase in ATCO productivity over the same period, resulting in a +7% increase in ATCO employment costs per unit of output.

Support costs of all kinds have been contained, showing only a +3% increase over the period. It is noteworthy, though, that the 2004-2008 period was one of relatively low investments. In a context of massive increases in traffic, the containment of support costs largely contributed to the overall improvement in cost-effectiveness. In 2008, EANS showed the lowest unit support costs in Europe, well below its Baltic neighbours. It provides an illustration of how a small ANSP can nevertheless be highly cost-effective.

Changes in financial cost-effectiveness



EANS (Estonia)

Comments on ANSP's forward-looking cost-effectiveness

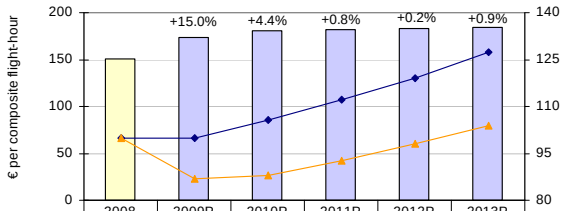
Gate-to-gate unit ATM/CNS costs are expected to rise by +22% between 2008 and 2013, an average annual increase of +4.1%. This contrasts with last year planned average annual increase of unit costs by +1.4% between 2007 and 2012. The actual 2008 costs are some -8% lower than those planned in ACE 2007, mainly due to significant savings in capital-related costs in relation to the postponement of some investments. Compared to the ACE 2007 plans, EANS revised its cost projections downwards until 2011. At the same time, though, traffic forecasts have been revised downwards in substantial proportions for the period 2009-2012, resulting in an overall deterioration of the planned unit ATM/CNS cost profile. Increases in planned costs (+27% over the period) contrast with many other ANSPs' plans, which responded to a stagnating traffic environment by planned cost reduction measures. This is perhaps difficult because of the major planned capex in 2011 and 2012.

The average remaining accounting life of the fixed assets has been fairly stable over the 2004-2008 period. In the meantime, the share of fixed assets under construction remained marginal, except in 2007 when assets under construction represented some 20%. Relatively small amounts of capex have been invested in the 2004-2008 period (some €8M), although EANS commissioned a new building including a new ACC OPS room fully operational on 7 October 2008, together with a new RDP system and a major upgrade in the FDP system. The forthcoming cumulative capex over 2009-2013 are more significant (€26M which represents 166% of the 2008 gate-to-gate ANS revenues), with noticeable peaks in 2011 and 2012. The main investments over this period include:

- Replacement of EUROCAT ATM system in Tallinn ACC, including new ATCO HMI (i.e. €8M, between 2009 and 2013);
- New Tallinn TWR ATM system (i.e. €1M, between 2009 and 2010);
- New VCS (i.e. €0.5M, between 2009 and 2012);
- Implementation of P-RNAV (i.e. €1M, between 2010 and 2012); and
- Implementation of Aeronautical Message Handling System (AMHS) (i.e. €0.5M, between 2011 and 2012).

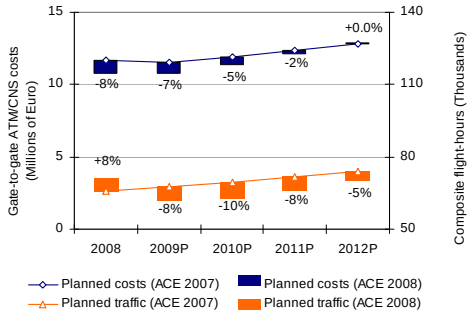
Traffic volumes are forecast to rise by only +4% between 2008 and 2013, while the number of ATCOs in OPS is planned to rise by +24%. This implies that EANS ATCO productivity is planned to fall, subsequently to changes in the manning per sector (utilisation of a "planning controller" position). The increase in the number of ATCOs and the new ATM system at Tallinn ACC will allow the number of en-route sectors to be increased from 3 in 2007 to 4 in 2009.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

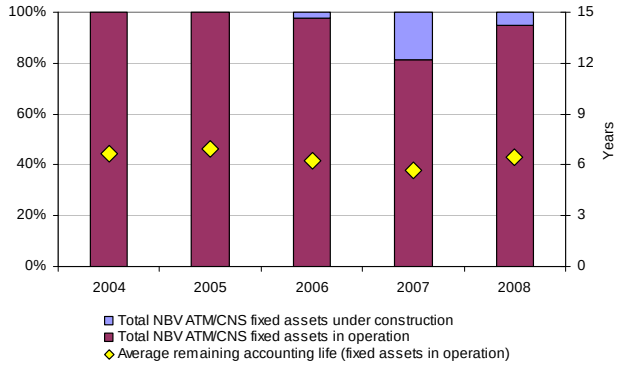


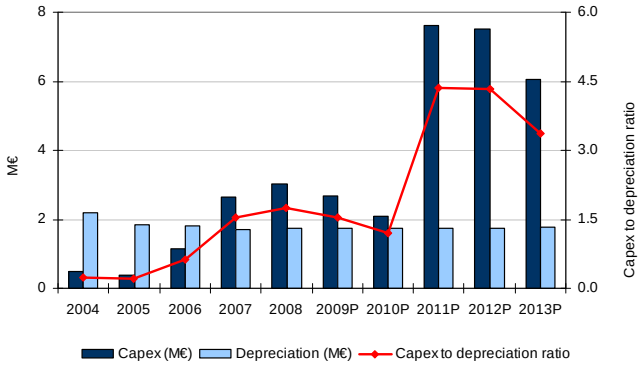
EANS

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	151	173	181	182	183	184
Gate-to-gate costs (index)	100	100	106	112	119	127
Composite flight-hours (index)	100	87	88	93	98	104

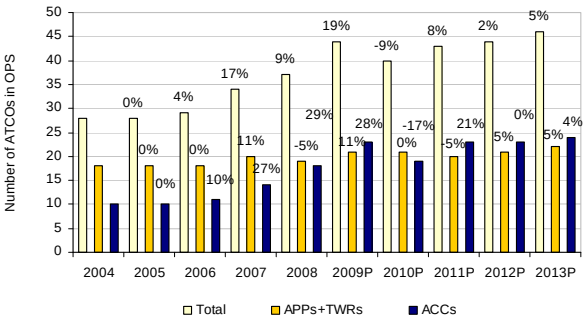


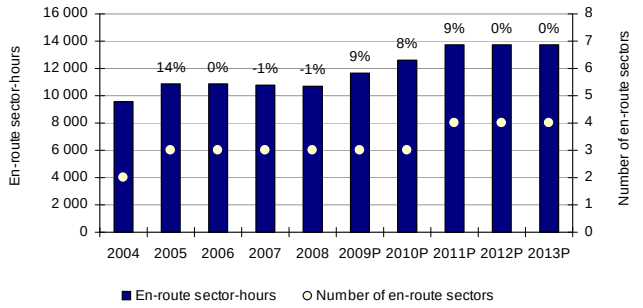
Assets structure and planned capital expenditure





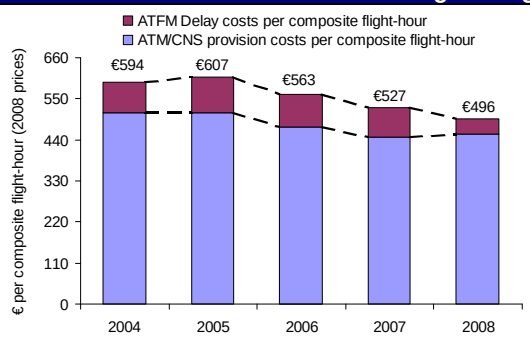
Planned staff and capacity data

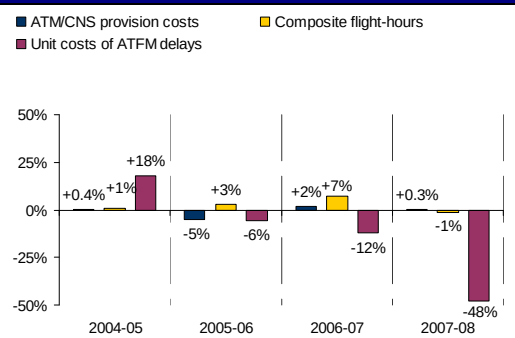




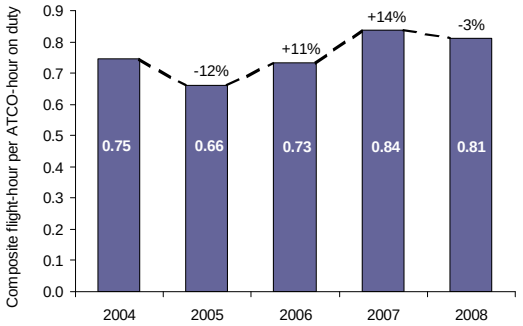
ENAV (Italy)

Trend in gate-to-gate economic cost-effectiveness

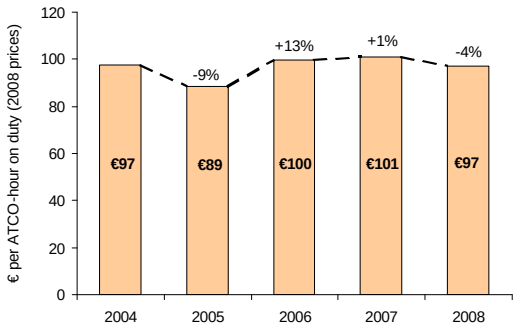




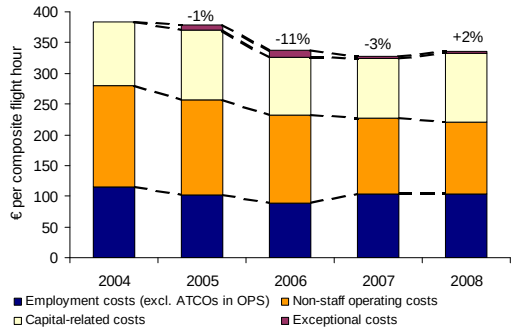
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

ENAV is one of the largest ANSPs in Europe, with costs amounting to nearly 9% of the European total.

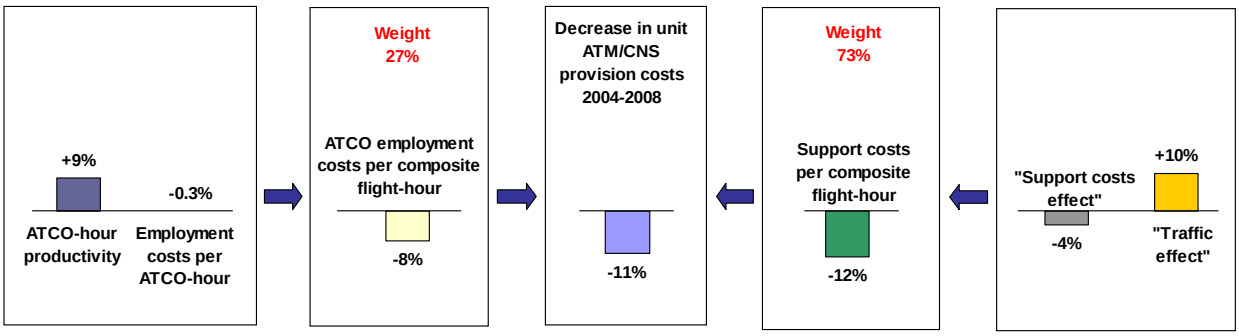
Traffic has grown modestly over the period, at around +2% a year, but traffic declined by -1% in 2008, reflecting difficulties with the national airline. Over the period ENAV experienced the lowest traffic growth among the five largest ANSPs (+10%). ENAV controls a mixture of areas of very high and relatively low traffic complexity. Overall, its complexity is relatively high, but not among the very highest. Among the other four large ANSPs, ENAV's traffic shows fairly similar complexity than DSNA, but definitively less than DFS and NATS.

Despite only modest traffic growth, there was an overall improvement in cost-effectiveness, with a fall in unit ATM/CNS costs of -11% over the period. The downward trend in unit costs stopped in 2008, but a -48% reduction in ATFM delays enabled a substantial fall in the unit economic costs which is now close to the European system average (€488) and lower than Aena and DFS.

Employment costs per ATCO-hour fell in 2008, and came back at their 2004 level. The containment of ATCO employment costs over the period, associated with a cumulated +9% increase in productivity allowed ENAV a -8% reduction in ATCO employment costs per unit of output. This is a unique achievement among the five largest ANSPs, driven by, on the one hand, new contractual arrangements (i.e. greater flexibility in rostering, productivity bonuses, etc) and, on the other hand, new technical tools available for ATCOs. After two years of consecutive growth in 2006 and 2007, productivity fell in 2008.

Unit support costs were reduced by -12% over the period, as a result of lower support costs and increased traffic. Non-staff operating costs and non-ATCO staff costs contributed to this reduction, while unit capital-related costs rose by +9% over the period in relation to a large-scale investment program. Despite the -12% reduction in unit support costs, these remain the highest among the five largest ANSPs in 2008, so that overall ENAV's unit ATM/CNS provision costs are the 2nd highest among the largest five ANSPs in 2008.

Changes in financial cost-effectiveness



ENAV (Italy)

Comments on ANSP's forward-looking cost-effectiveness

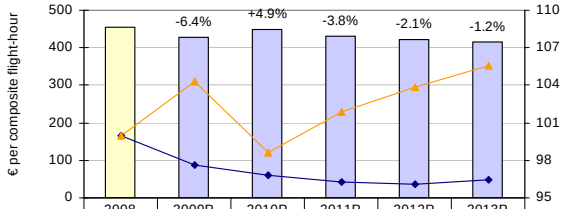
Gate-to-gate unit ATM/CNS costs are expected to fall by -9% between 2008 and 2013, an average annual reduction of -1.8%, since costs are planned to fall and traffic volumes are forecast to slightly increase. Compared to the ACE 2007 plans, ENAV has slightly revised its planned costs downwards, mostly towards the end of the period, while traffic forecasts have been shifted downwards by some -6% in 2010. If ENAV unit ATM/CNS cost profile actually materialises by 2013, it will position ENAV as the second best performer among the 5 largest ANSPs, just behind NATS. It is noteworthy, however, that ENAV traffic projections for 2009 (+4%) are based on November 2008 assumptions and have not been updated for the purposes of ENAV ACE 2008 data submission. It is clear that the projected unit costs decrease in 2009 (-6.4%) will not materialise.

The average remaining accounting life of the fixed assets slightly declined in 2008, after reaching a peak in 2006. The share of fixed assets under construction has been constantly above 20% of the total fixed assets, an indication that the 2004-2008 period had been one of intensive investments, with €932M of cumulative capex. Between 2009 and 2013, the planned capex remain high, with €738M, corresponding to 103% of 2008 gate-to-gate ANS revenues. Capex exceed depreciation throughout the period, suggesting a growing asset base. The main 2008-2013 capex include:

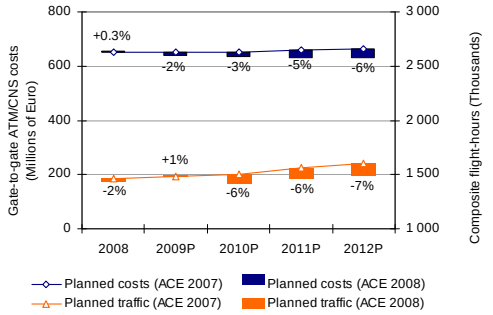
- Development of an integrated platform for the management of ATM procedures and aeronautical data (programme 4-FLIGHT next phase of COFLIGHT, i.e. €220M, should be partly financed by EC, to be in operation in 2012-2014);
- Infrastructure and security system enhancements in several airports (e.g. TWR buildings) and ACCs (i.e. €117M between 2009 and 2013);
- Technological enhancements in CNS in several airports and in ACCs (e.g. Navaids, i.e. €73M, between 2009 and 2012);
- Electric plant and electrical system enhancements in several airports (i.e. €44M, planned entry in operation in 2011);
- Development of the Multilateration System for the control on ground movements in several airports (i.e. €36M, 2011);
- System enhancement on operational automation (i.e. €32M, planned entry in operation in 2011).

Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise by +5%, which is in line with traffic forecasts (+6%), and significantly less than planned in ACE 2007, illustrating the adaptation of the recruitment plan to new traffic prospects.

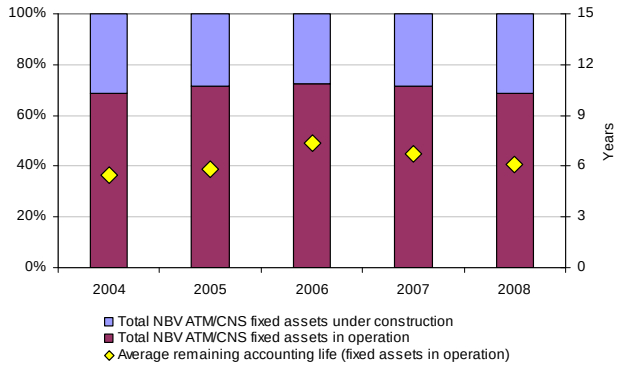
Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

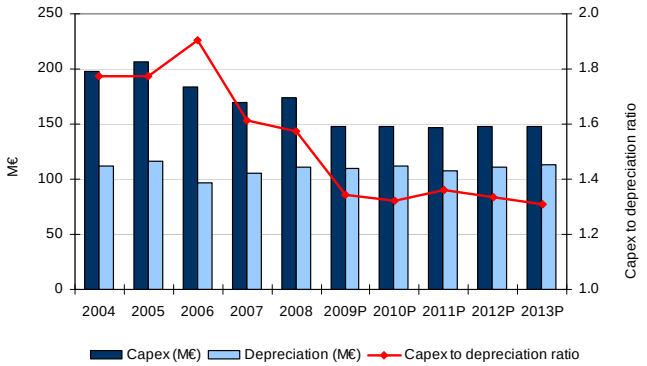


ENAV	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	456	427	447	431	421	416
Gate-to-gate costs (index)	100	98	97	96	96	96
Composite flight-hours (index)	100	104	99	102	104	106

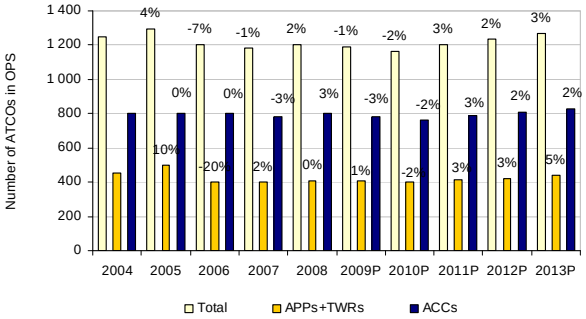


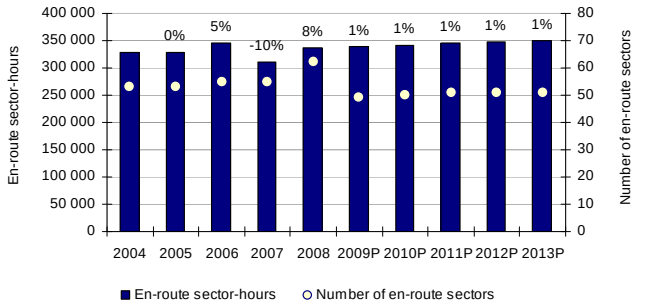
Assets structure and planned capital expenditure





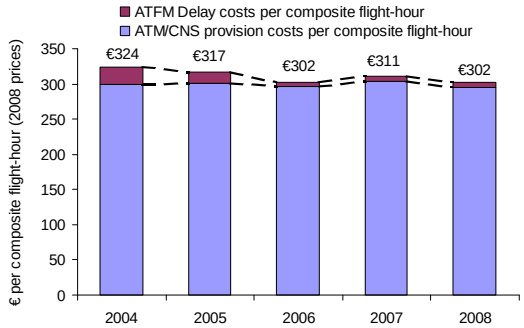
Planned staff and capacity data

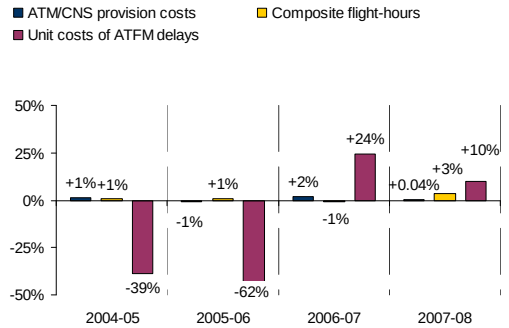




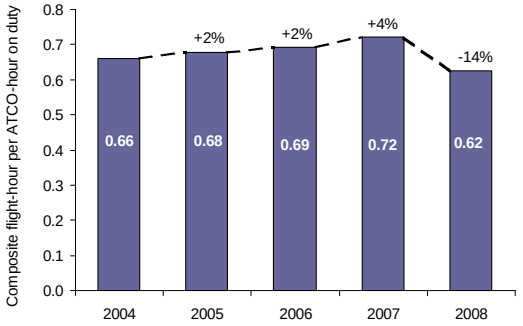
Finavia (Finland)

Trend in gate-to-gate economic cost-effectiveness



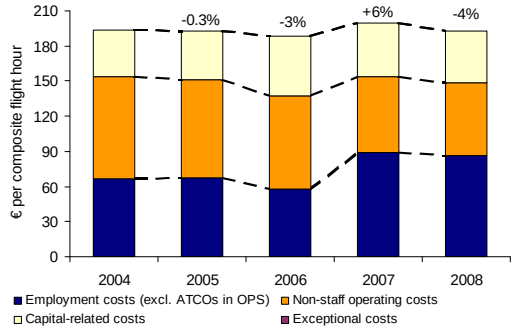


Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour

Trend in support costs per composite flight-hour



Assessment on ANSP performance

Finavia is a small ANSP, with costs amounting to 0.7% of the European total, although it provides services over a large area.

Traffic has been essentially static from 2004 to 2007, and grew by +3% in 2008, making a major contribution to the overall +4% increase over the period. Its traffic complexity is among the lowest in Europe.

ATFM delays have been recurrent but represent a very small portion of the unit economic costs.

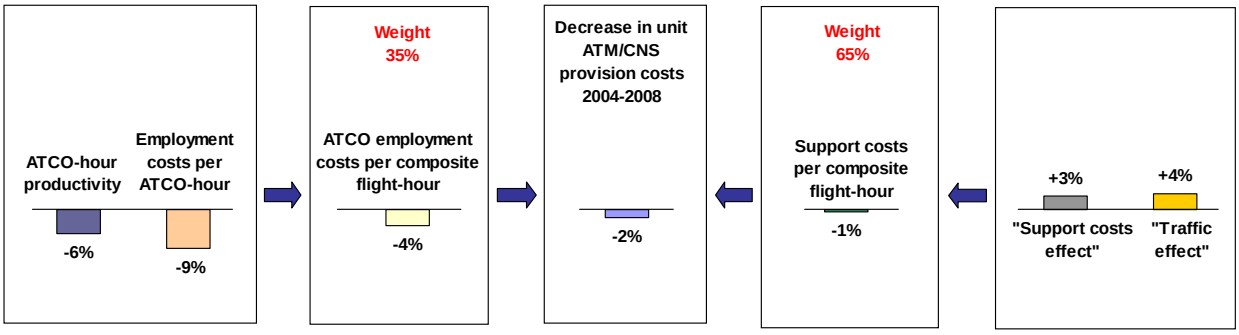
Unit ATM/CNS costs remained relatively constant over the 2004-2008 period (-2%). In fact, during the period Finavia's unit ATM/CNS costs remained among the lowest of the ACE sample (bottom quartile).

After three consecutive years of increase in both ATCO-hour productivity and employment costs per ATCO-hour, both indicators fell by -14% and -16%, respectively in 2008. These changes are mainly due to a significant reduction in the number of hours "not on duty", possibly reflecting inconsistency in data reporting.

Unit support costs have remained fairly stable over the period, since support costs and traffic grew in similar proportions. It is understood that the marked changes in the distribution of support costs in 2007 were caused by a change in reporting of some overhead staff costs.

Finavia's unit ATM/CNS provision costs lies between those of its neighbours Avinor and LFV/ANS Sweden. Its ATCO productivity and employment costs per ATCO-hour are close to LFV but lower than Avinor. Its unit support cost is comparable to LFV.

Changes in financial cost-effectiveness



Finavia (Finland)

Comments on ANSP's forward-looking cost-effectiveness

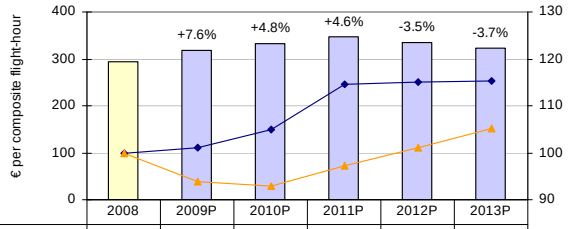
Gate-to-gate unit ATM/CNS costs are expected to rise by +10% between 2008 and 2013, an average annual increase of +1.9%. This is a higher increase than reported in ACE 2007 for the period 2007-2012. Compared to the ACE 2007 plans, Finavia has revised traffic forecast downwards, while planned costs have been revised upwards for the years 2011-2012.

The average remaining accounting life of the fixed assets has significantly declined in 2008 compared to its peak level in 2004. For the third consecutive year the share of fixed assets under construction continues to represent more than 20% of the total fixed assets. Large amounts of capex have been invested over the 2004-2008 period (€50M). These mainly related to the introduction of a new ATM system allowing for independent approaches on the two parallel runways of Helsinki-Vantaa, the replacement of the ATM systems at joint civil-military airports and the construction of new tower buildings at Kuopio and Rovaniemi airports. The cumulative planned capex for the period 2009-2013 are lower than in previous period and amounts to €40M (74% of the 2008 gate-to-gate ANS revenues), with peaks in 2010 and 2011. However, compared to ACE 2007, the investment plan has been revised upwards. These investments mainly relate to:

- The replacement of FDP and RDP systems at Tampere ACC and Helsinki-Vantaa APP/TWR (Eurocat) (i.e. €12M, 2012);
- Investments to WAM technology (i.e.€ 7.5M); and
- ILS/DME replacements (i.e. €8M).

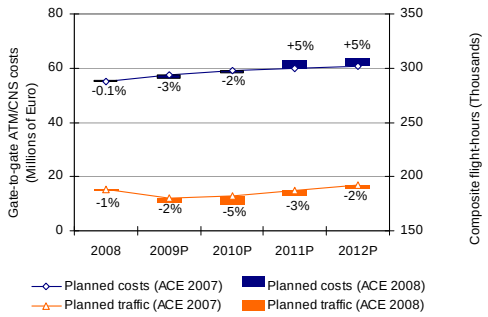
Traffic volumes are forecast to rise by +5% between 2008 and 2013, while the number of ATCOs in OPS is planned to remain the same as in 2008. This implies that, all else being equal, ATCO productivity is planned to increase. In the meantime, the number of en-route sectors and sector-hours is also planned to remain constant.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

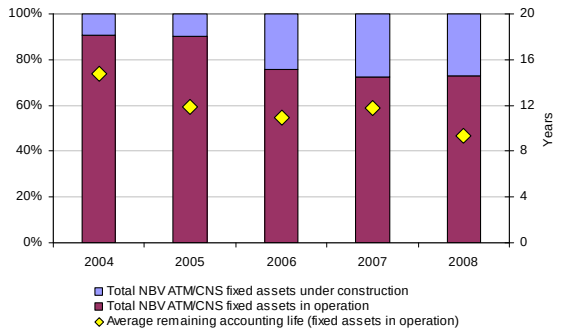


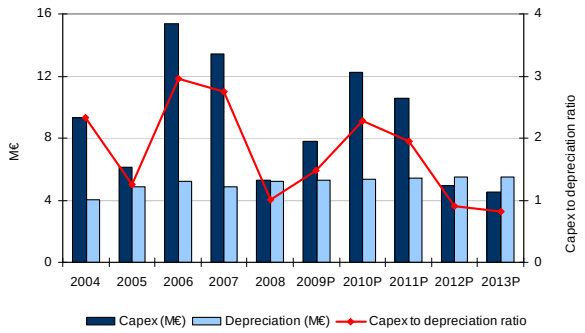
Finavia

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	295	317	332	348	335	323
Gate-to-gate costs (index)	100	101	105	115	115	115
Composite flight-hours (index)	100	94	93	97	101	105

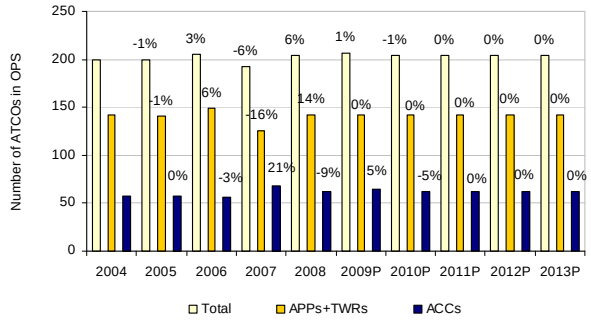


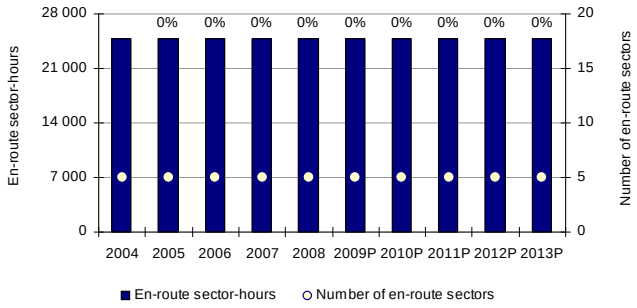
Assets structure and planned capital expenditure





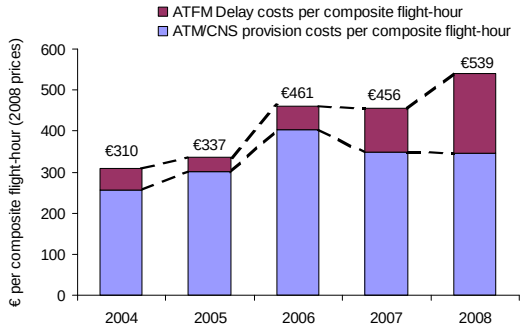
Planned staff and capacity data

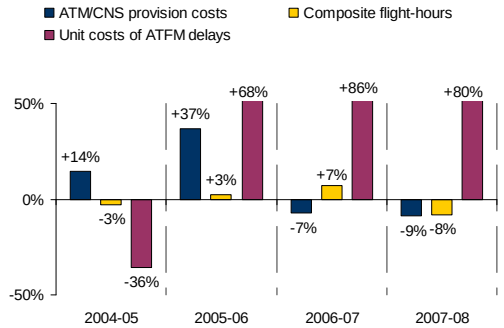




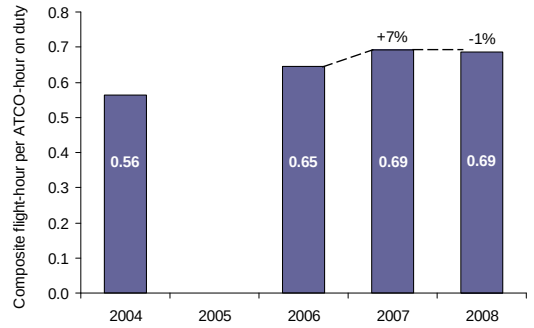
HCAA (Greece)

Trend in gate-to-gate economic cost-effectiveness

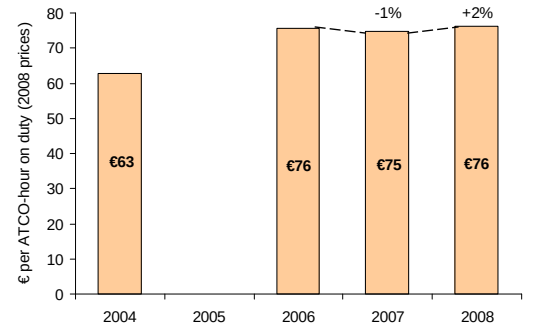




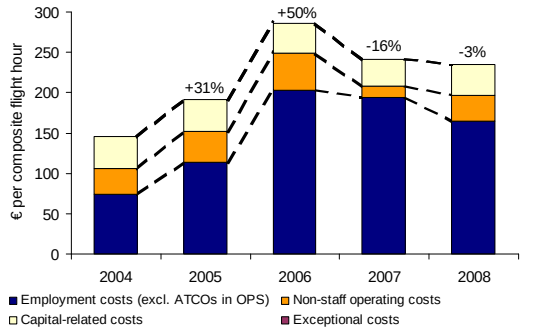
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

HCAA is a medium-sized ANSP, with costs amounting to 2.4% of the European total.

Traffic has decreased over the period, at around -0.5% a year. Traffic complexity in Greek airspace is relatively low, close to the bottom quartile, while the seasonality of traffic is among the highest.

HCAA did not report reliable data on terminal navigation costs during the years 2004-05, so the significant cost increase in 2006 is mostly due to the inclusion of an estimation of all ATM/CNS terminal costs. It is also understood that the full costs of Terminal ANS were not reported in HCCA 2008 submission, but only an initial estimate for the International Athens Airport explaining to a large extend the observed fall in unit ATM/CNS provision costs. It appears that since the cost accounting system is not operational and since there are no TNC at Greek airports (the first and presently only one will be the International Athens Airport in 2010), HCAA has serious difficulties with reporting accurate and reliable economic information in relation to the provision of ATM.

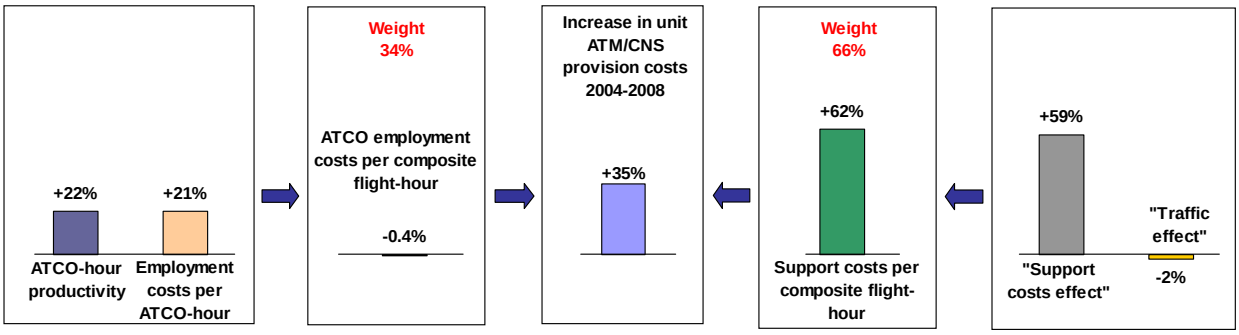
HCAA did not report reliable data on ATCO-hours in 2005, so for some indicators, this year is missing.

Delays rose quickly from 2005 onwards, and represent up to 36% of the unit economic cost in 2008. The situation did not improve in 2009, illustrating the need for all parties concerned to properly address and act upon capacity issues.

Employment costs per ATCO-hour increased by +21% over the period. This was more than compensated by the rise in productivity (+22%). During 2004-08, HCAA support costs increased by +59%, although substantial reductions are observed from 2006 record level. However, as the reliability of data underlying these trends is questionable, it is assumed that the observed variations are influenced by inconsistency in data reporting. This is an area where improvements are expected in order to enhance transparency and credibility.

Compared to its neighbour's HCAA employment costs per ATCO-hour are significantly higher than DCAC Cyprus and MATS. On the other hand, in 2008, unit capital-related costs were among the lowest in Europe, but recurrent delays may indicate insufficient investments in capacity.

Changes in financial cost-effectiveness



HCAA (Greece)

Comments on ANSP's forward-looking cost-effectiveness

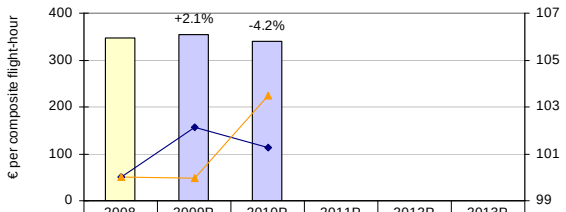
Similar to last year (ACE 2007) HCAA did not provide sufficient information in ACE 2008 to derive a five-year projection of the unit gate-to-gate ATM/CNS provision costs. Gate-to-gate unit ATM/CNS costs are expected to fall by -2% between 2008 and 2010, since costs are planned to increase faster (+1%) than traffic (+3%).

HCAA does not use a cost-accounting system which allows for providing balance sheet data. Furthermore, HCAA did not provide planned capex and complete capacity data for the period 2009-2013.

The 5 main investment projects in 2008 for HCAA were:

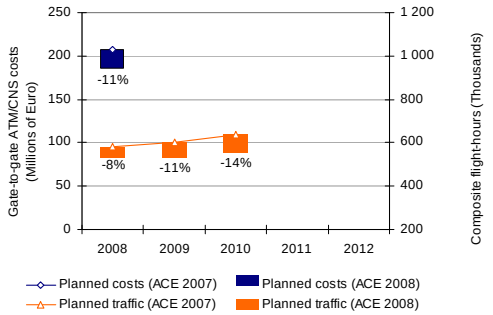
- Purchase of meteo Radar (i.e. €6.5M, between 2006 and 2008);
- Upgrade of FDP system (PALLAS) (i.e. €4.8M, between 2005 and 2008);
- Upgrade of major airports FDP system (PATROCLOS) (i.e. €2M, between 2008 and 2010);
- Implementation of the 8.33 kHz channel spacing above FL-195 (i.e. €1.3M, between 2006 and 2008); and
- ATIS project (i.e. €0.3M, between 2007 and 2008).

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour



HCAA

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	346	354	339			
Gate-to-gate costs (index)	100	102	101			
Composite flight-hours (index)	100	100	103			



Assets structure and planned capital expenditure

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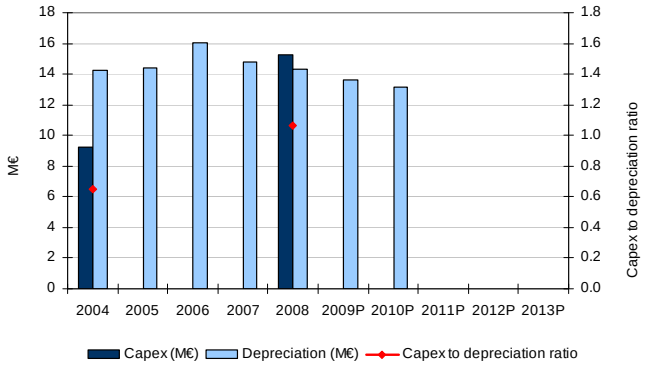
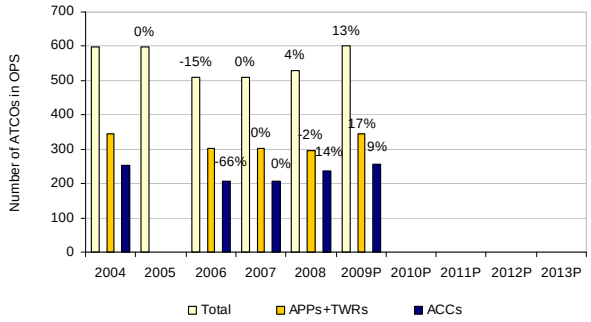
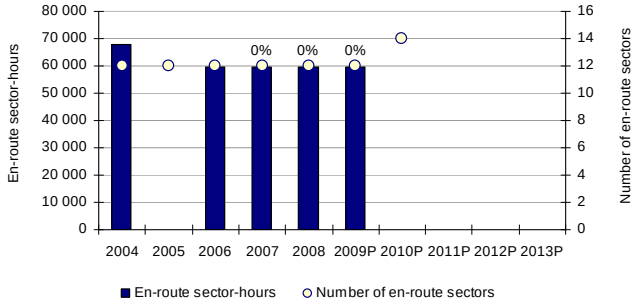


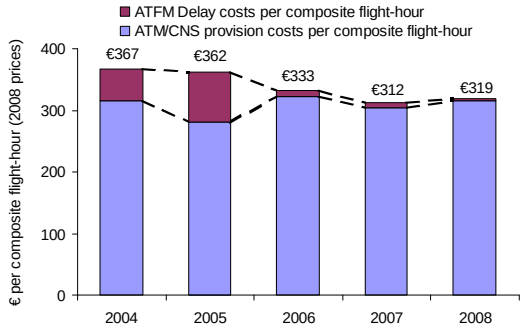
Planned staff and capacity data

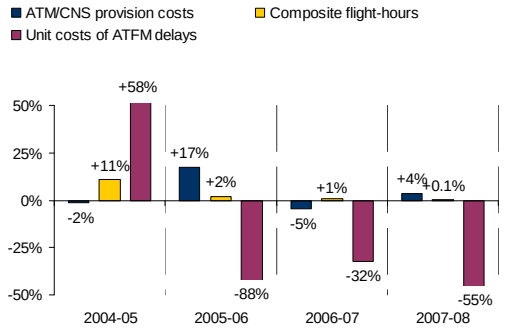




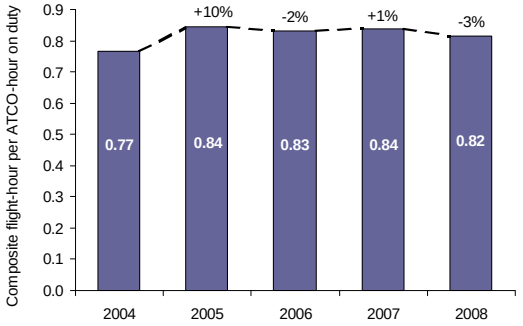
HungaroControl (Hungary)

Trend in gate-to-gate economic cost-effectiveness

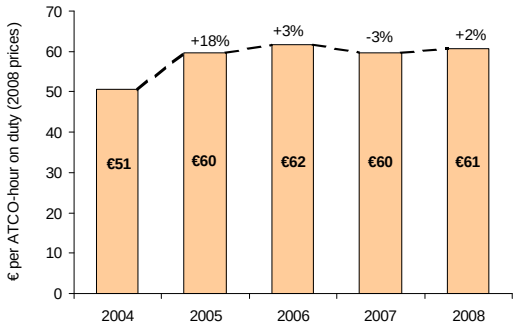




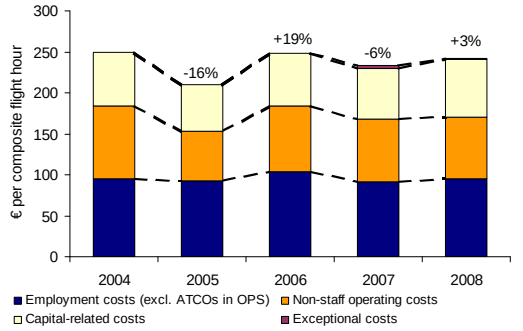
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

HungaroControl is a medium-sized ANSP, with costs amounting to 1% of the European total.

Traffic complexity is intermediate, and seasonality is rather high (comparable to its neighbour LPS).

Traffic grew by +14% over the period (+3.3% a year on average) with most of the growth being achieved early in the period, in the wake of the EU accession. Traffic has then been essentially static since 2006.

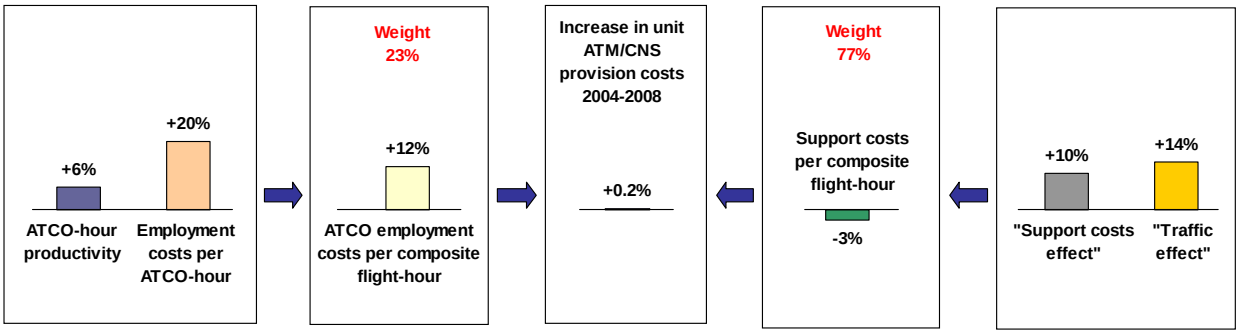
Unit ATM/CNS costs remained stable over the period. The lowest unit cost level was achieved in 2005 at a time when ATFM delays became significant. Opportunely, delays have since been much reduced, as traffic growth has slowed and an upgrade of the ATM system was introduced to provide additional capacity. The reduction of ATFM delays enabled a cumulated reduction of -13% in unit economic costs.

HungaroControl has consistently been in or close to the bottom quartile of unit costs, with substantially lower unit costs than its neighbours ANS CR and LPS. Its ATCO productivity is lower than ANS CR, and substantially higher than LPS. Employment costs per ATCO-hour lie between ANS CR and LPS, and unit support costs are substantially lower.

After a +10% increase in 2005, ATCO productivity has been on a declining trend. This contrasts with the much higher productivity increase achieved by Austro Control over the same period. However, HungaroControl did not benefit from comparable increases in traffic, and unlike Austro Control, ATFM delays have been successfully contained. Employment costs per ATCO-hour have grown more rapidly than productivity, at +4.6% a year on average, faster than the average real-terms growth in income per head over the period (+2.4%). As a result, ATCO employment costs per unit of output rose by +12%. This increase was outweighed by a containment of unit support costs (-3%), especially with respect to non-staff operating costs.

Another noticeable feature of HungaroControl is that a large amount of cash reserves have been accumulated and its liquidity ratio (ratio of current assets to current liability) was, in 2008, 2.5, higher than the European system average of 1.8.

Changes in financial cost-effectiveness



HungaroControl (Hungary)

Comments on ANSP's forward-looking cost-effectiveness

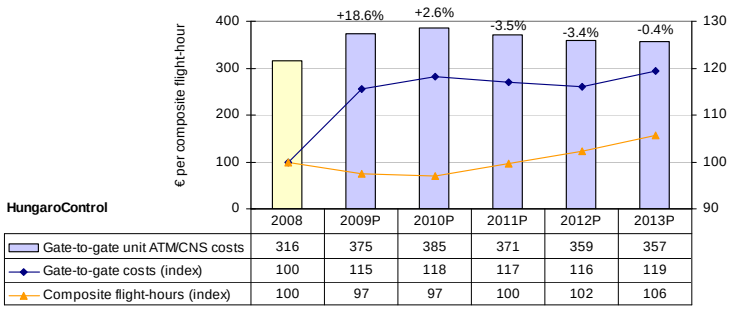
Gate-to-gate unit ATM/CNS costs are expected to rise by +13% between 2008 and 2013, an average annual increase of +2.5%, since costs are planned to rise much more rapidly than traffic. The ACE 2008 plans represent a worsening situation compared with ACE 2007, where unit costs were expected to rise by +2.5% a year between 2007 and 2012. Actual 2008 costs are -7% lower than planned in ACE 2007 due to a significant decrease in non-staff operating costs. Compared to the ACE 2007 plans, HungaroControl has revised projected traffic downwards as well as the planned costs, although only at a later stage in 2011 and 2012.

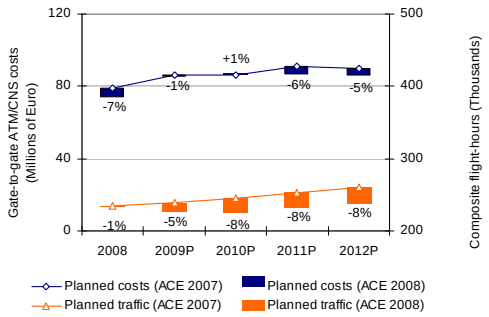
The average remaining accounting life of the fixed assets remained stable in 2008, and the share of fixed assets under construction fell to 10% subsequently to a reduction of capex. HungaroControl plans to invest €87M over the period 2009-2013 (99% of the 2008 gate-to-gate ANS revenues), with a peak in 2010. Compared to ACE 2007, the investment plan has been revised upwards quite significantly. Major forthcoming investments include:

- New building for Budapest ACC (i.e. €10M), planned to enter in operation in August 2011. The old building will be used as a contingency centre and will host a simulator;
- Installation of ATM system (MATIAS) in the new ACC (i.e. €18.4M, operational December 2011);
- Replacement of VCMS and VRRS equipment for the new ACC (i.e. €2.3M, April 2011);
- Total hardware platform replacement for MATIAS (i.e. €2.4M, June 2012);
- MATIAS upgrade (i.e. €3.6M, December 2013);
- Development of CPDLC infrastructure and MATIAS CPDLC functionality integration (i.e. €20M, operational December 2014);
- A-SMGCS upgrade (i.e. €3.4M, operational between 2011 and 2014); and
- Terminal Approach Radar (TAR) replacement (i.e. €6M, in 2012).

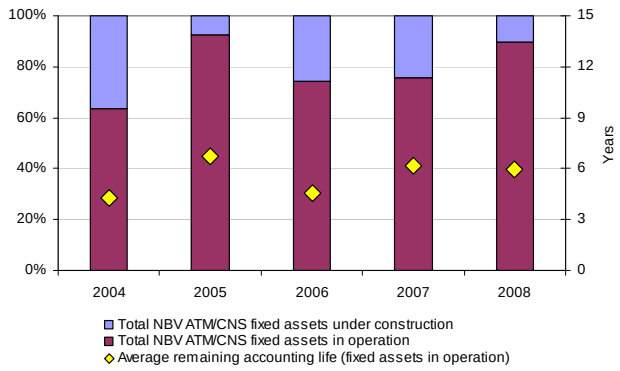
Traffic volumes are forecast to rise by +6% between 2008 and 2013. This increase is planned to be absorbed with the same number of ATCOs in OPS as in 2008, while the number of en-route sectors is planned to rise from 7 in 2008 to 8 in 2012, and the number of en-route sector-hours are planned to rise by +6%.

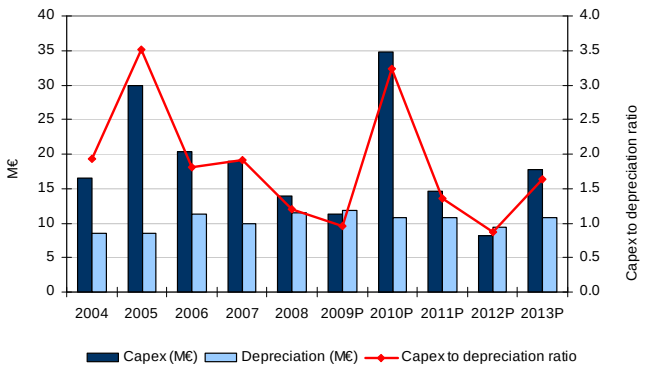
Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour



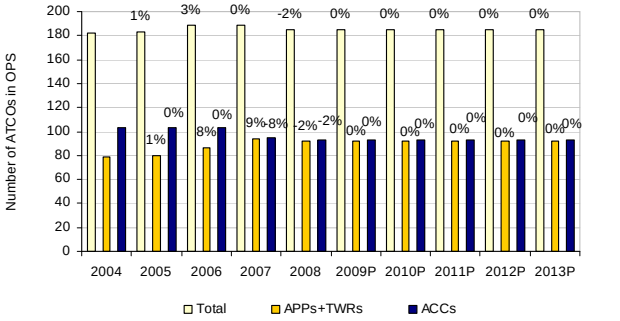


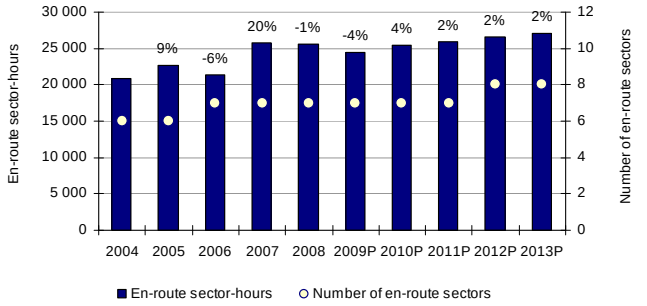
Assets structure and planned capital expenditure





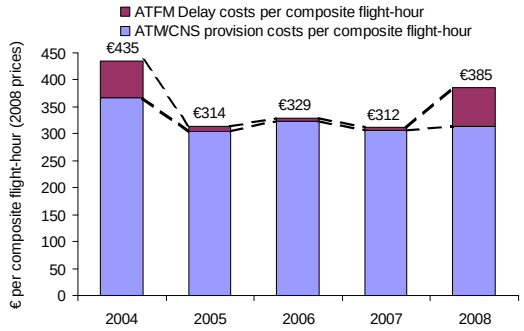
Planned staff and capacity data

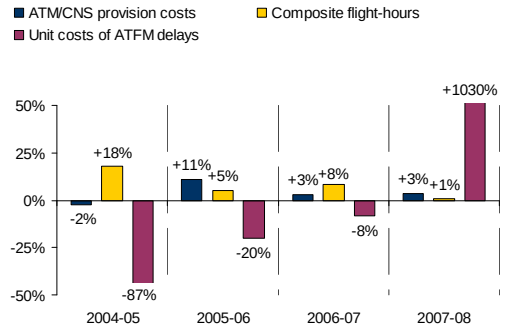




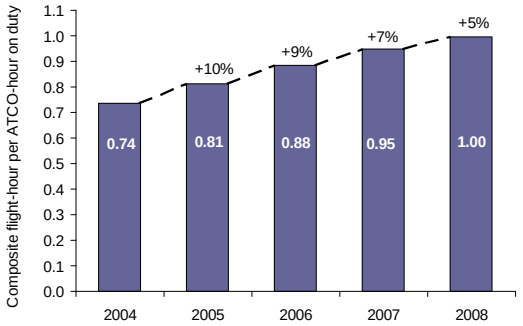
IAA (Ireland)

Trend in gate-to-gate economic cost-effectiveness

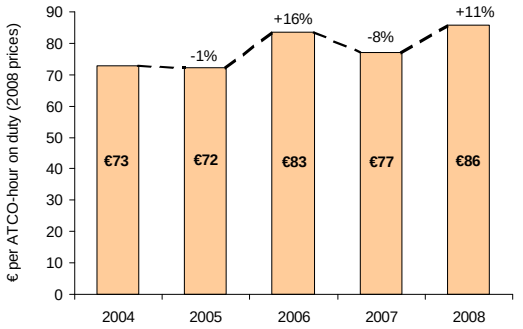




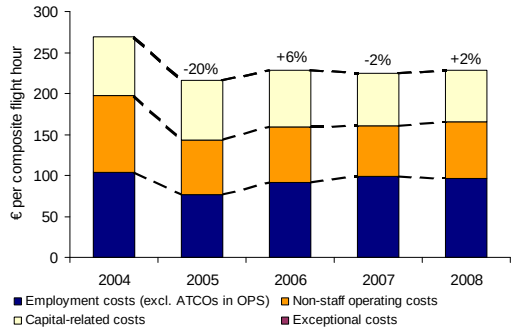
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

IAA is a medium-sized ANSP with costs amounting to 1.5% of the European total.

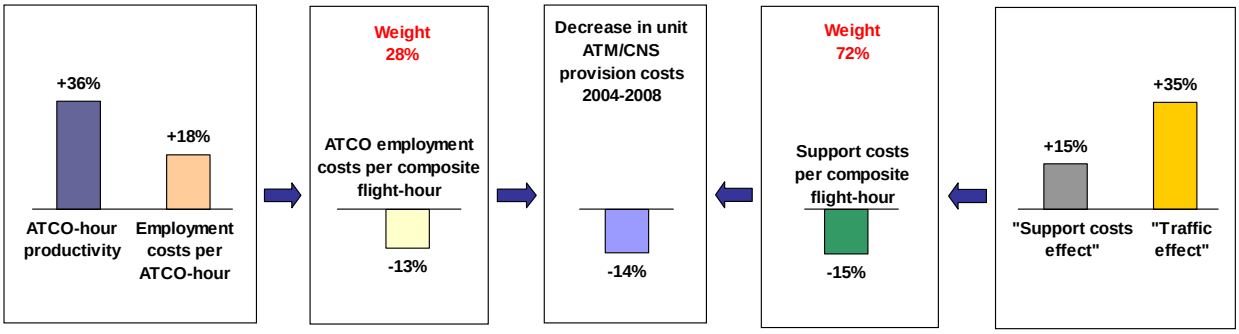
Its traffic has grown rapidly over the period, at around +8% a year. Traffic has grown rapidly in the early period, but the rise in 2005 was largely the result of IAA taking responsibility for an area of the North Atlantic that had previously been oceanic. Traffic remained stable in 2008. Irish airspace includes areas of both high and very low traffic complexity; overall, however, IAA traffic is among the least complex in Europe.

ATFM delays vary from year to year. They represent a substantial additional part of the unit economic costs in 2008, due to Dublin airport capacity shortfalls at peak time. Helped by a strong traffic decline, delays became marginal in 2009. In 2008, IAA unit economic costs are significantly lower than in NAVIAIR, but higher than LFV/ANS Sweden, its two partners in the COOPANS technology alliance.

Supported by a solid traffic growth, ATCO productivity rose by +36% over the period, consolidating IAA's position in the top quartile. In the meantime, employment costs per ATCO-hour rose by +18%. Most of this increase occurred in 2008, when employment costs per ATCO-hour were affected by the retroactive payment of pay increases relative to years 2006 and 2007. Overall, ATCO employment costs per unit of output fell by -13% over the period.

Support costs have increased by +15%, which is substantially less than traffic (+35%). It results in a fall in unit support costs of -15%. While 2004 support costs were affected by the capital-related costs from major investments, the subsequent fall in 2005 was supported by reductions in both staff costs and non-staff costs. In 2008, however, non-staff operating costs increased due to larger technical and administration expenses and additional maintenance support required on the ATM system.

Changes in financial cost-effectiveness



IAA (Ireland)

Comments on ANSP's forward-looking cost-effectiveness

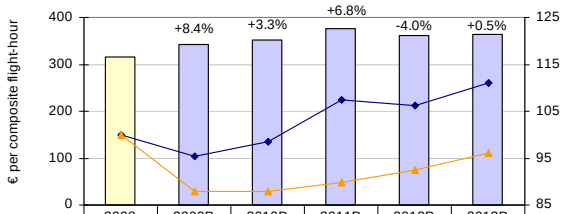
Gate-to-gate unit ATM/CNS costs are expected to rise by +15%, between 2008 and 2013, an average annual increase of +2.9%, as costs are planned to rise while traffic volumes are expected to fall. Compared to ACE 2007 projections, traffic forecasts have been revised downwards in substantial proportions, but planned costs have been revised downwards in even greater proportions. In response to the economic crisis and the consecutive traffic downturn, IAA decided to implement a cost containment programme including: pay freezes, revision of the recruitment plan, reduction of overhead expenses, lengthening of economic live of some fixed assets and postponement of capex. Although the resulting unit ATM/CNS cost profile shows a planned increase of +15%, this is significantly less than the increase planned in ACE 2007 (+41% between 2007 and 2012).

The average remaining accounting life of the fixed assets has been steadily declining since 2004 but the share of fixed assets under construction progressively increased and reached 35% in 2008. While cumulative capex over the period 2004-2008 amount to €84M, IAA plans to invest €196M between 2009 and 2013 (151% of the 2008 gate-to-gate ANS revenues). Compared to the ACE 2007 investment plans, the total capex have been lowered and concentrate towards the end of the period. These investments mainly relate to the following projects:

- COOPANS initiative between 2008-2015 to replace Flight and Radar Data Processing systems (2011);
- Construction of new towers in Cork (2009) and Dublin (2013+) airports;
- Radar Replacement Programme (Mode-S SSR and Solid State PSRs),expected to be completed in 2009; and
- Replacement of existing Voice Switch Technology with Transmission Control Protocol (TCPIP).

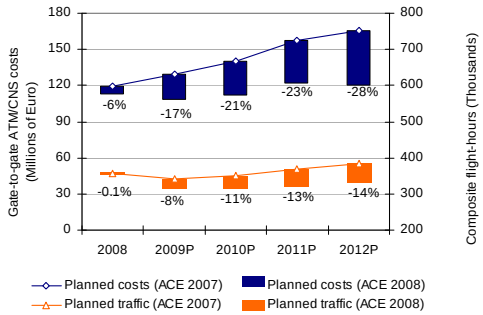
Between 2008 and 2013, the number of ATCOs in OPS is planned to increase by +1% in a projected environment of declining traffic (-4%). In the context of the airspace reorganisation programme, the number of en-route sectors is planned to increase gradually from 13 in 2008 to 18 in 2013, and sector-hours open are planned to rise by +33% over the period. This programme should indeed enable a reduction in the manning per area control sector from 2 to 1.25 ATCOs on average; its actual implementation schedule is, however, being reviewed.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

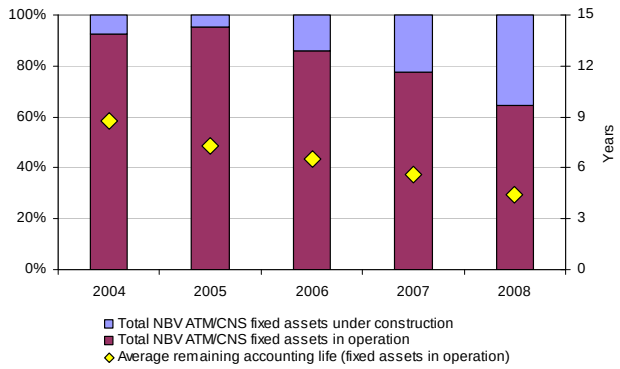


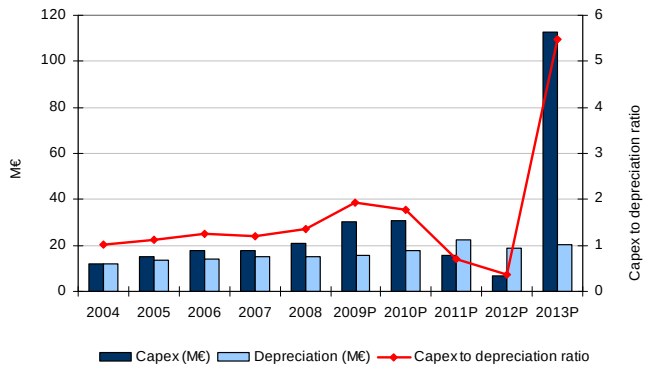
IAA

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	315	341	353	377	362	363
Gate-to-gate costs (index)	100	95	99	107	106	111
Composite flight-hours (index)	100	88	88	90	92	96

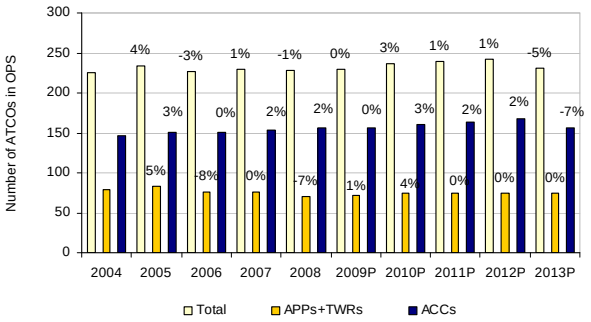


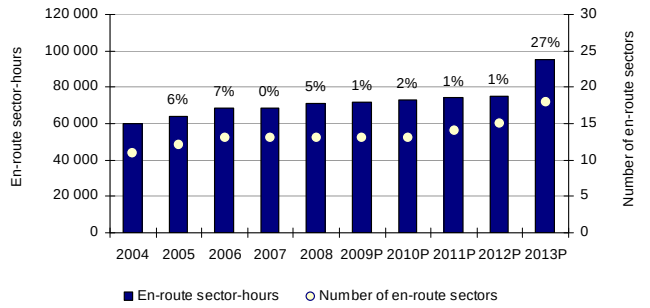
Assets structure and planned capital expenditure





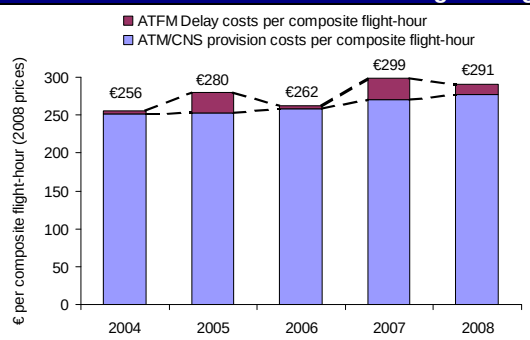
Planned staff and capacity data

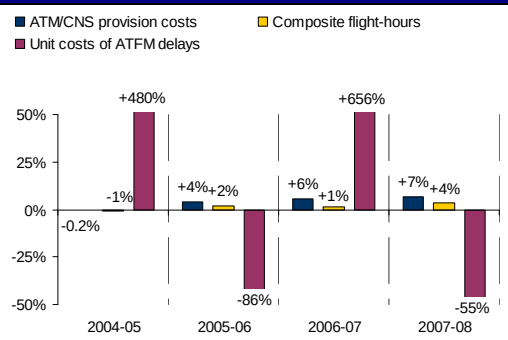




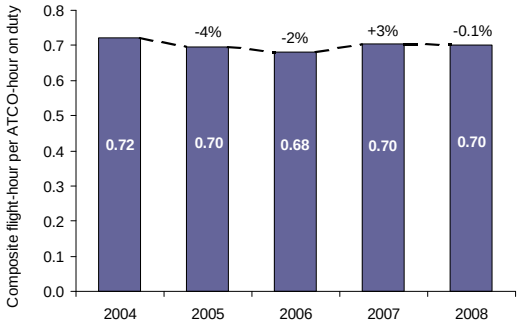
LFV/ANS Sweden (Sweden)

Trend in gate-to-gate economic cost-effectiveness

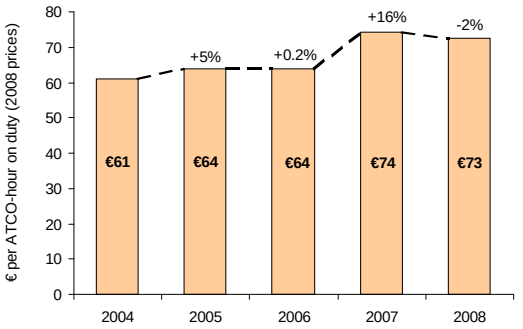




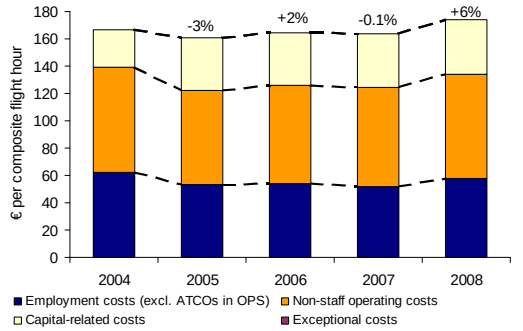
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

The ANS division of LFV is a medium-sized ANSP, with costs amounting to 2% of the European total.

Traffic has grown very modestly over the period, at around +1.5% a year. Traffic complexity is intermediate.

LFV/ANS Sweden's overall financial cost-effectiveness is among the best in Europe, impressively, given the position of Sweden as a country with a high income per head. However, it worsened slightly over the period as the unit ATM/CNS costs increased by +11%.

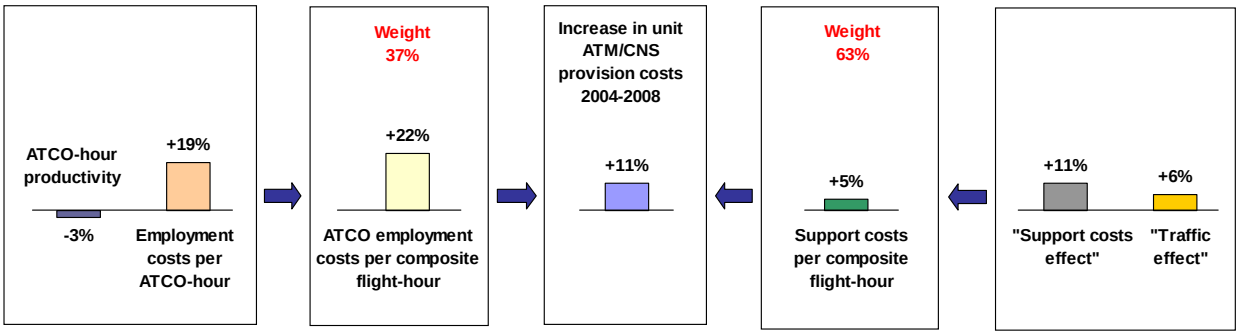
Delays were not a major feature of unit economic costs, but appeared from year to year.

Factors underlying the decline in cost-effectiveness comprised essentially static ATCO productivity, with a substantial increase in employment costs per ATCO-hour in 2007. This increase was associated with a new salary agreement applicable for the period 2007-2010, which in exchange should increase flexibility in the future, (e.g. removing the right for ATCOs to take holidays in the peak season). It is also noteworthy that LFV pension liabilities were revaluated in 2007 and that increased liabilities are financed from 2008 onwards through a progressive rise in social contributions. Employment costs per ATCO-hour fell slightly in 2008 which is counter intuitive given the new salary agreement.

Support costs rose by +11% over the period, which is faster than traffic, resulting in a +5% increase in unit support costs. This increase has been largely driven by higher capital-related costs early in the period (commission of a new FDP system in 2005) and by additional training costs necessary to meet the ATCO recruitment objective; a revision of the SAR helicopter agreement; and airport costs regarding ATM infrastructure. Despite this increase, the 2008 unit support costs were the third lowest in Europe.

Overall, compared to its Nordic neighbours and IAA, LFV/ANS Sweden has lower unit ATM/CNS costs, mainly due to much lower unit support costs.

Changes in financial cost-effectiveness



LFV/ANS Sweden (Sweden)

Comments on ANSP's forward-looking cost-effectiveness

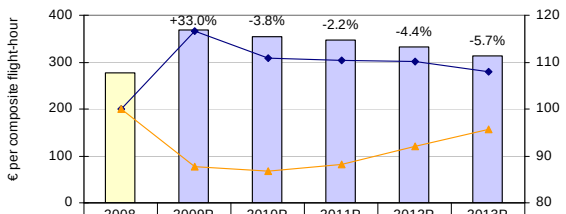
Gate-to-gate unit ATM/CNS costs are expected to rise by +13% between 2008 and 2013, an average annual increase of +2.4%, mainly due to increases in staff costs (additional training, recruitment of ATCOs, and increase in social security and pension contributions). This represents a more optimistic outlook than that presented in ACE 2007, when the planned average annual increase between 2007 and 2012 was +3%. In fact, 2008 actual costs were -6% lower than planned in ACE 2007. Similarly, planned costs for 2010 are -8% below ACE 2007 plans, following LFV/ANS Sweden decision to implement cost containment measures, including the postponement of some investments, reductions in the cost of capital and travel costs, and reductions in the number of ATCO students. In the meantime, traffic forecasts have also been revised downwards, reflecting the 2009 slump in air transport.

The average remaining accounting life of the fixed assets has been steadily declining since 2005 (year of renewal of the Thales EUROCAT 2000 FDP system, ATCO HMI and Voice COM systems). LFV/ANS Sweden invested €86M over the 2004-2008 period and plans to invest a cumulated amount of €89M over the period 2009-2013 (51% of the 2008 gate-to-gate ANS revenues). Forthcoming capital expenditures mainly comprise:

- COOPANS project (i.e. €67.7M, between 2006 and 2014) for common and harmonised upgrades of the EUROCAT 2000 ATM systems in partnership with Thales, the Irish Aviation Authority (IAA), NAVIAIR and Austro Control;
- Construction of a building in Malmö for training and support (i.e. €11.7M, between 2007 and 2011);
- Commissioning of new VHF Radio/UHF/8,33 kHz (i.e. €3.7M, between 2007 and 2011);
- Commissioning of new Voice COM System at Stockholm and Malmö ACCs (i.e. €2.1M , between 2007 and 2009); and
- Regional Advanced ATM Migration Programme, RAMP (i.e. €2.4M, between 2008 and 2010).

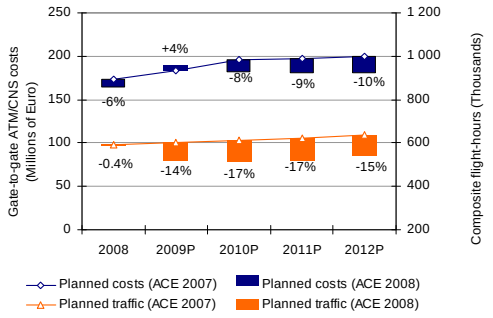
Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise by +21%, which contrasts with traffic forecasts (-4%). This indicates that LFV/ANS Sweden productivity is planned to decrease. In the meantime, the number of en-route sectors is planned to remain stable at 22 until 2013.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

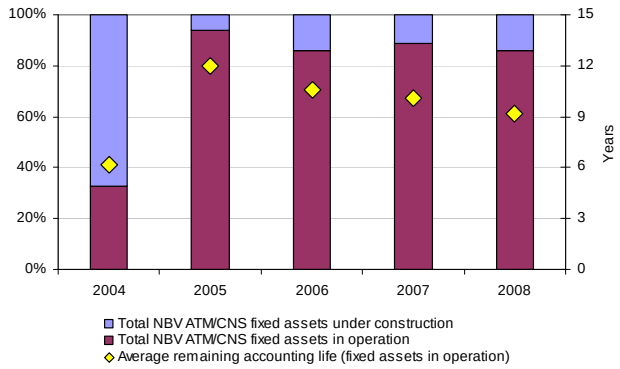


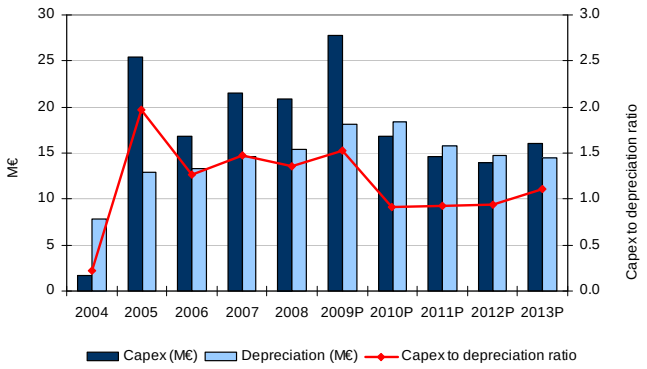
LFV/ANS Sweden

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	278	369	355	347	332	313
Gate-to-gate costs (index)	100	117	111	110	110	108
Composite flight-hours (index)	100	88	87	88	92	96

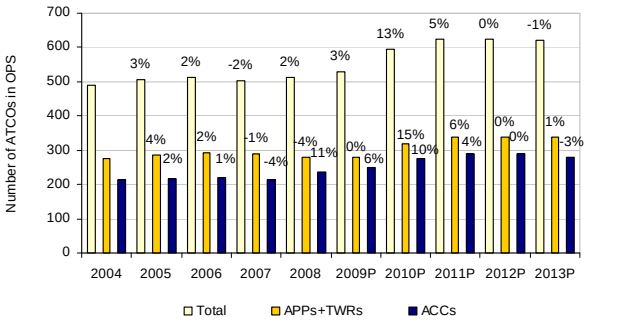


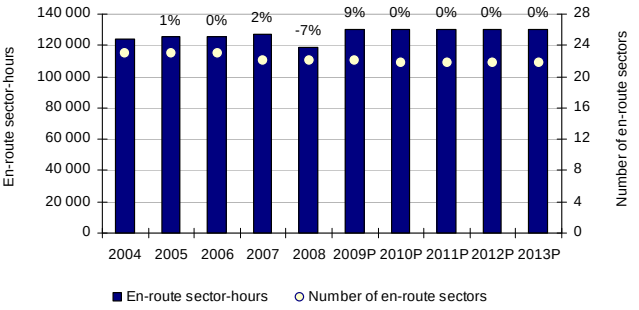
Assets structure and planned capital expenditure





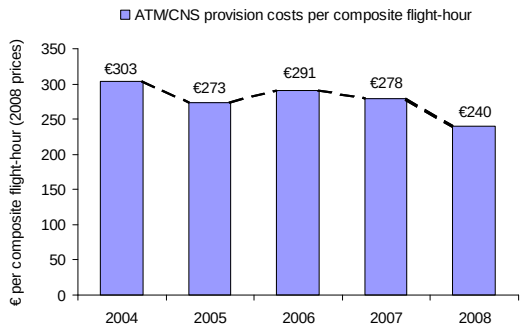
Planned staff and capacity data

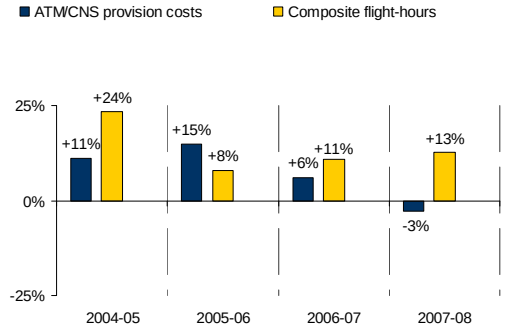




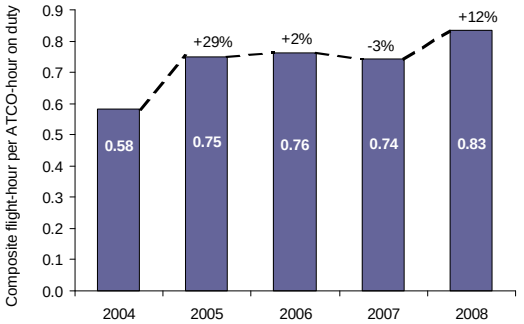
LGS (Latvia)

Trend in gate-to-gate economic cost-effectiveness

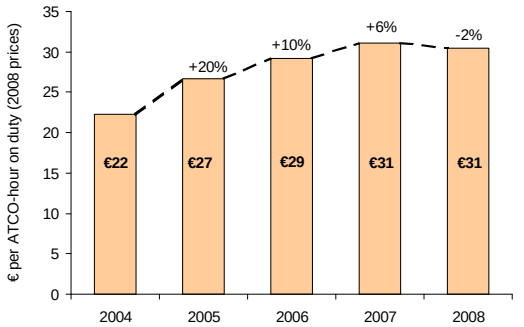




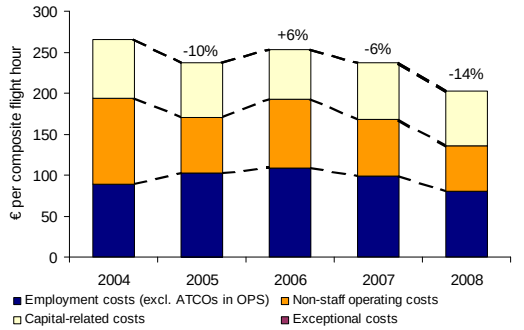
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

LGS is one of the smallest ANSPs in Europe, with costs amounting to 0.3% of the European total.

Traffic in Latvia and its neighbour Lithuania has grown more rapidly than anywhere else in Europe, averaging +13.6% a year. Despite this traffic increase, complexity remains among the lowest in Europe.

Unit ATM/CNS costs fell by -21% over the period, including a -14% reduction in 2008, consolidating LGS position among the ANSPs with the lowest unit costs. LGS unit costs are intermediate between those of EANS and Oro Navigacija, both neighbours of comparable size.

LGS is understood to have no ATC capacity or delay problems.

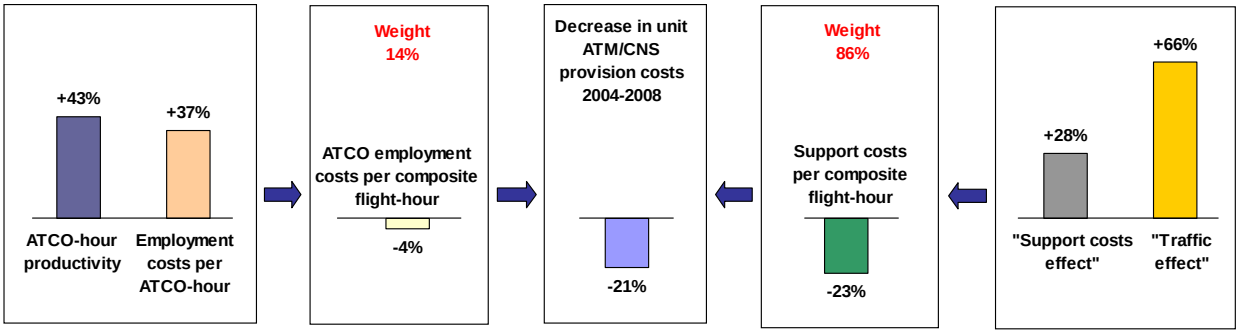
Growth in employment costs per ATCO-hour has been over +8% a year but this has been outweighed by a similar growth in ATCO productivity. It is noteworthy that significant productivity gains were achieved at the beginning (2005) and at the end (2008) of the period.

Support costs growth has been sustained (+28%), but remained much lower than traffic growth (+66%), resulting in a substantial decline of unit support costs (-23%). Unit support costs reductions were mainly achieved in 2005, following a strategic decision to in-source many previously outsourced services, and in 2008.

Compared to its Baltic neighbours, LGS shows intermediate productivity and intermediate unit support costs. Its employment costs per ATCO-hour are lower that EANS's, and similar to those of Oro Navigacija.

LGS does not operate under the EUROCONTROL full cost recovery system.

Changes in financial cost-effectiveness



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LGS (Latvia)

Comments on ANSP's forward-looking cost-effectiveness

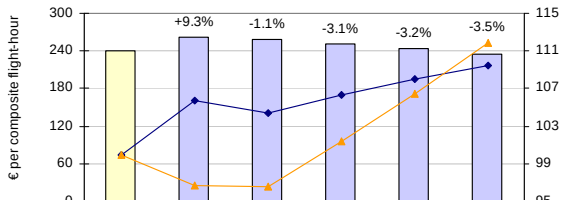
Gate-to-gate unit ATM/CNS costs are expected to fall by -2.1% between 2008 and 2013, an average annual decrease of -0.4%, since costs are planned to increase less than traffic (+9% and +12% respectively). This represents a much more optimistic outlook than that presented in ACE 2007. In fact, compared to ACE 2007 plans, LGS has significantly revised planned costs downwards (around 30%-40% for 2010-2012). It should also be noted that 2008 actual costs are -28% lower than planned in ACE 2007.

The average remaining accounting life decreased from 8 years in 2007 to 6 years in 2008, while the share of assets under construction increased from 14% in 2007 to 20% in 2008. The cumulative capex for the period 2009-2013 are around €22M (110% of the 2008 gate-to-gate ANS revenues). From 2009 onwards, capex are consistently lower than the depreciation, except in 2012, suggesting a stagnating asset base. The 2009-2013 capex include, *inter alia*, the following projects:

- Modernization of surveillance system for provision of ATS in Latvia (MSSAL project) (i.e. €8.8M, completed in 2009); and
- Wide Area Multilateration System for Riga TMA (WAMRIX project) (i.e. €1.7M, completed in 2009).

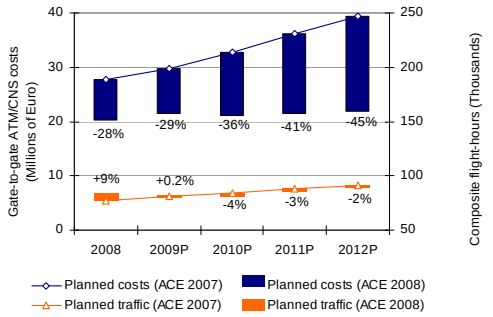
Traffic volumes are forecast to rise by +12% between 2008 and 2013. This increase is planned to be absorbed by +42% more ATCOs in OPS implying, all else being equal, that LGS ATCO productivity is planned to decrease over the period. The number of en-route sectors and sector-hours are planned to remain constant.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

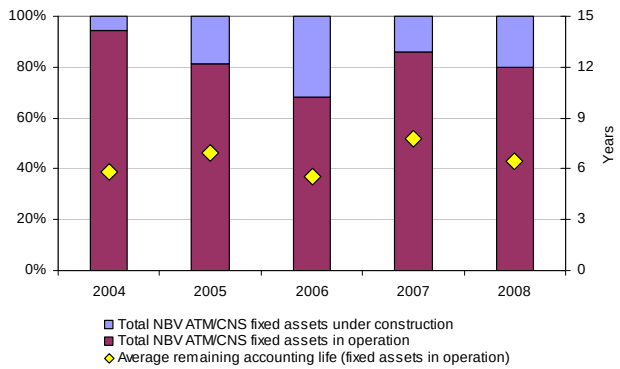


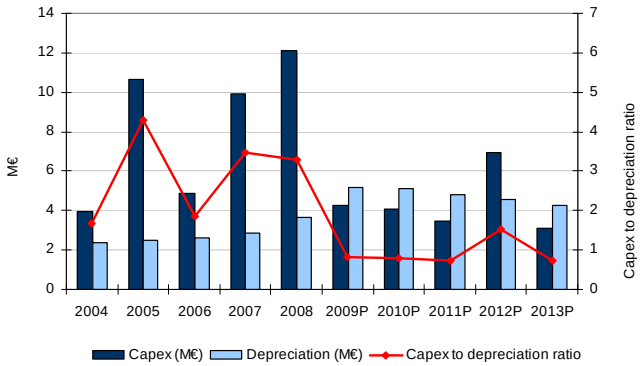
LGS

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	240	262	259	251	243	235
Gate-to-gate costs (index)	100	106	104	106	108	109
Composite flight-hours (index)	100	97	97	101	106	112

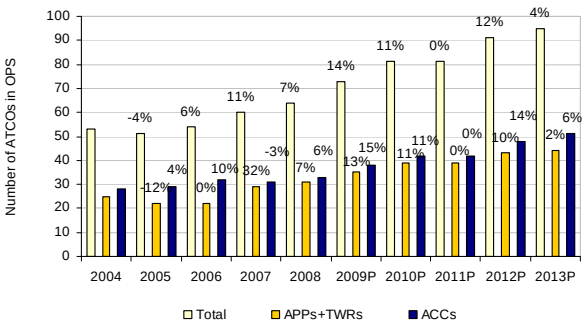


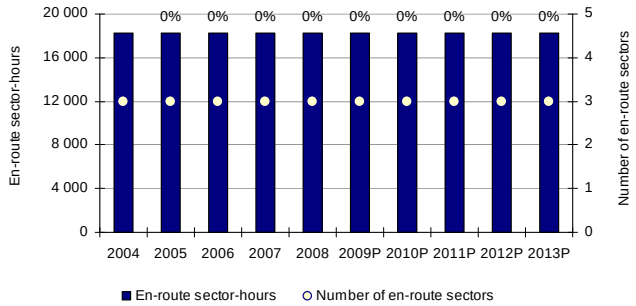
Assets structure and planned capital expenditure





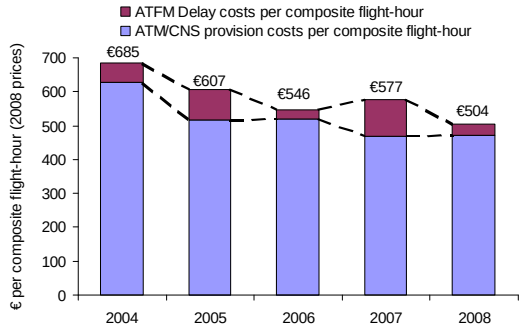
Planned staff and capacity data

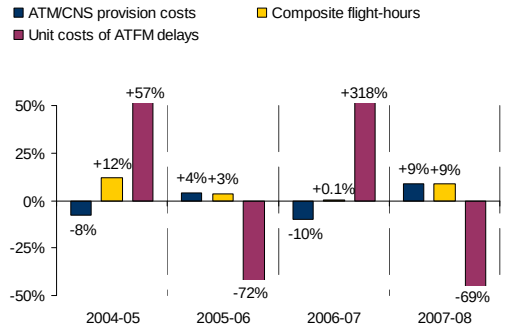




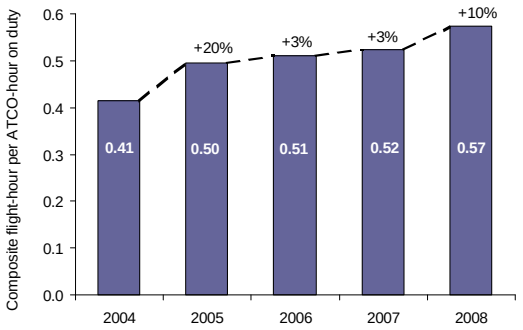
LPS (Slovak Republic)

Trend in gate-to-gate economic cost-effectiveness

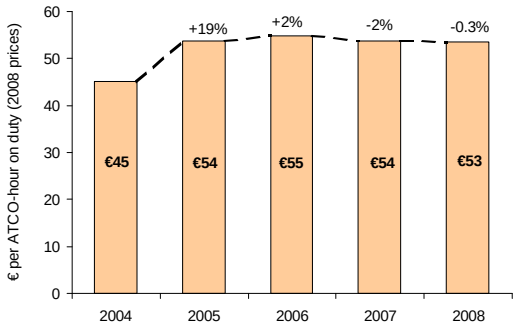




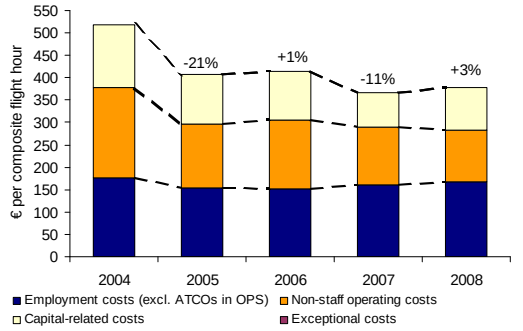
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

LPS is a small ANSP, with costs amounting to 0.6% of the European total.

Traffic has grown at around +6% a year over the period. Traffic complexity is intermediate, and traffic seasonality is rather high (comparable to its neighbour HungaroControl).

Over the 2004-08 period LPS achieved substantial improvements in cost-effectiveness. It succeeded in reducing overall ATM/CNS costs, and combined with the rapid traffic growth (+26%), achieved a -25% fall in unit costs. However, its starting point in 2004 was one of surprisingly high unit costs (the 4th in Europe) given the underlying economic and traffic demand fundamentals. Despite the improvement LPS 2008 unit ATM/CNS costs remain in the top quartile, above those of ANS CR, Austro Control and HungaroControl.

Despite a new ATM system implemented in 2005, delays have been recurrent over the period. Major delays in 2007, however, are mostly associated with a strike in February and the situation went back to normal in 2008.

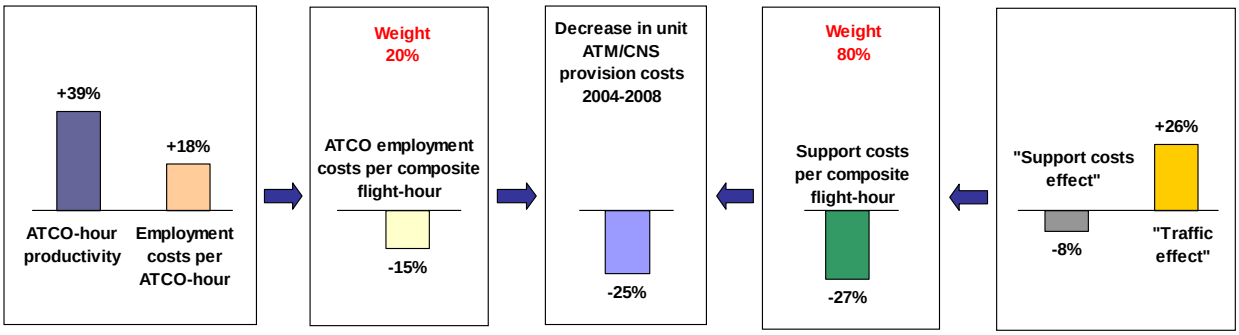
Employment costs per ATCO-hour rose by +19% in 2005 following the first time introduction of complementary pension costs. Since then, employment costs have been contained. The growth in employment costs per ATCO-hour (+18%) has been greatly exceeded by growth in productivity (+39%).

Unit support costs fell by -27% over the period, as a result of reductions in the overall support costs (-8%) and traffic increase. Reductions in capital-related costs and non-staff operating costs made a major contribution to the observed trend. Nevertheless, the level of LPS's unit support costs remains high (the 4th in Europe) and not commensurate with prevailing lower wage rates and cost of living.

Overall, despite an improvement, unit costs remained higher than those in ANS CR, Austro Control, and HungaroControl. Compared to ANS CR, lower productivity is counterbalanced by lower employment costs per ATCO-hour while unit support costs are higher. Delays are, however, less of a problem for LPS than for Austro Control and to some extent ANS CR.

A noticeable feature of LPS is that a large amount of cash reserves have been accumulated and in 2008 its liquidity ratio (current assets to current liability) was among the highest in Europe (5.1 compared to an average ratio of 1.8).

Changes in financial cost-effectiveness



LPS (Slovak Republic)

Comments on ANSP's forward-looking cost-effectiveness

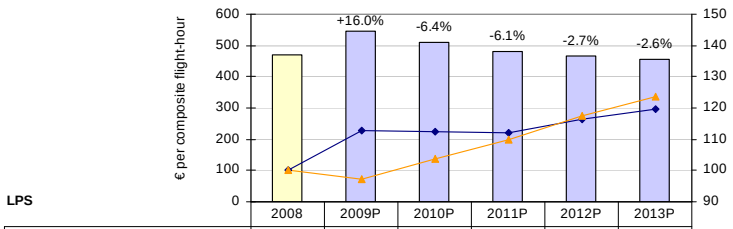
Gate-to-gate unit ATM/CNS costs are expected to fall by -3% between 2008 and 2013, an average annual reduction of -0.7%. The actual 2008 costs are -12% lower than planned in ACE 2007, mainly relating to operating costs lower than planned. The significant rise in unit costs planned for 2009 (+16%) arises from the combination of a planned +13% increase in gate-to-gate ATM/CNS costs and planned reductions in traffic volumes (-3%). Beyond the 2009 increase, costs are planned to remain fairly stable up until 2013. Although traffic forecasts have been revised downwards compared to ACE 2007 plans, a cumulated growth of +24% is projected by 2013. As a result of these updates, the planned unit ATM/CNS cost profile remains fairly consistent with that of ACE 2007.

The 2008 average remaining accounting life of the fixed assets remained close to its 2007 level, similarly to the share of fixed assets under construction (i.e. almost 20% of the total fixed assets). Cumulative investments over the period 2004-2008 amount to €35M (including the implementation in May 2005 of a new Thales EUROCAT ATM system). These investments were, however, relatively small compared to the planned capex for the period 2009-2013, which amount to €66M (136% of the 2008 gate-to-gate ANS revenues), with a peak in 2012. Compared to ACE 2007, the investment plan has been revised upwards quite significantly. The planned capex mainly relate to the following projects:

- New ACC in Bratislava (i.e. €30M, to be commissioned in 2012);
- Upgrade of ATM system E2000 (i.e. €10M);
- Monopulse Secondary Surveillance Radar (MSSR) East (i.e. €2.5M for buildings and equipment and €1.8 for technologies); and
- Monopulse Secondary Surveillance Radar (MSSR) Veľký Javorník (i.e. €1.6M for renovation);

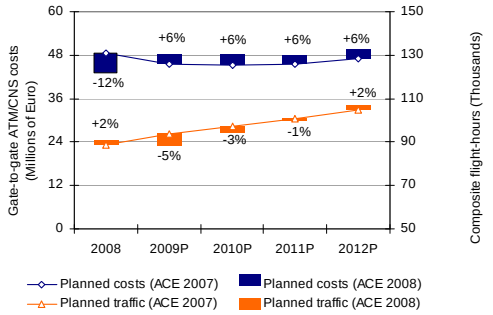
Between 2008 and 2013, traffic volumes are planned to rise faster (+24%) than the number of ATCOs in OPS (+5%) and the number of en-route sector-hours (+10%). This means that, all else being equal, LPS ATCO and sector productivity are planned to rise over the period. Furthermore, ATFM delays became less of an issue in 2009.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

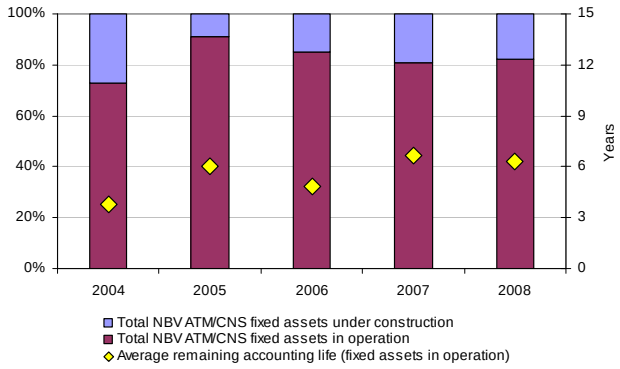


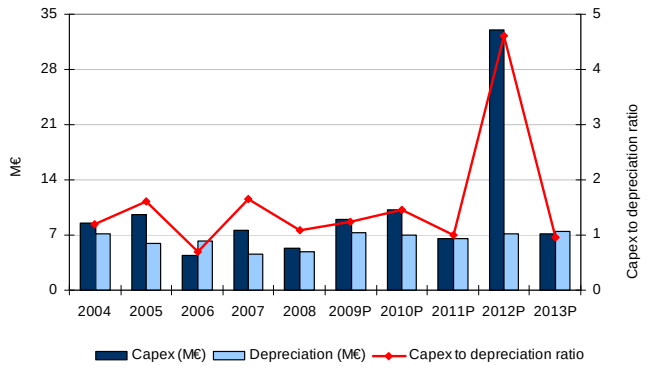
LPS

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	471	546	511	480	467	455
Gate-to-gate costs (index)	100	113	112	112	116	119
Composite flight-hours (index)	100	97	104	110	117	124

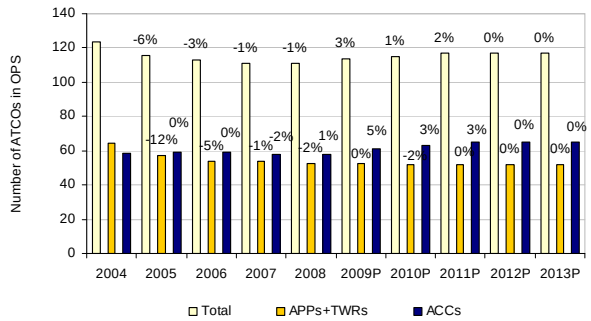


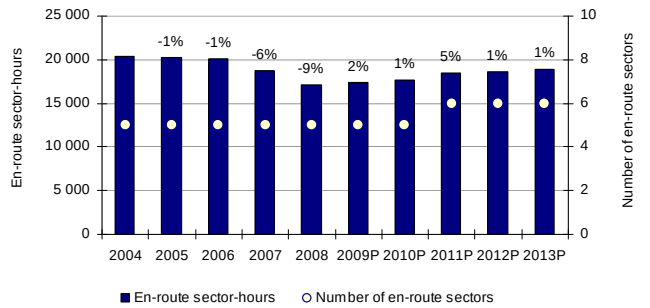
Assets structure and planned capital expenditure





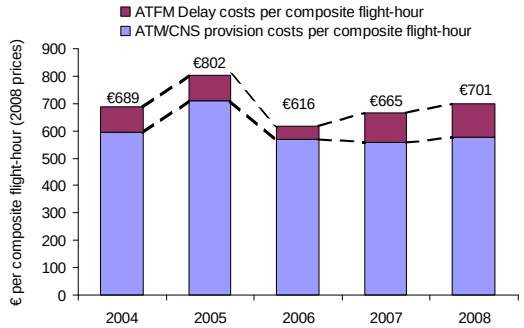
Planned staff and capacity data

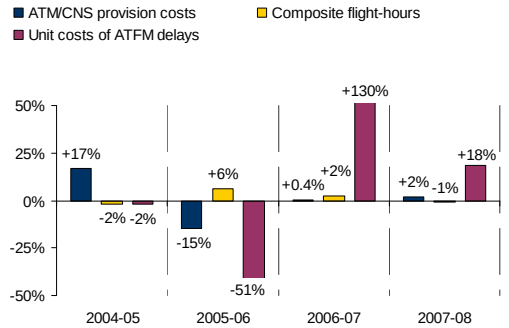




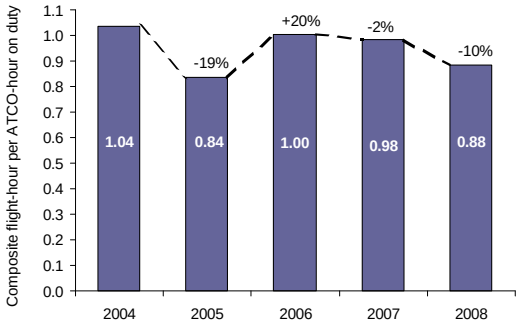
LVNL (Netherlands)

Trend in gate-to-gate economic cost-effectiveness

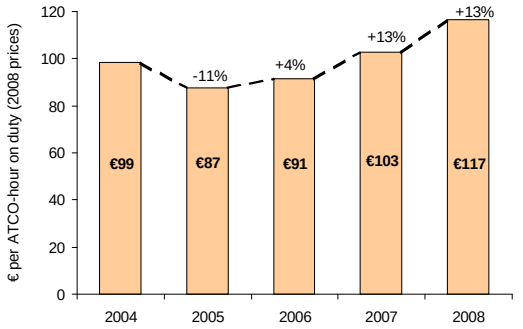




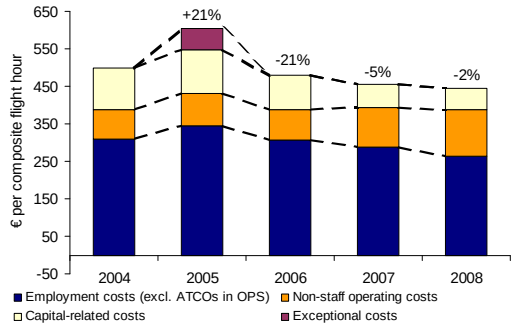
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

LVNL is a medium-sized ANSP, with costs amounting to 2.1% of the European total.

LVNL's responsibilities are confined to lower airspace, with Netherlands upper airspace controlled by MUAC. Traffic has grown very modestly over the period, at around +1% a year, and slightly declined in 2008. LVNL's traffic complexity is among the highest in Europe.

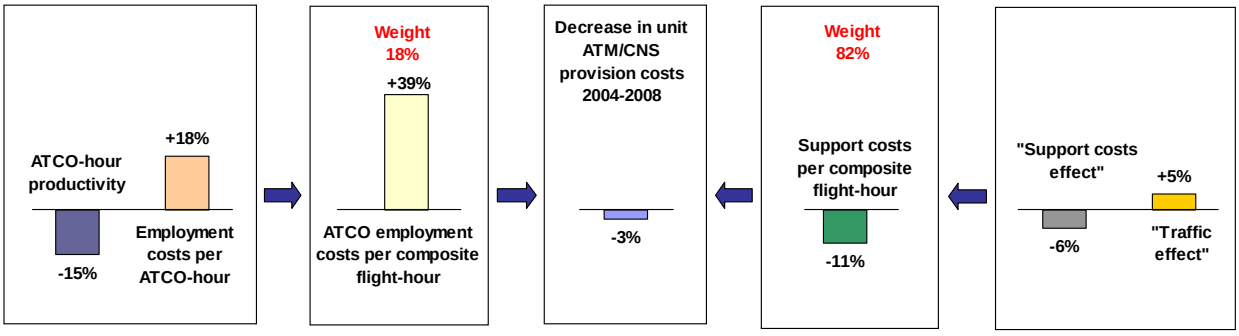
Faced with this slow traffic growth, LVNL has been able to improve its cost-effectiveness only slightly; unit ATM/CNS costs have been reduced by -3%. LVNL remains one of the ANSPs with the highest unit costs in Europe, but is still substantially more cost-effective than its neighbour with similar responsibilities, Belgocontrol. LVNL's ATCO productivity is higher, and both its employment costs per ATCO-hour and unit support costs are lower.

Delays, especially at Amsterdam airport remained a substantial proportion of the overall economic costs, and have been rising since 2006, despite the slow traffic growth. The 2008 increase in ATFM delays was chiefly due to adverse weather conditions and system replacements reducing available capacity. It brought LVNL unit economic costs to the second highest in Europe. However, ATFM delays declined in 2009.

Employment costs per ATCO-hour have increased by +4.3% a year, and this has not been matched by increasing ATCO productivity. In fact ATCO-hour productivity has decreased, especially in 2005 and 2008, perhaps reflecting an issue of consistency in data reporting. Employment costs per ATCO-hour rose by +13% in both 2007 and 2008. The 2007 increase was due to the recognition of additional pension liabilities required by the adoption of IFRS. Costs associated with ATCO Early Termination Scheme (ETS) were not reported as such in ACE 2007, and they contribute to the observed increase in 2008.

Overall support costs fell, although the figure in 2005 was elevated by a significant exceptional provision for restructuring costs in relation to ATM provision at regional airports and implementation of an ETS for operational staff to reduce future staff costs. Despite these reductions, unit support costs were the 2nd highest in Europe, in 2008.

Changes in financial cost-effectiveness



LVNL (Netherlands)

Comments on ANSP's forward-looking cost-effectiveness

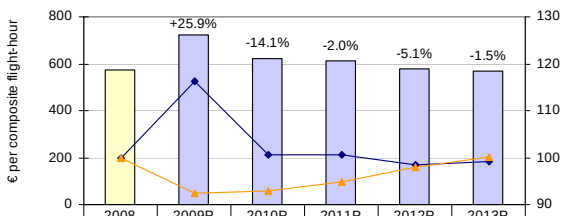
Gate-to-gate unit ATM/CNS costs are expected to decrease by -1% between 2008 and 2013, an average annual fall of -0.2%. In 2009 unit costs are expected to rise by some +26%, reaching 725€, their highest level since the beginning of ACE benchmarking. Unit costs are then planned to progressively fall back to their 2008 level. Overall, total costs and traffic volumes are both expected to retrieve their 2008 levels by 2013. With the exception of year 2009, showing higher costs (+13%) than planned in ACE 2007, previous year's projected costs have been revised downwards for years 2010-2012, while traffic forecasts have also been shifted downwards, reflecting the 2009 slump in air transport. Overall, the ACE 2008 unit cost profile shows a more optimistic outlook than the ACE 2007 plan, in which an average annual increase in unit costs of +1.9% was foreseen between 2007 and 2012. It is understood that the planned increase in total ATM/CNS costs in 2009 reflects the new labour contract agreed in October 2008 and cost relating to early termination of services for the air traffic controllers. On the other hand, LVNL plans to implement cost containment measures in order to mitigate the impacts of the crisis. These include the postponement of some investments, the reduction of staff number and capping of non-staff operating costs.

The average remaining accounting life of the fixed assets has been increasing since 2005, and reached almost 10 years in 2008. The cumulative capex for the period 2009-2013 are planned to be some €104M (48% of the 2008 gate-to-gate ANS revenues) with a peak in 2012, relating to, *inter alia*, investments in Long Distance Radar and Terminal Approach Radar. Although some investments have been postponed, the ACE 2008 plan remains higher that the capex invested over the period 2004-2008 (€47M) and higher than the ACE 2007 planned capex for the period 2008-2012. Investments for the period 2009-2013 mainly relate to the following projects:

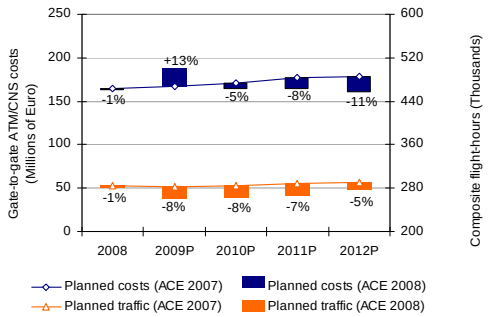
- Nomas/ADAS replacement (Notam handling and Aeronautical Data handling);
- Installation of long distance radar (€10M) and terminal approach radar (€8M) in 2012;
- Replacement of the tower simulator system (€6.8M in 2012) and of CCIS (auxiliary information system);
- Upgrade of the hardware components of the Amsterdam Advanced ATC (AAA) system (both ACC and APP); and
- Replacement of the Voice COM system (€5.6M in 2012).

Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise by +11% that is in higher proportion than traffic volumes, which are planned to remain stable. All else equal, this is expected to reduce the level of delays and improve quality of service. On the other hand, the number of en-route sectors open at maximum configuration is planned to remain constant until 2013. LVNL did not provide the planned number of sector-fours for the period 2009-2012.

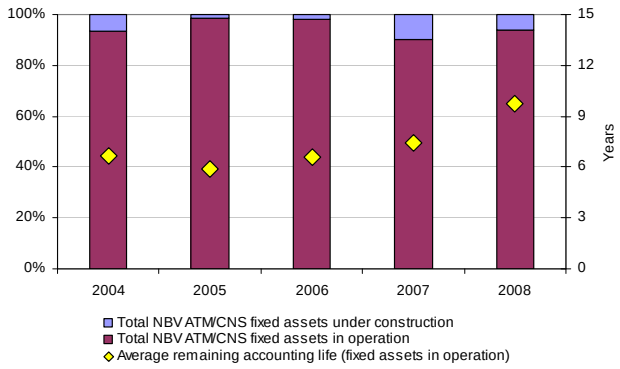
Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

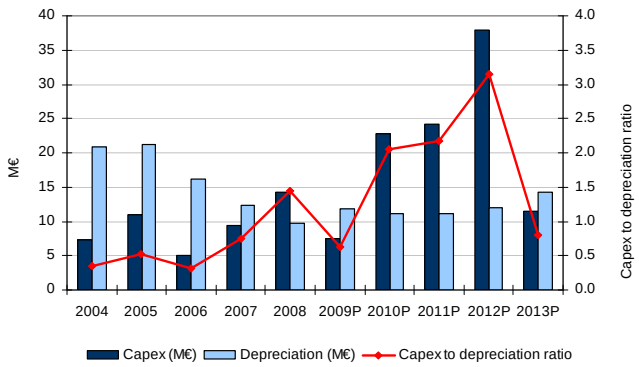


LVNL	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	576	725	622	610	579	570
Gate-to-gate costs (index)	100	116	100	101	98	99
Composite flight-hours (index)	100	92	93	95	98	100

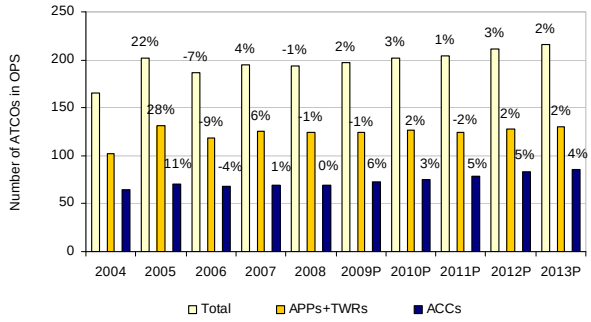


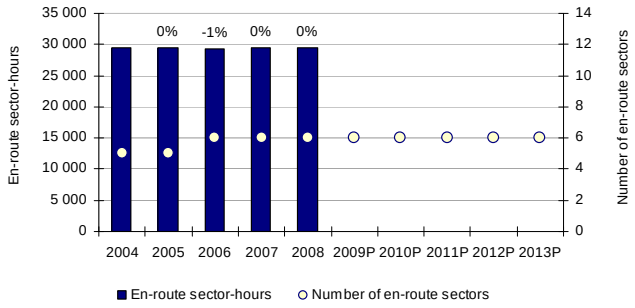
Assets structure and planned capital expenditure





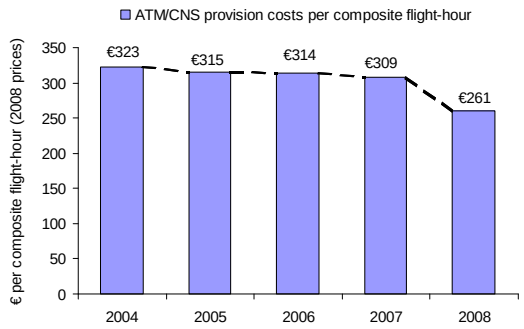
Planned staff and capacity data

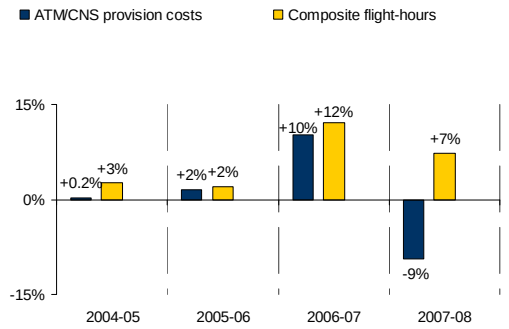




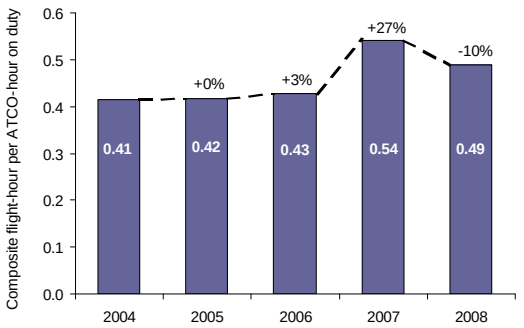
MATS (Malta)

Trend in gate-to-gate economic cost-effectiveness

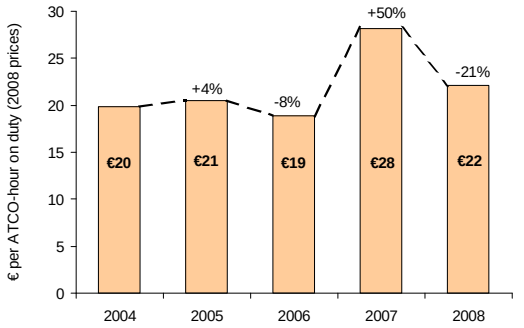




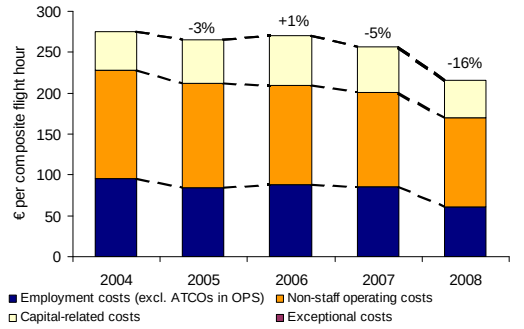
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

MATS is one of the smallest European ANSPs, with costs amounting to around 0.2% of the total. Its traffic has grown over the period (+26%), at around +6% a year. Traffic in Maltese airspace is the least complex in Europe, while traffic variability is lower than for its neighbour HCAA, and slightly higher than DCAC Cyprus.

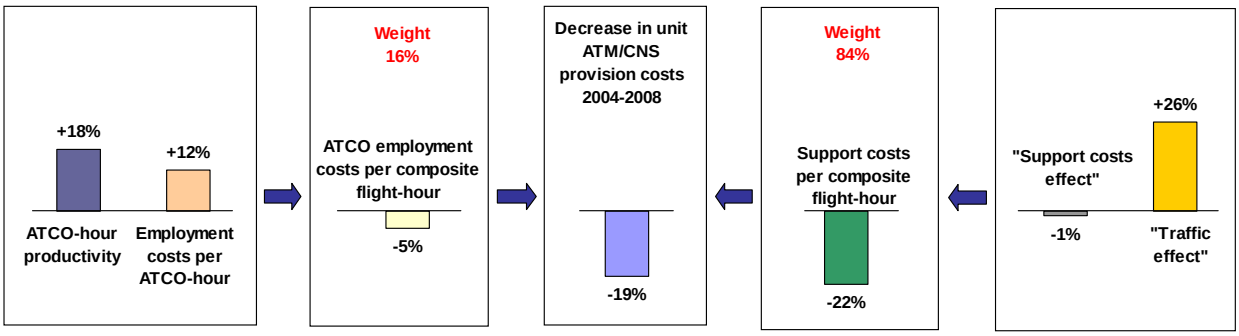
MATS's unit ATM/CNS costs have been steadily declining since 2004 (-19%), and especially in 2008 (-16% compared to 2007). This one-off effect arose from falls in staff costs (due to retirements) and cost of capital combined with a +7% increase in traffic. In 2008 MATS's unit ATM/CNS costs are among the lowest in Europe.

ATFM delays are not a problem in Maltese airspace, and MATS unit ATM/CNS costs are lower than DCAC Cyprus's (another Mediterranean island with substantial maritime airspace) its 2008.

ATCO productivity has shown a rise over the period 2004-2008 (+18%). The noticeable discontinuity in both ATCO productivity and employment costs per ATCO-hour in 2007 and 2008 is due to changes in reporting and to increases in overtime. Nevertheless, MATS ATCO productivity always remained in the bottom quartile among European ANSPs. Its productivity is substantially lower than DCAC Cyprus's, but employment costs per ATCO-hour are also lower.

Support costs fell by -1% over the period, while traffic rose by +26%, enabling a -22% reduction in unit support costs. The main driver of the -22% fall in unit support costs observed in 2008 is the reductions in technical support staff and ATC assistants. MATS unit support costs are among the lowest in Europe, below the bottom quartile.

Changes in financial cost-effectiveness



MATS (Malta)

Comments on ANSP's forward-looking cost-effectiveness

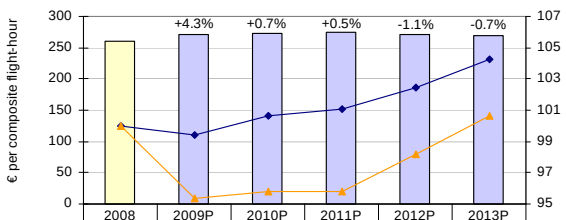
Gate-to-gate unit ATM/CNS costs are expected to rise by +4% between 2008 and 2013, an average annual increase of +0.7%, since costs are planned to increase slightly faster than traffic volumes (+4.3%, against +0.7%). Compared to ACE 2007 projections, traffic forecasts have been very significantly revised downwards, reflecting the 2009 slump in air transport. Costs have also been revised downwards but at lower proportion than traffic, suggesting a worse outlook than presented in ACE 2007, where unit costs were planned to decrease by -4.8% a year, between 2007 and 2012.

Since 2004 the average remaining accounting life of the fixed assets is gradually declining and is in 2008 among the lowest of European ANSPs. The cumulative capex for the period 2009-2013, in line with the capex invested in the 2004-2008 period, are around €9M (65% of the 2008 gate-to-gate ANS revenues), with a peak in 2010. These investment mainly relate to the following projects:

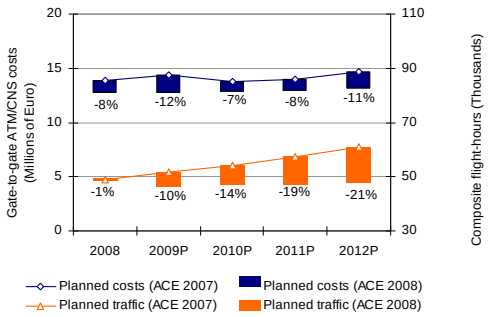
- Upgrade of the ATM system (i.e. €4.8M, between 2010 and 2012);
- Voice Communication system (i.e. €0.8M, between 2011 and 2012);
- ATS Q-Signalling (i.e. €0.2M in 2011);
- New technical building extension (i.e. €0.8M, between 2010 and 2011);
- Purchase of VOR equipment (i.e. €0.25M, in 2010); and
- Purchase of distance measuring equipment (DME) (i.e. €0.2M, in 2010).

After a slight increase in the number of ATCOs in OPS in 2009, ATCOs in OPS are planned to remain constant until 2013. Similarly, the number of sectors and sector-hours open are also planned to remain stable from 2008 to 2013.

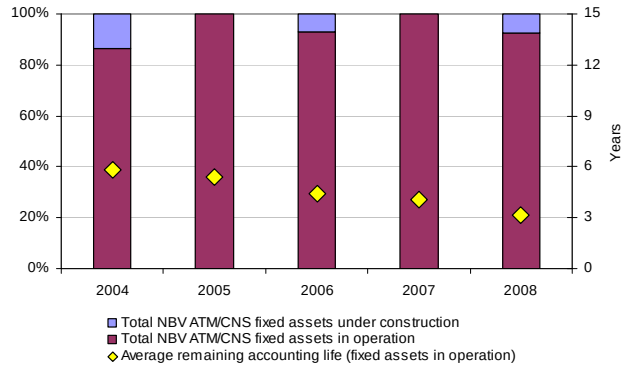
Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

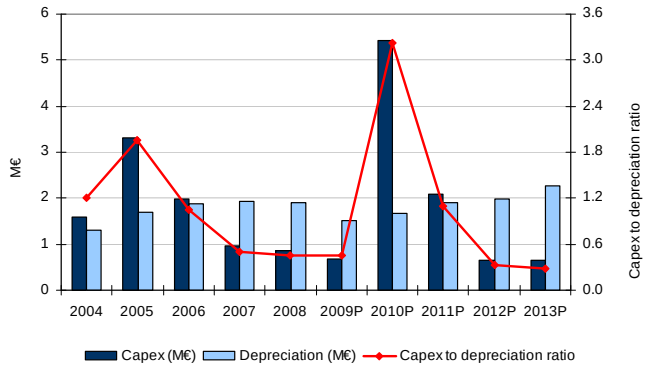


MATS	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	261	272	274	275	272	270
Gate-to-gate costs (index)	100	99	101	101	102	104
Composite flight-hours (index)	100	95	96	96	98	101

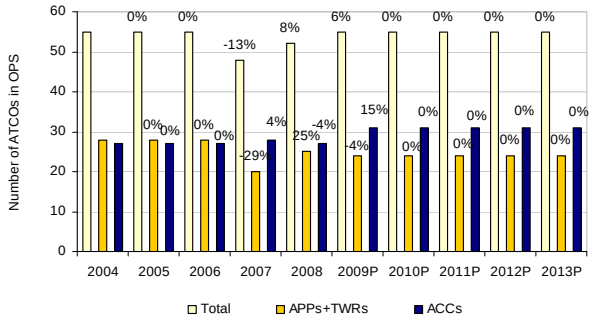


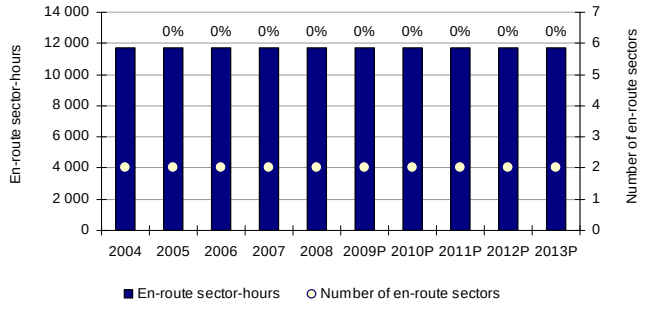
Assets structure and planned capital expenditure





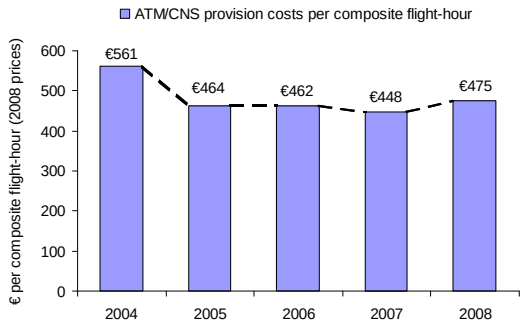
Planned staff and capacity data

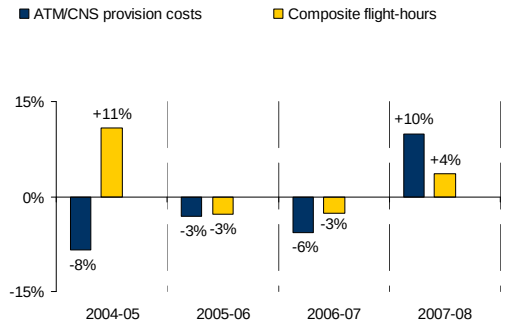




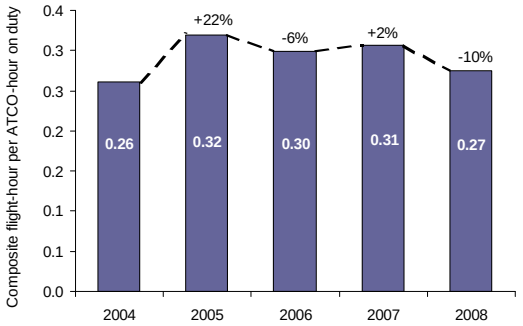
MK CAA (Former Yugoslav Republic of Macedonia)

Trend in gate-to-gate economic cost-effectiveness

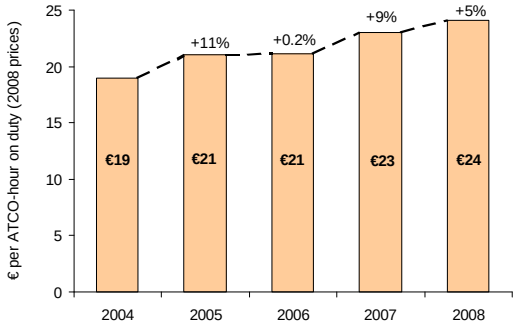




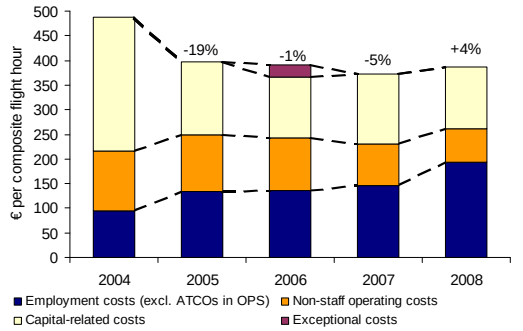
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

MK CAA is one of the smallest ANSPs in Europe, with costs amounting to 0.2% of the European total.

Traffic variations have been irregular over the period, with two years of grow (2005 and 2008) and two years of decline (2006 and 2007). Overall, traffic has grown modestly over the period, at around +2% a year. Traffic in the airspace is sensitive to changes in route structure and its adjacency to Kosovo introduces additional volatility. MK CAA traffic is of intermediate complexity but traffic seasonality is the highest with traffic in the peak week +56% higher than the average weekly traffic during the year. Over the period, delays have never been a problem in its airspace.

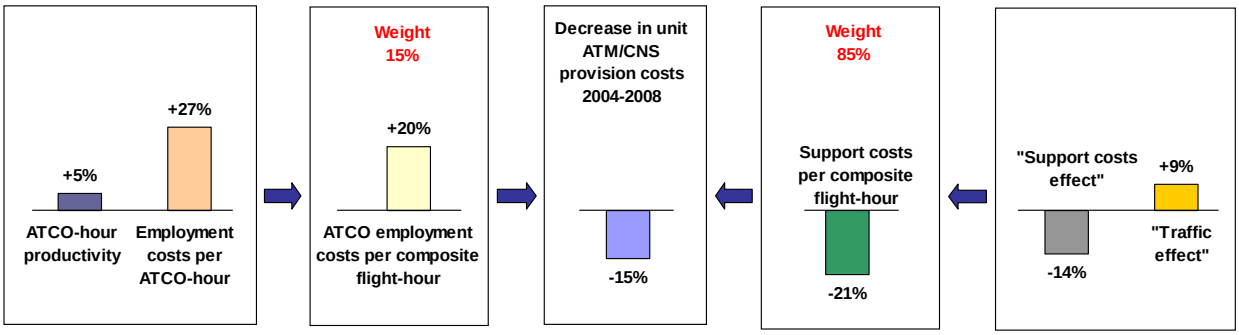
Although unit ATM/CNS costs fell by -15% over the period, MK CAA started from a high basis in 2004, and its 2008 unit ATM/CNS costs position MK CAA as the 5th highest in Europe. This position is surprisingly high given the low prevailing wage rates in FYROM. Its unit ATM/CNS costs are higher than all its direct neighbours and +22% above those of NATA Albania, its most comparable neighbour.

ATCO productivity has deteriorated since 2005 and remains among the lowest in Europe (2nd lowest in 2008). MK CAA ATCO productivity is lower than that of NATA Albania, although the employment cost per ATCO-hour is higher. Employment costs per ATCO-hour have increased by +6% a year.

Unit (and total) support costs fell substantially but started from an appallingly high level in 2004. Despite observed reductions, MK CAA unit support costs are the 3rd highest in Europe, and are slightly above those of NATA Albania. The main changes in unit support costs are the significant fall in capital-related costs in 2005, and the notable increase in unit non-ATCO staff costs in 2008 due to a new law in October 2007 (with retroactive effect from September 2007) specifying an increase of +10% per annum in net salaries of public administration staff over the period 2007-2009.

Unit capital related costs remain, however, among the highest in Europe and it is understood that MK CAA has accumulated a large amount of cash reserves. Indeed, its liquidity ratio (current assets to current liability) is among the highest in Europe (5.4 compared to an average ratio of 1.8).

Changes in financial cost-effectiveness



MK CAA (Former Yugoslav Republic of Macedonia)

Comments on ANSP's forward-looking cost-effectiveness

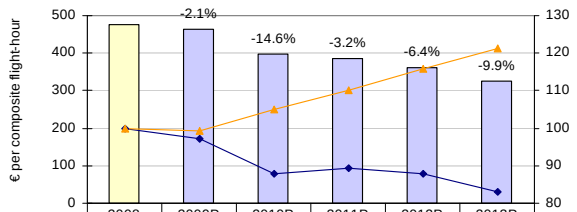
Gate-to-gate unit ATM/CNS costs are expected to fall by -32% between 2008 and 2013, an average annual decrease of -7.3%, as costs are expected to fall by some -17% and traffic volumes are expected to increase by +21%. It is noteworthy, however, that the projected traffic increases between 2009 and 2013 are much more optimistic than those of its neighbours NATA Albania and SMATSA. Compared to ACE 2007 plans, costs have been significantly revised downwards as from the year 2010 (-12%).

The average remaining accounting life of the fixed assets fell in 2008, after a peak in 2006. The cumulative capex for the period 2009-2013 amount to €4M (26% of the 2008 gate-to-gate ANS revenues). These capex are mainly related to the implementation of the new ATM system. Additional investments relate to the following projects:

- Mode-S enhanced surveillance ground station implementation (i.e. €2.3M, between 2012 and 2014);
- Purchase of LCD monitors for the ATC system (i.e. €0.1M, in 2010);
- Installation of backup/new VCS (i.e. €0.35M, in 2011);
- Purchase of new VHF radio system (i.e. €0.75M, in 2012);
- Construction of new building for ANSP headquarters (i.e. €0,4M, in 2014);
- Maintenance of building infrastructure (i.e. €0.1M, in 2010);
- AIS improvement (i.e. €0.2M, between 2011 and 2014);
- Purchase of new DME (i.e. €0.3M, in 2014); and
- Implementation of new AWOS/ATIS/VOLMET systems (i.e. €0.5M, between 2011 and 2012).

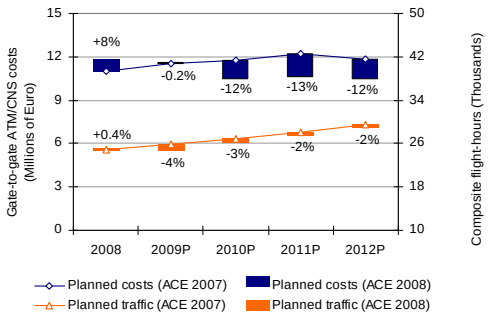
Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise by +2% while traffic volumes are planned to increase by +21%. All else equal, MK CAA productivity, which is currently among the lowest in Europe, is expected to increase. The number of en-route sector-hours is planned to rise by +4%, while the number of en-route sectors is expected to rise from 3 to 4 sectors in 2013.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

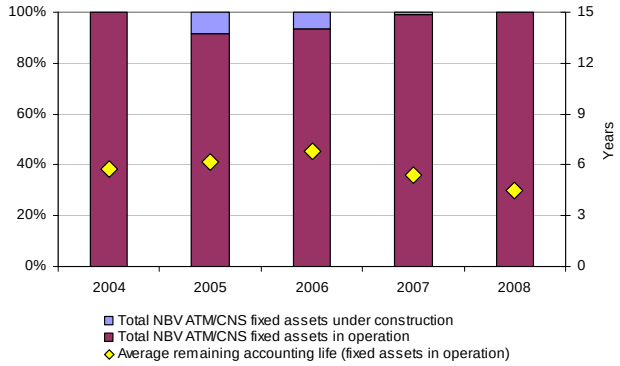


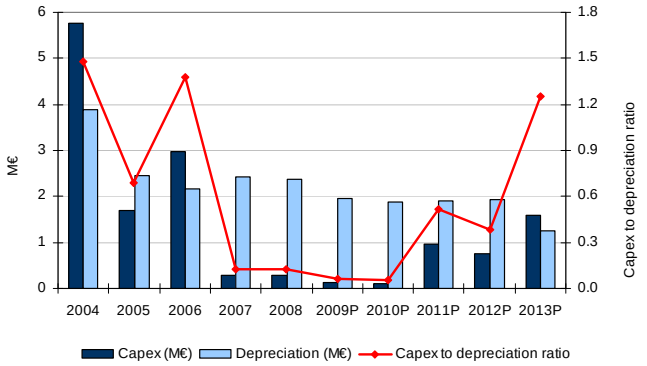
MK CAA

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	475	465	397	385	360	325
Gate-to-gate costs (index)	100	97	88	89	88	83
Composite flight-hours (index)	100	99	105	110	116	121

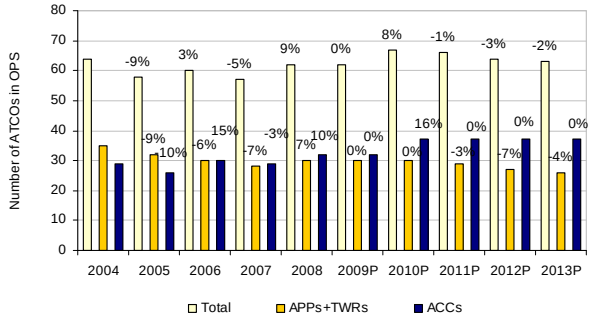


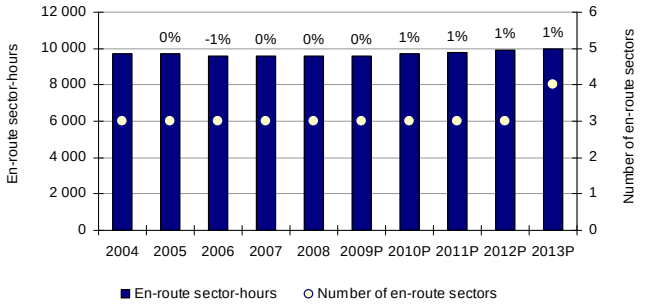
Assets structure and planned capital expenditure





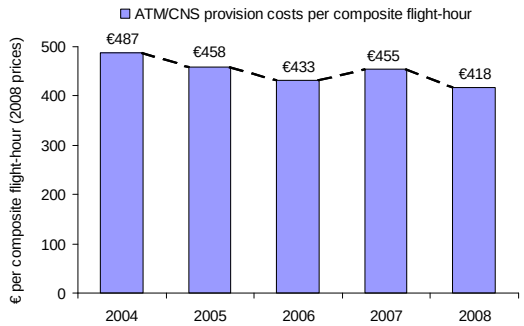
Planned staff and capacity data

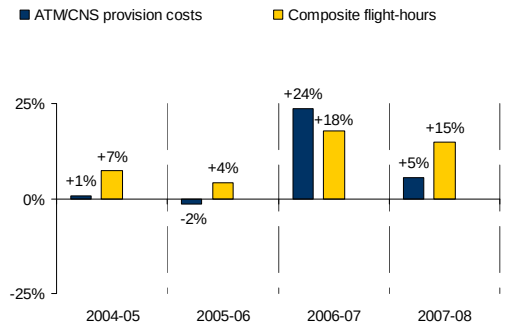




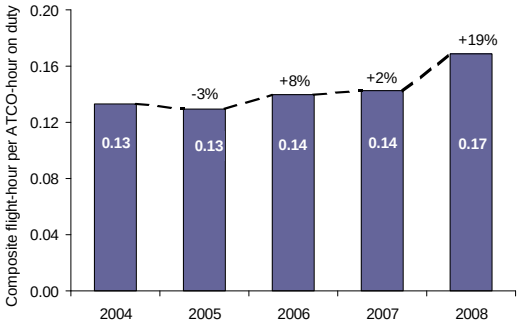
MoldATSA (Moldova)

Trend in gate-to-gate economic cost-effectiveness

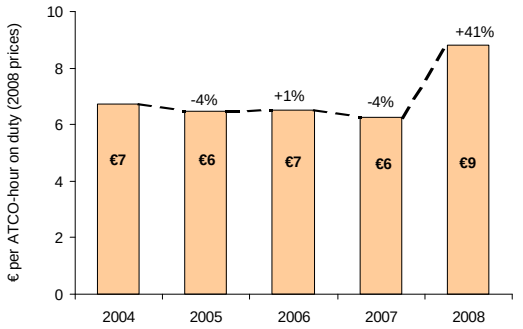




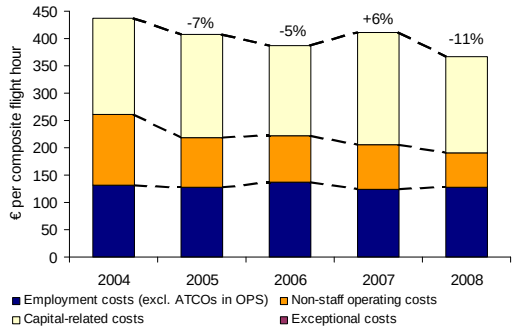
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

MoldATSA is the smallest ANSP reporting ACE data, with costs amounting to less than 0.1% of the European total.

Traffic has grown very rapidly over the period, at around +11% a year. In 2008, MoldATSA recorded the second highest traffic growth in Europe, with a +15% increase. Traffic complexity for MoldATSA is among the lowest of the European ANSPs. Traffic through Moldovan airspace shows a high seasonal variation. Despite the rapid and sustained traffic growth, delay is not a problem in Moldovan airspace.

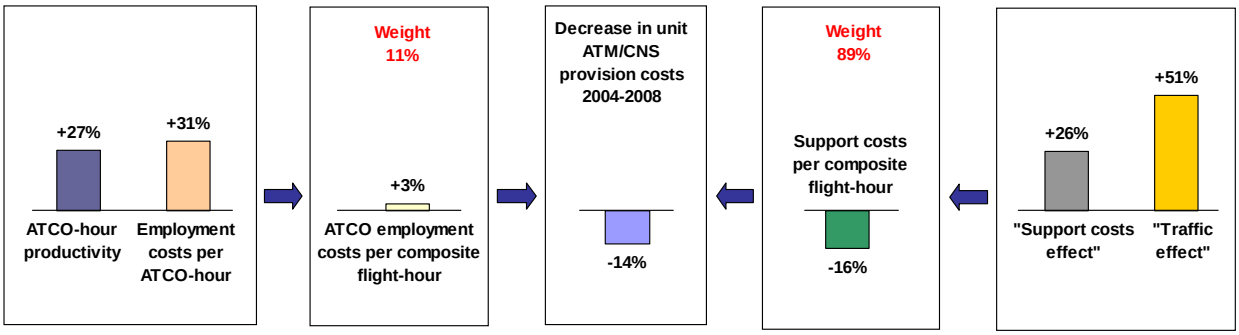
MoldATSA's unit ATM/CNS costs have decreased by -4% a year, supported by the strong traffic growth. The 2008 unit cost lies between those of its neighbours ROMATSA and UkSATSE. However, its 2008 unit cost is above the European average and is surprisingly high given underlying economic and traffic demand fundamentals.

Productivity increased over the period by +27%, and in particular in 2008 (+19%), but remains the lowest in Europe. Employment costs per ATCO-hour have been fairly stable until 2007 but they rose by +41% in 2008 (although remaining the lowest in Europe), following the establishment in 2008 of a minimal salary for public servants in Moldova.

Unit support costs have fallen over the period, although there has been a rise in 2007. In 2008 unit capital-related costs are the highest among European ANSPs. It is understood that capital-related costs are associated with the modernization of the ATM/CNS infrastructure, in particular the commissioning of a new RDP system. It also appears that some elements of capex have been reported directly as capital-related costs rather than being capitalised. This is likely to give rise to unusual volatility in reported capital-related costs.

Unit support costs fell by -11% between 2007 and 2008. However, the overall level of MoldATSA's unit support costs is significantly higher than the European average and not commensurate with prevailing low wage rates and cost of living. A noticeable feature of MoldATSA is that a large amount of cash reserves have been accumulated and in 2008 its liquidity ratio (current assets to current liability) was among the highest in Europe (9.7 compared to a ratio of 1.8).

Changes in financial cost-effectiveness



MoldATSA (Moldova)

Comments on ANSP's forward-looking cost-effectiveness

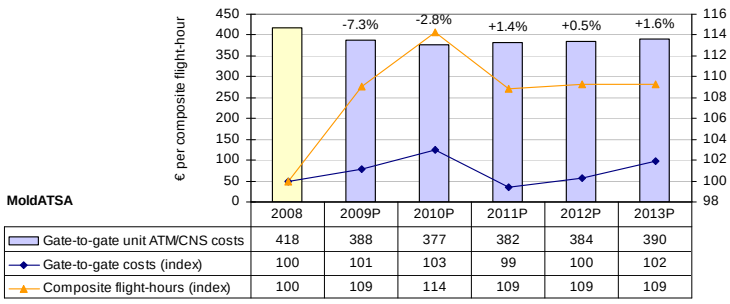
Gate-to-gate unit ATM/CNS costs are expected to fall by -7% between 2008 and 2013, an average annual fall of -1.4%, as costs are planned to rise by +2%, while traffic is projected to grow by +9%. Compared to ACE 2007 plans, MoldATSA has revised its traffic forecasts downwards, in particular for 2011 and 2012. In the meantime, planned costs have been revised significantly upwards as from 2010. As a result, the ACE 2008 unit cost profile shows a more pessimistic outlook than in the ACE 2007 plans.

The average remaining accounting life of fixed assets continuously since 2004 to reach 6 years in 2007. The increase observed for 2008 (from 6 to 14 years) is the result of a significant capex during this year. For the period 2009-2013, the planned cumulative capex amount to €6M (78% of the gate-to-gate ANS revenues). Caution is needed with the interpretation of MoldATSA "capex to depreciation" since some capex are not capitalised and depreciated, but directly expensed during the year. The actual capex and the planned figure for the period 2009-2013 mainly include:

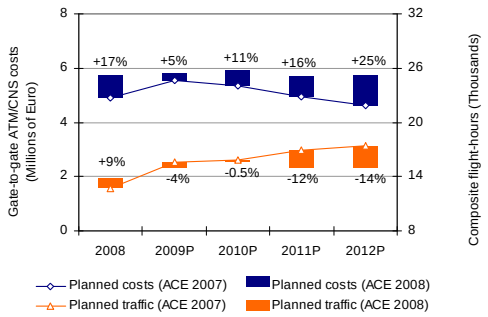
- Implementation of Aeronautical Fixed Telecommunication Network (i.e. €0.5M, between 2008 and 2009);
- Modernization of VHF (i.e. €0.7M, between 2008 and 2009);
- New DVOR/DME equipment (i.e. €0.8M, put in operation in December 2008);
- Thales radar system (€3.78M, between 2008 and 2009);
- Modernisation Meteo Radar System;
- Construction of ATCO's training centre;
- ATC Centre modernization; and
- Purchase of Voice Recording equipment;

Traffic volumes are expected to rise by +9% between 2008 and 2013. This increase is planned to be absorbed by +7% more ATCOs in OPS while the number of sectors and sector-hours are planned to remain constant. All else equal, this means that MoldATSA's ATCO productivity is not expected to improve and may well remain among the lowest in Europe.

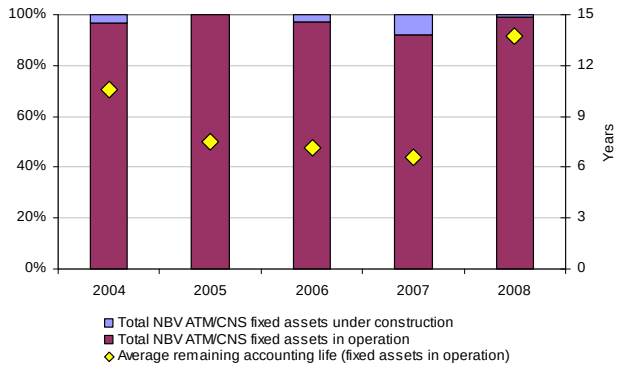
Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

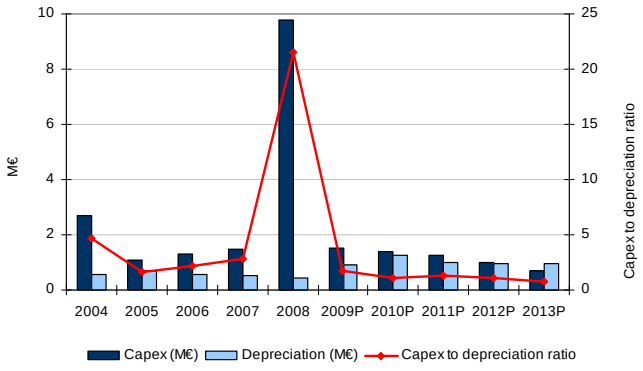


	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	418	388	377	382	384	390
Gate-to-gate costs (index)	100	101	103	99	100	102
Composite flight-hours (index)	100	109	114	109	109	109

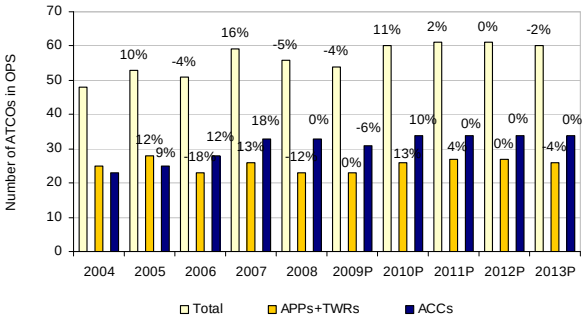


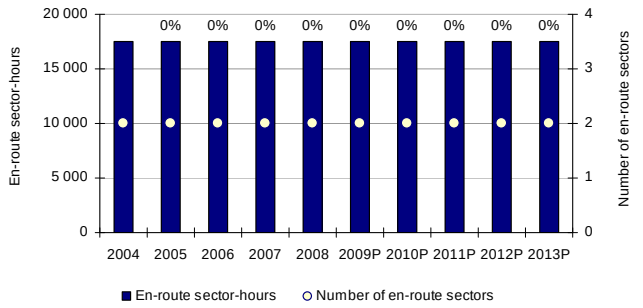
Assets structure and planned capital expenditure





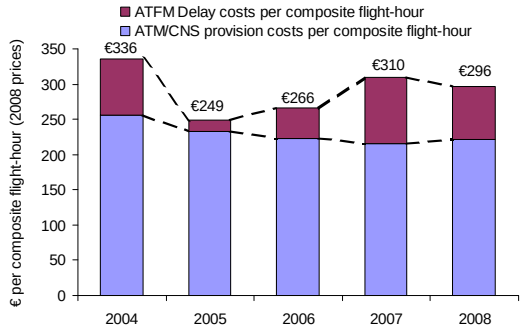
Planned staff and capacity data

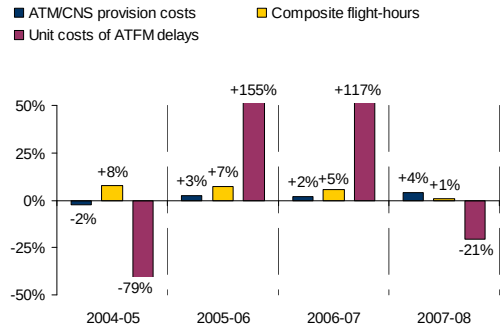




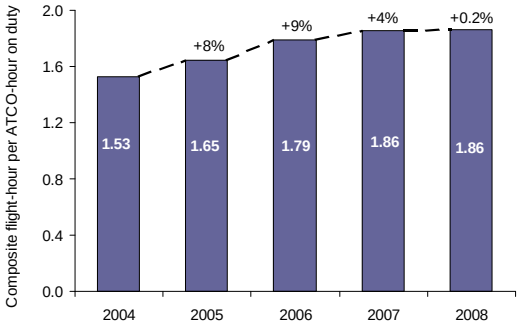
MUAC (Maastricht)

Trend in gate-to-gate economic cost-effectiveness

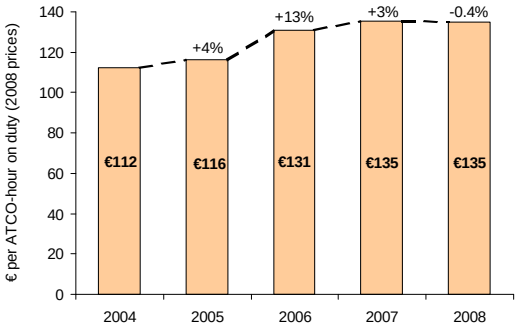




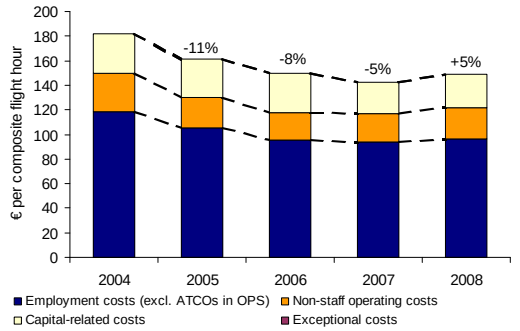
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

MUAC is a medium-sized ANSP, with costs amounting to 1.7% of the European total.

MUAC is responsible for upper airspace only. MUAC does not bear the full costs of CNS infrastructure which are made available for joint use by the ANSPs (Belgocontrol, DFS, and LVNL) operating in the Four States airspace. Its traffic complexity is the 5th highest in Europe, but less than Belgocontrol and DFS.

Traffic has grown at around +5% a year over the period.

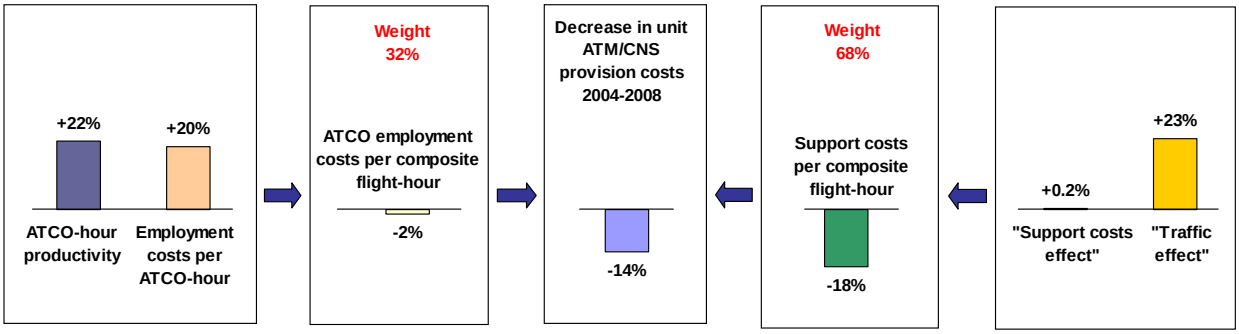
MUAC showed an overall improvement in cost-effectiveness, with a fall in unit ATM/CNS costs of -14% over the period. In 2008, unit ATM/CNS costs were the 2nd lowest in Europe, behind EANS. Delays remained a substantial proportion of the overall economic costs; initially high, they were significantly reduced in 2005, but returned to even higher levels in 2007. In 2008, the cost of delays represented about 25% of the total economic costs. The strong decline in traffic allowed for delays to become marginal in 2009.

Employment costs per ATCO-hour grew at +4.7% a year on average and are the 4th highest in Europe. In the meantime, ATCO-hour productivity rose by +5.1% a year, enabling a reduction in ATCO employment costs per unit of output of -2% over the period.

MUAC ATCO-hour productivity is still substantially higher than other ACCs with responsibilities confined to upper airspace, such as Rhein and London ACCs, while generating less ATFM delays per flight-hour than those two ACCs.

MUAC succeeded in containing support costs in all respects over the period, although absorbing a +23% traffic increase. It resulted in a reduction of -18% in unit support costs.

Changes in financial cost-effectiveness



MUAC (Maastricht)

Comments on ANSP's forward-looking cost-effectiveness

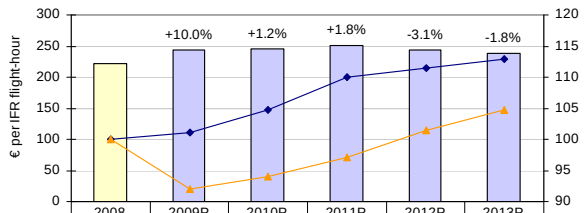
En-route unit ATM/CNS costs are expected to rise by +8% between 2008 and 2013, an average annual increase of +1.5%. Overall, this is a slightly more optimistic outlook than in last year's plan, in which the average annual increase planned between 2007 and 2012 was +2.0%. Compared with the ACE 2007 plans, MUAC has revised its planned traffic downwards in significant proportions (at least -9% a year between 2009 and 2013) to reflect the 2009 slump in the air transport sector. In response to the changing economic environment MUAC also revised its planned costs downwards compared to the profile presented in ACE 2007. Cost containment measures particularly focus on recruitment reductions, limitations in salary increases, and capital-related costs (reductions in the cost of capital and lengthening of useful life of fixed assets).

The average remaining accounting life of the en-route fixed assets rose from less than 4 years in 2007 to almost 6 years in 2008. The share of fixed assets under construction, which had remained close to 40% between 2005 and 2007 became marginal in 2008. These changes actually reflect the commissioning of a new FDP system (developed by Indra) in December 2008. The planned capex for the period 2009-2013 are €75M (58% of the 2008 cost-base). Although it is less than during the 2004-2008 period (€91M) and although MUAC revised its ACE 2007 planned capex downwards, capex are still planned to exceed depreciation costs throughout the period (except in 2009), suggesting a growing asset base. These investments mainly relate to the following projects:

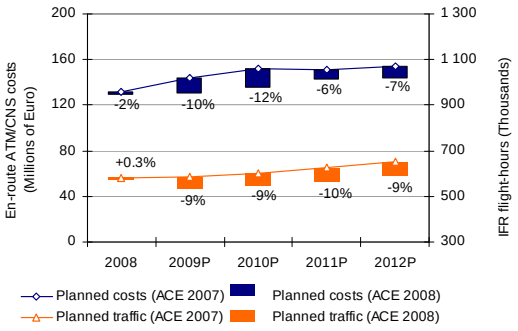
- Engineering support to ATC (i.e. €15M, between 2009 and 2013);
- Continuous development of the new FDP system (i.e. €15M, between 2009 and 2013);
- General engineering support (i.e. €14M , between 2009 and 2013);
- New voice COM switching system (i.e. €5.5M, between 2011 and 2013); and
- Consoles replacement (i.e. €5.5M, between 2010 and 2013).

Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise much faster (+37%) than the traffic (+5%). All else equal, MUAC ATCO productivity is expected to decrease. It is expected that this decrease be associated with an improvement of quality of service. The number of en-route sector-hours fell by 2009, reflecting the adaptation to the traffic downturn in 2009.

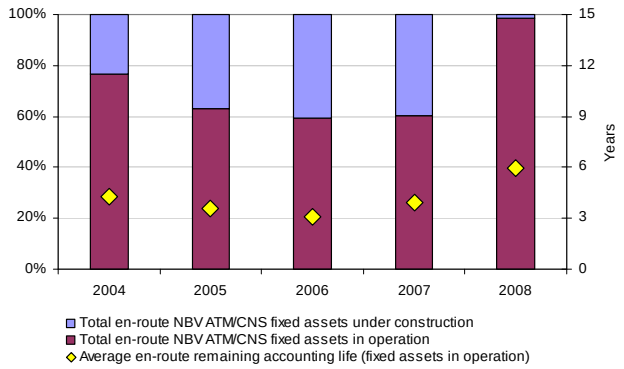
Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

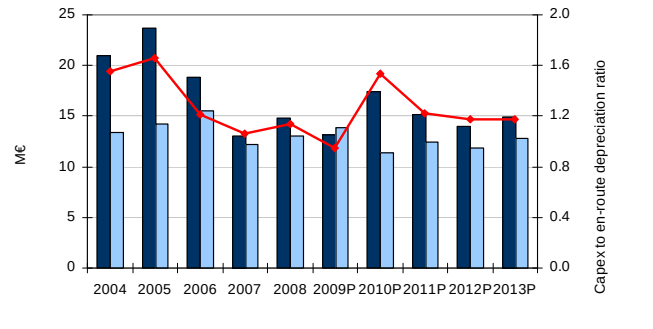


MUAC	2008	2009P	2010P	2011P	2012P	2013P
E-route unit ATM/CNS costs	221	243	246	251	243	238
En-route costs (index)	100	101	105	110	111	113
IFR flight-hours (index)	100	92	94	97	101	105

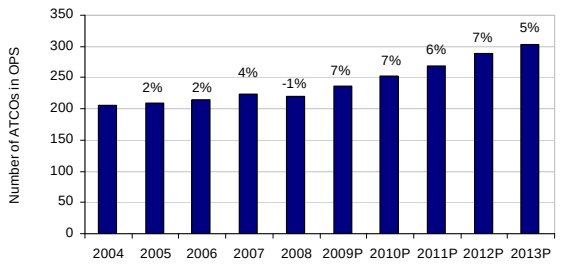


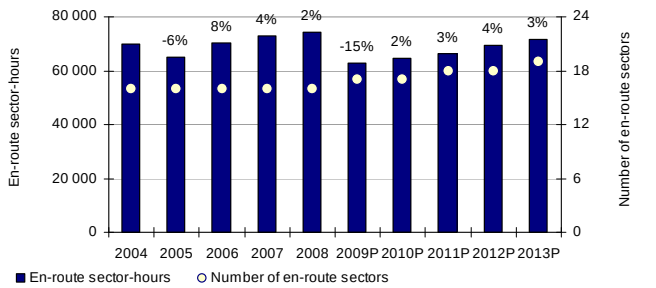
Assets structure and planned capital expenditure





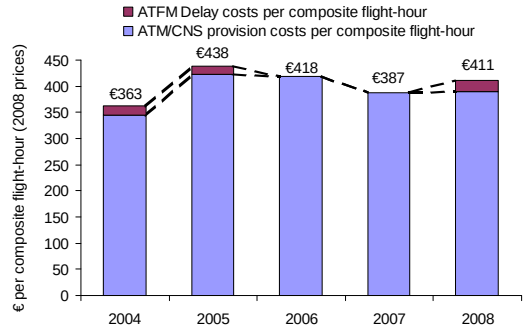
Planned staff and capacity data

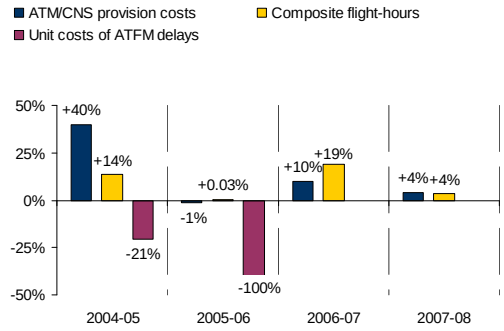




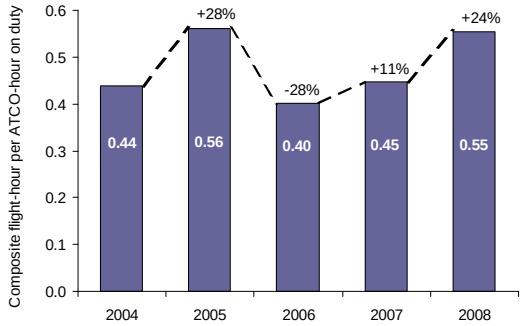
NATA Albania (Albania)

Trend in gate-to-gate economic cost-effectiveness



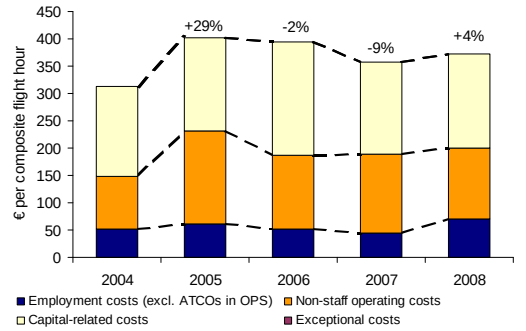


Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour

Trend in support costs per composite flight-hour



Assessment on ANSP performance

NATA Albania is one of the smallest ANSPs, with costs amounting to 0.2% of the European total.

Traffic has grown rapidly over the period, at nearly +9% a year, although growth was irregular. Albania's traffic complexity is among the lowest in Europe. On the other hand, traffic seasonality through Albanian airspace is among the highest (but slightly lower than its neighbour MK CAA).

Despite high traffic growth (+40%), there was an overall decline in cost-effectiveness, with a rise in unit ATM/CNS costs of around +13% over the period.

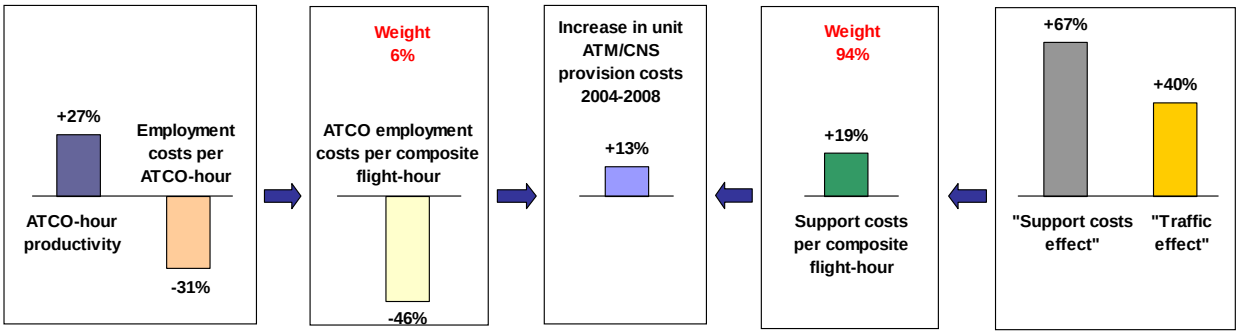
Delays appeared early in the period and in 2008 too, but were not significant.

Employment costs per ATCO-hour fell by -31% over the period, although this fall was irregular, probably reflecting an issue of consistency in data reporting rather than a genuine change in performance. Similar erratic variations are also observed for ATCO productivity. Although traffic growth was irregular, it is understood that there are inconsistencies in the number of ATCO-hour on duty reported by NATA Albania.

The main cause of the decline in cost-effectiveness performance, however, is support costs, which rose overall by +67% in the period; even with rapid traffic growth, unit support costs rose by +19% (+4% a year). Its unit support costs are in the top quartile. The underpinning factor for this is a massive increase in capital-related costs which are required to modernize the ATM/CNS infrastructure (NAMP). It also appears that some elements of capex have been reported directly as capital-related costs rather than being capitalised. In fact, unit capital-related costs are the 2nd highest in Europe. The level of unit support costs is significantly higher than the European average and not commensurate with underlying economic and traffic demand fundamentals.

NATA Albania's ATCO productivity and employment costs per ATCO-hour are among the lowest in Europe. On all indicators, however, it compares favourably to its neighbour MK CAA.

Changes in financial cost-effectiveness



NATA Albania (Albania)

Comments on ANSP's forward-looking cost-effectiveness

Gate-to-gate unit ATM/CNS costs are expected to rise by +32% between 2008 and 2013, an average annual increase of +5.7%, as ATM/CNS provision costs are planned to rise faster (+44%) than traffic (+9%). This contrasts with last year planned average annual decrease of -2.7% between 2007 and 2012. The +44% increase in ATM/CNS costs is mainly due to increases in staff costs and depreciation costs relating to the entry in operation of the new ACC/APP/TWR building in the context of the National Airspace Modernisation Project (NAMP). Compared to the ACE 2007 plans, NATA Albania has significantly revised its traffic forecasts downwards, while costs have on the contrary been revised significantly upwards as from 2009.

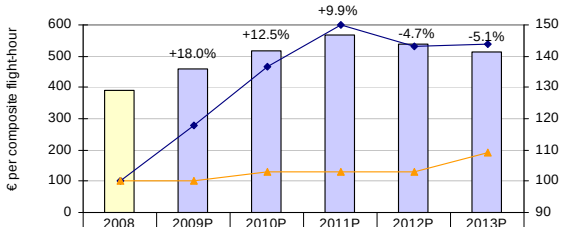
Since 2005, the average remaining accounting life of the fixed assets remained fairly stable at around 6 years. The share of fixed assets under construction has been on a declining trend since 2005, but still represents about 20% of the total fixed assets in 2007. Large amounts of capex have been invested since the initiation of the NAMP project (€63M over 2005-2008) and significant additional capex are planned in 2009. The cumulative capex over 2009-2013 are planned to be some €35M (with peaks in 2009 and 2010). Compared to ACE 2007, the investment plan has been very significantly revised upwards. Although it remains lower than in the previous period, it represents 180% of the 2008 gate-to-gate ANS revenues, the second highest proportion within the ACE sample of ANSPs, after DHMI. These investments mainly relate to the following projects :

- New joint ACC/APP/TWR building located near Mother Teresa Airport (i.e. €12.3M, to be commissioned in 2011);
- Replacement of FDP and RDP systems (i.e. €12.3M, to be completed in 2011);
- Voice Communication System (i.e. €1.5M, planned to be commissioned in 2011); and
- Remote radio facility (i.e. €1.6M, planned to be commissioned in 2011).

Incidentally, the profiles over time for the capex and for the depreciation are not fully intuitive, given that the depreciation does not seem commensurate with the capex. This could indicate some reporting inconsistency.

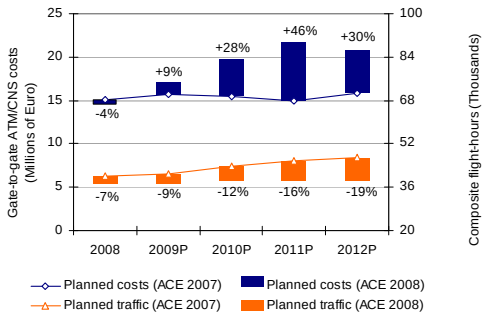
Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise much faster (+59%) than the traffic (+9%), indicating that NATA Albania productivity is expected to decrease. In the meantime, the number of sectors is planned to double, passing from 3 in 2008 to 6 sectors in 2011 and the sector-hours are planned to increase by +15% in the same period.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

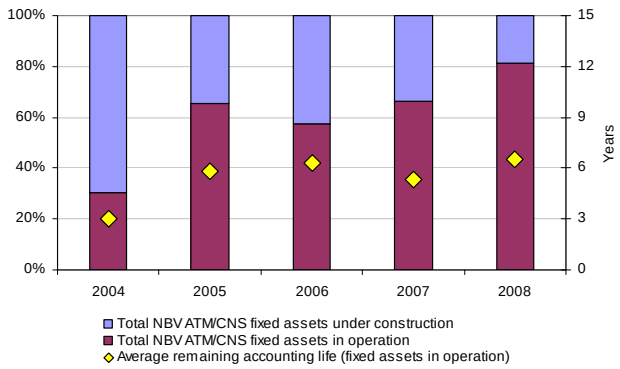


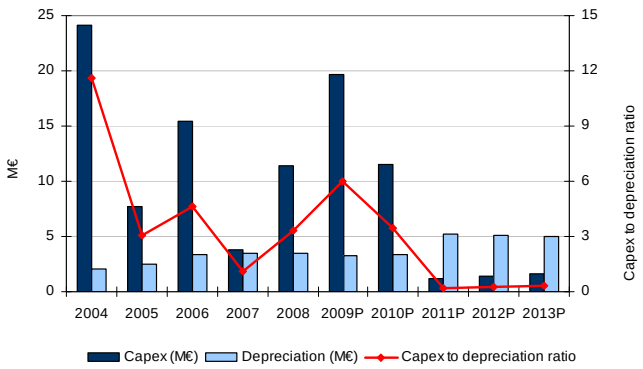
NATA Albania

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	389	459	516	567	540	513
Gate-to-gate costs (index)	100	118	137	150	143	144
Composite flight-hours (index)	100	100	103	103	103	109

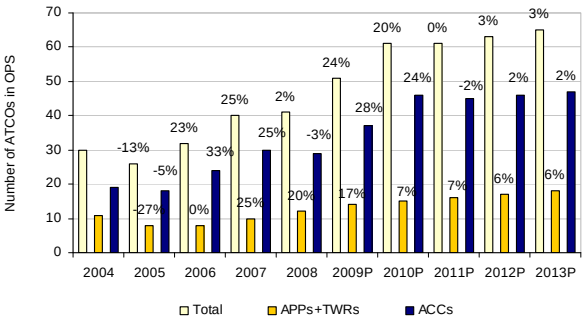


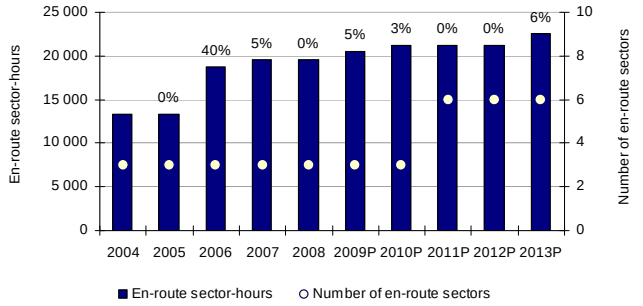
Assets structure and planned capital expenditure





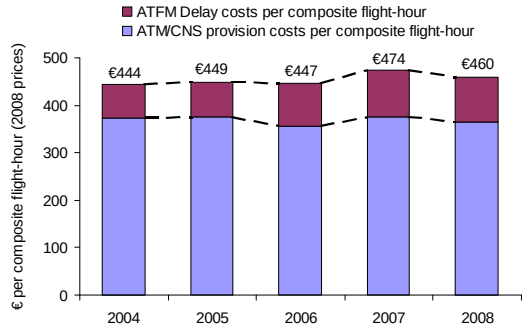
Planned staff and capacity data

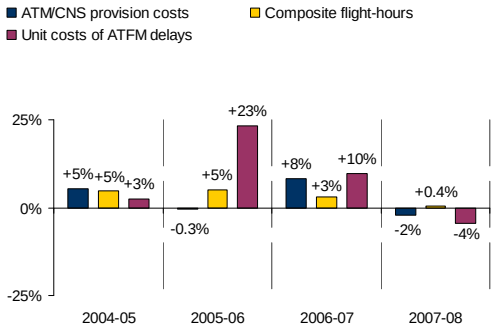




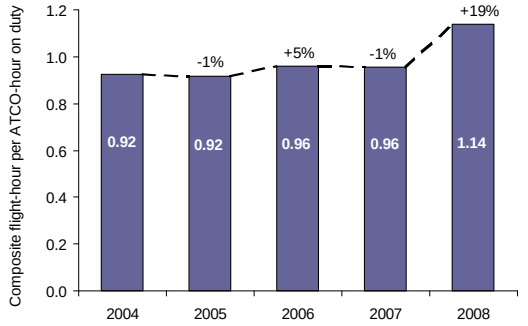
NATS (United Kingdom)

Trend in gate-to-gate economic cost-effectiveness

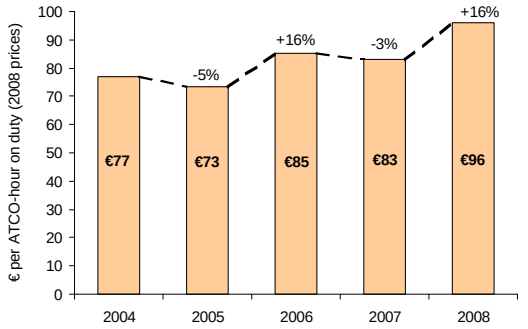




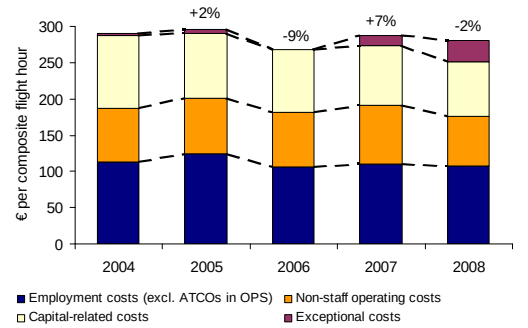
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

NATS is one of the largest ANSPs in Europe, with costs amounting to some 10% of the European total.

Traffic has grown moderately over the period, at around +3.3% a year. However, traffic remained static in 2008. NATS controls a mixture of areas of very high and relatively low traffic complexity. Overall, its complexity is the 2nd highest in Europe. Among the other four large ANSPs, NATS has a complexity just slightly above that of DFS.

Over the period NATS showed a small improvement in cost-effectiveness, with a fall in unit ATM/CNS costs of -2%.

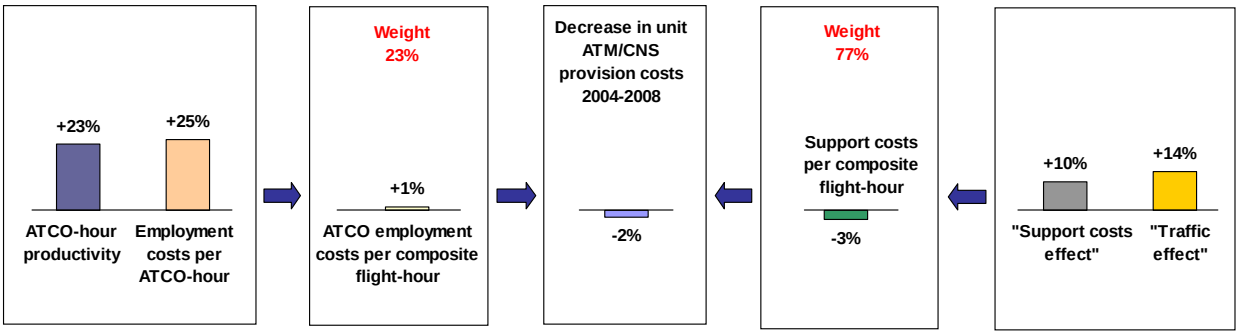
However, ATFM delays have remained a substantial proportion of the economic costs over the period and reached 21% in 2008. Helped by a strong decline in traffic volumes, ATFM delays became less of a problem in 2009.

Employment costs per ATCO-hour rose by +25% over the period, contrasting with the +5.7% increase in GDP/head over the same period. This increase was however counterweighted by a proportional increase in ATCO-hour productivity (+23%). The main thrust of these changes results from the reporting of significantly less ATCO-hours on duty in ACE 2008 compared to previous years (-12%). Following these changes, NATS ATCO-hour productivity is the 4th highest in Europe and significantly higher than the other four large ANSPs.

NATS succeeded in reducing its unit support by -3%, since support costs growth (+10%) was lower than traffic growth (+14%). While unit capital-related costs and unit non-ATCO employment costs have been reduced over the period, NATS support costs have been affected by growing exceptional costs in 2008, mainly associated with redundancy costs and relocation to Swanwick and Prestwick areas, following the implementation of the "two centres" strategy.

Overall, NATS unit ATM/CNS costs are the lowest among the largest five ANSPs, mainly due to superior ATCO-hour productivity. However, NATS unit economic costs are slightly higher than DSNA. The position of NATS relative to other ANSPs appears better in 2008 than in previous ACE reports as it benefited from the depreciation of the UK £ in 2008.

Changes in financial cost-effectiveness



NATS (United Kingdom)

Comments on ANSP's forward-looking cost-effectiveness

Gate-to-gate unit ATM/CNS costs could not be computed since NATS did not provide forward-looking data related to terminal ANS. However, NATS disclosed planned data for the en-route activity until 2013. En-route unit ATM/CNS costs are expected to remain stable between 2008 and 2013. This is a slightly more optimistic outlook than provided in ACE 2007, planning a +2% increase between 2007 and 2012. Compared to ACE 2007 plans, NATS has significantly revised its planned traffic downwards (-6% by 2012), while the costs forecast for the period 2009-2013 have been adjusted downwards in even larger proportions (-10% by 2012). NATS is subject to independent economic regulation and is not operating under the full cost recovery regime.

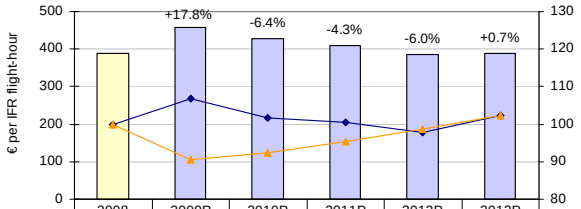
Since 2004, the average remaining accounting life of the fixed assets has been rising to reach 7 years in 2008. The share of fixed assets under construction continues to represent on average more than 30% of the total fixed assets since 2004. The cumulative capex for the period 2009-2013 are around €797M (93% of the gate-to-gate ANS revenues). Compared to ACE 2007, the investment plan has been revised downwards. These investments mainly relate to the following projects:

- Development of a new FDP system, iTEC (i.e. €297M, between 2009 and 2013);
- Replacement of Voice Communication (VCCS) infrastructure (i.e. €53M, delivered in January 2009);
- Advanced controller tools using electronic flight data for London AC, iFACTS (i.e. €195M, between 2009 and 2011);
- Construction of the Prestwick Centre (i.e. €171M, completed in 2009); and
- Electronic FDP at London TC and new Prestwick ACC (i.e. €30M, between 2009 and 2011).

Throughout the 2004-2013 period the "capex to depreciation" ratio is systematically higher than 1, although this is not surprising since capex figures are gate-to-gate ANS while depreciation costs are for en-route ANS only.

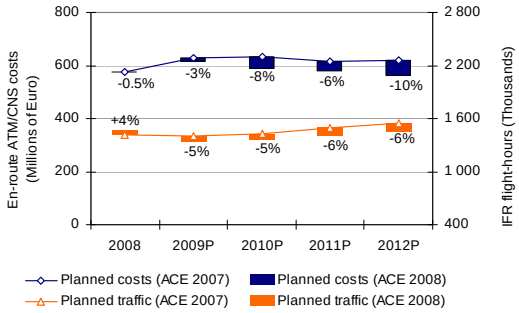
Between 2008 and 2013, the total number of ACC ATCOs in OPS is planned to rise slightly faster than traffic (i.e. +5% against +2%). All else equal, this means that NATS ACC ATCO productivity is planned to fall, possibly at the benefit of improvements in the quality of service. Between 2007 and 2008, the number of sector-hours open fell by -10%. The number of sectors and sector-hours open are planned to remain constant over the period 2009-2013.

Planned changes in en-route ATM/CNS provision costs per composite flight-hour

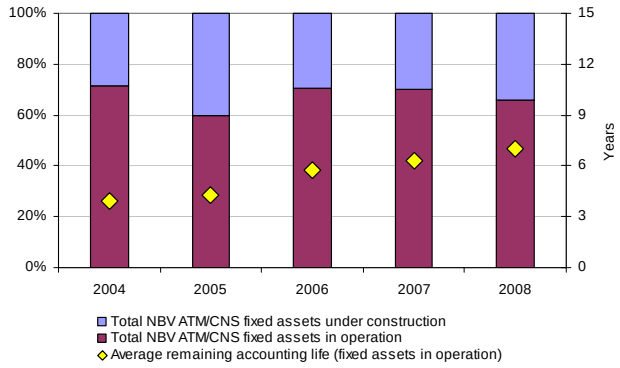


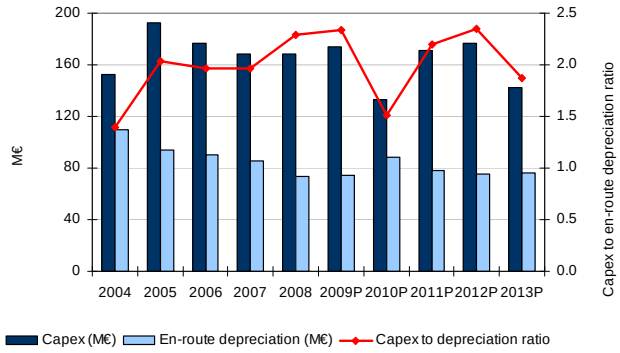
NATS

	2008	2009P	2010P	2011P	2012P	2013P
En-route unit ATM/CNS costs	389	458	429	410	386	389
En-route costs (index)	100	107	102	101	98	102
IFR flight-hours (index)	100	91	92	95	99	102

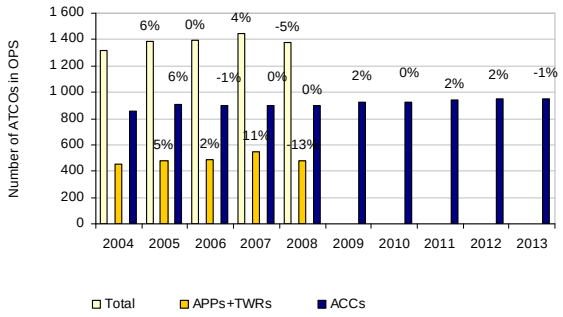


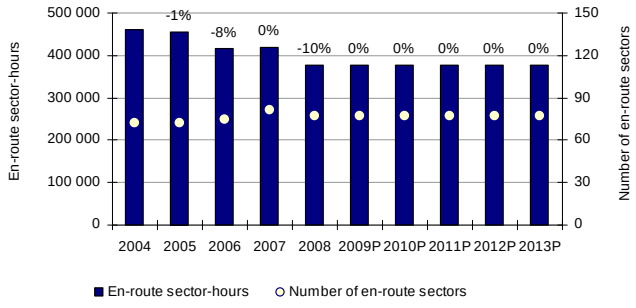
Assets structure and planned capital expenditure





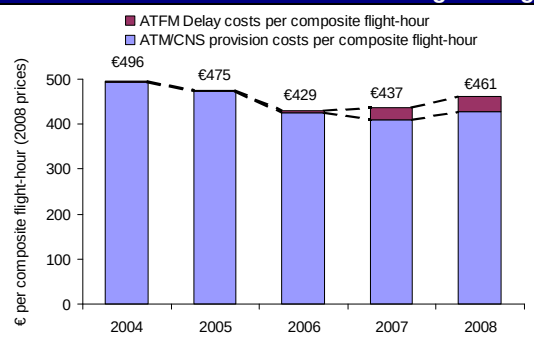
Planned staff and capacity data

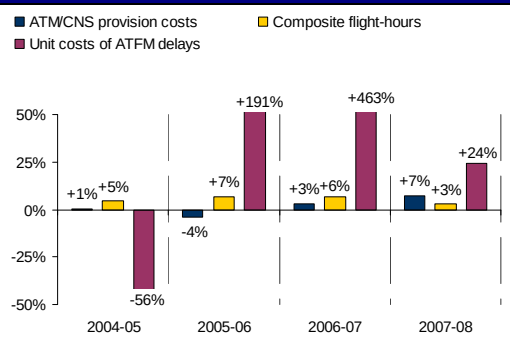




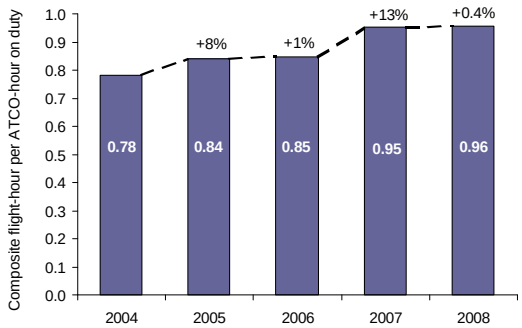
NAV Portugal - FIR Lisboa (Portugal)

Trend in gate-to-gate economic cost-effectiveness



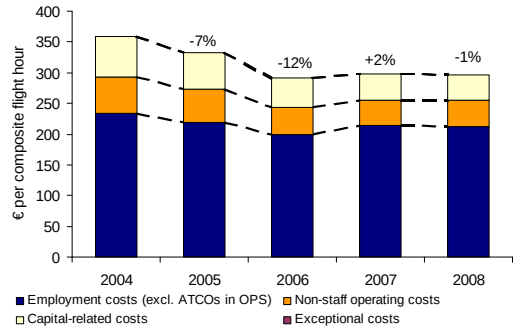


Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour

Trend in support costs per composite flight-hour



Assessment on ANSP performance

The activities of NAV Portugal in relation to Lisboa FIR constitute a medium-sized ANSP, with costs amounting to 2% of the European total.

Traffic has grown at around +5.2% a year over the period. NAV Portugal (FIR Lisboa)'s traffic complexity is relatively low. Perhaps surprisingly, the seasonality of traffic is among the lowest.

NAV Portugal achieved an overall improvement in cost-effectiveness, with a fall in unit ATM/CNS costs of -13% over the period.

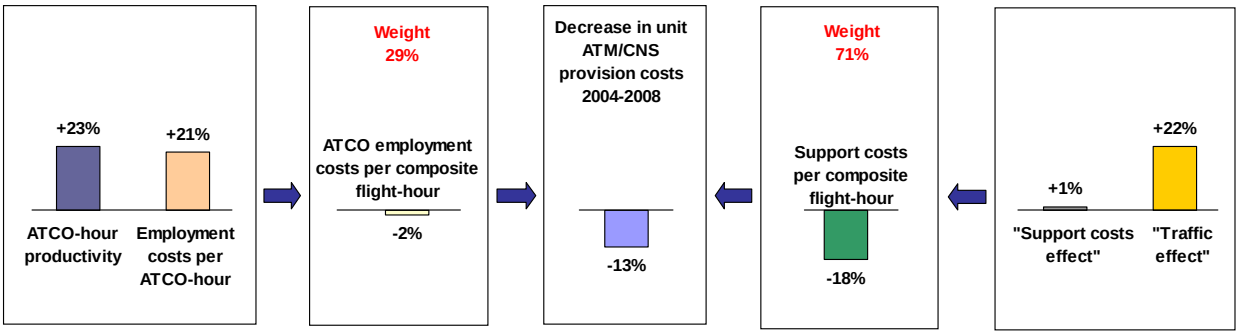
ATFM delays have started to become more noticeable only in 2007, but are still relatively minor in 2008. They became marginal in 2009.

ATCO productivity rose by +23% over the period. In 2008, NAV Portugal (FIR Lisboa) consolidates its position above the top quartile on this indicator. Overall, employment costs per ATCO-hour grew at a similar pace (+21% over the period) resulting in a slight reduction in ATCO employment costs per unit of output. However, changes in employment costs per ATCO-hour have been irregular over the period. The decrease in ATCO employment costs in 2006 and 2007 is mainly due to a downward revaluation of pension liabilities following an increase of the retirement age (from 55 to 57). The 2005 increase was caused by a new salary agreement, plus extensive use of overtime, while the 2008 increase relates to a rise in pension contributions and an upward revision of the pension liabilities. ATCO employment costs are the 5th highest in Europe in 2008.

Total support costs have been contained over the period, despite a +22% rise in traffic. In fact, unit support costs fell in 2005 and 2006 and have been kept fairly stable since then.

NAV Portugal (FIR Lisboa)'s unit ATM/CNS costs are substantially higher than those of IAA (+36%), which has a comparable complexity and similar position at the western edge of the continent. ATCO productivity in the two ANSPs is comparable, but NAV Portugal has both higher unit support costs and substantially higher employment costs per ATCO-hour.

Changes in financial cost-effectiveness



NAV Portugal - FIR Lisboa (Portugal)

Comments on ANSP's forward-looking cost-effectiveness

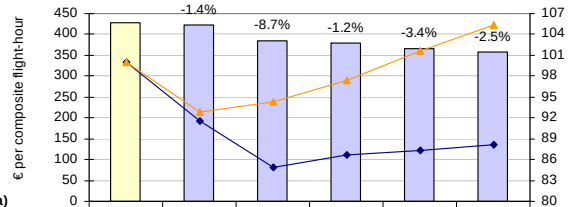
Gate-to-gate unit ATM/CNS costs are expected to fall by -16% between 2008 and 2013, an average annual reduction of -3.5%. This is in line with last year's plan, which projected a reduction averaging -3.6% a year between 2007 and 2012. Compared to the ACE 2007 plans, NAV Portugal revised its traffic forecast downwards by -9% in 2009, reflecting the 2009 slump in air transport. On the other hand, 2008 actual costs are +7% higher than planned, linked to a revaluation in pension liabilities in 2008. However, NAV Portugal expects to offset this deviation in 2009 and 2010 (-6% and -5%, respectively). Cost reductions are planned to be achieved through better control of general expenses, limitation of staff increase, prioritization of investments, reduction of the interest rate and modifications to the management pension scheme, moving from a defined benefit to a defined contribution scheme).

The value for the average remaining accounting life of the fixed assets in 2008 is among the lowest of European ANSPs. In fact, since 2004, this value has remained below 3 years despite previous investments which are reflected by the share of assets under construction, constantly above 20% of the total fixed assets since 2004. The cumulative capex for the period 2009-2013 are around €83M (54% of the 2008 gate-to-gate ANS revenues), significantly higher than planned in ACE 2007. These investments mainly relate to the following projects:

- iTEC-eFDP (i.e. €31M, between 2009 and 2014);
- Other ATM system upgrades (i.e. €24M, between 2009 and 2014);
- Purchase/enhancement of communication equipments (i.e. €5M, between 2009 and 2014);
- Purchase/replacement of navaids, including DMEs for PRNAV to TMAs (i.e. €4M, between 2009 and 2014); and
- Purchase/enhancement of surveillance equipments, including SSR Mode S and WAM/ADS-B Madeira and replacement of radar in Lisboa (i.e. €11M, between 2009 and 2013).

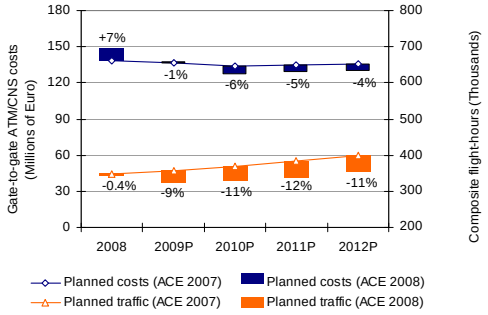
Between 2008 and 2013, the total number of ATCOs in OPS is expected to rise by +5%, in line with the projected traffic growth. In the meantime, the number of en-route sectors is planned to remain at its 2008 level. NAV Portugal did not provide the planned number of en-route sector-hours for the 2009-2013 period.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

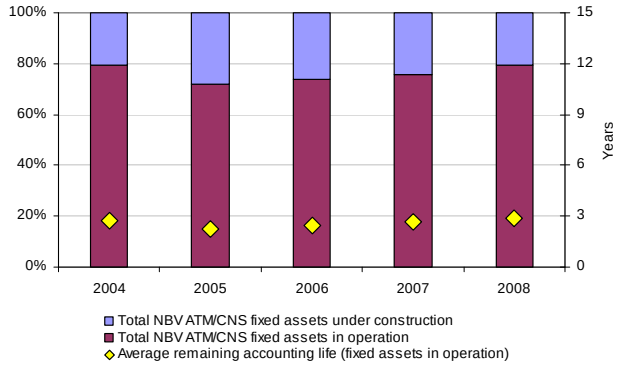


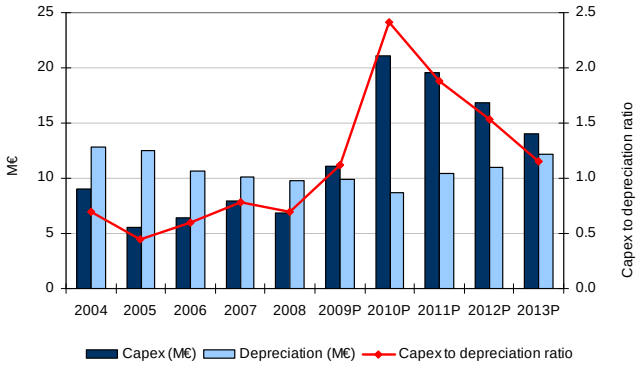
NAV Portugal (FIR Lisboa)

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	427	422	385	380	367	358
Gate-to-gate costs (index)	100	92	85	87	87	88
Composite flight-hours (index)	100	93	94	97	102	105

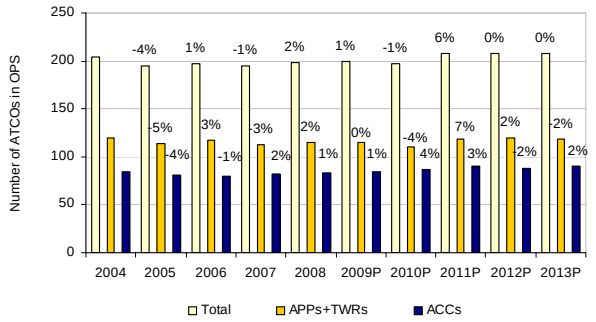


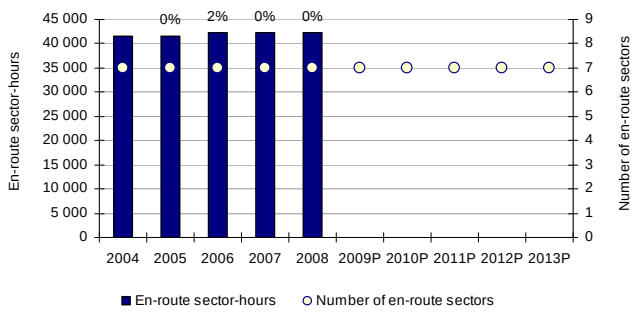
Assets structure and planned capital expenditure





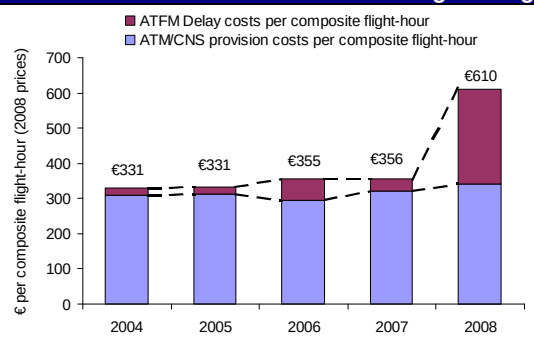
Planned staff and capacity data

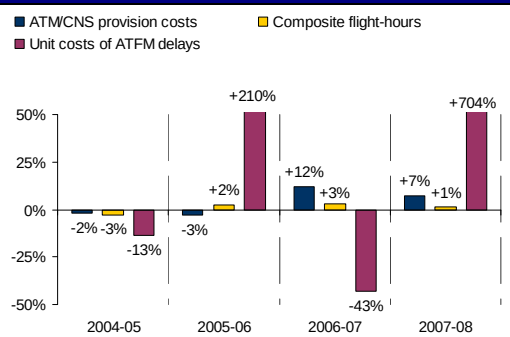




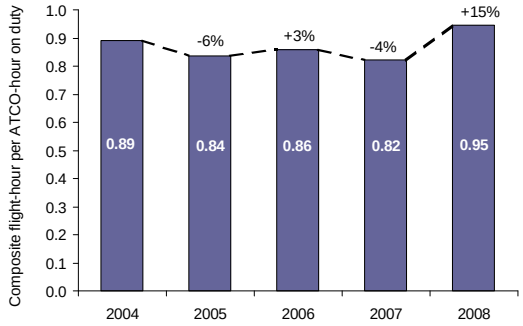
NAVIAIR (Denmark)

Trend in gate-to-gate economic cost-effectiveness

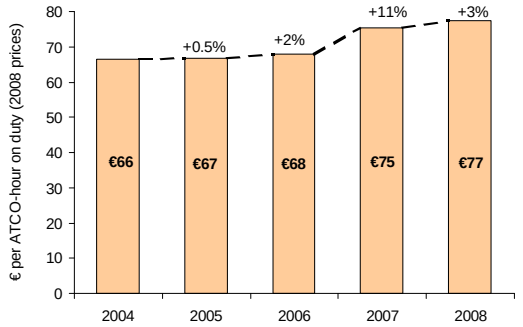




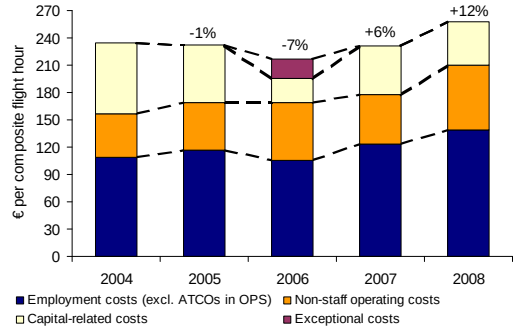
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

NAVIAIR is a medium-sized ANSP with costs amounting to 1.4% of the European total.

Traffic has grown by less than +1% a year over the period, the lowest growth among European ANSPs. Traffic complexity is intermediate.

Unit ATM/CNS costs rose over the period, and in 2008 were +10% higher than in 2004. NAVIAIR position against IAA and Finavia worsened over the period, but it improved against Avinor and LVF/ANS.

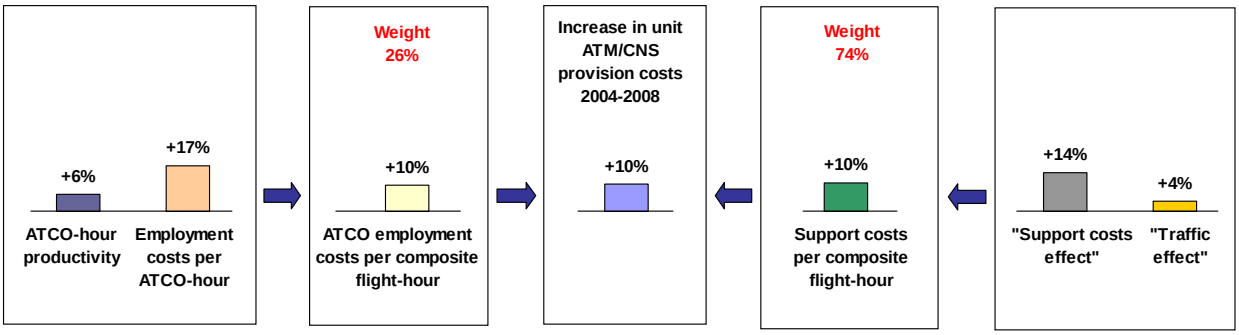
Delays, historically quite low, rose to a substantial level in 2006, although they reduced again in 2007. However, delays severely worsened in 2008 due to transition problems with the implementation of CASIMO, the new ATM system. In 2008 unit economic costs are in the top quartile and more than 50% higher than IAA and its Nordic neighbours. However, the situation went back to normal in 2009, with only marginal ATFM delays.

ATCO productivity fell slightly between 2004 and 2007, but rose by +15% in 2008, enabling a compensation of previous years' decreases. The 2008 increase mainly results from the reduction of 46 Apron ATCOs who lost their licence and are now reported as ATC assistants. The implementation of CASIMO and the reduction of ATCOs required additional overtime in 2008. Over the period, employment costs per ATCO-hour rose by +17%, mainly due to the implementation of a new collective agreement in 2007. This increase is similar to that of IAA and LVF/ANS Sweden.

Support costs rose by +14% over the period, despite modest traffic increase (+4%). After a decline in 2006, due to changes in depreciation policy, unit support costs rose in 2007 and in 2008 as a result of higher training costs and changes in accounting policy leading to the reporting of costs capitalised in 2006-07 as non-staff operating costs in 2008.

NAVIAIR's 2008 unit ATM/CNS costs are higher than IAA, LFV/ANS Sweden and Finavia, and similar to that of Avinor. Its ATCO productivity is the highest of the Nordic group, though not as high as IAA. Employment costs per ATCO-hour are on the average of its Nordic neighbours. Unit support costs are the highest in the group.

Changes in financial cost-effectiveness



NAVIAIR (Denmark)

Comments on ANSP's forward-looking cost-effectiveness

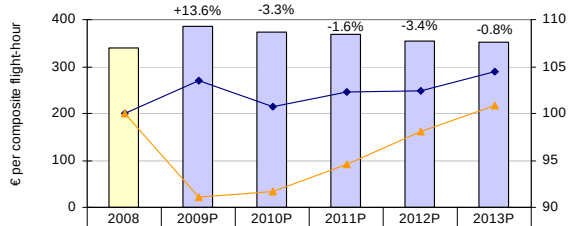
Gate-to-gate unit ATM/CNS costs are expected to rise by +4% between 2008 and 2013, an average annual increase of +0.7%. This is fairly in line with last year's plan, in which the average annual increase was +0.4% between 2007 and 2012. Compared to the ACE 2007 plans, NAVIAIR actual 2008 costs are +6% higher, and costs are planned to further increase starting from this higher basis. On the other hand, planned traffic volumes have been shifted downwards, implying a stagnation of traffic between 2008 and 2013.

Since 2004, the average remaining accounting life of the fixed assets has been steadily increasing, and reaches almost 23 years in 2008 (by a long way the highest figure among European ANSPs). This reflects the large amounts of capex invested over the period 2004-2008 (€126M) and the decision taken in 2008 to extend the estimated useful life of the DATMAS ATM system commissioned in December 2007 (CASIMO project) contributing to a -44% fall in depreciation costs. The cumulative planned capex for the period 2009-2013 amount to €92M (75% of the 2008 gate-to-gate ANS revenues) with a peak in 2010. Compared to ACE 2007, the investment plan has been slightly revised downwards, but capex are still planned to exceed depreciation throughout the period, suggesting a growing asset base. These investments mainly relate to the following projects:

- The COOPANS project with the IAA and LFV/ANS Sweden (in partnership with Thales) for common and harmonised upgrades of the EUROCAT 2000 ATM system (i.e. some €49M, 2012);
- Implementation of ADS-B (Automatic Dependent Surveillance - Broadcast), Wide Area Mulitilateration and Mode S support in Danish FIR (i.e. €6M, between 2010 and 2012); and,
- Upgrades of the IP LAN/WAN infrastructure (between 2009 and 2013) and new Voice Communications Systems in 2 Airports (between 2009 and 2011) for a capex of €6M.

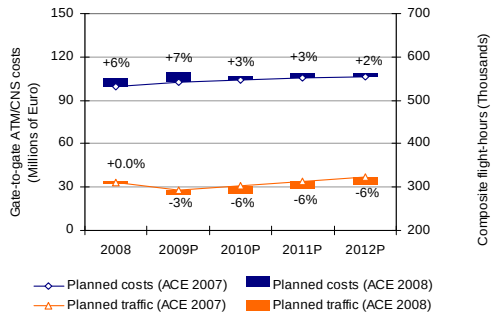
Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise by +33%, a surprisingly high increase in absence of expected traffic increase. This implies that, all else being equal, NAVIAIR's ATCO productivity is planned to decrease substantially over the period, but this is also expected to reduce the level of delays and improve the quality of service. The number of en-route sector-hours is planned to rise by +14% in 2012, consequently to the opening of an additional en-route sector.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

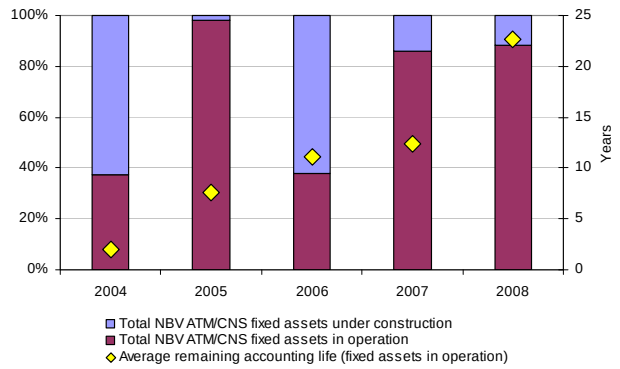


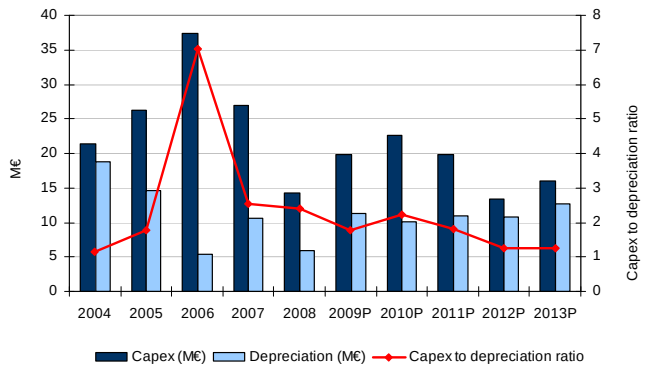
NAVIAIR

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	340	386	374	368	355	353
Gate-to-gate costs (index)	100	103	101	102	102	105
Composite flight-hours (index)	100	91	92	95	98	101

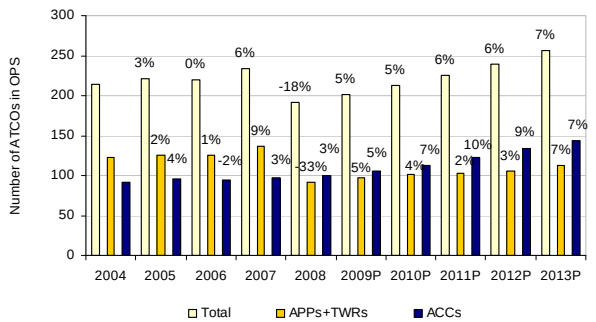


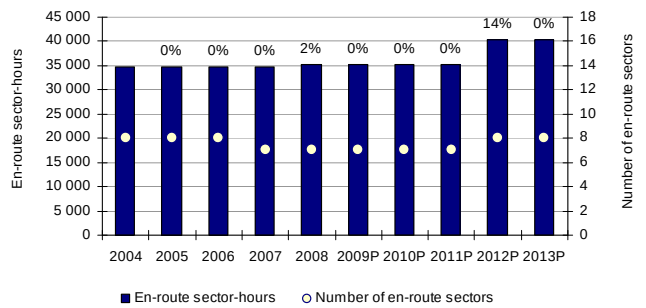
Assets structure and planned capital expenditure





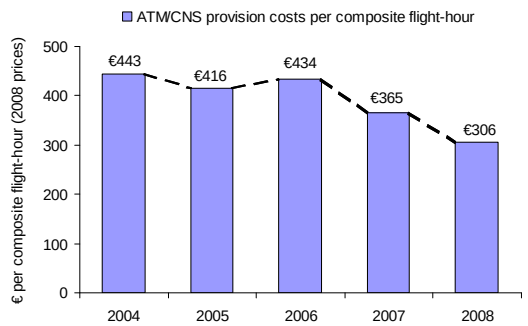
Planned staff and capacity data

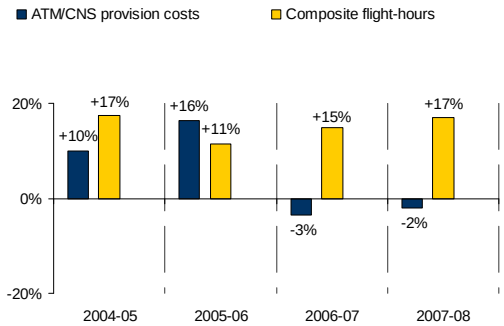




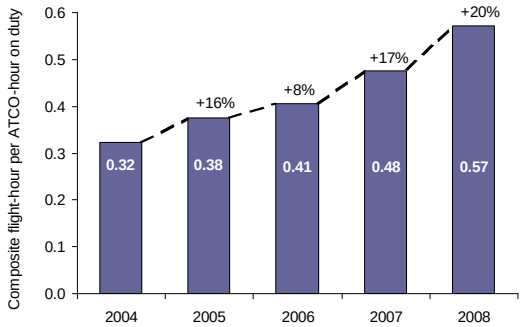
Oro Navigacija (Lithuania)

Trend in gate-to-gate economic cost-effectiveness

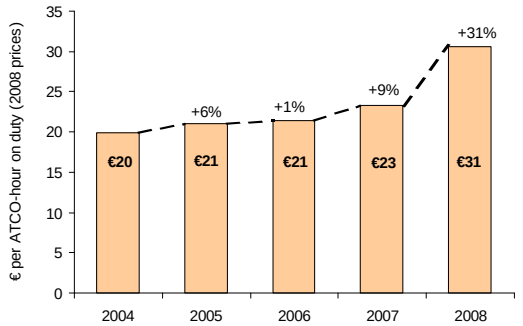




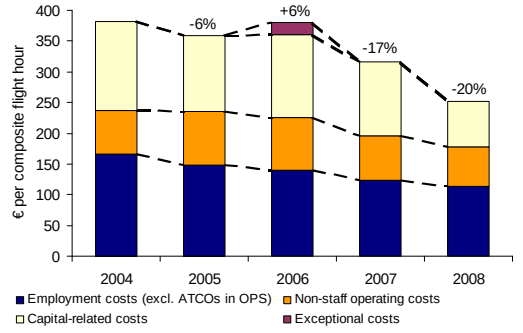
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

Oro Navigacija is one of the smallest European ANSPs, with costs amounting to 0.3% of the European total.

Traffic in Lithuania and its neighbour Latvia has grown more rapidly than anywhere else in Europe, averaging over +15% a year. In 2008, Oro Navigacija recorded the highest traffic growth, with a +17% increase. Despite this increase, traffic complexity in Lithuania is among the lowest in Europe.

Aided by the strong traffic growth, unit ATM/CNS costs fell over the period, and in 2008 were -31% lower than in 2004.

Capacity and delays are understood not to be a problem for Oro Navigacija.

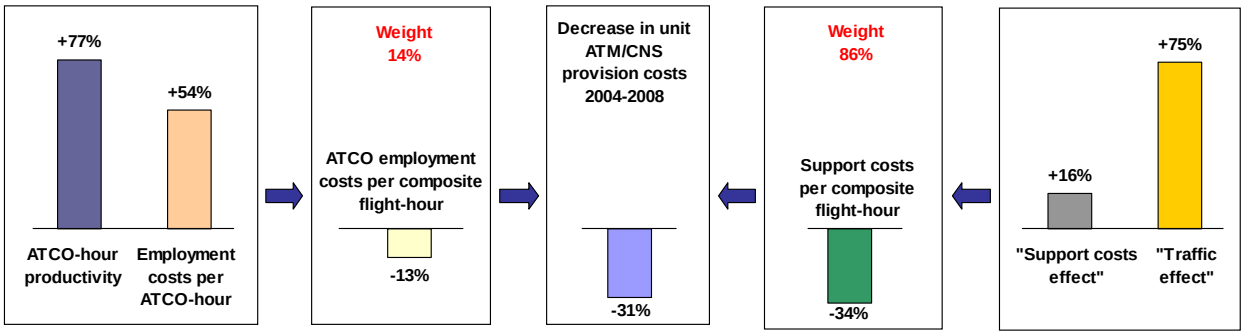
ATCO productivity rose impressively over the period, but remained well below the European average and below that of its neighbours EANS and LGS. The productivity increase largely outweighed the rise in employment costs per ATCO-hour, which grew at around +11% a year (by contrast the GDP per head rose by +7.6% a year in the same period). Between 2007 and 2008, there was a slight reduction in the ATCO in OPS hours on duty, which contributed to increase the observed productivity and employment costs per ATCO-hour. More importantly, a generous agreement with the ATCO association and technical support staff was signed in early 2008, which had a very substantial impact on ATCO employment costs.

Support costs rose over the period, but the rise was greatly outweighed by traffic growth, and falling unit support costs considerably contributed towards improving cost-effectiveness.

Comparing Oro's performance with its Baltic neighbours, productivity is lower, while employment costs per ATCO-hour are similar to LGS's and lower than EANS. On the other hand, unit support costs are higher. Overall, its unit costs are higher than its neighbours, but the gap existing in 2004 has been reduced over the period, especially towards LGS.

A noticeable feature of Oro Navigacija is that a large amount of cash reserves have been accumulated and in 2008 its liquidity ratio (current assets to current liability) was among the highest in Europe (28.3 compared to an average of 1.8).

Changes in financial cost-effectiveness



Oro Navigacija (Lithuania)

Comments on ANSP's forward-looking cost-effectiveness

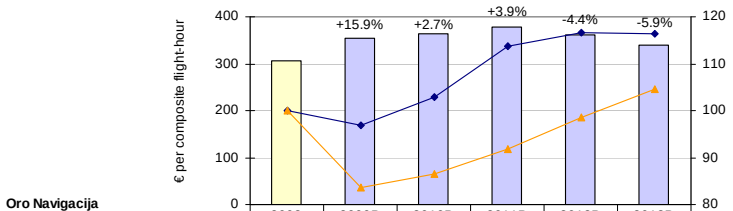
Gate-to-gate unit ATM/CNS costs are expected to rise by +11% between 2008 and 2013, an average annual increase of +2.2%. This is close to ACE 2007 plans, which presented an increase of +1.6% a year between 2007 and 2012. In fact, compared to the ACE 2007 plans, Oro Navigacija has significantly revised its traffic forecast downwards. The 2009-2012 traffic profile has been significantly revised downwards by (-25%in 2009, up to -33% in 2012). In response to the economic crisis and its impact on air transport, Oro Navigacija presented one of the most drastic downward revisions of planned costs. First, 2008 actual costs are -14% below ACE 2007 plans, and further to this decrease, 2009 and 2010 costs have been revised downwards by -24% and -33%, respectively. This planned cost reductions are based the following measures: (i) no cost of capital charged to airspace users in 2009 and 2010 (i.e. return on equity set to 0%); (ii) reduction of staff number; (iii) extension of main assets operating life; and, (iv) reviewing of operating expenses.

The average remaining accounting life of the fixed assets reaches 9 years in 2008, its highest level since 2004. Upgrades to the FDP and RDP systems took place in 2008, 3 years after their commissioning. 2008 was also the year of commissioning of a new radar (Vilnius) and of a surface movement radar at Vilnius airport (A-SMGCS). While €32M have been invested between 2004 and 2008, the cumulative capex for the period 2009-2013 are some €20M (84% of the 2008 gate-to-gate ANS revenues) with a peak in 2009 (€11M) which marks the end of an intensive investment period. 2009-2013 investments mainly relate to:

- Modernisation of surveillance systems which includes the replacement of radars at Kaunas, Palanga (i.e. €7M to be commissioned in 2010); and
- Modernisation of ATC equipments in Kaunas, Palanga and Vilnius (i.e. €5M).

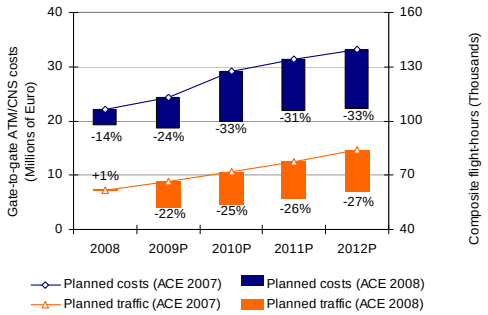
Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise by +4%, in line with the planned traffic volumes. All else being equal, ATCO-hour productivity is expected to remain at its 2008 level, which is relatively low (close to the bottom quartile). The number of en-route sectors open at maximum configuration is planned to increase from 2 to 3 sectors in 2011, reflecting the postponement of ACE 2007 plans.

lanned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

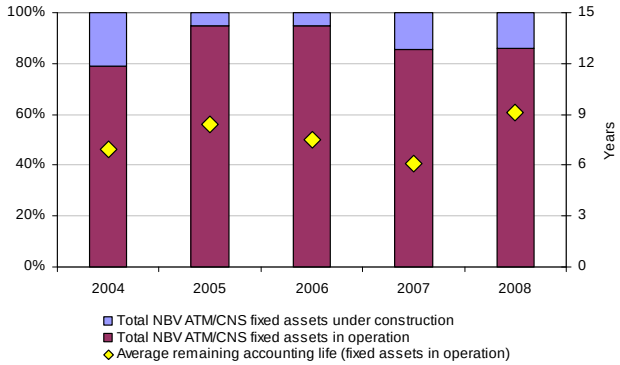


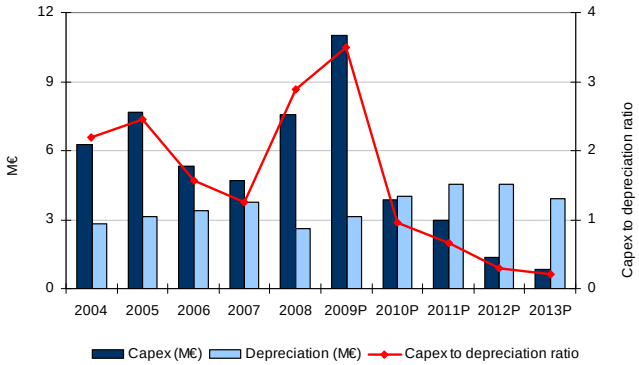
Oro Navigacija

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	306	355	364	379	362	341
Gate-to-gate costs (index)	100	97	103	114	117	116
Composite flight-hours (index)	100	84	86	92	98	105

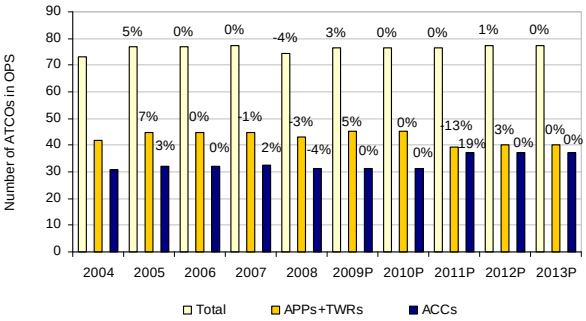


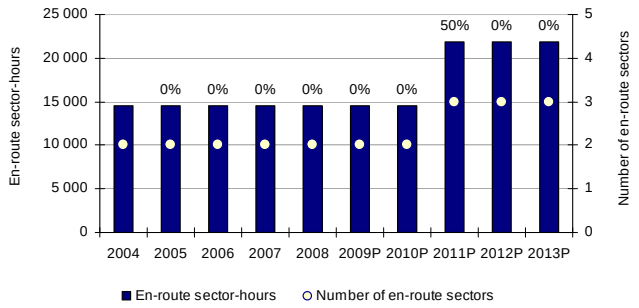
Assets structure and planned capital expenditure





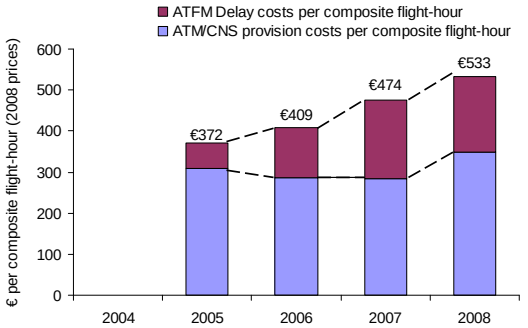
Planned staff and capacity data

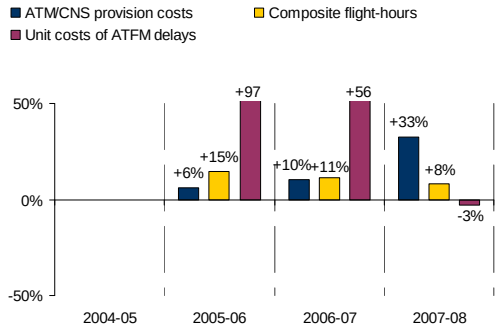




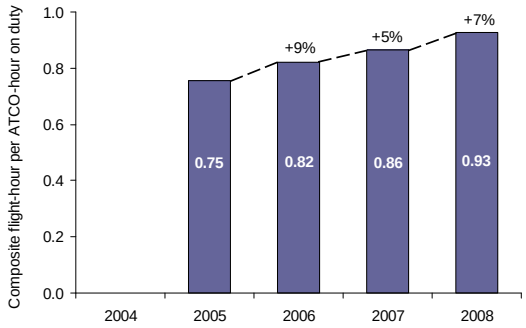
PANSA (Poland)

Trend in gate-to-gate economic cost-effectiveness

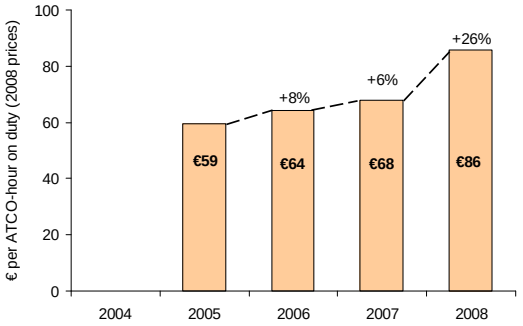




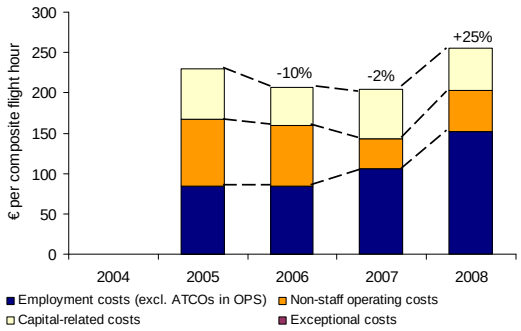
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

PANSA is a medium-sized ANSP with costs amounting to 2% of the European total.

PANSA has only been reporting data to ACE since 2005 so these comments only relate to the period 2005-2008. As PANSA was formed on 1 April 2007 out of PATA and PPL, some of the changes between 2005 and 2007 might be an artefact of changes in reporting.

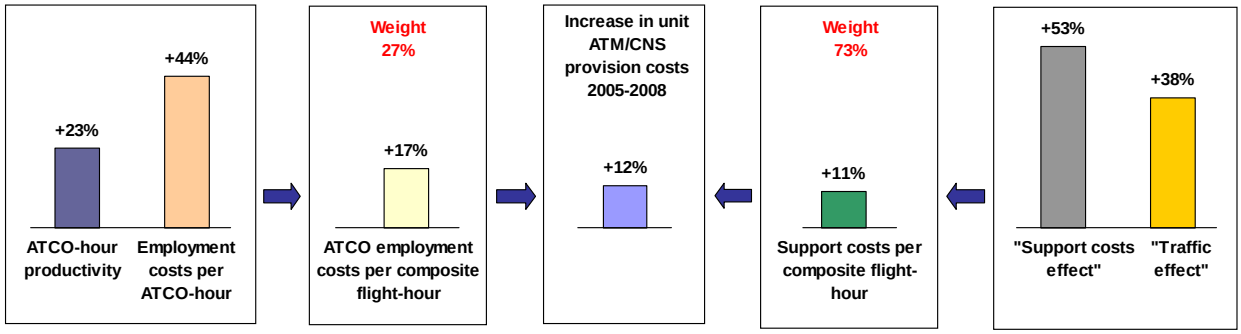
Traffic has grown rapidly in this period (+11% a year on average). Polish traffic complexity is intermediate, similar to LFV, higher than its Baltic neighbours and UkSATSE, but significantly lower than DFS and ANS CR.

After two consecutive years of decrease in 2006 and 2007, unit ATM/CNS costs rose by +23% in 2008, mainly due to increases in staff costs. Delays have been a recurrent issue over the period and Warszawa ACC has been continuously on the list of most en-route ATFM delay generating ACCs since 2005. As a result the 2008 unit economic costs are +9% higher than the European average. Despite a substantial fall in traffic, ATFM delays remained an issue in 2009, illustrating the need for all parties concerned to properly address the capacity issues and to act upon. However, the operational implementation of the new ATM system, Pegasus, is not planned until 2011.

ATCO productivity rose over the period at around +7% a year, and PANSA ATCO productivity is now close to that of ANS CR, but lower than DFS or EANS. Employment costs per ATCO-hour rose by some +13% a year (almost twice the growth in Polish GDP per head). High traffic growth gave rise to a need for overtime.

Unit support costs rose by +11% overall, although the picture is somewhat distorted because of the institutional change linked with the transfer to PANSA of infrastructure assets (these were revaluated, giving rise to an increase in capital-related costs), and with the postponement of the realisation of substantial items of non-staff costs. The 2007 figure for non-staff costs is therefore atypically low.

Changes in financial cost-effectiveness



PANSA (Poland)

Comments on ANSP's forward-looking cost-effectiveness

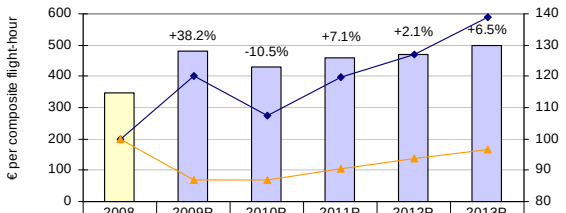
Gate-to-gate unit ATM/CNS costs are planned to significantly increase by +44% between 2008 and 2013. This represents an average annual unit costs increase of +7.6%, mainly resulting from a significant increase in planned costs (i.e. +39%) while traffic volumes are expected to decrease by -3%. The significant increase of unit costs in 2009 (+38%) suggests a lack of reactivity to adjust the cost base in line with the decrease in traffic in 2009. Compared to ACE 2007 plans, the traffic planned for the period 2009-2012 has been significantly revised downwards (between -30% and -50%). Planned costs were also revised downwards but not in the same order of magnitude (around -9%). As a result, the unit costs profile presents a much more pessimistic outlook than the plans reported in ACE 2007, where PANSA unit costs were expected to decrease by -1.6% a year between 2007 and 2012.

The average remaining accounting life of fixed assets continuously increased since 2006 to reach 12 years in 2007 and remained fairly constant in 2008. The year 2008 marks the start of a new investment cycle for PANSA. Indeed, the planned cumulative capex for the period 2009-2013 (€185M) represent 103% of 2008 gate-to-gate revenues. These investments mainly relate to the following projects:

- New ATM system for Warszawa ACC (PEGASUS 21, i.e. €25M, to be implemented in 2011);
- RMCDE radar data conversion and distribution system, in the context of the PRANET project (PANSA RAdar NETwork, i.e. €5.4M, completed in 2009);
- CNS – EMACS infrastructure analytical software (i.e. €0.6M, completed in 2009);
- Two aircraft for calibration (€8M, over the period 2010-11); and
- Technical infrastructure S&R (€4M in 2009-10).

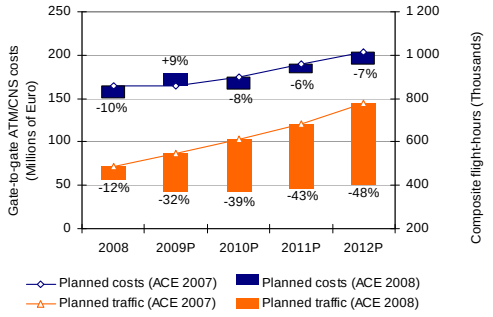
Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise by +80%, a significantly high increase in absence of expected traffic increase. Similarly, the number of en-route sectors is planned to rise by +50% between 2008 and 2013. This implies that, all else being equal, PANSA's ATCO productivity is planned to decrease substantially over the period, but the increases in ATCOs and en-route sectors are also expected to reduce the level of delays and improve the quality of service provided by PANSA.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

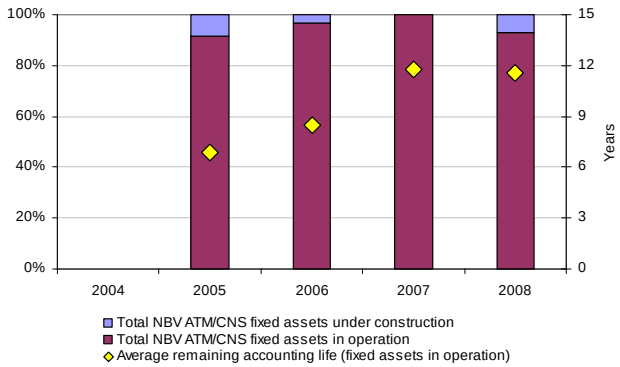


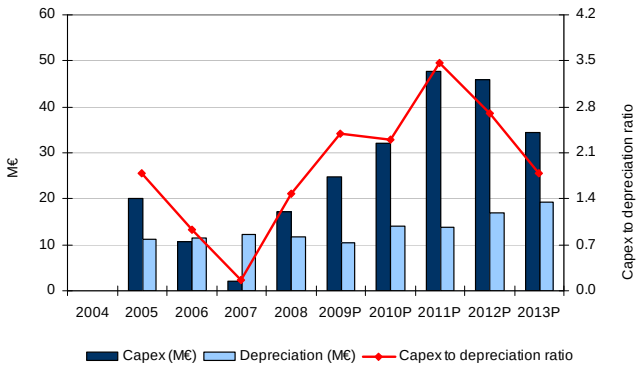
PANSA

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	347	480	430	460	470	500
Gate-to-gate costs (index)	100	120	108	120	127	139
Composite flight-hours (index)	100	87	87	90	94	97

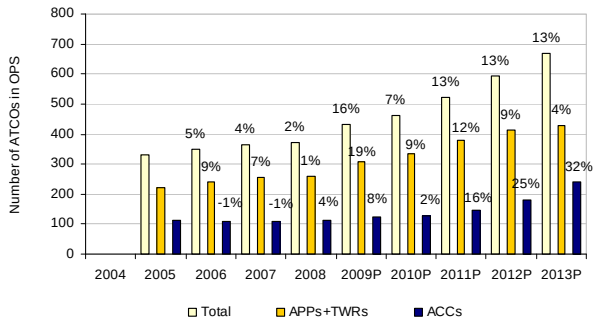


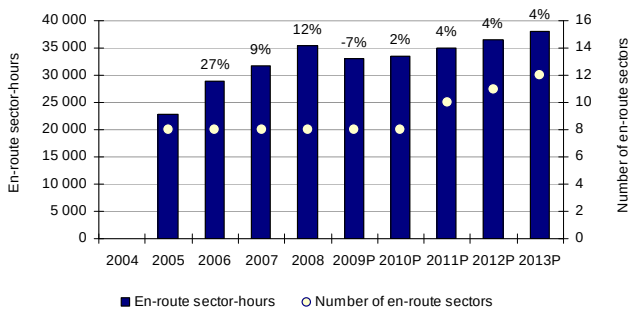
Assets structure and planned capital expenditure





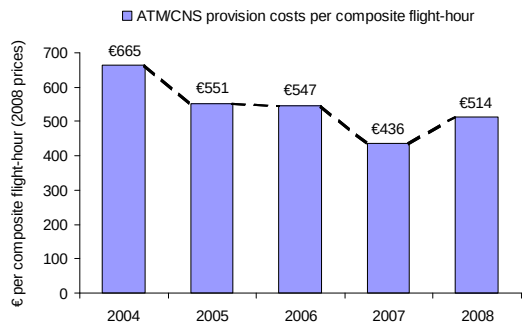
Planned staff and capacity data

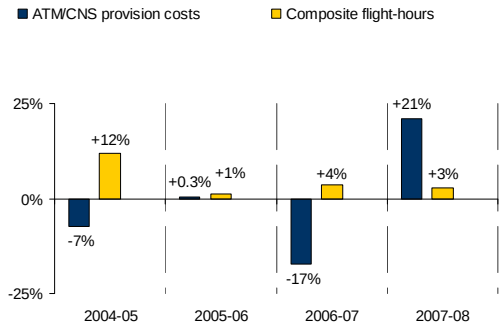




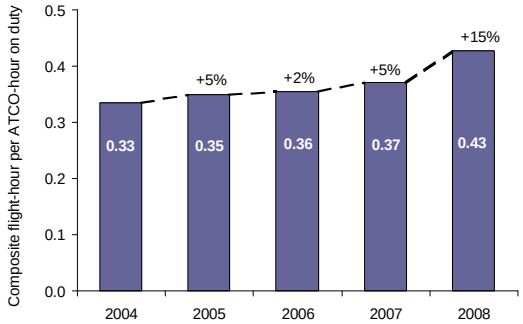
ROMATSA (Romania)

Trend in gate-to-gate economic cost-effectiveness

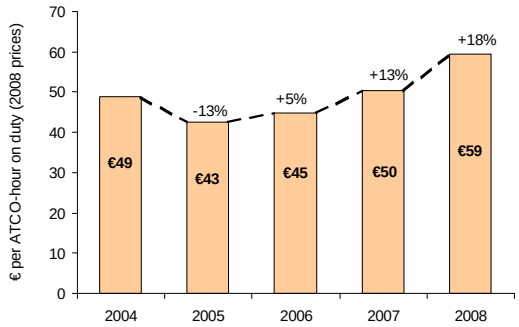




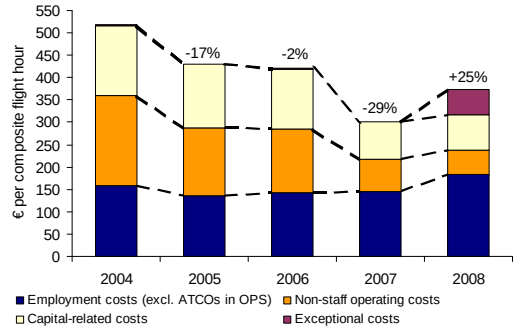
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

ROMATSA is a medium-sized ANSP with costs amounting to 2% of the European total.

Traffic has grown at around +5% a year over the period, with most of the growth in 2005. Romania's traffic complexity is relatively low, but seasonal variation in traffic is substantial, although lower than its neighbours ATSA Bulgaria and SMATSA. ROMATSA has no capacity or delay problems.

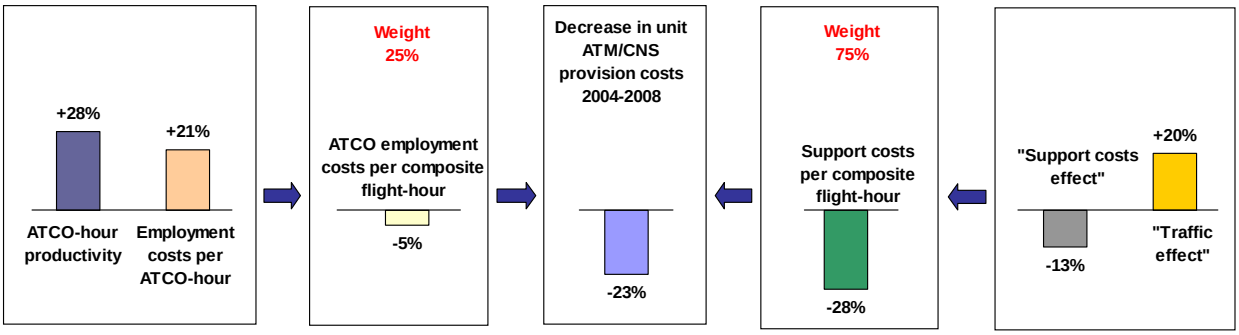
In 2004, ROMATSA's unit ATM/CNS costs were among the highest in Europe and very similar to its neighbour's ATSA Bulgaria. In 2008, though, ROMATSA still ranks 4th in Europe, but its unit ATM/CNS cost is now +26% higher than ATSA Bulgaria and +63% higher than SMATSA. This situation chiefly results from a significant increase in staff costs in 2008 (+18%) driven by the implementation of a new collective agreement in March 2008, the re-location of staff from Arad to Bucharest, and payments in relation to an Early Retirement Scheme specific to the support staff.

ATCO productivity rose over the period by +28%, and outweighed the +21% increase in employment costs per ATCO-hour, allowing for a -5% decrease in ATCO employment costs per unit of output. However, the ATCO productivity starting point was very low and remains among the lowest in Europe, and well below that of ATSA Bulgaria and SMATSA.

Total support costs have substantially reduced over the period (-13%) which combined with the +20% traffic growth, gave a reduction in unit support costs of -28%. As the unit support costs started from an appallingly high level in 2004, ROMATSA unit support costs remain among the highest in Europe. After a significant decrease in 2007 (-29%) unit support costs increased in 2008 (+25%). This increase is mainly caused by exceptional costs relating to amounts paid to employees leaving under early retirement scheme (ERS).

A noticeable feature of ROMATSA is that a large amount of cash reserves have been accumulated and in 2008 its liquidity ratio (current assets to current liability) was among the highest in Europe (7.2 compared to an average ratio of 1.8).

Changes in financial cost-effectiveness



ROMATSA (Romania)

Comments on ANSP's forward-looking cost-effectiveness

Gate-to-gate unit ATM/CNS costs are expected to fall by -24% between 2008 and 2013, an average annual reduction of -5.3%. Traffic is projected to rise by +12% while costs are planned to fall by -15%. However, actual 2008 costs were +22% higher than those planned in ACE 2007 for the year "N+1". Compared to ACE 2007 projections, traffic forecasts have been revised downwards, reflecting the 2009 slump in air transport, while planned costs have been shifted upwards in significant proportions. The expected cost savings in 2009 and 2011-2013 reflect ROMATSA's plans to prioritize capital investments, to reduce the number of staff (project initiated in 2007) and to reorganise its operational units, involving re-locations from Arad and Constanta to Bucharest.

The average remaining accounting life of the fixed assets reached fell from 12 to 10 years in 2008, although 2008 capex remained close to €19M, its second highest value since 2004. Compared to ACE 2007, the investment plan has been revised upwards. The 2008 capex related to the following projects:

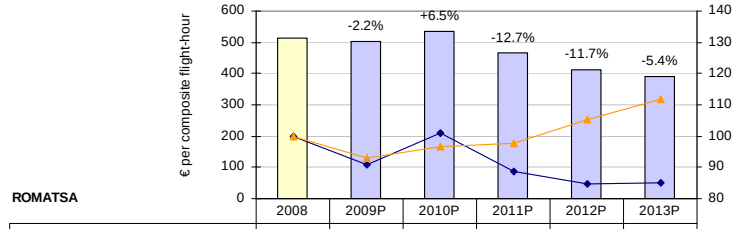
- ILS-DME installation (at Sibiu Airport and Timisoara) and replacement (in Cluj);
- STCR Upgrade; and
- CNS cable network upgrade at OTP Airport.

Cumulative capex for the 2009-2013 period amount to €70M (39% of the 2008 gate-to-gate ANS revenues) and relate to the following main projects:

- The finalisation of the Romanian target operational concept, including the consolidation of ACC activities (i.e. €17M, to be commissioned in November 2011);
- Improvement of A-SMGCS (i.e. €4M, to be commissioned in December 2011); and,
- Establishment of a SAR centre in Bucharest (i.e. €0.8M, completed in April 2010).

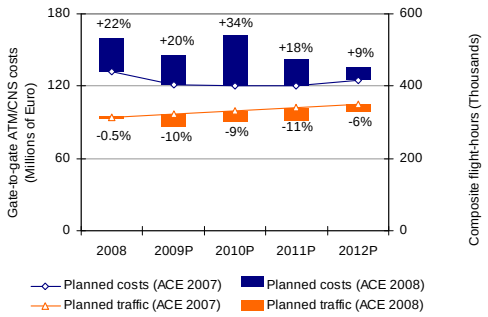
Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise by +6% while traffic is expected to rise by +12%. All else equal, this is expected to increase ROMATSA's ATCO productivity, which is currently among the lowest in Europe. On the other hand, the number of en-route sectors is planned to remain constant, but the number of sector-hours open are planned to rise by +20%.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

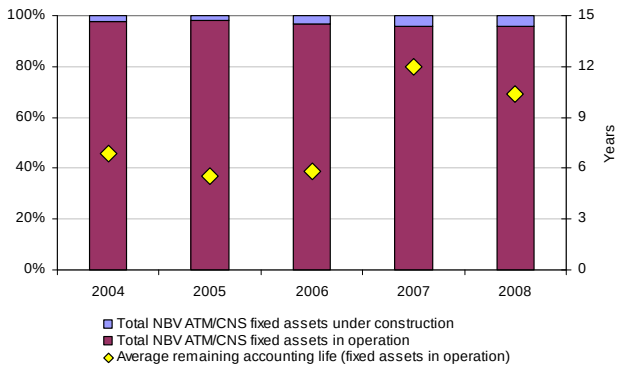


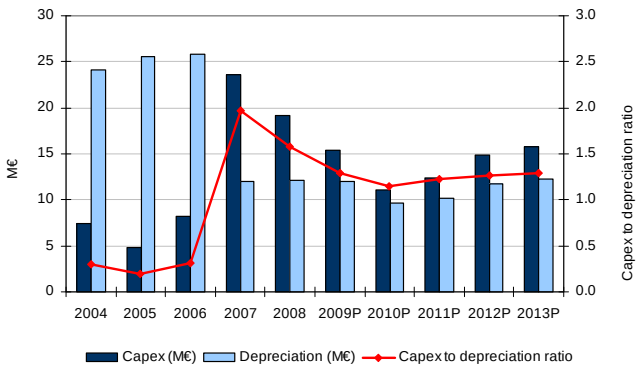
ROMATSA

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	514	502	535	467	413	390
Gate-to-gate costs (index)	100	91	101	89	85	85
Composite flight-hours (index)	100	93	97	98	105	112

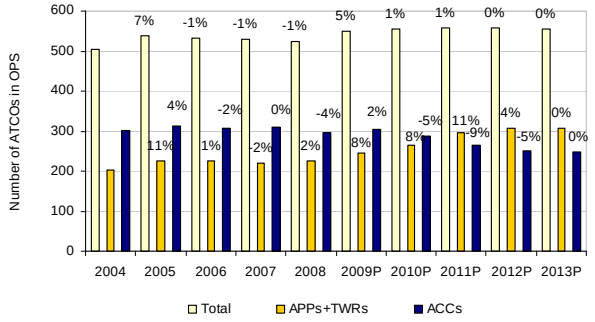


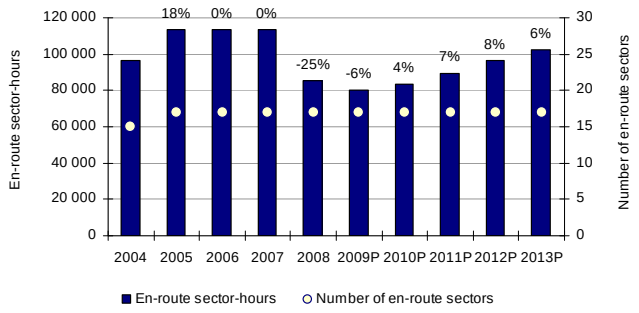
Assets structure and planned capital expenditure





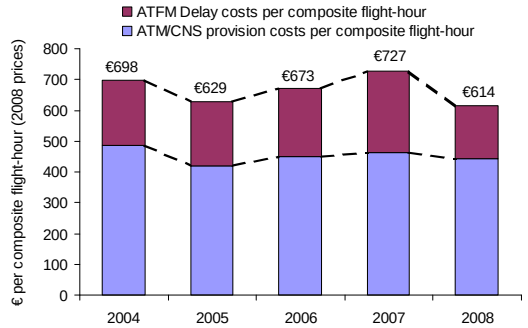
Planned staff and capacity data

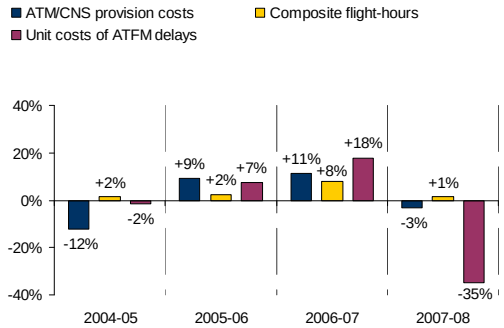




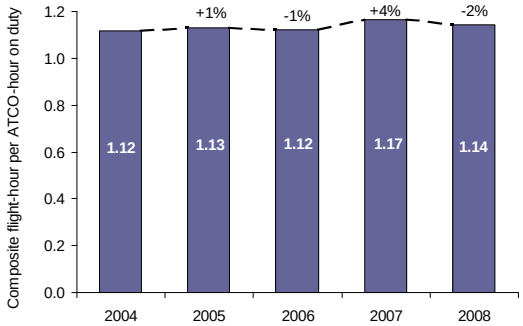
Skyguide (Switzerland)

Trend in gate-to-gate economic cost-effectiveness

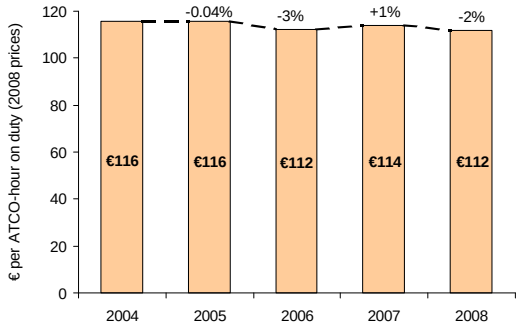




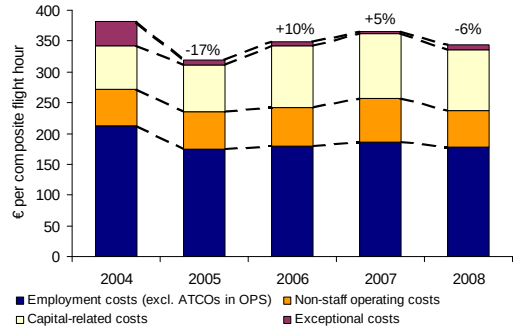
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

Skyguide is a medium-sized ANSP with costs amounting to 2.8% of the European total. A significant amount of ATM services are delegated to Skyguide for operational purposes.

Traffic has grown moderately over the period, at around +3.2% a year. Traffic complexity in Switzerland is the 3rd highest in Europe.

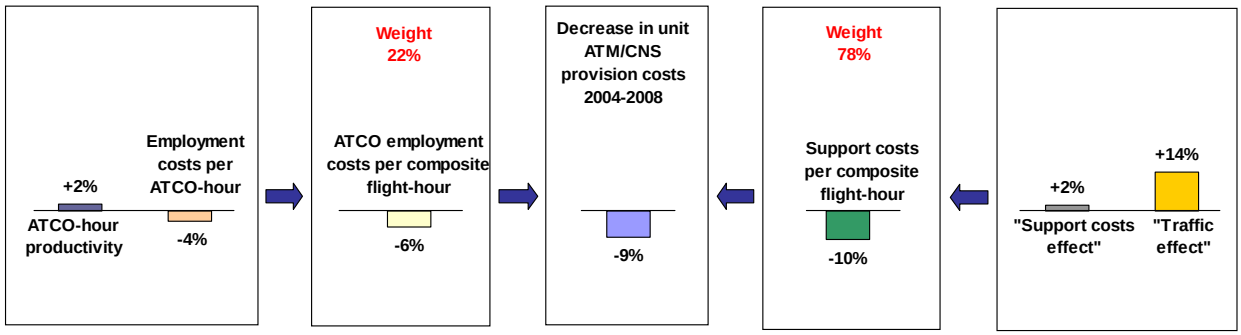
Unit ATM/CNS costs fell over the period, and in 2008 were -9% lower than in 2004. Delays have been a recurrent issue over the period and Zurich ACC has been continuously on the list of most en-route ATFM delay generating ACCs since 2005. Unit cost of delays fell substantially in 2008. Overall, Skyguide relative position in terms of unit economic cost has moved from 2nd to 7th in Europe so that although still high, its unit economic cost is below that of its neighbour Austro Control in 2008. The situation further improved in 2009, but Zurich ACC remained among the most congested areas, illustrating the need for all parties concerned to properly address and act upon capacity issues.

ATCO productivity slightly rose over the period (+2%), consolidating Skyguide position among the highest in Europe, despite high traffic complexity. Employment costs per ATCO-hour fell by -4%, which is a quite unusual feature among European ANSPs, and contrasts with trends in neighbour ANSPs. It appears that 2007 employment costs were affected by an exceptional one-off bonus. 2008 ATCO employment costs remain, however, just above the top quartile.

Support costs were impacted by a write-off of investments in the development of ATM systems in 2004 and by unplanned depreciation relating to the postponement of a major ACC rationalisation project in 2006. Unit support costs fell in 2008, as a result of the Challenge 07 cost containment measures. Overall unit support costs fell by -10% between 2004 and 2008. This is less than Austro Control reduction, which was however supported by higher traffic increases.

While its productivity is higher and employment costs per ATCO-hour are lower than Austro Control, these are outweighed by much higher unit support costs (mainly higher capital-related costs).

Changes in financial cost-effectiveness



Skyguide (Switzerland)

Comments on ANSP's forward-looking cost-effectiveness

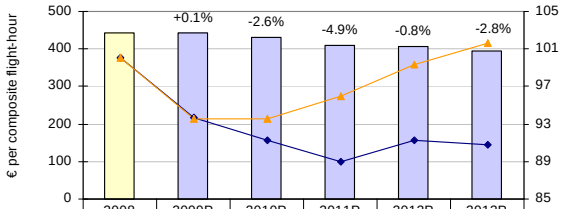
Gate-to-gate unit ATM/CNS costs are expected to fall by -11% between 2008 and 2013, an average annual reduction of -2.2%. This outlook is fairly in line with last year's plan, where an average decrease of unit costs by -2% a year was planned between 2007 and 2012. In its 2008 data submission, Skyguide has revised both its projected traffic and planned costs downwards compared with ACE 2007 plans. The planned reductions in ATM/CNS costs (-6% in 2009) are due to reductions in operational and capital expenditures, reduction of overtime and salary freeze.

Despite new investments since 2004, the average remaining accounting life of the fixed assets has remained fairly stable, around 6-7 years. This is due to substantial assets write-offs. However, the share of fixed assets under construction is gradually decreasing as new assets are entering into operation (upgrade of the FDP system in Zurich in May 2007). With some €282M invested between 2004 and 2008, 2008 marks the end of an intensive investment period. By contrast the cumulative planned capex between 2009 and 2013 amount to €129M (66% of the 2008 gate-to-gate ANS revenues). Depreciation costs are planned to remain above annual capex between 2009 and 2013. The main projects over this period include:

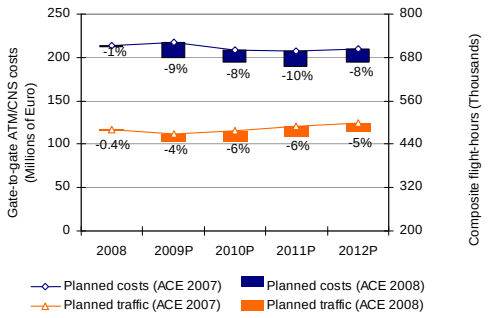
- TACO (Tower – Approach – Communication) system integration into the new FDP in Zurich (i.e. €6.8M, to be completed in 2012);
- Implementation of stripless system (i.e. €9.7M, to be completed in 2013);
- Implementation of datalink (i.e. €7.6M, to be completed in 2013);
- Upgrade of Local Area Network (LAN) (i.e. €7.1M, to be completed in 2014); and
- Hardware replacement (i.e. €7.1M, to be completed in 2014).

Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise by +18% while traffic is expected to rise by +2%), implying that, all else being equal, Skyguide's ATCO productivity is planned to decrease over the period, but is also expected to reduce the level of delays and improve the quality of service. The number of en-route sectors is planned to increase from 16 in 2008 to 19 in 2011 and the number of en-route sector-hours is planned to rise by +11% during the same period.

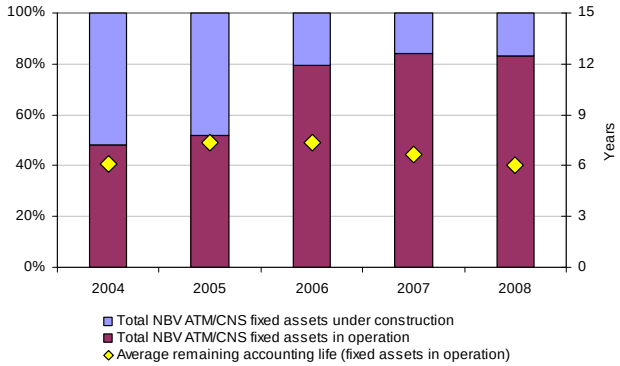
Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

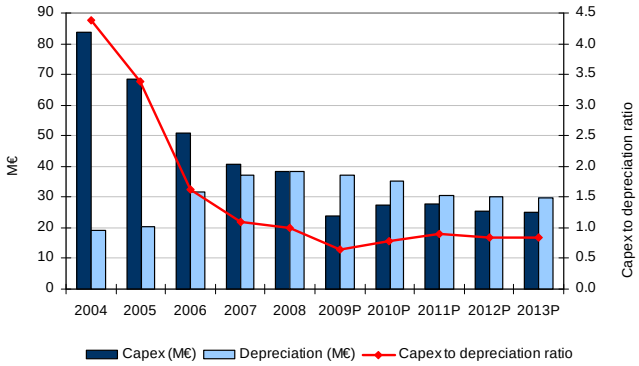


Skyguide	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	442	442	431	409	406	395
Gate-to-gate costs (index)	100	94	91	89	91	91
Composite flight-hours (index)	100	94	94	96	99	102

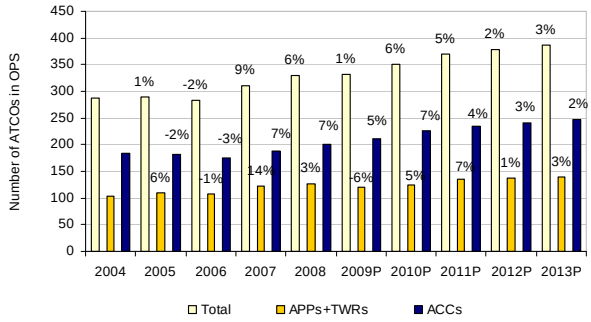


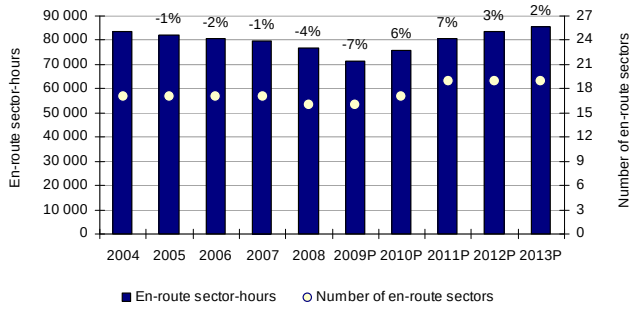
Assets structure and planned capital expenditure





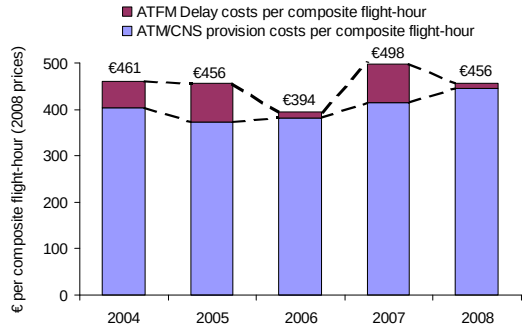
Planned staff and capacity data

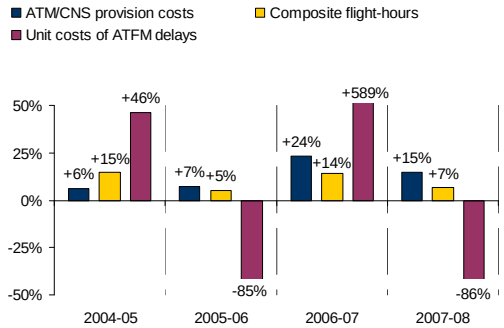




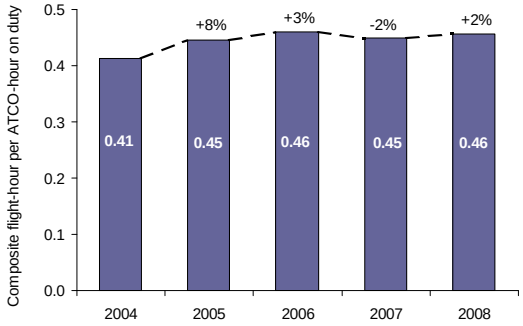
Slovenia Control (Slovenia)

Trend in gate-to-gate economic cost-effectiveness

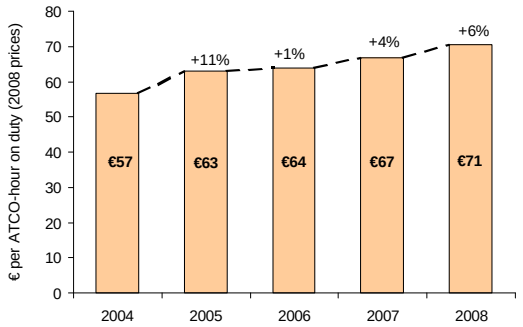




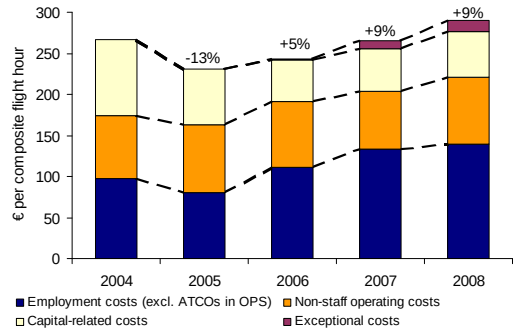
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

Slovenia Control is one of Europe's smallest ANSPs, with costs amounting to 0.3% of the European total.

Traffic has grown very rapidly over the period, at over +10% a year. Traffic complexity in Slovenia is intermediate, but seasonal variability high.

Unit ATM/CNS costs fell in 2005 but started to rise again, quite rapidly in 2007 and 2008. As a result of these changes, unit costs in 2008 were +10% higher than in 2004 and placed Slovenia among the most expensive ANSPs (top quartile).

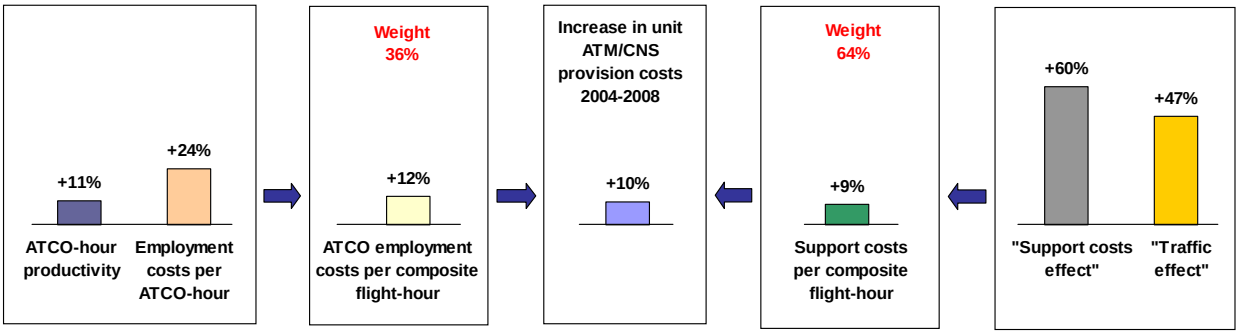
ATFM delays vary from year to year. After a peak in 2007, perhaps because of the unexpectedly high traffic increase in 2007 and transition to a new FDP system, they fell to marginal levels in 2008.

ATCO productivity remains among the lowest in Europe. It rose rapidly at the beginning of the period, and more slowly thereafter. The overall rise in productivity was well below the increase in employment costs per ATCO-hour, which amounted to +5.6% a year.

Unit support costs fell in 2005, because of reduced capital-related costs, but rose in significant proportion since then, mainly because of increasing non-staff costs, and exceptional costs (asset revaluation and provisions for jubilee and termination benefits). The overall result was a rise in unit support costs of +9%, despite a +47% traffic increase.

Slovenia Control shows higher unit costs than its neighbours HungaroControl and Croatia Control. This results from its lower ATCO productivity, which is among the lowest in Europe, and higher unit support costs. Employment costs per ATCO-hour are higher than HungaroControl. Since 2004, Slovenia Control unit support costs rose by +9%, while those of HungaroControl and Croatia Control fell by -3% and -17%, respectively.

Changes in financial cost-effectiveness



Slovenia Control (Slovenia)

Comments on ANSP's forward-looking cost-effectiveness

Gate-to-gate unit ATM/CNS costs are expected to rise by +16% between 2008 and 2013, an annual average increase of +3.1%. This contrasts with the outlook provided in ACE 2007, where unit costs were expected to remain fairly stable between 2007 and 2012 (+0.3% a year). Compared with ACE 2007 plans, Slovenia Control has significantly revised its planned traffic downwards, while the actual 2008 costs were higher than planned in ACE 2007 and 2012 costs have been shifted upwards by some +10%. Planned cost increases contrast with many other ANSPs' plans, which responded to a stagnating traffic environment by planned cost reduction measures. Actually, these increases mainly relate to the future entry in operation of the new ACC building and ATM systems in Ljubljana.

The average remaining accounting life of the fixed assets fell below 5 years in 2008, after 4 years of relative stability around 7 years. The cumulative capex for the period 2009-2013 are quite significant, amounting to €32M (117% of the 2008 gate-to-gate ANS revenues) and peaking at around €14M in 2010. Compared to ACE 2007, the investment plan has been revised upwards. By contrast capex invested between 2004 and 2008 amounted to €18M. Major capex projects in 2008 included:

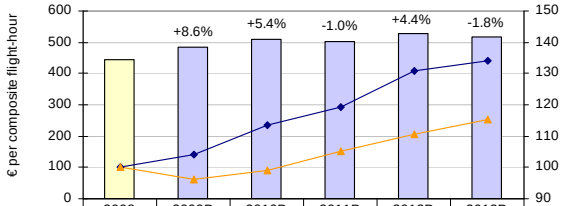
- Upgrades to FDP and RDP systems, including upgrades to safety nets (i.e. €0.6M, between 2007 and 2008); and
- New radars (i.e. €4.2M, between 2007 and 2008).

Investment projects for the period 2009-2013 mainly relate to:

- The future ACC building (including HQ) and TWR at Ljubljana (i.e. €23M, to be operational in 2011); and
- The commissioning of D-VOR equipments (i.e. €0.9M, delivered in 2009).

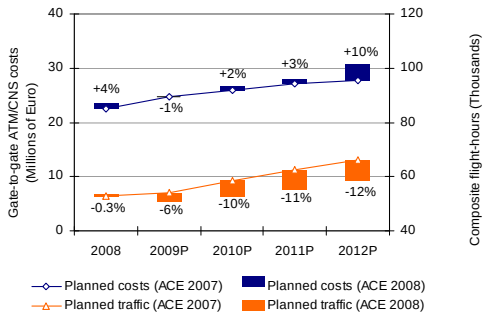
Between 2008 and 2013, traffic is expected to rise by +15%, while the total number of ATCOs in OPS is planned to remain stable. All else equal, this is expected to increase Slovenia Control's ATCO productivity, which is currently relatively low. The number of en-route sectors open at maximum configuration is planned to increase from 3 to 4 sectors in 2012, following the entry in operation of the new ACC.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

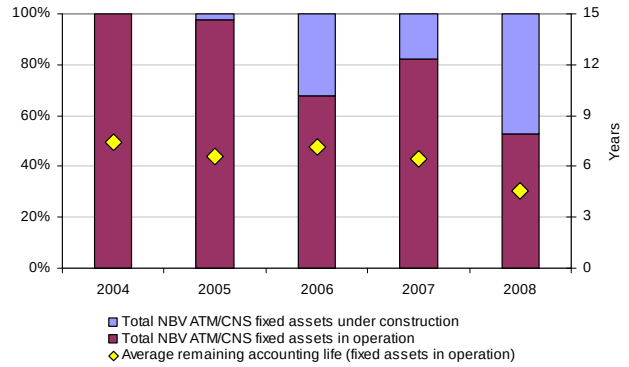


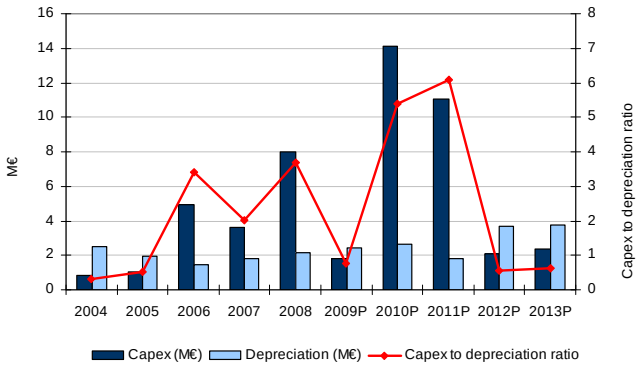
Slovenia Control

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	445	483	509	504	526	517
Gate-to-gate costs (index)	100	104	113	119	131	134
Composite flight-hours (index)	100	96	99	105	110	115

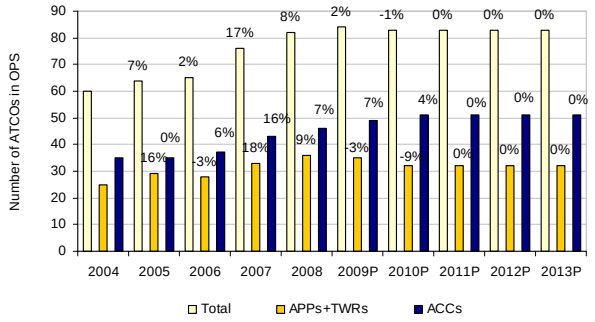


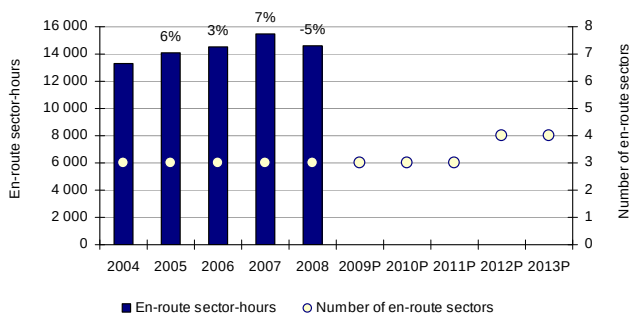
Assets structure and planned capital expenditure





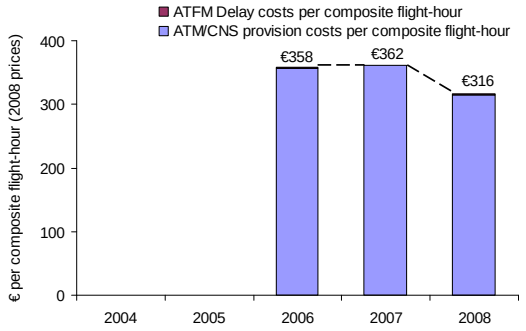
Planned staff and capacity data

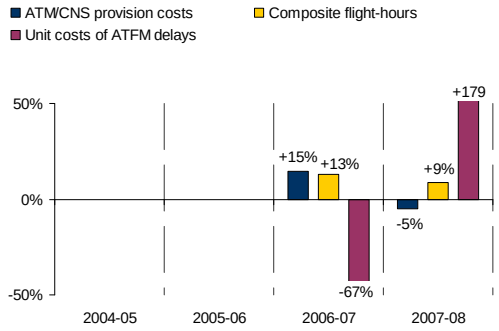




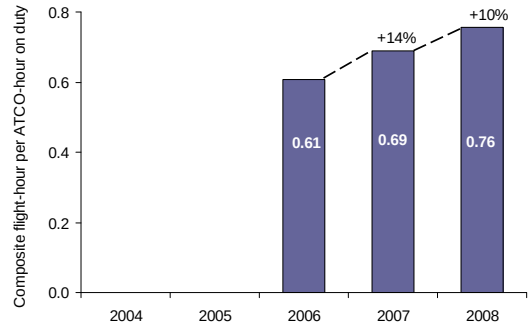
SMATSA (Serbia and Montenegro)

Trend in gate-to-gate economic cost-effectiveness

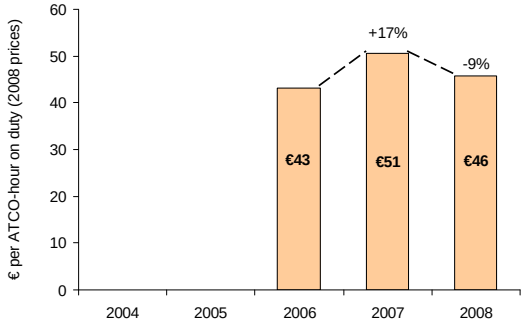




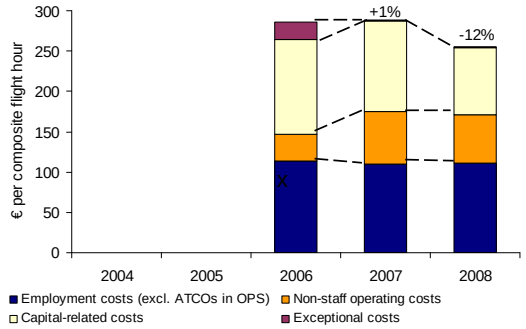
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

SMATSA is a medium-sized ANSP with costs amounting to 0.9% of the European total. As well as the airspace of Serbia and Montenegro, SMATSA also provides services in part of the airspace of Bosnia and Herzegovina.

Following the accession of Serbia and Montenegro to EUROCONTROL in July 2005, SMATSA has only been reporting data to ACE since 2006, so these comments only relate to the 2006-2008 period.

Traffic grew at by +23% in only two years. Traffic complexity in the airspace of Serbia and Montenegro is intermediate, but seasonality is among the highest in Europe.

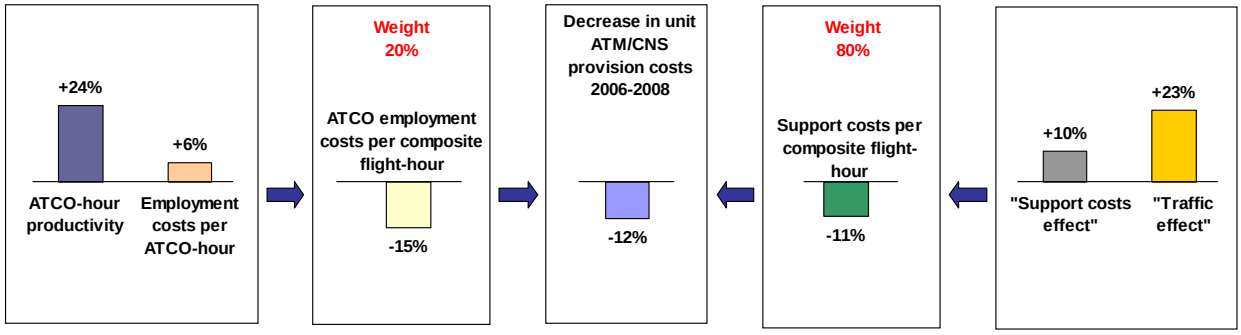
SMATSA's unit ATM/CNS costs are close to the bottom quartile, following a -12% reduction in 2008.

Delays are not to be a problem in Serbia and Montenegro and SMATSA has a policy of aiming for zero delay. The +179% increase in ATFM delays unit costs in 2008 is not relevant as it relates to minimal delays.

ATCO productivity rose by +24% in the period and is close to the European average, while employment costs per ATCO-hour rose by +6%, thus enabling a reduction in ATCO employment costs per unit of output by -15%. Unit support costs fell by -11% over the period, mainly due to significant reductions in capital related costs in 2008.

SMATSA shows lower unit costs than its neighbours ATSA Bulgaria and ROMATSA. This results both from its higher ATCO-hour productivity, and from unit support costs lower than ATSA Bulgaria and ROMATSA. Its employment costs per ATCO-hour are lower than ROMATSA's and similar to ATSA Bulgaria's.

Changes in financial cost-effectiveness



SMATSA (Serbia and Montenegro)

Comments on ANSP's forward-looking cost-effectiveness

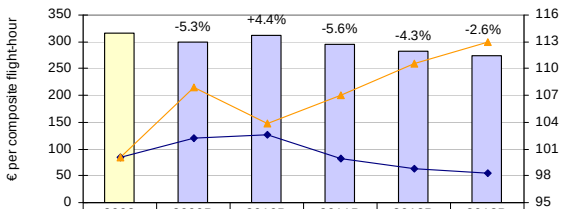
Gate-to-gate unit ATM/CNS costs are expected to fall by -13% between 2008 and 2013, an average annual decrease of -2.8%, as costs are planned to fall by -2% against an increase in traffic (+13%). This is a more optimistic outlook than the one presented in ACE 2007, which was projecting an annual average increase of +0.7% between 2007 and 2012. Compared to the ACE 2007 plans, SMATSA has significantly revised its planned costs downwards, more than the forecast traffic.

The average remaining accounting life of the fixed assets has been on a declining trend since 2006, and the share of fixed assets in construction has increased to 20% of the total fixed assets, in 2008. Nearly €24M were invested in 2008 in relation to major upgrades to the FDPS, RDS, and ATCO working position HMIs. The cumulative capex for the period 2009-2013 are quite significant as they amount to €74M (106% of the 2008 gate-to-gate ANS revenues). Compared to ACE 2007, the investment plan has been revised downwards. The main project for SMATSA is the modernisation of its ATM system (FAMUS). This project includes the following investments:

- A new ACC building in Belgrade (i.e. €16.5M, between 2009 and 2010);
- A new ATM System for Belgrade ACC and SMATSA communications network (i.e. €30M, between 2009 and 2011);
- NAVAIDs modernisation (i.e. €2M, between 2012 and 2013);
- DVRPSs for SMATSA towers (i.e. €1M, between 2012 and 2013;
- Investments in infrastructure (i.e. €10M, between 2012 and 2013); and
- Equipment replacement and modernization (i.e. €17M, between 2013 and 2013).

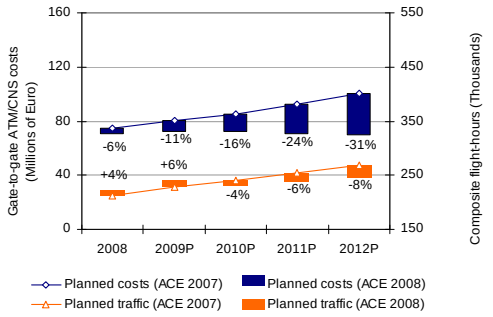
Between 2008 and 2013, the total number of ATCOs in OPS is expected to rise by +17%, slightly faster than the traffic (+13%), implying that, all else being equal, SMATSA's ATCO productivity is planned to slightly increase over the period. The number of en-route sectors open at maximum configuration is planned to gradually increase from 8 to 11 sectors in 2013.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

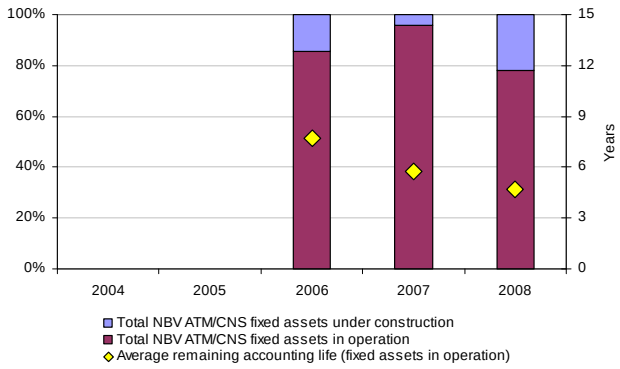


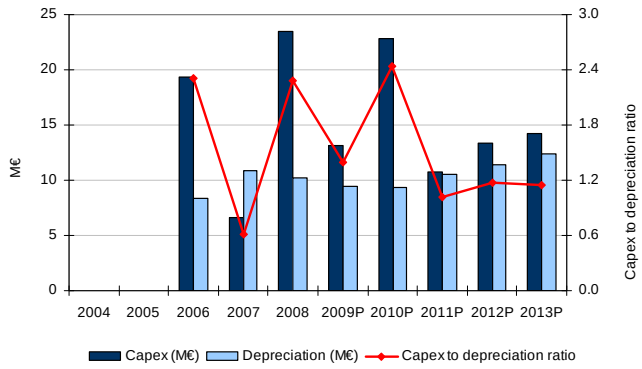
SMATSA

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	315	299	312	294	282	274
Gate-to-gate costs (index)	100	102	103	100	99	98
Composite flight-hours (index)	100	108	104	107	111	113

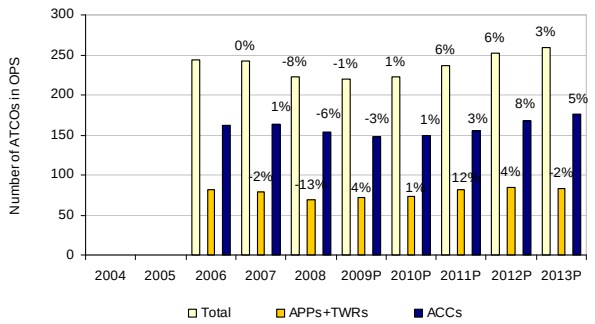


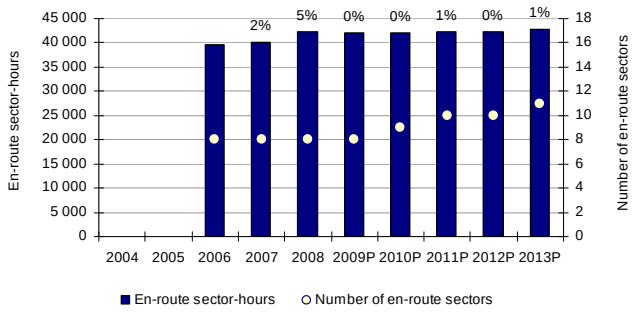
Assets structure and planned capital expenditure





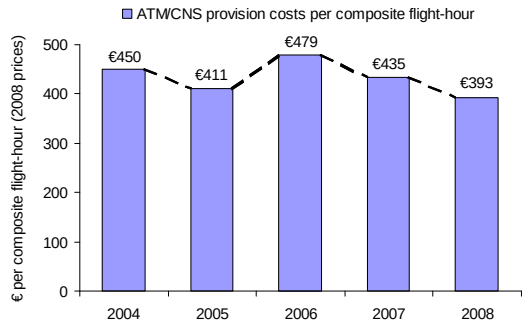
Planned staff and capacity data

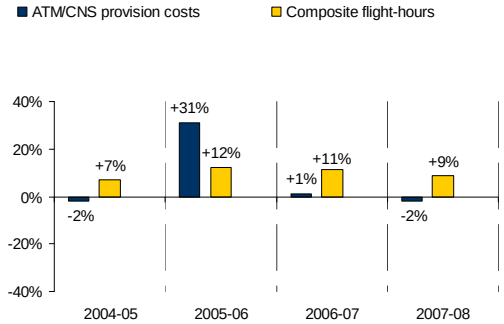




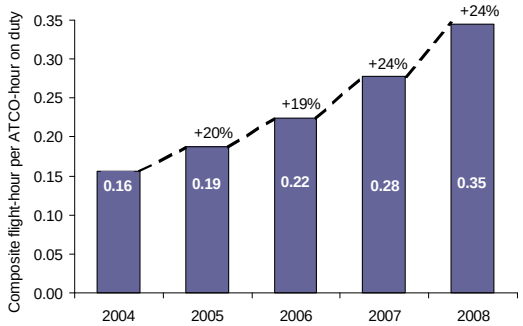
UkSATSE (Ukraine)

Trend in gate-to-gate economic cost-effectiveness

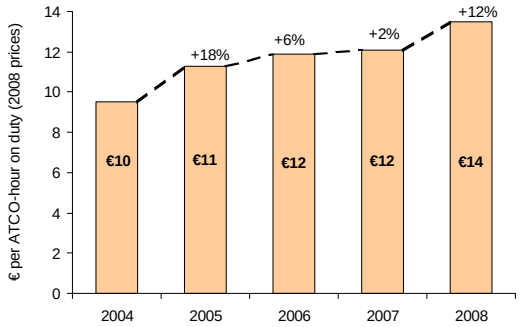




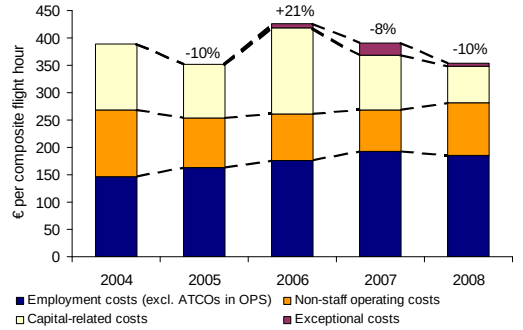
Trend in ATCO-hour productivity



Trend in employment costs per ATCO-hour



Trend in support costs per composite flight-hour



Assessment on ANSP performance

UkSATSE is a medium-sized ANSP with costs amounting to 2% of the European total.

Traffic has grown by +10% a year, on average, over the period. Traffic complexity in Ukraine is among the lowest in Europe.

Unit ATM/CNS costs varied widely from year to year, but declined by -13% over the period.

Capacity and ATFM delays are not a problem in UkSATSE.

Despite a +121% increase over the period, ATCO-hour productivity in UkSATSE is still the third lowest (behind MoldATSA and MK CAA) in Europe. Numbers of ATCOs were substantially reduced over the period, although it appears to be a major inconsistency in reporting between 2005 and 2006.

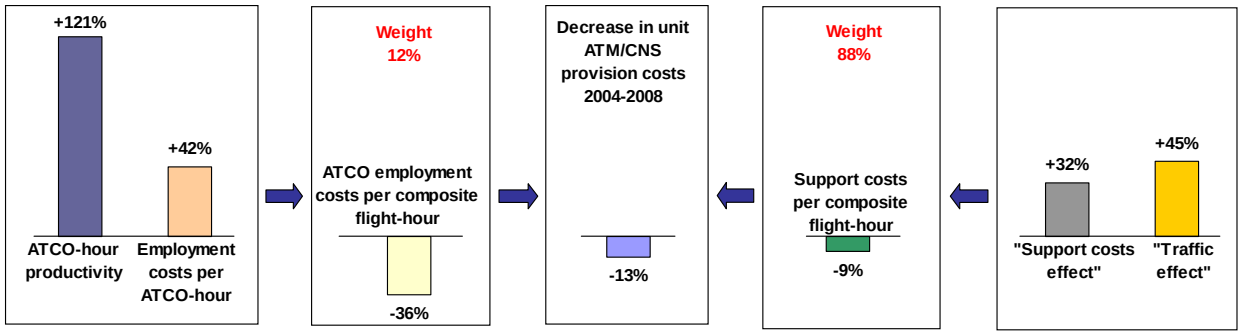
Employment costs per ATCO-hour have risen over the period (although the same reservations apply as to ATCO numbers), but the +42% rise was greatly surpassed by the increase in ATCO-hour productivity. Moreover, employment costs per ATCO-hour remains among the lowest in Europe.

Unit support costs fell over the period by -6%. 2006 unit support costs were affected by a major addition to capital-related costs, and exceptional costs were reported in 2007 and 2008 due to write-offs and provisions for bad debt. The level of UkSATSE's unit support costs is the 8th highest and not commensurate with prevailing low wage rates and cost of living.

UkSATSE has no problem with reporting data on time to ACE, but some issues exist regarding data consistency.

A noticeable feature of UkSTATSE is that a large amount of cash reserves have been accumulated and in 2008 its liquidity ratio (current assets to current liability) was among the highest in Europe (5.5 compared to an average ratio of 1.8).

Changes in financial cost-effectiveness



UkSATSE (Ukraine)

Comments on ANSP's forward-looking cost-effectiveness

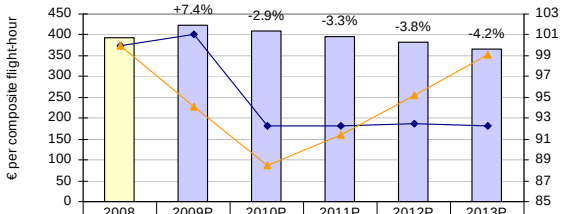
Gate-to-gate unit ATM/CNS costs are expected to fall by -7% between 2008 and 2013, an average annual decrease of -1.4% as costs are planned to fall by -8% while traffic volumes are expected to remain constant. The significant increase of unit costs in 2009 (+7.4%) suggests a lack of reactivity to adjust the cost base in line with the decrease in traffic in 2009 (-6%).

The average remaining accounting life of the fixed assets has been on a rising trend since 2006, and reached almost 9 years in 2008. The share of fixed assets under construction, although declining, still represents nearly 20% of the total fixed assets in 2008. Between 2004 and 2012, depreciation costs are constantly lower than capex (some 50% in some years). Although it is understood that ATM infrastructure modernisation in Ukraine is a large scale project, it also raises questions on the accuracy of data reported by UkSATSE. Capital expenditure in 2008 are among the lowest in the period, but 2009 seems to mark the start of a new investment cycle, with some €83M cumulative capex planned between 2009 and 2013 (52% of the gate-to-gate ANS revenues). The main capex projects for the period 2009-2013 include:

- 5 ATCR-33S radars (i.e. €25M, between 2007 and 2009);
- Building & equipment for RX centre in Dnipropetrovs'k (i.e. €2M, between 2008 and 2010);
- Building & equipment for ATM centre in L'viv (i.e. €10M, between 2009 and 2011);
- Building tower in Simferopol (i.e. €2M, between 2008 and 2009); and
- Upgrade of one en-route radar (i.e. €1.5M, between 2009 and 2010).

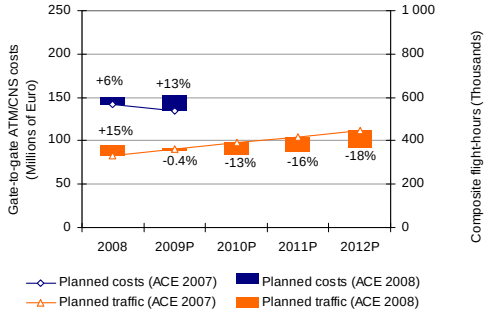
Between 2008 and 2013, the total number of ATCOs in OPS is planned to rise by +20%, a significantly high increase in absence of expected traffic increase. This implies that, all else being equal, UkSATSE's ATCO productivity, which is among the lowest, is planned to decrease substantially over the period.

Planned changes in gate-to-gate ATM/CNS provision costs per composite flight-hour

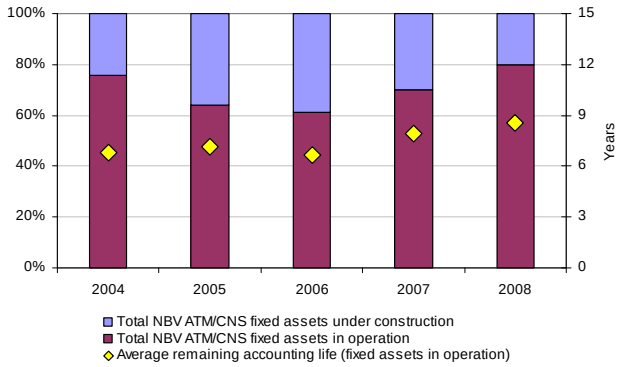


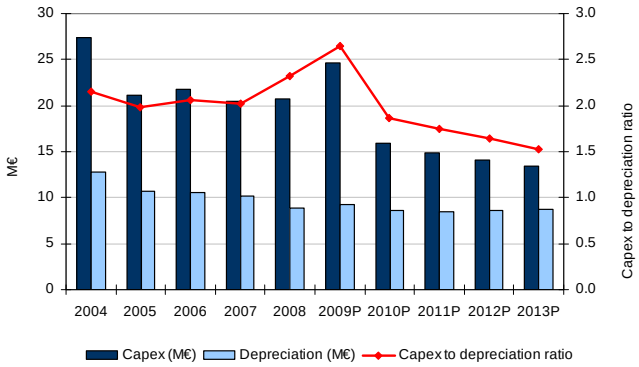
UkSATSE

	2008	2009P	2010P	2011P	2012P	2013P
Gate-to-gate unit ATM/CNS costs	393	422	410	396	381	365
Gate-to-gate costs (index)	100	101	92	92	92	92
Composite flight-hours (index)	100	94	88	91	95	99

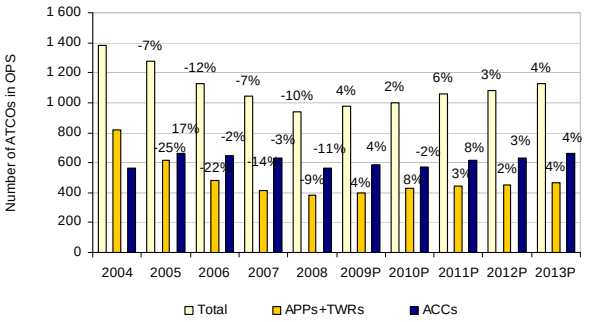


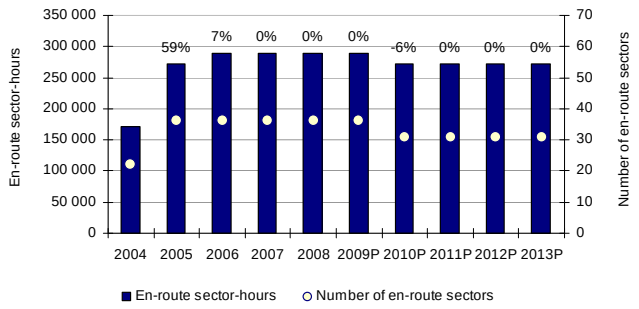
Assets structure and planned capital expenditure





Planned staff and capacity data





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ANNEX 1 – STATUS ON ANSPs YEAR 2008 ANNUAL REPORTS

	Availability of a public Annual Reports (AR)	Availability of Management Report	Availability of Annual Accounts	Independent audited accounts	Separate accounts for en-route and terminal ANS costs	Information provided in English	PRU comments
Aena	✔	✔	✔	✔	No	✔	Includes airport activities.
ANS CR	✔	✔	✔	✔	No	✔	
ATSA Bulgaria	✔	No	✔	✔	No	✔	
Austro Control	✔	✔	✔	✔	No	✔	
Avinor	✔	✔	✔	✔	No	✔	AR mainly in Norwegian, except a five-page summary in English.
Belgocontrol	✔	✔	✔	✔	No	No	Audit performed by the "Collège des Commissaires". No cash flow statement.
Croatia Control	✔	✔	✔	✔	No	✔	
DCAC Cyprus	No	No	No	No	No	No	
DFS	✔	✔	✔	✔	No	✔	Separate accounts are used for internal reporting purposes and charges calculation.
DHMİ	✔	✔	✔	✔	No	✔	
DSNA	✔	✔	✔	✔	No	✔	
EANS	✔	✔	✔	✔	No	✔	
ENAV	✔	✔	✔	✔	No	No	A document comprising a short summary of ENAV financial statements is available in English.
Finavia	✔	✔	✔	✔	No	✔	Detailed accounts only available for total Finavia.
HCAA	No	No	No	No	No	No	
HungaroControl	✔	✔	✔	✔	No	✔	
IAA	✔	✔	✔	✔	No	✔	
LFV/ANS Sweden	✔	✔	✔	✔	No	✔	Detailed accounts for total LFV.
LGS	✔	✔	✔	✔	No	✔	
LPS	✔	✔	✔	✔	No	✔	
LVNL	✔	✔	✔	✔	✔	✔	Separate Income Statement for en-route and terminal ANS
MATS	✔	✔	✔	✔	✔	✔	Separate Income Statement for en-route and terminal ANS.
MK CAA	No	No	✔	No	No	No	
MoldATSA	No	No	No	No	No	No	
MUAC	✔	✔	✔	✔	n/appl	✔	.
NATA Albania	✔	No	✔	✔	No	✔	
NATS	✔	✔	✔	✔	✔	✔	Several ARs for individual group companies.
NAV Portugal (FIR Lisboa)	✔	✔	✔	✔	No	✔	
NAVIAIR	✔	✔	✔	No	✔	No	
Oro Navigacija	✔	✔	✔	✔	No	✔	
PANSA	✔	✔	✔	✔	No	✔	
ROMATSA	✔	✔	✔	✔	No	✔	
Skyguide	✔	✔	✔	✔	✔	✔	Separate accounts for military OAT services.
Slovenia Control	✔	✔	✔	✔	No	✔	
SMATSA	No	No	✔	No	No	No	PRU received an extract of the financial statements comprising an Income, a Balance Sheet and a Cash Flow statements.
UkSATSE	No	No	No	No	No	No	

Annex 1 - Table 0.1: Status on ANSP's 2008 Annual Reports

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ANNEX 2 - PERFORMANCE INDICATORS USED FOR THE COMPARISON OF ANSPs

The output measures for ANS provision are, for en-route, the en-route flight-hours controlled[92] and, for terminal ANS, the number of IFR airport movements controlled. Those output measures can be derived from the EUROCONTROL database and therefore readily available and consistent across the ANSPs included in the analysis.

In addition to those output metrics, it is important to consider a "gate-to-gate" perspective, because the boundaries used to allocate costs between en-route and terminal ANS vary between ANSPs and might introduce a bias in the cost-effectiveness analysis[93].

For this reason, an indicator combining the two separate output measures for en-route and terminal ANS provision has been calculated. The "composite gate-to-gate flight-hours" are determined by weighting the output measures by their respective average cost of the service for the whole European system. This average weighting factor is based on the total monetary value of the outputs over the period 2002-2008 and amounts to 0.26.

The composite gate-to-gate flight-hours are consequently defined as:

Composite gate-to-gate flight-hours	=	En-route flight-hours	+	(0.26 x IFR airport movements)

In the ACE 2001-2006 Reports, two different weighting factors were used to compute ANSPs cost-effectiveness: one for the year under study and another to examine changes in performance across time. As the ACE data sample became larger in terms of years, the difference between these two weighting factors became insignificant. For the sake of simplicity, it was therefore proposed in the ACE 2007 Benchmarking Report to use only one weighting factor to analyse ANSPs performance for the year and to examine historical changes in cost-effectiveness.

Although the composite gate-to-gate output metric does not fully reflect all aspects of the complexity of the services provided, it is nevertheless the best metric currently available for the analysis of gate-to-gate cost-effectiveness[94].

[92] Controlled flight-hours are calculated by the CFMU as the difference between the exit time and entry time of any given flight in the controlled airspace of an operational unit. Three types of flight-hours are currently computed by the CFMU (filed model, regulated model and current model). The data used for the cost-effectiveness analysis is based on the current model (Model III or CFTM) and includes flight-hours controlled in the ACC, APP and FIS operational units which are described in the CFMU environment.

[93] See also working paper on "*Cost-effectiveness and Productivity Key Performance Indicators*", available on the PRC web site at www.eurocontrol.int/prc.

[94] Further details on the theoretical background to producing composite indicators can be found in a working paper on "Productivity of European ANSPs: basic concepts and application" (Sept. 2003).

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ANNEX 3 – TRAFFIC COMPLEXITY INDICATORS AT ANSP LEVEL

ANSPs	[1] Adjusted density	[2] Vertical interactions	[3] Horizontal interactions	[4] Speed interactions	[5] = [2]+[3]+[4] Structural complexity indicator	[6] = [1]x[5] Aggregated complexity score
Aena	5.91	0.19	0.40	0.13	0.73	4.29
ANS CR	7.18	0.21	0.53	0.23	0.97	6.96
ATSA Bulgaria	6.20	0.05	0.24	0.06	0.35	2.18
Austro Control	8.33	0.24	0.49	0.23	0.97	8.05
Avinor	2.19	0.37	0.49	0.25	1.11	2.43
Belgocontrol	9.85	0.44	0.54	0.42	1.39	13.72
Croatia Control	5.29	0.07	0.49	0.09	0.65	3.43
DCAC Cyprus	3.77	0.15	0.39	0.09	0.63	2.38
DFS	10.73	0.31	0.54	0.25	1.09	11.72
DHMI	4.46	0.15	0.38	0.11	0.64	2.86
DSNA	9.43	0.16	0.39	0.14	0.70	6.60
EANS	3.35	0.15	0.28	0.17	0.60	2.01
ENAV	5.62	0.29	0.55	0.22	1.06	5.94
Finavia	2.30	0.27	0.32	0.33	0.92	2.11
HCAA	3.74	0.13	0.37	0.10	0.60	2.25
HungaroControl	7.13	0.09	0.44	0.13	0.66	4.70
IAA	4.89	0.10	0.22	0.09	0.41	1.99
LFV/ANS Sweden	3.91	0.21	0.45	0.23	0.89	3.47
LGS	3.06	0.10	0.43	0.15	0.68	2.08
LPS	4.94	0.17	0.51	0.19	0.88	4.34
LVNL	9.98	0.25	0.37	0.32	0.94	9.39
MATS	1.03	0.12	0.35	0.11	0.58	0.60
MK CAA	4.84	0.11	0.42	0.09	0.62	3.02
MoldATSA	0.98	0.10	0.45	0.16	0.71	0.70
MUAC	10.76	0.26	0.51	0.16	0.93	10.00
NATA Albania	3.99	0.06	0.33	0.05	0.44	1.77
NATS	11.61	0.40	0.42	0.28	1.10	12.77
NAV Portugal (FIR Lisboa)	3.77	0.16	0.40	0.07	0.63	2.38
NAVIAIR	4.06	0.18	0.54	0.20	0.92	3.73
Oro Navigacija	2.69	0.12	0.45	0.17	0.73	1.98
PANSA	3.87	0.14	0.53	0.22	0.88	3.40
ROMATSA	4.98	0.07	0.35	0.12	0.54	2.69
Skyguide	11.52	0.30	0.56	0.22	1.08	12.44
Slovenia Control	5.70	0.17	0.50	0.17	0.83	4.75
SMATSA	8.16	0.05	0.45	0.07	0.58	4.71
UkSATSE	2.73	0.06	0.37	0.16	0.58	1.60
Average	7.35	0.24	0.45	0.19	0.88	6.44

Annex 3 - Table 0.1: Traffic complexity indicators at ANSP level, 2008

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ANNEX 4 – COST OF CAPITAL REPORTED BY ANSPs

ANSPs	Comments
Aena	An average rate of 5.1% is applied on the average value of capital employed.
ANS CR	Gross cost of capital computed as the product of an average rate of 5.7% and an asset base comprising the NBV of fixed assets and a part of the working capital.
ATSA Bulgaria	Corresponds to the product of the total capital employed and an average rate of 6%.
Austro Control	Product of the NBV of fixed assets (without the land and financial assets) with an average rate of 4.2%.
Avinor	Product of the NBV of tangible fixed with an average rate of 8%.
Belgocontrol	Gross cost of capital which comprises the financial cost of debt and the product of the yearly average Belgian OLO rate (linear bonds, 3.98%) and the NBV fixed assets less the borrowings.
Croatia Control	Corresponds to the product of the asset base and an average rate of 5.5%.
DCAC Cyprus	Not available.
DFS	Computed as the product of an average rate of 5.9% and an asset base comprising the NBV of fixed assets in operation and the net working capital.
DHMİ	Computed as the product of an average rate of 8.5% and an asset base comprising the total NBV of fixed assets and the working capital net of provision for over/under recovery.
DSNA	Corresponds to the product of an asset base and an average rate of 4.1%.
EANS	Net cost of capital which is computed as the sum of the cost of equity (8% required return on equity) and the cost of debt.
ENAV	Gross cost of capital computed as the product of an average rate of 3.7% and an asset base comprising the NBV of fixed assets and current assets.
Finavia	Gross cost of capital computed as the product of an average rate of 4.6% and an asset base comprising the NBV of fixed assets and current assets.
MK CAA	Cost of capital computed as the product of an average rate of 7.7% and an asset base comprising the NBV of fixed.
HCAA	Calculated as the product of the average long term assets and a weighted average rate of 2.24%.
HungaroControl	Gross cost of capital calculated using an average interest rate (i.e. 8.7%) applied to the annual average NBV of fixed assets in operation.
IAA	Computed by multiplying an average rate of 7.0% by the average fixed assets in operation
LFV/ANS Sweden	Product of the average value of fixed assets and net current assets with an average rate of 4.3%.
LGS	Gross cost of capital computed as the product of an average rate of 6.8% and an asset base comprising the NBV of fixed assets and current assets.
LPS	Corresponds to the product of an asset base comprising the NBV of fixed assets and current assets with an average rate of 8.7%.
LVNL	Net financial cost of capital. Do not comprise the cost of equity.
MATS	Corresponds to the product of asset base comprising the NBV of total fixed assets and net current assets with an average rate of 2.6%.
MoldATSA	Cost of capital computed as the product of an average rate of 25.5% and an asset base comprising the NBV of fixed assets in operation.
MUAC	Product of the actual interest paid by EUROCONTROL to the banks with the proportion of EUROCONTROL NBV assets belonging to MUAC.
NATA Albania	Computed as the product of the NBV of total fixed assets and an average rate of 4%.

NATS	Economic cost of capital computed as the product of the regulatory rate of return (6.53%) with the regulatory asset base for en-route ANS and with the capital employed for terminal ANS.
NAV Portugal (FIR Lisboa)	Gross cost of capital computed as the product of an average rate of 7.98% and an asset base comprising the NBV of fixed assets and current assets.
NAVIAIR	Cost of capital computed as the product of an average rate of 5% and an asset base comprising the NBV of fixed assets and current assets.
Oro Navigacija	Cost of capital computed as the product of an average rate of 6.3% and an asset base comprising the NBV of fixed assets and current assets.
PANSA	Gross cost of capital computed by multiplying an average rate of 5.8% with NBV of fixed assets in operation.
ROMATSA	Corresponds to the sum of the cost of debt and the cost of equity (8% applied to equity).
Skyguide	Corresponds to the product of the average book value of fixed assets and an average rate of 3.0%.
Slovenia Control	Corresponds to the product of an average rate of 4% and an asset base comprising the average fixed assets and net current assets.
SMATSA	Corresponds to the product of an asset base comprising the NBV of fixed assets and net current assets with an average rate of 12.3%.
UkSATSE	Computed on the average net book value of the total capital employed.

Annex 4 - Table 0.1: Comments on cost of capital reported by ANSPs, 2008

ANNEX 5 – EXCHANGE RATES, INFLATION RATES AND PURCHASING POWER PARITIES (PPPs) 2008 DATA

ANSPs	Countries	2008 Exchange rate (1 € =)	2008 Inflation rates (%)	2008 PPPs	Comments
Aena	Spain	1.0	4.1	0.93	
ANS CR	Czech Republic	24.9	6.3	17.55	
ATSA Bulgaria	Bulgaria	2.0	12.0	11.32	
Austro Control	Austria	1.0	3.2	0.85	
Avinor	Norway	8.2	3.8	1.09	
Belgocontrol	Belgium	1.0	4.5	11.13	
Croatia Control	Croatia	7.2	6.1	1.12	
DCAC Cyprus	Cyprus	1.0	4.4	4.98	
DFS	Germany	1.0	2.8	0.90	
DHMI	Turkey	1.9	10.4	1.05	
DSNA	France	1.0	3.2	1.17	
EANS	Estonia	15.6	10.4	1.12	
ENAV	Italia	1.0	3.5	11.10	
Finavia	Finland	1.0	3.9	1.03	
HCAA	Greece	1.0	4.2	1.18	
HungaroControl	Hungary	251.1	6.1	23.86	
IAA	Ireland	1.0	3.1	0.90	
LFV/ANS Sweden	Sweden	9.6	3.3	163.81	
LGS	Latvia	0.7	15.3	1.21	
LPS	Slovak Republic	1.0	3.9	0.50	Adjustment made on Euros since EUROSTAT PPPs for Slovak Republic are based on the Euro and not on the SKK
LVNL	Netherlands	1.0	2.2	0.69	
MATS	Malta	1.0	4.7	1.08	
MK CAA	F.Y.R. Macedonia	61.2	8.3	0.72	
MoldATSA	Moldova	15.2	12.7	7.24	PPPs from IMF database
MUAC		1.0	2.2	1.08	Netherlands PPPs and inflation rate used for MUAC
NATA Albania	Albania	122.2	3.4	52.94	
NATS	United Kingdom	0.8	3.6	0.81	
NAV Portugal (FIR Lisboa)	Portugal	1.0	2.6	0.82	
NAVIAIR	Denmark	7.5	3.4	10.51	
Oro Navigacija	Lithuania	3.5	11.1	2.13	
PANSA	Poland	3.5	4.2	2.36	
ROMATSA	Romania	3.7	7.8	1.99	
Skyguide	Switzerland	1.6	2.4	2.01	
Slovenia Control	Slovenia	1.0	5.7	41.04	
SMATSA	Serbia and Montenegro	82.0	11.7	0.81	Data for Serbia only since ACE data is provided in Serbian Dinar
UkSATSE	Ukraine	7.7	25.2	3.46	PPPs from IMF database

Annex 5 - Table 0.1: 2008 Exchange rates, inflation rates and PPPs data

Presentation and comparison of historical series of financial data from different countries poses problems, especially when different currencies are involved, and inflation rates differ. There is a danger that time-series comparisons can be distorted by transient variations in exchange rates.

For this reason, the following approach has been adopted in this Report for allowing for inflation and exchange rate variation. The financial elements of performance are assessed, for each year, in national currency. They are then converted to national currency in 2008 prices using national inflation rates. Finally, for comparison purposes in 2008, all national currencies are converted to Euros using the 2008 exchange rate.

This approach has the virtue that an ANSP's performance time series is not distorted by transient changes in exchange rates over the period. It does mean, however, that the performance figures for any ANSP in a given year prior to 2008 are not the same as the figures in that year's ACE report, and cannot legitimately be compared with another ANSP's figures for the same year. Cross-sectional comparison using the figures in this report is only appropriate for 2008 data.

The exchange rates used in this Report to convert the 2008 data in Euros are those provided by the ANSPs in their ACE data submission.

The historical inflation figures used in this analysis were obtained from the International Monetary Fund (http://www.imf.org/external/pubs/ft/weo/2010/01/weodata/index.aspx). For the projections (2009-2013), the ANSPs' own assumptions concerning inflation rates were used.

Purchasing Power Parities (PPPs) are currency conversion rates that are applied to convert economic indicators in national currency to an artificial common currency (Purchasing Power Standard (PPS) for EUROSTAT statistics). The PPPs data used to adjust most of the ANSPs employment costs in Chapter 5 of this report was extracted from EUROSTAT (http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home).

For two countries (Moldova and Ukraine), PPP data was not available in the EUROSTAT database. In these cases, the IMF database was used. Since in the IMF database, the PPPs are expressed in local currency per **international Dollar** rather than **PPS**, an adjustment has been made so that the figures used for MoldATSA and UkSATSE are as consistent as possible with the data used for the rest of the ANSPs. The assumption underlying this adjustment is that the difference in PPPs between two countries shall be the same in the EUROSTAT and in the IMF databases.

According to the IMF database, there is a factor of 3.08 between the PPPs for Ukraine (2.816 UAH per international dollar in 2008) and the PPPs for France (0.915 Euro per international Dollar). This factor is applied to the PPPs for France as disclosed in the EUROSTAT database (i.e. 1.12) to express the PPPs for Ukraine in PPS (3.46 = 1.12 × 3.08). A similar methodology is used to express Moldova PPPs in PPS.

ANNEX 6 - KEY DATA

ANSPs	En-route ANS revenues (in €'000)									
	Income from charges	Income for airport operator	Income received from other States for delegation of ANS	Income from the military	Income in respect of exempted flights	Other income from domestic government	Financial income	Other income	Exceptional revenue item	**Total revenues**
Aena	829 629	0	0	0	15 402	6 071	1 339	2 881	0	855 322
ANS CR	89 461	0	0	0	2 657	575	1 433	0	66	94 194
ATSA Bulgaria	79 856	0	0	0	502	0	0	0	0	80 358
Austro Control	154 192	0	0	0	474	2 033	444	0	0	157 143
Avinor	98 011	0	0	0	0	0	0	0	0	98 011
Belgocontrol	158 093	0	0	0	0	7 361	2 583	4 246	3	172 287
Croatia Control	53 809	0	5 429	0	0	0	0	0	0	59 239
DCAC Cyprus	43 850	0	0	0	0	0	0	0	0	43 850
DFS	649 924	0	0	0	0	0	39 323	0	0	689 247
DHMI	193 659	0	0	0	7 518	1 551	0	0	0	202 728
DSNA	1 042 797	0	0	0	18 563	0	0	2 654	0	1 064 015
EANS	14 258	0	0	0	0	0	0	0	0	14 258
ENAV	541 488	0	0	0	16 765	28 920	4 411	16 481	1 847	609 911
Finavia	31 556	0	0	314	0	440	0	70	0	32 380
HCAA	185 210	0	0	0	0	0	0	0	0	185 210
HungaroControl	69 222	0	0	0	0	115	5 459	0	0	74 796
IAA	105 026	0	0	0	2 110	0	76	0	0	107 212
LFV/ANS Sweden	148 346	0	909	0	411	0	145	0	0	149 810
LGS	16 783	0	0	0	0	0	34	255	0	17 072
LPS	38 884	0	0	680	794	208	281	459	0	41 305
LVNL	101 667	0	0	0	2 131	0	67	2 303	52 698	158 866
MATS	10 820	0	0	0	349	0	0	0	0	11 169
MK CAA	10 787	0	0	0	0	0	0	0	0	10 787
MoldATSA	5 357	0	0	0	10	20	486	0	0	5 874
MUAC	0	0	374 000	0	0	0	0	0	0	374 000
NATA Albania	14 324	0	0	0	0	0	1 878	2 056	0	18 258
NATS	618 311	0	0	0	0	0	5 432	0	6 385	630 128
NAV Portugal (FIR Lisboa)	122 627	0	0	0	0	1 018	0	0	0	123 645
NAVIAIR	86 679	0	0	0	2 091	0	141	0	0	88 910
Oro navigacija	18 943	0	0	100	82	0	682	160	0	19 967
PANSA	142 200	0	0	0	773	17	4 672	1 367	0	149 029
ROMATSA	129 549	0	0	0	4 286	1 154	11 182	8 925	0	155 096
Skyguide	104 905	0	36 548	0	0	2 454	-8 229	0	0	135 678
Slovenia Control	20 531	0	0	0	148	0	14	157	2 272	23 122
SMATSA	53 765	0	4 454	0	0	0	6 364	0	0	64 583
UkSATSE	137 420	0	0	0	0	0	0	0	0	137 420

ANSPs	Terminal ANS revenues (in €'000)									
	Income from charges	Income for airport operator	Income received from other States for delegation of ANS	Income from the military	Income in respect of exempted flights	Other income from domestic government	Financial income	Other income	Exceptional revenue item	**Total revenues**
Aena	203 248	0	0	0	0	0	322	2 167	0	205 737
ANS CR	27 382	0	0	0	346	0	703	0	33	28 464
ATSA Bulgaria	5 659	0	0	0	0	0	3 874	166	0	9 699
Austro Control	36 025	0	0	0	0	0	392	0	0	36 417
Avinor	0	77 299	0	0	0	0	0	1 203	0	78 502
Belgocontrol	29 842	59	0	0	0	0	776	1 533	1	32 210
Croatia Control	5 395	0	0	0	0	0	0	0	0	5 395
DCAC Cyprus	0	11 466	0	0	0	0	0	0	0	11 466
DFS	194 048	0	0	0	0	0	12 184	0	0	206 233
DHMI	99 838	0	0	0	0	0	0	0	0	99 838
DSNA	217 186	0	0	0	41 831	0	0	2 654	0	261 672
EANS	1 357	0	0	0	0	0	0	0	0	1 357
ENAV	39 214	0	0	0	25 597	38 488	946	3 837	411	108 493
Finavia	18 085	0	0	0	0	336	0	3 395	0	21 816
HCAA	0	0	0	0	0	0	0	0	0	0
HungaroControl	10 919	428	0	0	0	0	1 047	0	0	12 394
IAA	22 661	0	0	0	0	0	58	0	0	22 719
LFV/ANS Sweden	0	23 958	0	0	0	0	0	0	0	23 958
LGS	2 766	0	0	0	0	0	6	41	0	2 813
LPS	6 869	0	0	0	203	0	47	76	0	7 195
LVNL	49 973	0	0	0	0	0	77	6 932	0	56 982
MATS	0	1 290	0	0	0	2 080	113	0	0	3 483
MK CAA	730	379	0	27	0	0	39	0	1 827	3 002
MoldATSA	1 635	0	0	0	0	0	0	0	0	1 635
MUAC	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl
NATA Albania	1 118	0	0	0	0	0	163	179	0	1 460
NATS	10 097	166 284	0	0	0	0	1 534	0	52 102	230 016
NAV Portugal (FIR Lisboa)	28 429	0	0	0	0	0	0	749	0	29 178
NAVIAIR	29 698	3 010	0	0	0	0	34	23	0	32 764
Oro navigacija	3 509	0	0	21	167	0	126	33	0	3 856
PANSA	29 108	0	0	0	469	0	960	281	0	30 818
ROMATSA	20 038	0	0	0	0	0	15	1 463	0	21 516
Skyguide	62 873	0	0	0	0	0	-3 452	0	0	59 420
Slovenia Control	3 235	93	0	207	78	0	2	1	248	3 864
SMATSA	4 056	0	0	0	0	0	552	500	459	5 568
UkSATSE	22 761	0	0	0	0	0	0	0	0	22 761

ANSPs	Gate-to-gate ANS revenues (in €'000)									
	Income from charges	Income for airport operator	Income received from other States for delegation of ANS	Income from the military	Income in respect of exempted flights	Other income from domestic government	Financial income	Other income	Exceptional revenue item	**Total revenues**
Aena	1 032 877	0	0	0	15 402	6 071	1 661	5 047	0	1 061 059
ANS CR	116 844	0	0	0	3 003	575	2 136	0	100	122 658
ATSA Bulgaria	85 515	0	0	0	502	0	3 874	166	0	90 057
Austro Control	190 217	0	0	0	474	2 033	836	0	0	193 560
Avinor	98 011	77 299	0	0	0	0	0	1 203	0	176 513
Belgocontrol	187 935	59	0	0	0	7 361	3 359	5 779	4	204 497
Croatia Control	59 204	0	5 429	0	0	0	0	0	0	64 634
DCAC Cyprus	43 850	11 466	0	0	0	0	0	0	0	55 316
DFS	843 972	0	0	0	0	0	51 507	0	0	895 479
DHMI	293 497	0	0	0	7 518	1 551	0	0	0	302 566
DSNA	1 259 983	0	0	0	60 395	0	0	5 309	0	1 325 686
EANS	15 615	0	0	0	0	0	0	0	0	15 615
ENAV	580 702	0	0	0	42 362	67 408	5 357	20 317	2 258	718 404
Finavia	49 641	0	0	314	0	776	0	3 465	0	54 196
HCAA	185 210	0	0	0	0	0	0	0	0	185 210
HungaroControl	80 142	428	0	0	0	115	6 505	0	0	87 189
IAA	127 687	0	0	0	2 110	0	134	0	0	129 932
LFV/ANS Sweden	148 346	23 958	909	0	411	0	145	0	0	173 768
LGS	19 549	0	0	0	0	0	40	296	0	19 885
LPS	45 753	0	0	680	997	208	328	535	0	48 501
LVNL	151 640	0	0	0	2 131	0	144	9 235	52 698	215 848
MATS	10 820	1 290	0	0	349	2 080	113	0	0	14 652
MK CAA	11 517	379	0	27	0	0	39	0	1 827	13 789
MoldATSA	6 992	0	0	0	10	20	486	0	0	7 509
MUAC	0	0	374 000	0	0	0	0	0	0	374 000
NATA Albania	15 442	0	0	0	0	0	2 042	2 235	0	19 718
NATS	628 408	166 284	0	0	0	0	6 965	0	58 487	860 144
NAV Portugal (FIR Lisboa)	151 056	0	0	0	0	1 018	0	749	0	152 823
NAVIAIR	116 377	3 010	0	0	2 091	0	174	23	0	121 675
Oro navigacija	22 453	0	0	121	249	0	808	193	0	23 823
PANSA	171 308	0	0	0	1 242	17	5 632	1 648	0	179 847
ROMATSA	149 587	0	0	0	4 286	1 154	11 197	10 388	0	176 611
Skyguide	167 777	0	36 548	0	0	2 454	-11 681	0	0	195 098
Slovenia Control	23 766	93	0	207	226	0	16	158	2 519	26 986
SMATSA	57 821	0	4 454	0	0	0	6 916	500	459	70 150
UkSATSE	160 180	0	0	0	0	0	0	0	0	160 180

Annex 6 - Table 0.1: Breakdown of total ANS revenues (en-route, terminal and gate-to-gate), 2008

ANSPs	En-route ANS costs (in €'000)								Terminal ANS costs (in €'000)								Gate-to-gate ANS costs (in €'000)							
	ATM/CNS provision costs	MET costs	Payment for regulatory and supervisory services	Payment ot the State for provision of other services	Eurocontrol costs	Payments for delegation of ANS	Irrecoverable value added tax (VAT)	**Total costs**	ATM/CNS provision costs	MET costs	Payment for regulatory and supervisory services	Payment ot the State for provision of other services	Eurocontrol costs	Payments for delegation of ANS	Irrecoverable value added tax (VAT)	**Total costs**	ATM/CNS provision costs	MET costs	Payment for regulatory and supervisory services	Payment ot the State for provision of other services	Eurocontrol costs	Payments for delegation of ANS	Irrecoverable value added tax (VAT)	**Total costs**
Aena	811 381	33 758	7 173	6 039	58 998	0	0	917 350	402 401	0	0	0	0	0	0	402 401	1 213 782	33 758	7 173	6 039	58 998	0	0	1 319 750
ANS CR	90 459	1 663	0	0	5 752	939	0	98 814	27 252	798	0	0	0	0	0	28 050	117 711	2 461	0	0	5 752	939	0	126 863
ATSA Bulgaria	66 504	5 675	793	0	4 866	0	181	78 019	9 378	1 537	448	0	0	0	18	11 381	75 881	7 213	1 241	0	4 866	0	199	89 400
Austro Control	136 576	16 050	0	0	11 911	0	0	164 537	32 675	3 302	0	0	0	0	0	35 977	169 251	19 352	0	0	11 911	0	0	200 514
Avinor	83 544	1 403	538	0	7 745	0	0	93 230	86 033	1 079	409	0	0	0	0	87 522	169 578	2 482	947	0	7 745	0	0	180 752
Belgocontrol	111 329	8 881	726	0	13 565	37 950	0	172 451	37 730	3 944	247	0	0	0	0	41 920	149 059	12 825	973	0	13 565	37 950	0	214 371
Croatia Control	55 713	2 702	0	0	3 630	612	0	62 657	5 779	0	0	0	0	0	0	5 779	61 491	2 702	0	0	3 630	612	0	68 435
DCAC Cyprus	32 217	3 097	2 426	0	2 337	0	0	40 077	6 316	540	414	0	0	0	0	7 270	38 533	3 637	2 840	0	2 337	0	0	47 347
DFS	646 362	32 853	0	0	0	0	0	679 215	177 183	8 879	846	846	0	0	0	187 754	823 544	41 732	846	846	0	0	0	866 969
DHMI	181 464	16 275	6 289	0	15 016	0	0	219 044	55 572	0	0	0	0	0	0	55 572	237 036	16 275	6 289	0	15 016	0	0	274 616
DSNA	884 230	63 301	9 831	0	84 787	42 917	0	1 085 066	241 140	18 885	2 319	0	0	0	0	262 345	1 125 370	82 186	12 151	0	84 787	42 917	0	1 347 411
EANS	8 705	42	0	0	0	0	0	8 747	2 022	141	0	0	0	0	0	2 164	10 727	183	0	0	0	0	0	10 910
ENAV	531 220	47 741	0	0	53 667	919	0	633 546	121 194	4 875	0	0	0	0	0	126 068	652 414	52 615	0	0	53 667	919	0	759 614
Finavia	24 612	1 050	271	0	3 736	236	0	29 905	30 507	3 800	752	0	0	0	0	35 059	55 119	4 850	1 023	0	3 736	236	0	64 964
HCAA	153 231	10 385	3 274	0	13 312	0	0	180 202	31 619	1 768	0	0	0	0	0	33 387	184 850	12 153	3 274	0	13 312	0	0	213 589
HungaroControl	54 749	1 250	1 195	0	5 121	672	0	62 986	18 882	1 382	0	0	0	0	0	20 264	73 631	2 631	1 195	0	5 121	672	0	83 250
IAA	91 781	6 440	1 543	1 497	7 382	0	0	108 643	20 751	1 610	201	336	0	0	0	22 898	112 531	8 050	1 744	1 833	7 382	0	0	131 541
LFV/ANS Sweden	135 847	6 834	318	0	0	0	0	142 999	27 253	0	102	0	0	0	0	27 355	163 100	6 834	420	0	0	0	0	170 354
LGS	14 460	1 204	1 863	0	0	0	0	17 527	5 643	181	583	0	0	0	0	6 407	20 103	1 384	2 446	0	0	0	0	23 933
LPS	36 161	700	0	0	2 505	588	0	39 953	6 665	308	0	0	0	0	0	6 973	42 825	1 008	0	0	2 505	588	0	46 926
LVNL	109 239	9 602	1 165	0	14 500	31 780	6 533	172 819	52 730	0	0	0	0	0	2 606	55 336	161 969	9 602	1 165	0	14 500	31 780	9 139	228 155
MATS	9 719	674	0	0	789	0	0	11 182	2 988	158	0	0	0	0	0	3 146	12 707	832	0	0	789	0	0	14 328
MK CAA	9 165	386	0	0	668	0	0	10 219	2 693	129	0	0	0	0	0	2 822	11 858	515	0	0	668	0	0	13 041
MoldATSA	4 366	682	120	0	190	0	0	5 357	1 386	216	33	0	0	0	0	1 635	5 752	897	152	0	190	0	0	6 992
MUAC	128 429		0	0	0	0	5	128 434	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	128 429	0	0	0	0	0	5	128 434
NATA Albania	12 748	191	358	0	796	0	376	14 469	1 720	64	0	0	0	0	4	1 787	14 468	255	358	0	796	0	380	16 256
NATS	572 425	225	4 740	0	0	0	0	577 391	153 526	107	3 187	0	0	0	0	156 820	725 952	333	7 927	0	0	0	0	734 211
NAV Portugal (FIR Lisboa)	120 125	5 096	345	0	9 846	0	0	135 413	28 511	0	0	0	0	0	0	28 511	148 636	5 096	345	0	9 846	0	0	163 924
NAVIAIR	76 794	4 085	5 471	131	7 277	0	4 445	98 203	29 026	0	0	43	0	0	0	29 069	105 819	4 085	5 471	174	7 277	0	4 445	127 272
Oro navigacija	15 808	452	246	0	1 094	0	0	17 600	3 244	70	51	0	0	0	0	3 366	19 053	522	298	0	1 094	0	0	20 966
PANSA	121 304	6 309	2 704	0	7 725	579	0	138 621	27 567	2 793	565	0	0	0	0	30 924	148 871	9 102	3 268	0	7 725	579	0	169 544
ROMATSA	139 263	7 497	4 219	0	10 261	0	0	161 241	21 182	370	102	0	0	0	0	21 654	160 445	7 867	4 322	0	10 261	0	0	182 895
Skyguide	151 966	8 053	39	0	0	0	0	160 057	59 578	3 538	15	0	0	158	0	63 289	211 545	11 591	54	0	0	158	0	223 346
Slovenia Control	20 050	1 362	196	0	1 210	226	0	23 043	3 428	410	29	0	0	0	0	3 867	23 478	1 771	226	0	1 210	226	0	26 911
SMATSA	57 457	4 416	0	0	0	0	0	61 873	12 652	881	0	0	0	0	0	13 533	70 109	5 297	0	0	0	0	0	75 406
UkSATSE	122 721	1 257	0	0	8 041	0	2 524	134 543	27 759	0	0	0	0	0	554	28 313	150 480	1 257	0	0	8 041	0	3 078	162 856

Annex 6 - Table 0.2: Breakdown of total ANS costs (en-route, terminal and gate-to-gate), 2008

ANSPs	En-route ATM/CNS costs (in €'000)						Terminal ATM/CNS costs (in €'000)						Gate-to-gate ATM/CNS costs (in €'000)					
	Staff costs	Non-staff operating costs	Depreciation costs	Cost of capital	Exceptional items	**ATM/CNS provision costs**	Staff costs	Non-staff operating costs	Depreciation costs	Cost of capital	Exceptional items	**ATM/CNS provision costs**	Staff costs	Non-staff operating costs	Depreciation costs	Cost of capital	Exceptional items	**ATM/CNS provision costs**
Aena	564 190	114 510	72 072	36 200	24 409	811 381	304 813	32 313	33 067	22 994	9 215	402 401	869 002	146 823	105 139	59 194	33 624	1 213 782
ANS CR	44 223	15 797	21 716	8 723	0	90 459	18 211	4 275	2 968	1 798	0	27 252	62 434	20 072	24 684	10 521	0	117 711
ATSA Bulgaria	37 127	7 573	11 753	10 051	0	66 504	6 457	1 156	1 320	446	0	9 378	43 584	8 729	13 073	10 496	0	75 881
Austro Control	102 998	15 755	14 725	3 098	0	136 576	21 527	3 743	5 847	1 558	0	32 675	124 525	19 498	20 572	4 656	0	169 251
Avinor	55 944	20 174	5 156	2 271	0	83 544	55 148	23 952	4 844	2 089	0	86 033	111 092	44 126	10 000	4 360	0	169 578
Belgocontrol	80 024	11 653	10 986	4 810	3 856	111 329	26 067	4 458	5 492	335	1 378	37 730	106 091	16 111	16 477	5 145	5 234	149 059
Croatia Control	34 755	9 978	7 249	3 731	0	55 713	3 467	1 181	746	384	0	5 779	38 222	11 159	7 995	4 115	0	61 491
DCAC Cyprus	9 839	13 591	5 113	3 674	0	32 217	2 242	2 612	622	840	0	6 316	12 081	16 203	5 735	4 514	0	38 533
DFS	402 221	88 777	72 273	56 340	26 751	646 362	122 857	15 377	17 486	13 540	7 922	177 183	525 078	104 154	89 759	69 880	34 673	823 544
DHMI	71 365	53 900	24 414	31 785	0	181 464	20 118	15 680	10 337	9 437	0	55 572	91 482	69 580	34 751	41 222	0	237 036
DSNA	627 632	132 424	89 143	35 031	0	884 230	158 762	49 539	22 968	9 871	0	241 140	786 394	181 963	112 111	44 901	0	1 125 370
EANS	4 026	2 257	1 446	976	0	8 705	1 306	243	297	176	0	2 022	5 332	2 500	1 743	1 152	0	10 727
ENAV	263 701	139 057	84 980	39 713	3 768	531 220	55 775	29 394	25 546	9 817	662	121 194	319 476	168 451	110 527	49 530	4 430	652 414
Finavia	14 531	6 630	2 251	1 200	0	24 612	20 765	5 002	2 989	1 751	0	30 507	35 296	11 632	5 240	2 951	0	55 119
HCAA	129 891	11 580	8 621	3 139	0	153 231	17 555	5 379	5 675	3 010	0	31 619	147 446	16 959	14 296	6 149	0	184 850
HungaroControl	28 925	12 090	9 323	4 230	182	54 749	10 478	5 652	2 210	542	0	18 882	39 403	17 742	11 533	4 772	182	73 631
IAA	55 390	19 635	11 139	5 616	0	91 781	9 966	5 060	4 084	1 641	0	20 751	65 356	24 695	15 223	7 257	0	112 531
LFV/ANS Sweden	72 203	40 285	15 386	7 973	0	135 847	22 516	4 737	0	0	0	27 253	94 719	45 023	15 386	7 973	0	163 100
LGS	7 372	3 328	2 557	1 203	0	14 460	2 463	1 335	1 118	727	0	5 643	9 835	4 663	3 675	1 930	0	20 103
LPS	19 522	9 210	4 082	3 346	0	36 161	4 076	1 312	720	557	0	6 665	23 598	10 522	4 802	3 903	0	42 825
LVNL	74 711	25 022	6 878	2 628	0	109 239	36 560	10 226	2 947	2 997	0	52 730	111 271	35 248	9 825	5 625	0	161 969
MATS	3 499	4 408	1 535	277	0	9 719	1 670	895	357	65	0	2 988	5 169	5 304	1 892	342	0	12 707
MK CAA	5 217	1 491	1 941	516	0	9 165	1 786	187	432	287	0	2 693	7 003	1 679	2 374	803	0	11 858
MoldATSA	1 883	461	391	1 631	0	4 366	581	422	64	320	0	1 386	2 463	883	455	1 951	0	5 752
MUAC	97 945	14 899	13 008	2 577	0	128 429	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	97 945	14 899	13 008	2 577	0	128 429
NATA Albania	2 323	4 462	3 176	2 786	0	12 748	959	317	270	175	0	1 720	3 282	4 779	3 446	2 961	0	14 468
NATS	273 680	95 907	73 596	71 530	57 713	572 425	108 713	37 581	4 329	1 982	921	153 526	382 393	133 488	77 925	73 512	58 634	725 952
NAV Portugal (FIR Lisboa)	94 714	13 663	8 173	3 576	0	120 125	25 085	1 303	1 617	507	0	28 511	119 798	14 965	9 790	4 083	0	148 636
NAVIAIR	47 578	17 993	4 351	6 871	0	76 794	21 029	4 202	1 583	2 211	0	29 026	68 607	22 195	5 934	9 083	0	105 819
Oro navigacija	8 822	3 310	2 094	1 582	0	15 808	1 612	707	527	399	0	3 244	10 434	4 017	2 621	1 980	0	19 053
PANSA	85 849	17 043	9 638	8 774	0	121 304	18 602	5 121	2 012	1 832	0	27 567	104 451	22 164	11 650	10 606	0	148 871
ROMATSA	88 075	15 546	10 666	10 648	14 329	139 263	12 541	1 820	1 487	1 485	3 850	21 182	100 616	17 366	12 153	12 132	18 178	160 445
Skyguide	93 903	19 315	28 328	6 068	4 352	151 966	38 157	9 032	10 182	2 207	0	59 578	132 060	28 348	38 510	8 275	4 352	211 545
Slovenia Control	12 942	3 713	2 027	704	664	20 050	2 575	607	143	35	68	3 428	15 518	4 320	2 170	739	732	23 478
SMATSA	31 538	11 274	8 130	6 392	123	57 457	6 490	2 320	2 121	1 694	27	12 652	38 027	13 594	10 251	8 086	150	70 109
UkSATSE	68 539	31 345	7 422	13 630	1 786	122 721	17 144	5 723	1 508	2 992	392	27 759	85 683	37 068	8 930	16 622	2 177	150 480
Total	3 617 095	1 008 059	655 739	403 298	137 932	5 822 123	1 178 071	292 862	177 917	100 699	24 435	1 773 984	4 795 167	1 300 921	833 656	503 996	162 367	7 596 106

Annex 6 - Table 0.3: Breakdown of ATM/CNS provision costs (en-route, terminal and gate-to-gate), 2008

ANSPs	ANSP BALANCE SHEET in (€'000)								
	NBV fixed assets in operation	NBV fixed assets under construction	Long-term financial assets	Current assets	**Total assets**	Capital and reserves	Long-term liabilities	Current liabilities	**Total liabilities**
Aena	732 458	272 457	155 207	154 287	1 314 409	318 620	713 051	282 739	1 314 409
ANS CR	131 065	16 685	0	39 029	186 779	161 691	8 348	16 739	186 779
ATSA Bulgaria	120 719	8 020	815	144 818	274 371	242 886	8 129	23 356	274 371
Austro Control	185 254	4 824	23 823	111 237	325 138	51 033	203 787	70 318	325 138
Avinor	43 078	40 544	0	0	83 622	1 127 981	1 019 551	301 683	2 449 214
Belgocontrol	182 498	25 031	560	101 732	309 820	219 260	39 864	50 696	309 820
Croatia Control	61 858	1 444	4 784	23 887	91 973	54 902	26 465	10 606	91 973
DCAC Cyprus	76 211	18 487	0	853	95 551				
DFS	716 328	19 272	34 923	951 926	1 722 449	335 154	1 177 128	210 167	1 722 449
DHMI	339 552	107 318	0	98 219	545 089	454 961	56 059	34 070	545 089
DSNA	671 205	132 858	167	384 436	1 188 666	254 124	715 742	218 800	1 188 666
EANS	11 524	620	0	5 195	17 339	14 855	193	2 291	17 339
ENAV	797 071	356 919	114 817	807 416	2 076 223	1 258 961	179 283	637 979	2 076 223
Finavia	52 602	23 447	0	0	76 049				
HCAA									
HungaroControl	69 570	7 874	15	45 394	122 853	82 031	21 792	7 455	111 278
IAA	66 916	36 554	0	30 821	134 291	98 927	4 634	37 070	140 631
LFV/ANS Sweden	141 773	23 182	1 527	32 258	198 740	171 423	3 883	23 434	198 740
LGS	24 885	5 881	24	7 698	38 487	26 000	5 471	7 015	38 486
LPS	30 284	6 522	0	27 451	64 257	56 434	2 421	5 403	64 257
LVNL	95 897	7 430	0	33 214	136 541	-19 360	110 603	45 298	136 541
MATS	5 933	480	0	7 420	13 832	5 191	6 057	2 584	13 832
MK CAA	13 978	36	0	13 263	27 277	18 979	5 850	2 448	27 277
MoldATSA	7 182	69	142	2 773	10 166	8 081	1 800	285	10 166
MUAC	86 414	1 048	0	34 799	122 261	0	87 462	34 799	122 261
NATA Albania	22 713	5 293	149	46 811	74 967	37 603	36 243	1 121	74 967
NATS	641 346	302 377	420 981	416 392	1 781 095	435 538	998 296	347 260	1 781 094
NAV Portugal (FIR Lisboa)	53 208	9 839	4 681	213 297	281 025	85 025	139 260	56 740	281 025
NAVIAIR	135 373	17 982	4 186	22 430	179 971	1 602	152 854	25 515	179 971
Oro navigacija	23 975	3 894	1 640	18 185	47 693	46 247	805	642	47 693
PANSA	134 971	10 241	6 653	61 289	213 154	171 806	21 093	20 255	213 154
ROMATSA	132 282	5 536	0	79 029	216 847	191 398	14 498	10 951	216 847
Skyguide	238 312	48 674	29 773	120 387	437 145	175 368	130 879	130 898	437 145
Slovenia Control	9 959	8 846	249	4 035	23 089	3 042	14 132	5 915	23 089
SMATSA	51 362	14 330	0	37 167	102 859	71 626	13 583	17 650	102 859
UkSATSE	51 362	14 330	0	37 167	102 859	71 626	13 583	17 650	102 859
Total	6 159 116	1 558 343	805 117	4 114 314	12 636 890	6 233 015	5 932 798	2 659 832	14 825 646

Annex 6 - Table 0.4: Balance Sheet data at ANSP level, 2008

ANSPs	ATCOs in OPS	ATCOs on other duties	Ab-initio trainees	On-the-job trainees	ATC assistants	OPS support (non-ATCO)	Technical support staff for operational maintenance	Technical support staff for planning & development	Administration	Staff for ancillary services	Other	**Total staff**	ACC ATCOs in OPS	ACC ATCO-hours on duty	APPs+TWRs ATCOs in OPS	APPs+TWRs ATCO-hours on duty	Employment costs for ATCOs in OPS (€'000)
Aena	2 005	146	0	0	197	35	473	312	500	30	275	3 973	1 131	2 019 966	874	1 588 058	688 268
ANS CR	183	7	21	22	94	34	135	27	265	32	74	894	86	137 583	97	150 331	23 784
ATSA Bulgaria	223	57	8	7	39	11	516	15	124	147	96	1 243	90	117 450	133	177 156	13 934
Austro Control	259	25	46	37	19	58	112	92	96	116	3	863	116	179 661	143	229 058	59 668
Avinor	349	95	0	31	196	4	202	21	24	40	19	981	153	258 876	196	370 548	50 880
Belgocontrol	219	46	2	23	43	35	176	54	162	115	90	965	85	124 367	134	188 138	38 774
Croatia Control	207	26	22	23	47	28	109	19	147	130	0	758	77	103 257	130	169 130	17 317
DCAC Cyprus	68	12	5	0	42	0	64	0	42	126	0	359	43	105 780	25	53 075	8 959
DFS	1 716	20	63	33	359	444	704	523	493	148	286	4 789	1 342	1 508 252	374	454 489	271 344
DHMI	701	34	37	36	34	193	1 285	20	1 110	495	931	4 876	351	648 648	350	646 800	29 122
DSNA	2 662	382	401	363	132	1 435	1 435	461	1 182	281	0	8 734	1 373	1 789 169	1 289	1 679 708	297 065
EANS	37	3	5	3	2	4	0	24	27	17	0	122	18	30 168	19	31 654	2 883
ENAV	1 206	211	79	63	0	0	229	74	374	491	37	2 764	800	1 160 000	406	604 534	171 321
Finavia	204	23	0	2	34	0	99	16	32	95	2	507	62	85 064	142	214 704	19 128
HCAA	530	80	70	0	0	46	466	88	90	0	500	1 870	235	345 450	295	433 650	59 294
HungaroControl	185	10	11	4	99	44	127	19	106	68	18	691	93	144 057	92	141 772	17 313
IAA	228	24	35	9	24	12	34	20	77	17	3	483	157	246 333	71	112 109	30 733
LFV/ANS Sweden	514	103	0	18	41	71	90	50	88	46	0	1 021	235	390 100	279	446 958	60 795
LGS	64	0	0	15	0	28	86	5	79	32	0	309	33	51 447	31	49 166	3 071
LPS	111	12	5	14	49	11	114	10	115	28	0	469	58	77 912	53	80 315	8 457
LVNL	194	32	30	32	92	189	102	170	180	9	0	1 030	69	114 027	125	204 366	37 100
MATS	52	0	3	0	11	0	46	3	24	12	0	151	27	52 859	25	47 047	2 214
MK CAA	62	14	0	15	7	16	52	10	30	50	36	292	32	46 848	30	43 920	2 188
MoldATSA	56	8	0	1	5	15	70	7	34	34	74	304	33	48 015	23	33 465	718
MUAC	221	27	29	32	54	86	101	25	50	0	0	625	221	311 955	n/appl	n/appl	42 045
NATA Albania	41	5	0	0	15	0	65	0	53	32	20	231	29	46 255	12	20 856	643
NATS	1 377	176	126	162	509	442	899	237	1 058	19	0	5 006	901	1 142 468	476	603 568	167 712
NAV Portugal (FIR Lisboa)	198	39	0	4	30	68	87	67	164	46	22	725	83	151 226	115	211 715	45 808
NAVIAIR	192	72	27	19	108	0	94	34	119	10	0	675	100	173 220	92	155 903	25 466
Oro navigacija	74	13	0	0	0	29	84	7	85	29	0	320	31	46 162	43	62 749	3 331
PANSA	372	10	41	47	72	249	348	50	306	116	0	1 612	114	142 362	258	319 622	39 595
ROMATSA	523	43	0	0	0	30	448	0	390	210	79	1 723	297	410 494	227	320 271	43 435
Skyguide	329	54	55	44	57	169	165	110	183	100	0	1 266	201	264 845	127	154 049	46 784
Slovenia Control	82	9	0	15	14	5	30	0	30	25	0	210	46	66 056	36	49 500	8 160
SMATSA	222	66	18	21	40	39	155	54	83	154	0	852	153	203 184	69	91 080	13 475
UkSATSE	941	272	0	69	100	142	2 800	42	683	223	634	5 906	561	661 980	380	448 400	15 000
Total	16 607	2 156	1 139	1 164	2 565	3 973	12 003	2 666	8 605	3 523	3 199	57 599	9 436	13 405 496	7 171	10 587 862	2 365 783

Annex 6 - Table 0.5: Total staff and ATCOs in OPS data, 2008

ANSPs	Size of controlled airspace	Number of ACC operational units	Number of APP operational units	Number of TWR operational units	Number of AFIS	Total distance in charging area	Total IFR flights controlled by the ANSP	Total flight-hours controlled by the ANSP	IFR Airport mov controlled by the ANSP	Composite flight-hours
Aena	2 190 000	5	23	38	0	882 894 856	1 856 967	1 410 456	2 048 406	1 944 868
ANS CR	78 600	1	4	4	0	150 427 778	659 233	223 589	194 702	274 385
ATSA Bulgaria	145 120	1	3	5	0	121 841 924	487 093	161 001	98 635	186 734
Austro Control	81 800	1	6	6	0	210 673 779	970 498	315 942	413 208	423 745
Avinor	719 000	3	17	17	28	136 072 171	552 024	314 523	634 609	480 087
Belgocontrol	39 500	1	4	5	0	172 475 671	593 642	120 049	368 248	216 122
Croatia Control	158 000	1	9	10	0	99 209 337	411 382	162 388	86 318	184 907
DCAC Cyprus	174 000	1	2	2	0	89 321 814	272 286	124 343	64 309	141 121
DFS	389 000	4	0	17	0	1 041 109 367	2 935 173	1 443 062	2 163 665	2 007 545
DHMI	982 000	2	17	36	20	476 180 666	792 051	674 455	649 155	843 814
DSNA	1 000 000	5	12	79	0	1 505 070 656	2 911 047	2 291 924	1 941 200	2 798 368
EANS	77 102	1	1	1	0	44 460 348	172 575	60 258	41 930	71 197
ENAV	734 000	4	22	13	11	724 381 855	1 631 469	1 111 106	1 229 799	1 431 951
Finavia	415 000	2	7	19	6	62 283 329	249 746	116 290	271 335	187 079
HCAA	537 000	1	16	18	15	316 984 384	642 796	483 624	193 240	534 039
HungaroControl	93 000	1	1	1	2	145 853 711	621 749	202 210	118 391	233 097
IAA	457 000	2	3	3	0	199 295 168	598 271	284 650	279 252	357 505
LFV/ANS Sweden	625 000	2	26	35	2	266 506 623	732 472	444 158	550 252	587 714
LGS	94 000	1	2	3	0	45 301 308	222 994	68 782	57 904	83 889
LPS	48 700	1	2	6	0	56 436 208	344 173	78 549	47 545	90 953
LVNL	51 100	1	3	4	0	196 679 331	572 893	152 085	495 565	281 374
MATS	230 000	1	2	1	1	25 034 762	84 821	40 891	30 094	48 742
MK CAA	24 800	1	2	2	1	14 985 820	125 251	21 409	13 568	24 949
MoldATSA	33 800	1	1	3	0	7 444 089	41 020	10 426	12 783	13 761
MUAC	260 000	1	0	0	0	490 089 670	1 608 454	580 818	n/appl	580 818
NATA Albania	35 900	1	1	1	1	24 147 968	148 246	32 052	19 797	37 217
NATS	878 000	3	16	16	0	806 201 936	2 465 727	1 471 343	1 975 173	1 986 650
NAV Portugal (FIR Lisboa)	665 000	1	4	6	0	187 377 744	433 090	276 148	274 375	347 730
NAVIAIR	158 000	1	7	7	1	121 583 914	644 011	216 259	363 380	311 062
Oro navigacija	76 200	1	3	4	0	31 087 285	178 000	50 249	46 192	62 300
PANSA	334 000	1	4	11	0	242 431 706	596 340	348 322	307 573	428 565
ROMATSA	254 000	1	2	16	0	201 293 939	444 283	270 668	159 867	312 376
Skyguide	73 300	2	4	7	0	131 290 343	1 244 275	354 444	476 436	478 743
Slovenia Control	18 400	1	3	3	0	29 348 418	248 617	41 043	45 099	52 809
SMATSA	144 676	1	8	8	0	134 081 532	485 906	204 578	67 995	222 317
UkSATSE	776 442	6	12	32	0	239 756 844	419 456	333 135	191 868	383 192
Total		64	249	439	88	9 629 616 254		14 495 229	15 931 868	18 651 727

Annex 6 - Table 0.6: Operational data (ANSP and State level), 2008

ANNEX 7 - ANSP FACT SHEETS

ANSP name	Country	Page
Aena	Spain	221
ANS CR	Czech Republic	222
ATSA Bulgaria	Bulgaria	223
Austro Control	Austria	224
Avinor	Norway	225
Belgocontrol	Belgium	226
Croatia Control	Croatia	227
DCAC Cyprus	Cyprus	228
DFS	Germany	229
DHMİ	Turkey	230
DSNA	France	231
EANS	Estonia	232
ENAV	Italy	233
Finavia	Finland	234
HCAA	Greece	235
HungaroControl	Hungary	236
IAA	Ireland	237
LFV/ANS Sweden	Sweden	238
LGS	Latvia	239
LPS	Slovak Republic	240
LVNL	Netherlands	241
MATS	Malta	242
M-NAV	F.Y.R. Macedonia	243
MoldATSA	Moldova	244
MUAC		245
NATA Albania	Albania	246
NATS	United Kingdom	247
NAV Portugal (FIR Lisboa)	Portugal	248
NAVIAIR	Denmark	249
Oro Navigacija	Lithuania	250
PANSA	Poland	251
ROMATSA	Romania	252
Skyguide	Switzerland	253
Slovenia Control	Slovenia	254
SMATSA	Serbia and Montenegro	255
UkSATSE	Ukraine	256

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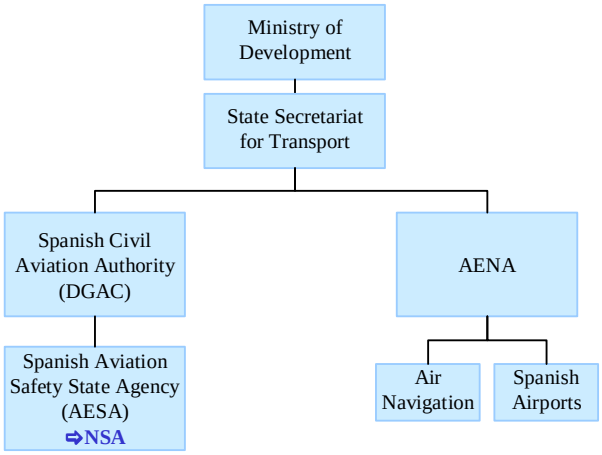
Aena, Spain

Aeropuertos Españoles y Navegación Aérea

www.aena.es

Institutional arrangements and links (2010)



Status (2010)

- Business Public Entity attached to Ministry of Development
- A company with specific status (governed by Private Law, except when acting in its administrative capacity)
- 100% State-owned

National Supervisory Authority (NSA):

- AESA (Spanish Aviation Safety State Agency) (for AENA)
- Spanish Air Force Staff (for MIL)
- General Secretariat for the Climate Change and Pollution Prevention (for MET)

Body responsible for:

Safety Regulation

Spanish Civil Aviation Authority - Government
AESA (Spanish Aviation Safety State Agency) - Government

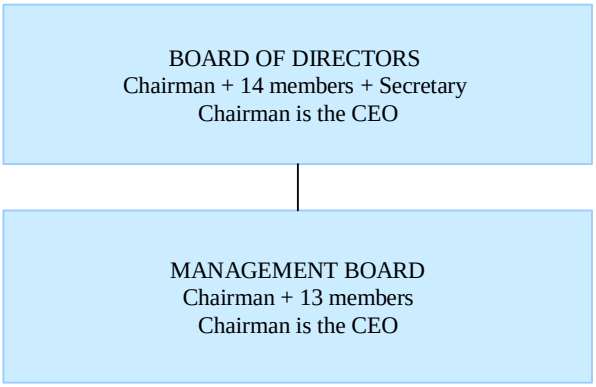
Airspace Regulation

Spanish Civil Aviation Authority - Government
AESA (Spanish Aviation Safety State Agency) - Government

Economic Regulation

Government

Corporate governance structure (2010)



Aena (2010)

CHAIRMAN OF THE BOARD OF DIRECTORS:

Juan Ignacio Lema Devesa

DIRECTOR GENERAL (CEO):

Juan Ignacio Lema Devesa

DIRECTOR OF AIR NAVIGATION:

Carmen Librero Pintado

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

- Operation of 47 airports and 1 heliport in Spain
- Participation in the management of 12 airports in Mexico, 3 in Colombia, 1 in Cuba, 3 in United Kingdom, 1 in Sweden, 5 in USA, 3 in Bolivia and 1 in Costa Rica

Operational ATS units:

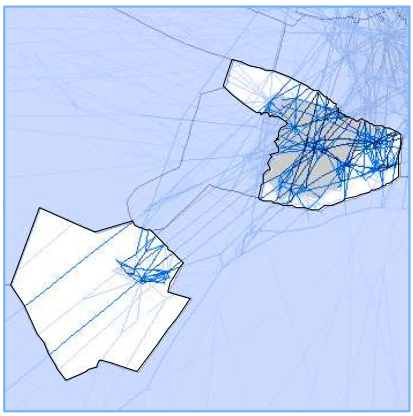
5 ACCs (Barcelona, Madrid, Canarias, Sevilla, Palma)
23 APPs
38 TWRs

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	1 061
Gate-to-gate total costs (M€)	1 320
Gate-to-gate ATM/CNS provision costs (M€)	1 214
Gate-to-gate total ATM/CNS assets(M€)	958
Gate-to-gate ANS total capex (M€)	159
ATCOs in OPS	2 005
Gate-to-gate total staff	3 973
Total IFR flight-hours controlled by ANSP ('000)	1 410
IFR airport movements controlled by ANSP ('000)	2 048
En-route sectors	67
Minutes of ATFM delays > 15 min ('000)	1 343

Size

Size of controlled airspace: 2 190 000 km²

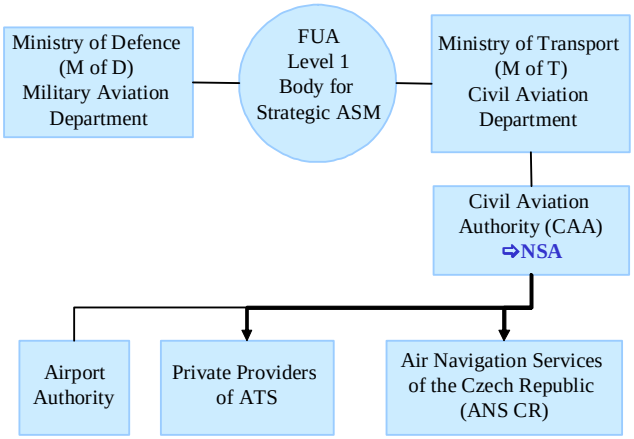


ANS CR, Czech Republic

Air Navigation Services of the Czech Republic

www.rlp.cz

Institutional arrangements and links (2010)



Status (2010)

- State-enterprise founded under the State Enterprise Act in 1995
- 100% State-owned

National Supervisory Authority (NSA):

Civil Aviation Authority (CAA)

Body responsible for:

Safety Regulation

Civil Aviation Authority

Airspace Regulation

Body for Strategic ASM

Economic Regulation

Ministry of Transport

Corporate governance structure (2010)

SUPERVISORY BOARD (6 members)

Chairman + 5 members
Members appointed by:
4 M of T
2 ANS CR employees

DIRECTOR GENERAL
appointed by the M of T

ANS CR (2010)

CHAIRMAN OF THE SUPERVISORY BOARD:

Jiri Nedoma

DIRECTOR GENERAL (CEO):

Jan Klas

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

Operational ATS units:

1 ACC (Praha)
4 APPs (Praha, Karlovy Vary, Brno, Ostrava)
4 TWRs (Praha, Karlovy Vary, Brno, Ostrava)
1 AFIS (located in Praha ACC)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	123
Gate-to-gate total costs (M€)	127
Gate-to-gate ATM/CNS provision costs (M€)	118
Gate-to-gate total ATM/CNS assets(M€)	148
Gate-to-gate ANS total capex (M€)	18
ATCOs in OPS	183
Gate-to-gate total staff	894
Total IFR flight-hours controlled by ANSP ('000)	224
IFR airport movements controlled by ANSP ('000)	195
En-route sectors	8
Minutes of ATFM delays > 15 min ('000)	248

Size

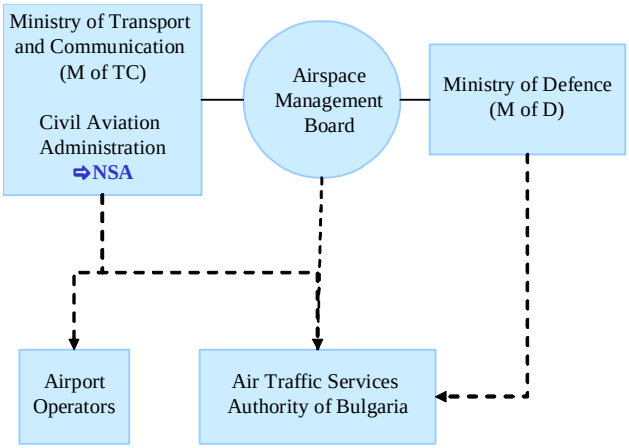
Size of controlled airspace: 78 600 km²

ATSA Bulgaria, Bulgaria

Air Traffic Services Authority of Bulgaria

www.atsa.bg

Institutional arrangements and links (2010)



Status (2010)

- State enterprise as of April 2001 (Art 53 §1 of the Civil Aviation Law)
- 100% State-owned

National Supervisory Authority (NSA):

Civil Aviation Administration

Body responsible for:

Safety Regulation

Civil Aviation Administration (Ministry of Transport and Communication)

Airspace Regulation

Airspace Management Board

Economic Regulation

Ministry of Transport and Communication

Corporate governance structure (2010)

CONTROL BOARD (3 members)
Chairman + 2 members
All members appointed by the M of TC.
The 3 members represent Deputy Minister of Finance, Director of "EU Coordination and International Relations" Directorate
of the Ministry of Transport
and Director of "Internal Audit Unit" Directorate
of the Ministry of Transport

MANAGEMENT BOARD (5 members)
DG + 4 members
All members appointed by the M of TC.

ATSA Bulgaria (2010)

CHAIRMAN OF THE CONTROL BOARD:

Lyubomir Datzov

DIRECTOR GENERAL (CEO):

Emanuil Radev

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

- Training of ATCOs

Operational ATS units:

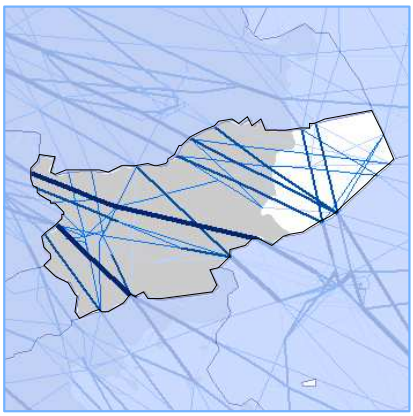
1 ACCs (Sofia)
3 APPs (Sofia, Varna, Burgas)
5 TWRs (Sofia, Varna, Burgas, Gorna Oriahovitza, Plovdiv)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	90
Gate-to-gate total costs (M€)	89
Gate-to-gate ATM/CNS provision costs (M€)	76
Gate-to-gate total ATM/CNS assets(M€)	126
Gate-to-gate ANS total capex (M€)	14
ATCOs in OPS	223
Gate-to-gate total staff	1 243
Total IFR flight-hours controlled by ANSP ('000)	161
IFR airport movements controlled by ANSP ('000)	99
En-route sectors	6
Minutes of ATFM delays > 15 min ('000)	2

Size

Size of controlled airspace: 145 120 km²



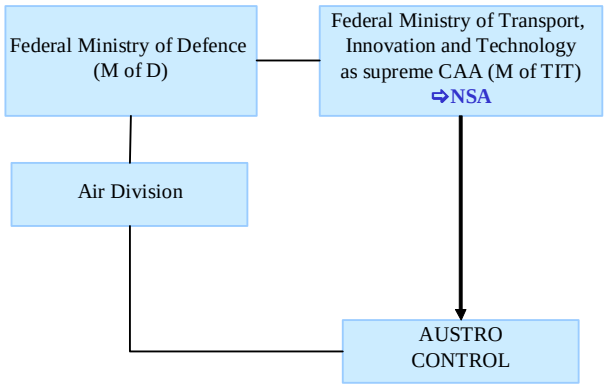
117 000 km² plus 28 120 km² over the Black Sea.

Austro Control, Austria

Österreichische Gesellschaft für Zivilluftfahrt mbH

www.austrocontrol.at

Institutional arrangements and links (2010)



Status (2010)

- Private limited company as of 1994
- 100% State-owned (Law makes provision for Austrian Airports to own up to 49 %)

National Supervisory Authority (NSA):

Federal Ministry of Transport, Innovation and Technology (M of TIT)

Body responsible for:

Safety Regulation

The power for regulatory decisions including safety oversight lies within the M of TIT

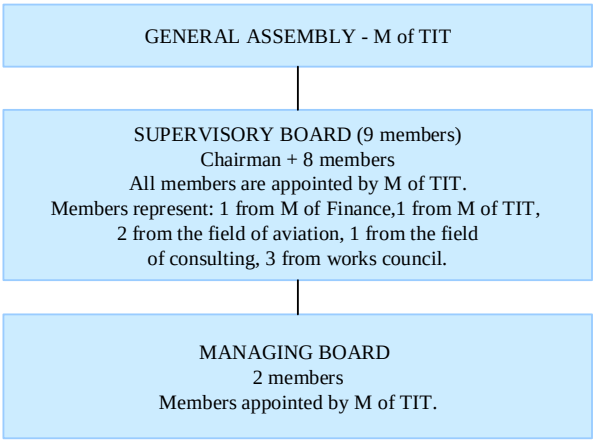
Airspace Regulation

M of TIT, normally on basis of proposals of Austro Control

Economic Regulation

Covered by the Commercialisation Act, the Managing Board, and Federal Acts relating to procurement and accounting

Corporate governance structure (2010)



Austro Control (2010)

CHAIRMAN OF THE SUPERVISORY BOARD:

Gaston Glock

MANAGING BOARD:

Dr. Heinz Sommerbauer
Mag. Johann Zemsky

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

Operational ATS units:

1 ACC (Wien)
6 APPs (Wien, Graz, Innsbruck, Klagenfurt, Linz, Salzburg)
6 TWRs

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	194
Gate-to-gate total costs (M€)	201
Gate-to-gate ATM/CNS provision costs (M€)	169
Gate-to-gate total ATM/CNS assets(M€)	146
Gate-to-gate ANS total capex (M€)	16
ATCOs in OPS	259
Gate-to-gate total staff	863
Total IFR flight-hours controlled by ANSP ('000)	316
IFR airport movements controlled by ANSP ('000)	413
En-route sectors	13
Minutes of ATFM delays > 15 min ('000)	1 268

Size

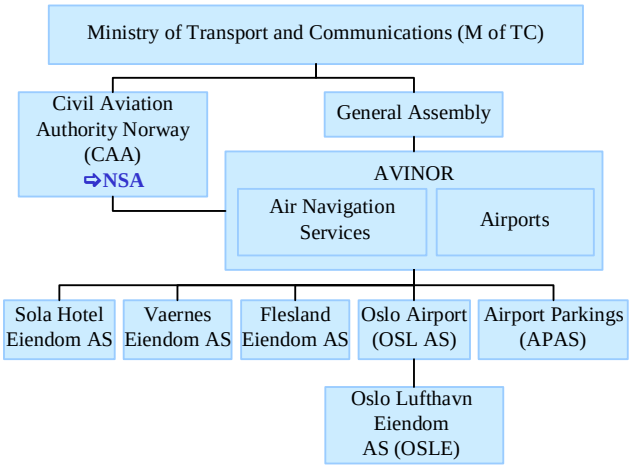
Size of controlled airspace: 81 800 km²

Avinor, Norway

AVINOR

www.avinor.no

Institutional arrangements and links (2010)



Status (2010)

- State owned limited company.Civil ANSP and airport owner/ operator
- Independent of CAA

National Supervisory Authority (NSA):

Civil Aviation Authority Norway (CAA)

Body responsible for:

Safety Regulation

Civil Aviation Authority Norway

Airspace Regulation

Civil Aviation Authority Norway

Economic Regulation

Aeronautic charges are set annually by the Ministry of Transport and Communications

Corporate governance structure (2010)

SUPERVISORY BOARD (10 members)
Chairman + 9 members
Members represent: 6 M of TC, 4 staff

EXECUTIVE BOARD (12 members)
CEO + 11 members
CEO appointed by Supervisory Board

Avinor (2010)

CHAIRMAN OF THE SUPERVISORY BOARD:

Inge K. Hansen

CHIEF EXECUTIVE OFFICER:

Sverre Quale

Scope of services

☑ GAT	☑ Upper Airspace	☑ Oceanic ANS
☑ OAT	☑ Lower Airspace	☐ MET

- AVINOR owns and operates 46 airports, 12 in association with Armed Forces

Operational ATS units:

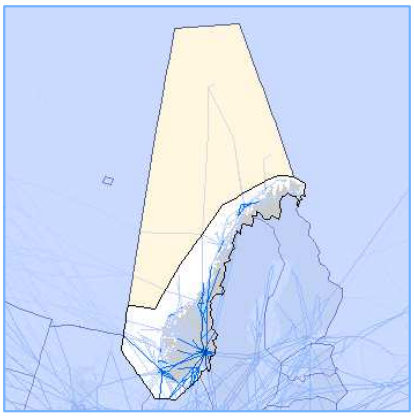
3 ACCs Oslo (ACC + APP), Stavanger (ACC), Bodo (ACC + APP + Oceanic)
17 APPs (1 APP combined with Oslo ACC+16 TWRs/APPs)
17 TWRs
28 AFISs

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	177
Gate-to-gate total costs (M€)	181
Gate-to-gate ATM/CNS provision costs (M€)	170
Gate-to-gate total ATM/CNS assets(M€)	83
Gate-to-gate ANS total capex (M€)	7
ATCOs in OPS	349
Gate-to-gate total staff	981
Total IFR flight-hours controlled by ANSP ('000)	315
IFR airport movements controlled by ANSP ('000)	635
En-route sectors	15
Minutes of ATFM delays > 15 min ('000)	84

Size

Size of controlled airspace: 2 049 000 km²



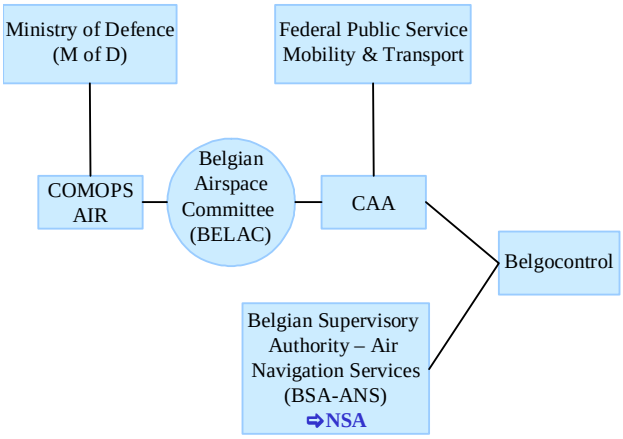
Continental: 719 000 km² - Oceanic:1 330 000 km²

Belgocontrol, Belgium

Belgocontrol

www.belgocontrol.be

Institutional arrangements and links (2010)



Status (2010)

- Public Autonomous Enterprise as of 1998 under a management contract
- 100% State-owned

National Supervisory Authority (NSA):

Belgian Supervisory Authority - Air Navigation Services (BSA-ANS)

Body responsible for:

Safety Regulation

Civil Aviation Authority

Airspace Regulation

Belgian Airspace Committee

Economic Regulation

Federal Public Service of Mobility and Transport

Corporate governance structure (2010)

SUPERVISORY BOARD (10 members)
Chairman + CEO + 8 members
Members appointed by Ministry of Mobility
CEO represents staff.

EXECUTIVE BOARD (4 members)
CEO + 3 members

Belgocontrol (2010)

CHAIRMAN OF THE SUPERVISORY BOARD:

Charles-Louis d'Arenberg

DIRECTOR GENERAL (CEO):

Jean-Claude Tintin

Scope of services

☑ GAT	☐ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

- Belgocontrol controls lower airspace up to FL 245, including Luxembourg airspace above FL 135
- Upper airspace (> FL 245) is controlled by Maastricht UAC

Operational ATS units:

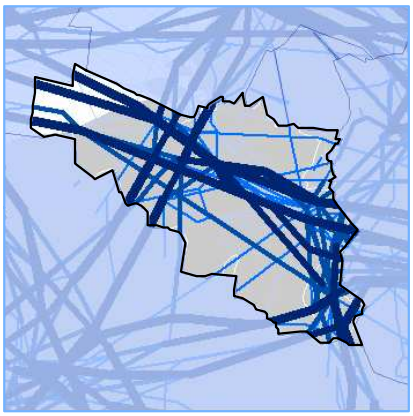
1 ACC (Brussels)
4 APPs (Brussels, Liege, Charleroi, Oostende)
5 TWRs (Brussels, Antwerp, Liege, Charleroi, Oostende)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	204
Gate-to-gate total costs (M€)	214
Gate-to-gate ATM/CNS provision costs (M€)	149
Gate-to-gate total ATM/CNS assets(M€)	189
Gate-to-gate ANS total capex (M€)	27
ATCOs in OPS	219
Gate-to-gate total staff	965
Total IFR flight-hours controlled by ANSP ('000)	120
IFR airport movements controlled by ANSP ('000)	368
En-route sectors	7
Minutes of ATFM delays > 15 min ('000)	280

Size

Size of controlled airspace: 39 500 km²

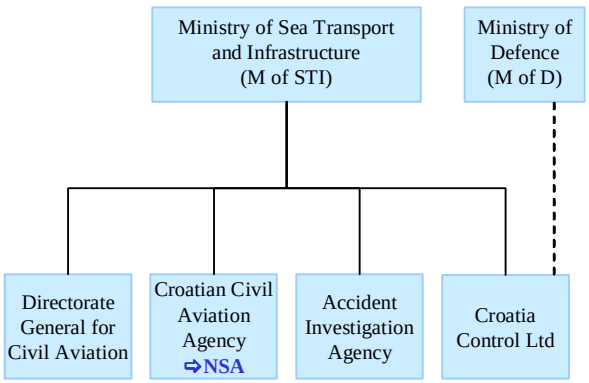


Croatia Control, Croatia

Croatia Control Ltd, Croatian Air Navigation Services

www.crocontrol.hr

Institutional arrangements and links (2010)



Status (2010)

- Limited liability company as of 1 January 2000
- 100% State-owned
- Integrated civil/military ANSP

National Supervisory Authority (NSA):

Croatian Civil Aviation Agency (CCAA)

Body responsible for:

Safety Regulation

Directorate General for Civil Aviation

Airspace Regulation

MoSTI - National High Level Airspace Policy Body

Economic Regulation

State Law and Croatia Control Ltd

Corporate governance structure (2010)

ASSEMBLY (3 members)
The President represents Ministry of STI (Minister), the other Two members represent M of D (Minister) and M of F (Minister).

SUPERVISORY BOARD (5 members)
The Chairman + 4 members
The members represent the M of STI, M of D, M of F, and employees. They are appointed for a 4-year period. The member representing the employees is elected and appointed pursuant to the Company Statute and Labour Relations Act.

MANAGEMENT
Director General
The DG is appointed by the Supervisory Board for a 5-year period, following an open competition and under the conditions stipulated by the Company Statute.

Croatia Control (2010)

CHAIRMAN OF THE SUPERVISORY BOARD:

Ante Cajic

DIRECTOR GENERAL:

Dražen Ramljak

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

- ATS provision in Sarajevo FIR (Bosnia & Herzegovina) within FL 100 to FL 285 and FL 285 to FL 660

Operational ATS units:

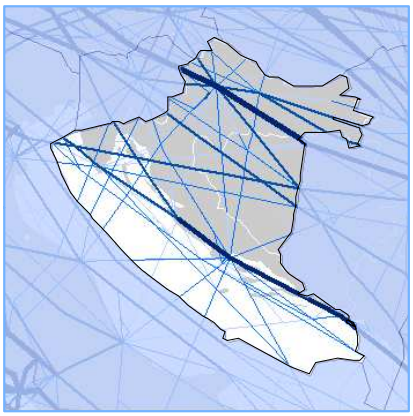
1	ACC	(Zagreb)
7	APPs	(Zagreb, Pula, Split, Dubrovnik, Rijeka, Zadar, Osijek)
2	APP/TWRs	(Brac, Losinj)
8	TWRs	(Zagreb, Pula, Split, Dubrovnik, Rijeka, Zadar, Osijek, Lucko)
1	AFIS	(to be opened soon and located as a sector at Zagreb ACC)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	65
Gate-to-gate total costs (M€)	69
Gate-to-gate ATM/CNS provision costs (M€)	61
Gate-to-gate total ATM/CNS assets(M€)	62
Gate-to-gate ANS total capex (M€)	4
ATCOs in OPS	207
Gate-to-gate total staff	758
Total IFR flight-hours controlled by ANSP ('000)	162
IFR airport movements controlled by ANSP ('000)	86
En-route sectors	7
Minutes of ATFM delays > 15 min ('000)	662

Size

Size of controlled airspace: 158 000 km²

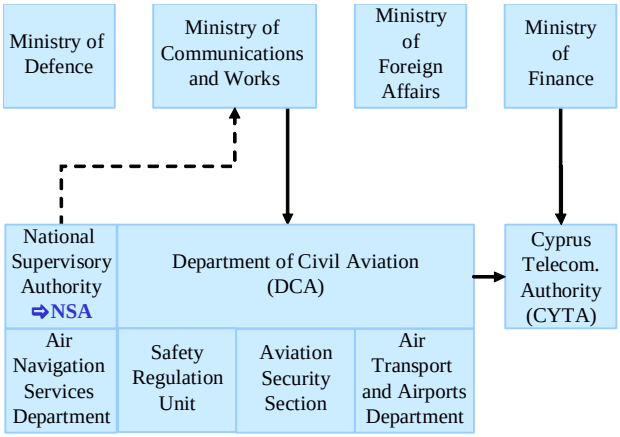


DCAC Cyprus, Cyprus

Department of Civil Aviation of Cyprus

www.mcw.gov.cy

Institutional arrangements and links (2010)



Status (2010)

- State body
- 100% State-owned

National Supervisory Authority (NSA):

Department of Civil Aviation

Body responsible for:

Safety Regulation

Department of Civil Aviation of Cyprus

Airspace Regulation

Department of Civil Aviation of Cyprus

Economic Regulation

Ministry of Finance

Corporate governance structure (2010)

Minister of Communications and Works

Director DCAC, Head of ANS dept, Head of T&A dept, Head of Aviation Security Section and Head of Safety Regulation Unit are nominated by the Civil Service. The Head of the NSA is nominated by the Council of Ministers.

DCAC Cyprus (2010)

DIRECTOR OF DCAC:

Leonidas Leonidou

HEAD OF NSA:

Panayiota Demetriou

HEAD OF ANS DEPARTMENT (COO):

Nicos Nicolaou

HEAD OF AIR TRANSPORT AND AIRPORTS DEPARTMENT:

Iacovos Demetriou

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

- DCAC Cyprus owns and operates 2 airports

Operational ATS units:

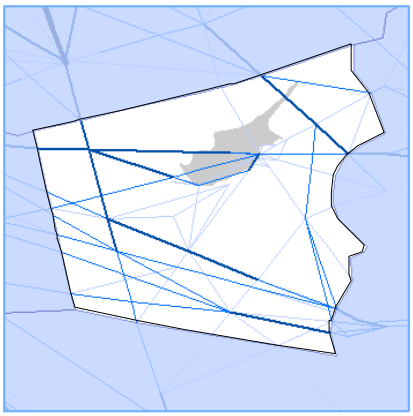
1 ACC (Nicosia)
2 APPs (Larnaca, Paphos)
2 TWRs (Larnaca, Paphos)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	55
Gate-to-gate total costs (M€)	47
Gate-to-gate ATM/CNS provision costs (M€)	39
Gate-to-gate total ATM/CNS assets(M€)	95
Gate-to-gate ANS total capex (M€)	5
ATCOs in OPS	68
Gate-to-gate total staff	359
Total IFR flight-hours controlled by ANSP ('000)	124
IFR airport movements controlled by ANSP ('000)	64
En-route sectors	3
Minutes of ATFM delays > 15 min ('000)	653

Size

Size of controlled airspace: 174 000 km²

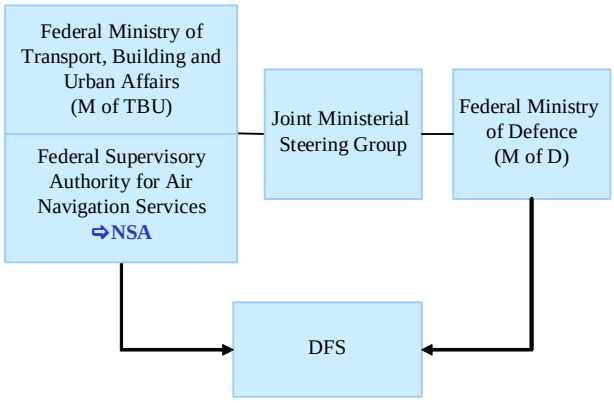


DFS, Germany

Deutsche Flugsicherung GmbH

www.dfs.de

Institutional arrangements and links (2010)



Status (2010)

- Limited liability company as of 1993, governed by Private Company Law
- 100% State-owned
- Integrated civil/military ANSP

National Supervisory Authority (NSA):

Federal Supervisory Authority for Air Navigation Services

Body responsible for:

Safety Regulation

Federal Ministry of Transport, Building and Urban Affairs

Airspace Regulation

Federal Ministry of Transport, Building and Urban Affairs

Economic Regulation

Federal Ministry of Transport, Building and Urban Affairs

Corporate governance structure (2010)

SHAREHOLDER Meeting with M of TBU

Supervisory Board (12 Members)
Chairman + 11 Members
Chairman appointed by the Government
Members represent: 1 (Chairman) from M of TBU
1 M of TBU
2 M of D, 1 M of F, 1 KFW*, 6 staff reps
Chairman has a double voting right

EXECUTIVE BOARD (3 members)
CEO + 2 members
Executive Board is appointed by the Supervisory Board.

* KFW = KFW-Bankengruppe

DFS (2010)

CHAIRMAN OF THE SUPERVISORY BOARD:

Robert Scholl

CHAIRMAN OF THE EXECUTIVE BOARD:

Dieter Kaden

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☐ MET

- DFS controls both upper and lower airspace, except GAT for the upper airspace in North-Western Gerrmany
- Other ANS
- Consulting, training, engineering & maintenance services

Operational ATS units:

1 UAC	(Karlsruhe)
1 ACC/UAC/APP	(München)
2 ACCs/APPs	(Bremen, Langen)
1 ACC	(co-located with Maastricht UAC) for OAT in upper airspace in North-Western Germany
17 TWRs	(Berlin Tempelhof closed in Nov.08)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	895
Gate-to-gate total costs (M€)	833
Gate-to-gate ATM/CNS provision costs (M€)	824
Gate-to-gate total ATM/CNS assets(M€)	603
Gate-to-gate ANS total capex (M€)	65
ATCOs in OPS	1 716
Gate-to-gate total staff	4 789
Total IFR flight-hours controlled by ANSP ('000)	1 443
IFR airport movements controlled by ANSP ('000)	2 164
En-route sectors	99
Minutes of ATFM delays > 15 min ('000)	2 995

Size

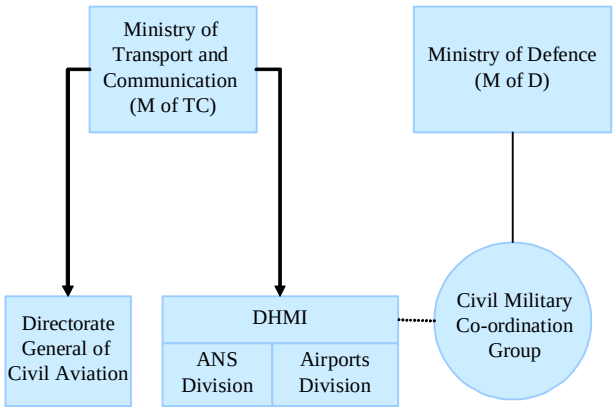
Size of controlled airspace: 389 000 km²

DHMI, Turkey

General Directorate of State Airports Authority

www.dhmi.gov.tr

Institutional arrangements and links (2010)



Status (2010)

- Autonomous State body
- 100% State-owned

National Supervisory Authority (NSA):

Not applicable since Turkey is not bound by SES Regulations

Body responsible for:

Safety Regulation

Directorate General of Civil Aviation

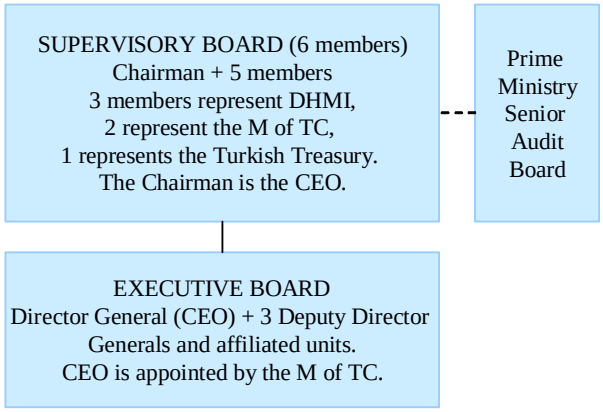
Airspace Regulation

General Directorate of DHMI

Economic Regulation

General Directorate of DHMI

Corporate governance structure (2010)



DHMI (2010)

CHAIRMAN OF THE SUPERVISORY BOARD:

Mr. Orhan Birdal

DIRECTOR GENERAL (CEO):

Mr. Orhan Birdal

DIRECTOR ANS DIVISION:

Mr. Mustafa Kiliç

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☐ MET

- DHMI is responsible for the administration of 40 State Airports. ATS services are provided by DHMI in 36 State Airports

Operational ATS units:

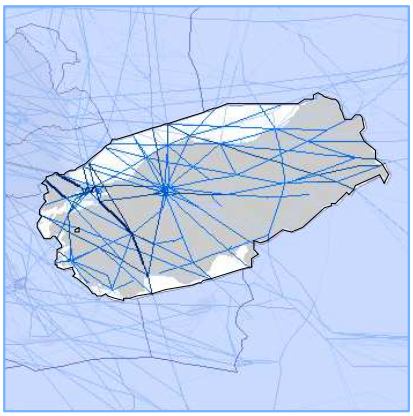
2 ACCs (Ankara, Istanbul)
17 APPs
36 TWRs
20 AFISs

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	303
Gate-to-gate total costs (M€)	275
Gate-to-gate ATM/CNS provision costs (M€)	237
Gate-to-gate total ATM/CNS assets(M€)	443
Gate-to-gate ANS total capex (M€)	81
ATCOs in OPS	701
Gate-to-gate total staff	4 876
Total IFR flight-hours controlled by ANSP ('000)	674
IFR airport movements controlled by ANSP ('000)	649
En-route sectors	21
Minutes of ATFM delays > 15 min ('000)	679

Size

Size of controlled airspace: 982 000 km²

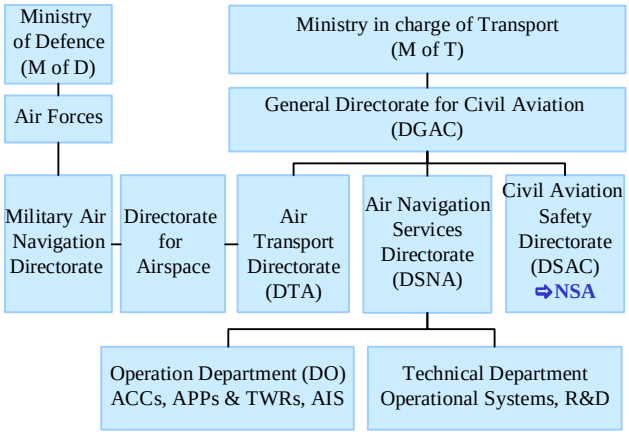


DSNA, France

Directorate of Air Navigation Services

www.aviation-civile.gouv.fr

Institutional arrangements and links (2010)



Status (2010)

- DSNA is a division of DGAC
- 100% State-owned

National Supervisory Authority (NSA):

Directorate for Civil Aviation Safety (DSAC)

Body responsible for:

Safety Regulation

Air Transport Directorate (DTA)

Airspace Regulation

Air Transport Directorate (DTA)
Direction de la circulation aérienne militaire (DIRCAM)

Economic Regulation

Air Transport Directorate (DTA)

Corporate governance structure (2010)

Minister in charge of Transport

Director General for Civil Aviation

EXECUTIVE BOARD (DSNA)
- Director of DSNA
- Deputy Director for Finance
- Deputy Director for Planning & Strategy
- Deputy Director for Human Resources
- Director of Operation Department (DO)
- Director of Technical Department (DTI)

DSNA (2010)

DIRECTOR OF DSNA:

M. Georges

DIRECTOR OF OPERATION DEPARTEMENT (DO):

M. Bruneau

DIRECTOR OF TECHNICAL DEPARTEMENT (DTI):

P. Merlot

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

- Delegation of airspace to Skyguide and Jersey

Operational ATS units:

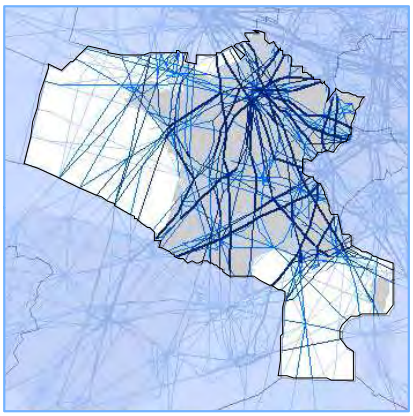
5 ACCs
12 APPs/TWRs (i.e. Paris Orly, Paris CDG, Marseille, Lyon, Nice, Bordeaux, Toulouse, Clermont Ferrand, Montpellier, Strasbourg, Bâle-Mulhouse, Nantes)
67 TWRs

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	1 326
Gate-to-gate total costs (M€)	1 347
Gate-to-gate ATM/CNS provision costs (M€)	1 125
Gate-to-gate total ATM/CNS assets(M€)	745
Gate-to-gate ANS total capex (M€)	144
ATCOs in OPS	2 662
Gate-to-gate total staff	8 734
Total IFR flight-hours controlled by ANSP ('000)	2 292
IFR airport movements controlled by ANSP ('000)	1 941
En-route sectors	93
Minutes of ATFM delays > 15 min ('000)	1 752

Size

Size of controlled airspace: 1 000 000 km²



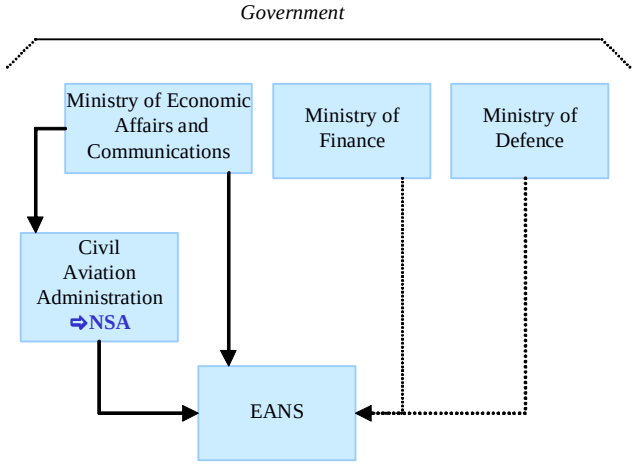
EANS, Estonia

Estonian Air Navigation Services

www.eans.ee

LENNULIIKLUSTEENINDUSE AS
ESTONIAN AIR NAVIGATION SERVICES

Institutional arrangements and links (2010)



Status (2010)

- Joint-stock company as of 1998
- 100% State-owned

National Supervisory Authority (NSA):

Civil Aviation Administration

Body responsible for:

Safety Regulation

Government of the Republic of Estonia
Safety Supervision is done by the Civil Aviation Administration (CAA)

Airspace Regulation

Government of the Republic of Estonia

Economic Regulation

Government of the Republic of Estonia
(Ministry of Economic Affairs and Communications & Ministry of Finance)

Corporate governance structure (2010)

SUPERVISORY BOARD (6 members)
Chairman + 5 members
Members: 3 appointed by M of EC, of which 1 is elected Chairman by members of the Supervisory Board; 3 appointed by M of F, of which one represents M of D.

EXECUTIVE BOARD (3 members)
CEO + 2 members
CEO appointed by the Supervisory Board

EANS (2010)

CHAIRMAN OF THE SUPERVISORY BOARD:

Andres Uusma

CHAIRMAN OF THE MANAGEMENT BOARD & CEO:

Tanel Rautits

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

- Tech. serv. (NAV/COMM/SUR), Aeronautical info serv.
- Consultancy services
- Control Tallinn Aerodrome
- Estonia is not member of EUROCONTROL
- Estonia does not belong to IFPS zone

Operational ATS units:

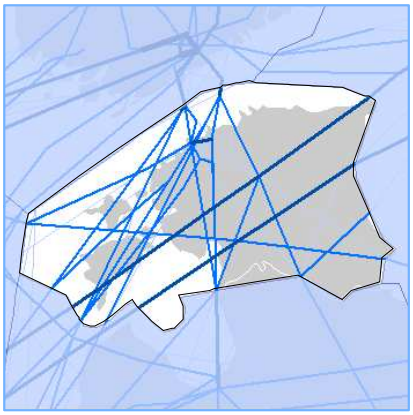
1 ACC (Tallinn)
1 APP (Tallinn)
1 TWR (Tallinn)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	16
Gate-to-gate total costs (M€)	11
Gate-to-gate ATM/CNS provision costs (M€)	11
Gate-to-gate total ATM/CNS assets(M€)	12
Gate-to-gate ANS total capex (M€)	3
ATCOs in OPS	37
Gate-to-gate total staff	122
Total IFR flight-hours controlled by ANSP ('000)	60
IFR airport movements controlled by ANSP ('000)	42
En-route sectors	3
Minutes of ATFM delays > 15 min ('000)	2

Size

Size of controlled airspace: 77 102 km²

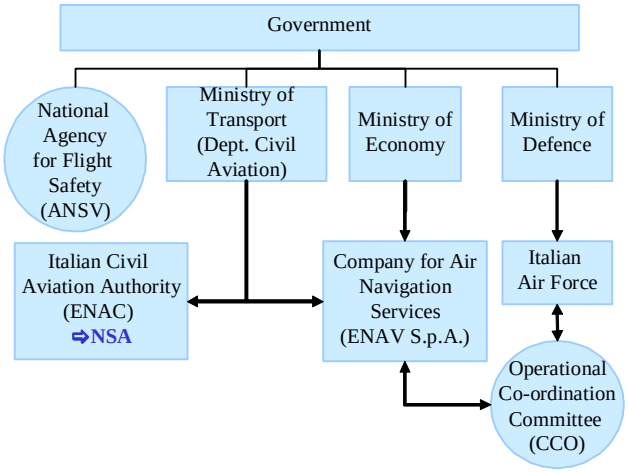


ENAV, Italy

Company for Air Navigation Services

www.enav.it

Institutional arrangements and links (2010)



Status (2010)

- Joint-Stock Public Corporation as of 2001 under contract management
- 100% State-owned by Ministry of Economy

National Supervisory Authority (NSA):

Italian Civil Aviation Authority (ENAC)

Body responsible for:

Safety Regulation

Italian Civil Aviation Authority (ENAC) and Ministry of Transport (M of T)

Airspace Regulation

Department of Civil Aviation, Italian Air Force, ENAC

Economic Regulation

Ministry of Transport and ENAC review annually ANS charges in co-operation with Ministry of Economy and Ministry of Defence

Corporate governance structure (2010)

ADMINISTRATION BOARD:
Chairman + CEO + 5 members.
The Administration Board has been appointed by the Ministry of Economy in consultation with the Ministry of Transport.

Reciprocal obligations between the Ministry of Transport and ENAV are regulated through programme contract and service contract.

ENAV (2010)

CHAIRMAN OF ADMINISTRATION BOARD:

Luigi Martini

CEO:

Guido Pugliesi

DIRECTOR GENERAL:

Massimo Garbini

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

- Aeronautical Information service
- Training and licensing of ATCO's
- R&D consultancy services
- Aerodrome weather services
- Flight inspection

Operational ATS units:

4 ACCs (Milan, Padua, Rome, Brindisi)
18 APPs + 4 APPs combined with ACCs
28 TWRs (including 15 low traffic airports which are not included in ACE data analysis)
11 AFISs

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	718
Gate-to-gate total costs (M€)	737
Gate-to-gate ATM/CNS provision costs (M€)	652
Gate-to-gate total ATM/CNS assets(M€)	984
Gate-to-gate ANS total capex (M€)	174
ATCOs in OPS	1 206
Gate-to-gate total staff	2 764
Total IFR flight-hours controlled by ANSP ('000)	1 111
IFR airport movements controlled by ANSP ('000)	1 230
En-route sectors	62
Minutes of ATFM delays > 15 min ('000)	711

Size

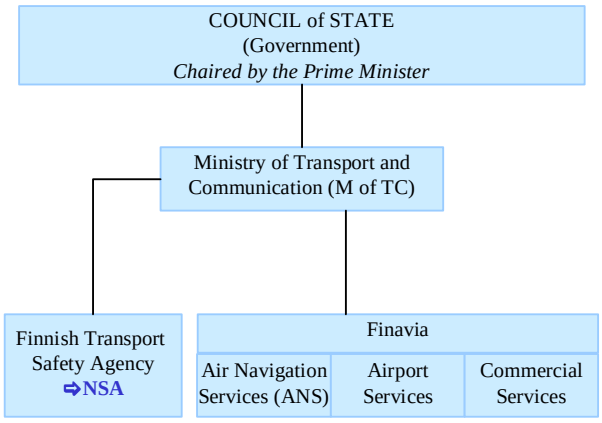
Size of controlled airspace: 734 000 km²

Finavia, Finland

Finavia

www.finavia.fi

Institutional arrangements and links (2010)



Status (2010)

- Public Limited Company
- Integrated civil/military ANSP
- 100% State-owned

National Supervisory Authority (NSA):

Finnish Transport Safety Agency

Body responsible for:

Safety Regulation

Finnish Transport Safety Agency

Airspace Regulation

Finnish Transport Safety Agency

Economic Regulation

Finnish Transport Safety Agency

Corporate governance structure (2010)

The BOARD (6 members)
Chairman + 5 members (1 member represents staff)
All members are appointed by the Council of State.

President (CEO) of Finavia is not a member of the Board.

President (CEO)

Finavia (2010)

CHAIRMAN OF THE FINAVIA BOARD:

Seppo Paatelainen

PRESIDENT (CEO):

Samuli Haapasalo

SENIOR VICE PRESIDENT - AIR NAVIGATION SERVICES:

Anne Ilola

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☑ MET

- Finavia owns and operates 25 airports
- Partly internal MET provision, partly outsourced
- Delegation of ATS in certain areas to LFV (Sweden) and Avinor (Norway)

Operational ATS units:

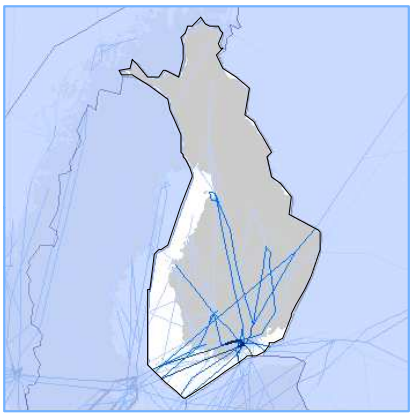
2 ACCs (Rovaniemi, Tampere)
5 APPs (Helsinki, Jyväskylä, Kuopio, Tampere-Pirkkala, Rovaniemi)
2 Mil-APPs (Halli, Kauhava)
19 TWRs
6 AFISs (Enontekiö, Kittilä, Kajaani, Savonlinna, Kuusamo, Varkaus)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	54
Gate-to-gate total costs (M€)	65
Gate-to-gate ATM/CNS provision costs (M€)	55
Gate-to-gate total ATM/CNS assets(M€)	67
Gate-to-gate ANS total capex (M€)	5
ATCOs in OPS	204
Gate-to-gate total staff	507
Total IFR flight-hours controlled by ANSP ('000)	116
IFR airport movements controlled by ANSP ('000)	271
En-route sectors	5
Minutes of ATFM delays > 15 min ('000)	18

Size

Size of controlled airspace: 415 000 km²

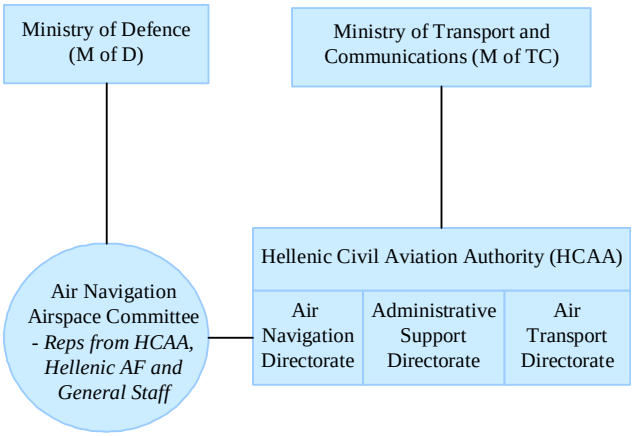


HCAA, Greece

Hellenic Civil Aviation Authority

www.hcaa.gr

Institutional arrangements and links (2010)



Status (2010)

- State body
- 100% State-owned

National Supervisory Authority (NSA):

NSA not yet established

Body responsible for:

Safety Regulation

Hellenic Civil Aviation Authority

Airspace Regulation

Air Navigation Airspace Committee

Economic Regulation

Ministry of Finance is responsible for HCAA Budget

Corporate governance structure (2010)

Governor HCAA

2 Deputy Governors in charge with Directorates

Air Navigation Directorate:
- *ATS Division.*
- *Telecoms Division.*
- *Electronics Division.*
- *Electric Instal. & Application Centre.*
- *Flight Inspection Unit.*

HCAA (2010)

DIRECTOR GENERAL (GOVERNOR) OF HCAA:

Leonardos-Odyseeas Vlamis

DEPUTY GOVERNORS OF HCAA:

Dimitrios Katounis

DIRECTOR GENERAL OF AIR NAVIGATION:

Marinos Kardaris

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

Operational ATS units:

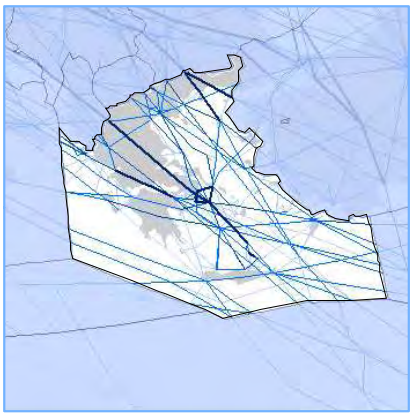
1 ACC
16 APPs
18 TWRs
14 AFISs

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	185
Gate-to-gate total costs (M€)	214
Gate-to-gate ATM/CNS provision costs (M€)	185
Gate-to-gate total ATM/CNS assets(M€)	n/a
Gate-to-gate ANS total capex (M€)	15
ATCOs in OPS	530
Gate-to-gate total staff	1 870
Total IFR flight-hours controlled by ANSP ('000)	484
IFR airport movements controlled by ANSP ('000)	193
En-route sectors	12
Minutes of ATFM delays > 15 min ('000)	1 259

Size

Size of controlled airspace: 537 000 km²

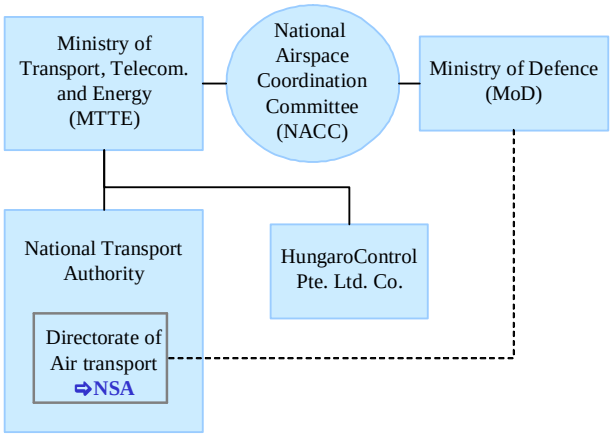


HungaroControl, Hungary

Hungarian Air Navigation Services

www.hungarocontrol.hu

Institutional arrangements and links (2010)



Status (2010)

- HungaroControl was set up on January 1st 2002
- Registered as Private Limited Company as of 22 November 2006
- Operates as a Pte. Ltd. Co. As of 1 January 2007
- 100% State-owned

National Supervisory Authority (NSA):

Directorate of Air transport

Body responsible for:

Safety Regulation

MTTE

Airspace Regulation

Govt., MTTE

Economic Regulation

Govt., MTTE

Corporate governance structure (2010)

SHAREHOLDER
The Minister responsible for transport exercises the rights of the shareholder on behalf of the State

BOARD OF DIRECTORS
President + 4 members
The President and all members are appointed by the Minister responsible for transport

CHIEF EXECUTIVE OFFICER
The CEO is appointed by the Minister responsible for transport and is a member of the Executive Board

SUPERVISORY BOARD
President + 5 members
The President and all members are appointed by the Minister responsible for transport
2 members are representatives of the employees

HungaroControl (2010)

CHAIRMAN OF THE BOARD OF DIRECTORS:

Dr. Károly Lotz

CHIEF EXECUTIVE OFFICER (CEO):

Ms. Andrea Markó

CHAIRMAN OF THE SUPERVISORY BOARD:

Dr. Dénes Bots

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

- HungaroControl provides Training activities (ATM training courses, language courses) in its Civil Aviation Training Centre (CATC)

Operational ATS units:

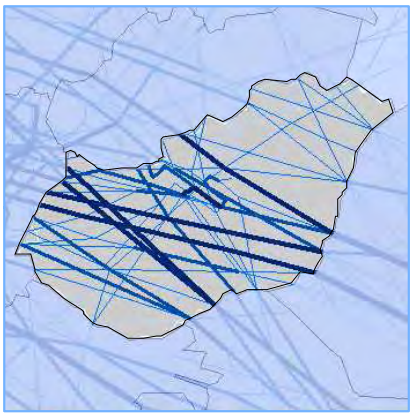
1 ACC (Budapest)
1 APP (Budapest)
2 TWRs (Budapest and Sármellék)
1 AFIS (Sármellék)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	87
Gate-to-gate total costs (M€)	83
Gate-to-gate ATM/CNS provision costs (M€)	74
Gate-to-gate total ATM/CNS assets(M€)	77
Gate-to-gate ANS total capex (M€)	14
ATCOs in OPS	185
Gate-to-gate total staff	691
Total IFR flight-hours controlled by ANSP ('000)	202
IFR airport movements controlled by ANSP ('000)	118
En-route sectors	7
Minutes of ATFM delays > 15 min ('000)	9

Size

Size of controlled airspace: 93 000 km²

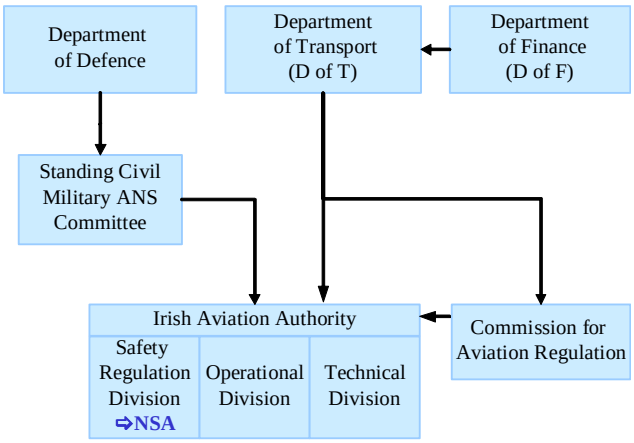


IAA, Ireland

Irish Aviation Authority

www.iaa.ie

Institutional arrangements and links (2010)



Status (2010)

- Commercial company as of 1994 governed by Companies Acts, 1963 to 2006
- 100% State-owned (Department of Finance)

National Supervisory Authority (NSA):

Safety Regulation Division

Body responsible for:

Safety Regulation

IAA Safety Regulation Division

Airspace Regulation

IAA Safety Regulation Division

Economic Regulation

Commission for Aviation Regulation (established under the Aviation Regulation Act in 2001)

The Act requires the Commission to make a determination specifying the maximum levels of terminal navigation charges

Corporate governance structure (2010)

BOARD OF THE AUTHORITY (8 members)
Chairman + CEO + 6 members

EXECUTIVE BOARD (Senior Management Board)
(8 members)
CEO + 6 executive directors + company secretary & solicitor

IAA (2010)

CHAIRMAN OF THE BOARD OF AUTHORITY:

Jerry V. Liston

CEO:

Eamonn Brennan

DIRECTOR OF OPERATIONS DIVISION:

Donie Mooney

DIRECTOR OF TECHNICAL DIVISION:

Philip Hughes

Scope of services

☑ GAT	☑ Upper Airspace	☑ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

Operational ATS units:

2 ACCs (Dublin, Shannon)
3 APPs (Dublin, Shannon, Cork)
3 TWRs (Dublin, Shannon, Cork)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	130
Gate-to-gate total costs (M€)	132
Gate-to-gate ATM/CNS provision costs (M€)	113
Gate-to-gate total ATM/CNS assets(M€)	103
Gate-to-gate ANS total capex (M€)	21
ATCOs in OPS	228
Gate-to-gate total staff	483
Total IFR flight-hours controlled by ANSP ('000)	285
IFR airport movements controlled by ANSP ('000)	279
En-route sectors	13
Minutes of ATFM delays > 15 min ('000)	308

Size

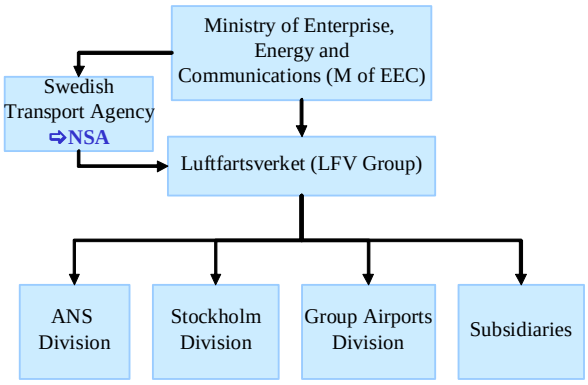
Size of controlled airspace: 457 000 km²

LFV/ANS Sweden, Sweden

LFV, Swedish Airports and Navigation Services

www.lfv.se

Institutional arrangements and links (2010)



Status (2010)

- Public Enterprise
- 100% State-owned

National Supervisory Authority (NSA):

Swedish Transport Agency

Body responsible for:

Safety Regulation

Swedish Transport Agency

Airspace Regulation

Swedish Transport Agency

Economic Regulation

Swedish Transport Agency

Corporate governance structure (2010)

BOARD OF DIRECTORS (10 members)
Chairman + DG + 8 members
8 members (Chairman + DG + 6 members) are appointed by the Government; 2 members are appointed by Trade Unions.

EXECUTIVE BOARD (10 members)
DG + 9 members
DG appointed by the Government

LFV/ANS Sweden (2010)

CHAIRMAN OF THE BOARD OF DIRECTORS:

Ingemar Skogö

DIRECTOR GENERAL:

Lars Rekke

DIRECTOR OF THE ANS DIVISION:

Thomas Allard

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☑ MET

- LFV is managing 16 airports, including 2 military airports where LFV is responsible for the passenger and terminal services only
- The Gov. directs LFV's overall objectives and long-term targets on return on equity (after tax) and equity/assets ratio

Operational ATS units:

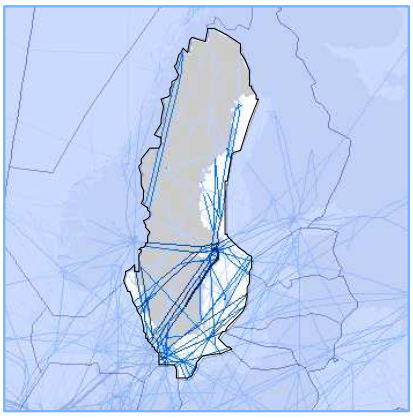
2 ACCs (Stockholm and Malmö)
26 APPs (2 APPs combined with ACCs + 24 APPs combined with TWRs)
35 TWRs
2 AFISs

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	174
Gate-to-gate total costs (M€)	170
Gate-to-gate ATM/CNS provision costs (M€)	163
Gate-to-gate total ATM/CNS assets(M€)	165
Gate-to-gate ANS total capex (M€)	21
ATCOs in OPS	514
Gate-to-gate total staff	1 021
Total IFR flight-hours controlled by ANSP ('000)	444
IFR airport movements controlled by ANSP ('000)	550
En-route sectors	22
Minutes of ATFM delays > 15 min ('000)	96

Size

Size of controlled airspace: 625 000 km²

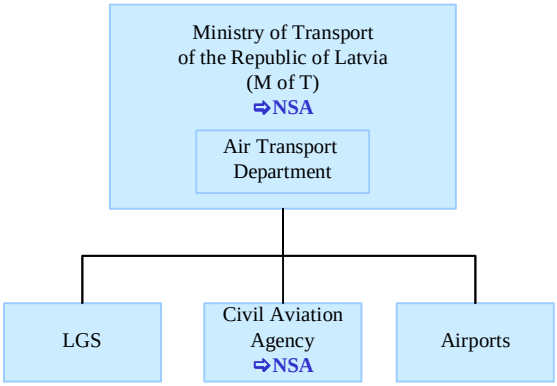


LGS, Latvia

SJSC Latvijas Gaisa Satiksme

www.lgs.lv

Institutional arrangements and links (2010)



Status (2010)

- Joint-stock company since 1997
- 100% State-owned

National Supervisory Authority (NSA):

- MoT (for policy and economic issues)
- Civil Aviation Agency (for safety, operational aspects, certification and licensing issues)

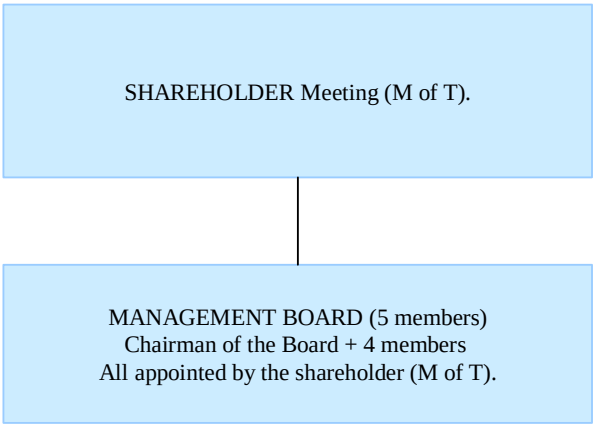
Body responsible for:

Safety Regulation
Civil Aviation Agency

Airspace Regulation
Civil Aviation Agency

Economic Regulation
Air Transport Department

Corporate governance structure (2010)



LGS (2010)

SHAREHOLDER'S REPRESENTATIVE:
Aivita Lublina - Goldmane

CHAIRMAN OF THE BOARD:
Arturs Kokars

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☐ MET

- ATC services delegated to Latvia by Lithuania over a part of the Baltic Sea
- Latvia has applied for Eurocontrol membership in September 2008 and the integration into Eurocontrol has started in 2009

Operational ATS units:

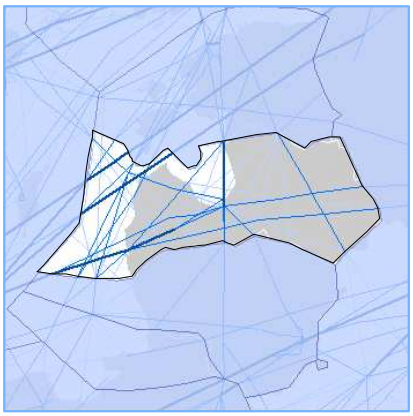
1 ACC (Riga)
2 APPs (Riga, Liepaja)
3 TWRs (Riga, Liepaja and Ventspils)
In Liepaja APP and TWR are combined in one ATS unit.

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	20
Gate-to-gate total costs (M€)	24
Gate-to-gate ATM/CNS provision costs (M€)	20
Gate-to-gate total ATM/CNS assets(M€)	29
Gate-to-gate ANS total capex (M€)	12
ATCOs in OPS	64
Gate-to-gate total staff	309
Total IFR flight-hours controlled by ANSP ('000)	69
IFR airport movements controlled by ANSP ('000)	58
En-route sectors	3
Minutes of ATFM delays > 15 min ('000)	0

Size

Size of controlled airspace: 94 000 km²

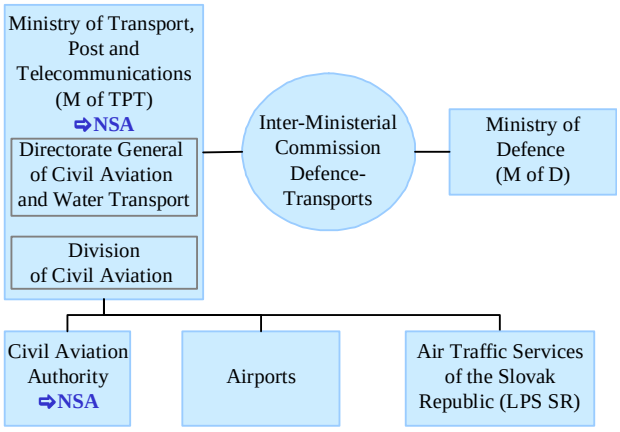


LPS, Slovak Republic

Letové Prevádzkové Služby Slovenskej Republiky

www.lps.sk

Institutional arrangements and links (2010)



Status (2010)

- State-owned enterprise as of January 2000
- 100% State-owned

National Supervisory Authority (NSA):

- Ministry of Transport, Post and Telecommunications
- Civil Aviation Authority

Body responsible for:

Safety Regulation

Civil Aviation Authority

Airspace Regulation

Ministry of Transport, Posts and Telecommunications

Economic Regulation

Ministry of Transport, Posts and Telecommunications

Corporate governance structure (2010)

SUPERVISORY BOARD (9 members)
Chairman + 8 members
Members represent: 5 M of TPT,
3 staff reps., 1 trade union association rep.
Chairman is also the DG of the Section of Budget and Internal Economy

EXECUTIVE BOARD (9 members)
CEO + 8 members
The CEO is appointed by the M of TPT.

LPS (2010)

CHAIRPERSON OF THE SUPERVISORY BOARD:

František Perutka

DIRECTOR GENERAL (CEO):

Roman Bíro

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☐ MET

Operational ATS units:

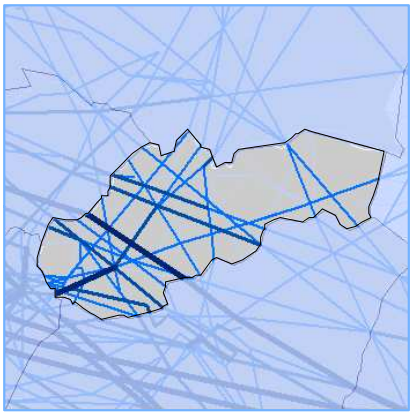
1 ACC (Bratislava)
2 APPs (Bratislava, Kosice)
5 TWRs (Bratislava, Kosice, Piestany, Poprad, Sliac and Zilina)
1 Central ATS Reporting Office (Bratislava)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	49
Gate-to-gate total costs (M€)	47
Gate-to-gate ATM/CNS provision costs (M€)	43
Gate-to-gate total ATM/CNS assets(M€)	37
Gate-to-gate ANS total capex (M€)	5
ATCOs in OPS	111
Gate-to-gate total staff	469
Total IFR flight-hours controlled by ANSP ('000)	79
IFR airport movements controlled by ANSP ('000)	48
En-route sectors	5
Minutes of ATFM delays > 15 min ('000)	37

Size

Size of controlled airspace: 48 700 km²

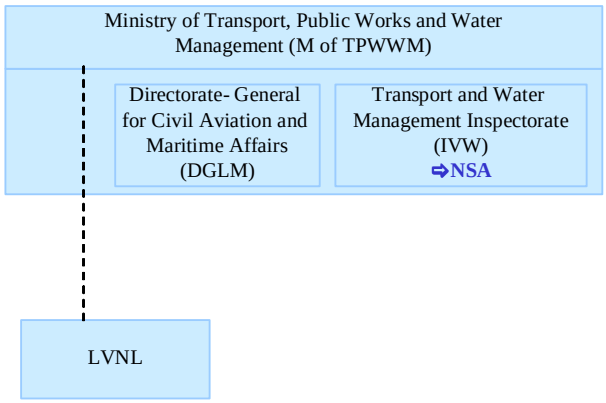


LVNL, Netherlands

Luchtverkeersleiding Nederland

www.lvnl.nl

Institutional arrangements and links (2010)



Status (2010)

- Corporate Entity as of 1993 (by Air Traffic Law)
- 100% State-owned

National Supervisory Authority (NSA):

Transport and Water Management Inspectorate (IVW)

Body responsible for:

Safety Regulation

Directorate-General for Civil Aviation and Maritime Affairs (DGLM)

Airspace Regulation

Directorate-General for Civil Aviation and Maritime Affairs (DGLM)

Economic Regulation

Directorate-General for Civil Aviation and Maritime Affairs (DGLM)

Corporate governance structure (2010)

SUPERVISORY DIRECTORS BOARD (6 members)
Chairman + 5 members + 1 observer
Members comprise representatives from: Ministry of Defence, and members nominated by Dutch scheduled airlines (KLM), Dutch charter airlines (Transavia) and Dutch airports (Amsterdam Schiphol)

EXECUTIVE BOARD (2 members)
Chairman + 1 member
Executive Board is appointed by the M of TPWWM, on the recommendation of the Supervisory Board.

LVNL (2010)

CHAIRMAN OF THE SUPERVISORY BOARD:

H.F. Dijkstal

CHAIRMAN OF THE EXECUTIVE BOARD (CEO):

Ir. P. Riemens (CEO)

Scope of services

☑ GAT	☐ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

- Controls lower airspace up to FL 245

Operational ATS units:

1 ACC (Amsterdam)
3 APPs (Schiphol, Eelde, Beek)
4 TWRs (Schiphol, Rotterdam, Eelde, Beek)

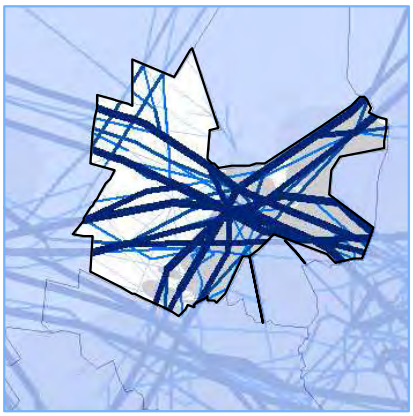
- New Millingen ACC (Military ACC) is not included in ACE data analysis
- Rotterdam APP has been located in Schiphol since 2002

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	216
Gate-to-gate total costs (M€)	228
Gate-to-gate ATM/CNS provision costs (M€)	162
Gate-to-gate total ATM/CNS assets(M€)	102
Gate-to-gate ANS total capex (M€)	14
ATCOs in OPS	194
Gate-to-gate total staff	1 030
Total IFR flight-hours controlled by ANSP ('000)	152
IFR airport movements controlled by ANSP ('000)	496
En-route sectors	6
Minutes of ATFM delays > 15 min ('000)	429

Size

Size of controlled airspace: 51 100 km²

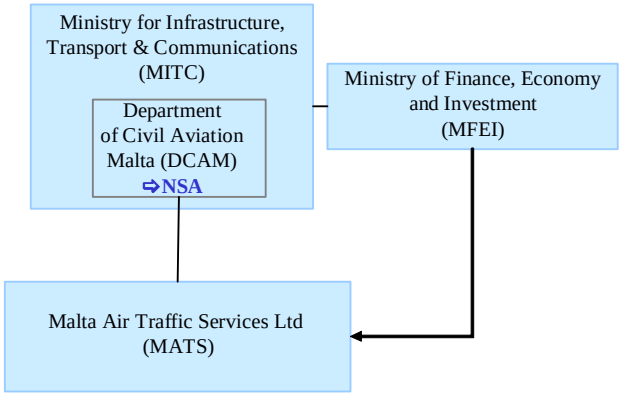


MATS, Malta

Malta Air Traffic Services Limited

www.maltats.com

Institutional arrangements and links (2010)



Status (2010)

- Malta Air Traffic Services Ltd (Reg. no. C27965) is a fully Government owned company. MATS has been operating as the sole ANSP for Malta since the 1st January 2002

National Supervisory Authority (NSA):

Department of Civil Aviation Malta (DCAM)

Body responsible for:

Safety Regulation

Department of Civil Aviation

Airspace Regulation

Department of Civil Aviation

Economic Regulation

Department of Civil Aviation

Corporate governance structure (2010)

BOARD of DIRECTORS (4 members)
Chairman + 3 Directors
Members appointed by the Government, representing the MFEI.

The Board of Directors appoints the CEO.

MATS (2010)

CHAIRMAN OF THE SUPERVISORY BOARD:

Maj. Vanni Ganado

CEO & HEAD OF THE ATS DIVISION:

Lawrence Fenech

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

- MATS controls portions of airspace delegated to Malta ACC by Rome ACC

Operational ATS units:

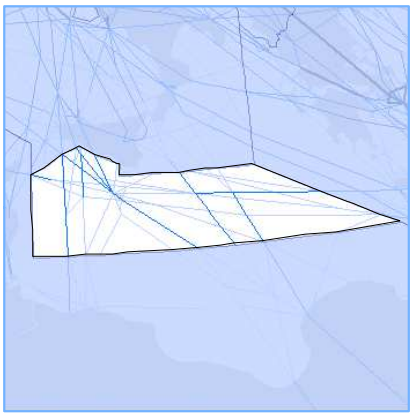
1 ACC (Malta)
1 APP (Malta)
1 TWR (Luqa)
1 AFIS

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	15
Gate-to-gate total costs (M€)	14
Gate-to-gate ATM/CNS provision costs (M€)	13
Gate-to-gate total ATM/CNS assets(M€)	6
Gate-to-gate ANS total capex (M€)	1
ATCOs in OPS	52
Gate-to-gate total staff	151
Total IFR flight-hours controlled by ANSP ('000)	41
IFR airport movements controlled by ANSP ('000)	30
En-route sectors	2
Minutes of ATFM delays > 15 min ('000)	0

Size

Size of controlled airspace: 230 000 km²

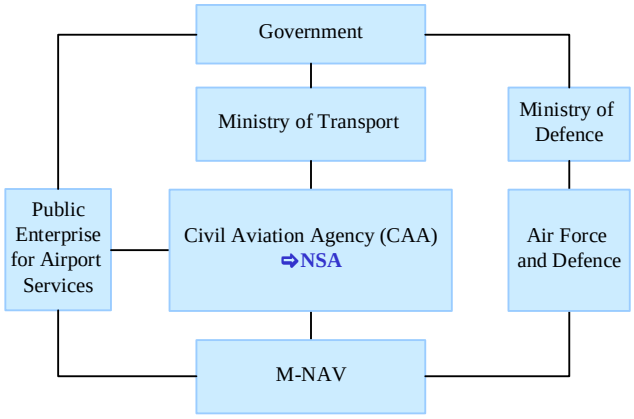


M-NAV, Former Yugoslav Republic of Macedonia

Air Navigation Services

www.dgca.gov.mk

Institutional arrangements and links (2010)



Status (2010)

- State body (acting as a legal entity)
- 100% State-owned

National Supervisory Authority (NSA):

Civil Aviation Agency (CAA)

Body responsible for:

Safety Regulation

Safety Dept. of Civil Aviation Agency

Airspace Regulation

ATM Dept. of Civil Aviation Agency

Economic Regulation

Government, Civil Aviation Agency

Corporate governance structure (2010)

SUPERVISORY BOARD
(3 members appointed by the Government)

MANAGEMENT BOARD
(3 executive directors appointed by the Government)

M-NAV (2010)

CHAIRMAN OF THE SUPERVISORY BOARD:

Dragan Andreevski

DIRECTOR GENERAL OF CAA:

Zoran Krstevski

DIRECTOR OF ANS DEPARTEMENT:

Toni Prgomet

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☑ MET

Operational ATS units:

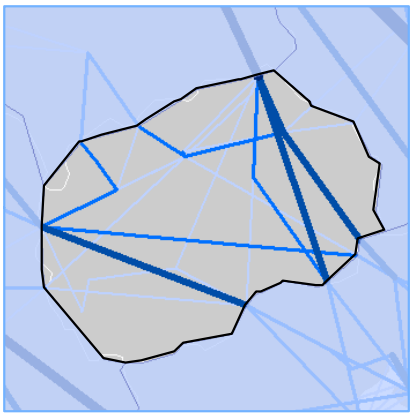
1 ACC (Skopje)
2 APPs (Skopje and Ohrid)
2 TWRs (Skopje and Ohrid)
1 AFIS (Skopje)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	14
Gate-to-gate total costs (M€)	13
Gate-to-gate ATM/CNS provision costs (M€)	12
Gate-to-gate total ATM/CNS assets(M€)	11
Gate-to-gate ANS total capex (M€)	0
ATCOs in OPS	62
Gate-to-gate total staff	292
Total IFR flight-hours controlled by ANSP ('000)	21
IFR airport movements controlled by ANSP ('000)	14
En-route sectors	3
Minutes of ATFM delays > 15 min ('000)	0

Size

Size of controlled airspace: 24 800 km²

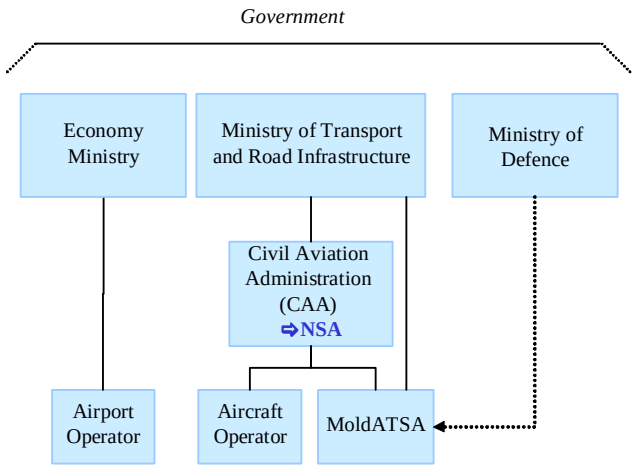


MoldATSA, Moldova

Moldavian Air Traffic Services Authority

www.moldatsa.md

Institutional arrangements and links (2010)



Status (2010)

- State enterprise since 1994 (by Government Regulation Nr.3 from 12.01.1994)
- 100% State-owned

National Supervisory Authority (NSA):

Civil Aviation Administration (CAA)

Body responsible for:

Safety Regulation

Ministry of Transport and Road Infrastructure

Airspace Regulation

Ministry of Transport and Road Infrastructure

Economic Regulation

Ministry of Transport and Road Infrastructure

Corporate governance structure (2010)

SUPERVISORY BOARD (7 members)
Chairman + 6 members
All members are appointed by the Ministry of Transport and Road Infrastructure
Members represent Ministry of Transport and Road Infrastructure (1), MoldATSA management (2), Ministry of Finance (2), Ministry of Economy and Commerce (2)

Management Board:
Director General MoldATSA

MoldATSA (2010)

CHAIRMAN OF THE SUPERVISORY BOARD:

Natalia Vrabie

DIRECTOR GENERAL (CEO):

Cornelia Vasilita-Barbaros

HEAD OF ATM DIVISION:

Andrei Istrati

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☑ MET

Operational ATS units:

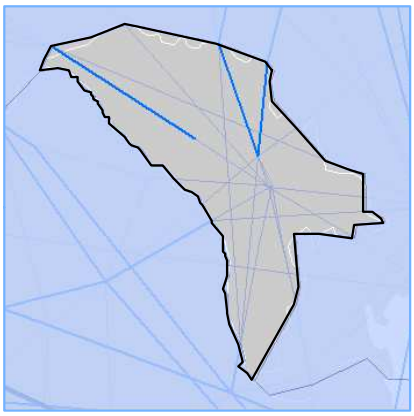
1 ACC (Chisinau)
1 APP (Chisinau)
3 TWRs (Chisinau, Balti, Cahul)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	8
Gate-to-gate total costs (M€)	7
Gate-to-gate ATM/CNS provision costs (M€)	6
Gate-to-gate total ATM/CNS assets(M€)	6
Gate-to-gate ANS total capex (M€)	10
ATCOs in OPS	56
Gate-to-gate total staff	304
Total IFR flight-hours controlled by ANSP ('000)	10
IFR airport movements controlled by ANSP ('000)	13
En-route sectors	2
Minutes of ATFM delays > 15 min ('000)	0

Size

Size of controlled airspace: 33 800 km²



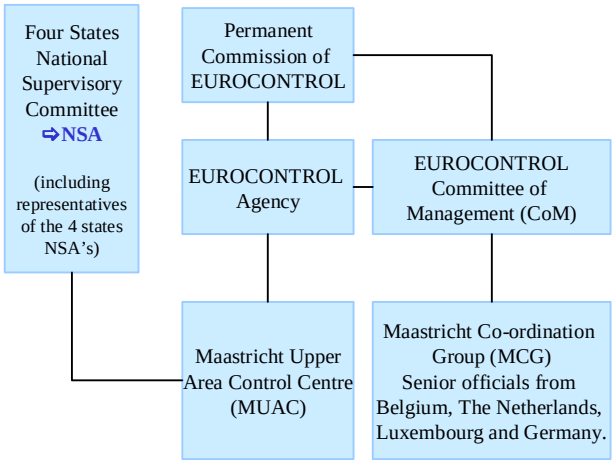
MUAC, Maastricht

Maastricht Upper Area Control Centre

www.eurocontrol.int

EUROCONTROL

Institutional arrangements and links (2010)



Status (2010)

- EUROCONTROL: International Organisation established under the EUROCONTROL Convention of 13.12.1960 and amended on 12.2.1981. At the request of the Benelux States and Germany, MUAC is operated as a EUROCONTROL Agency's Service according to the Maastricht Agreements of 25.11.1986

National Supervisory Authority (NSA):

Four States National Supervisory Committee

Body responsible for:

Safety Regulation

Maastricht Agreements Art. 1.2: each of the 4 States retains its competence and obligations in respect of regulations

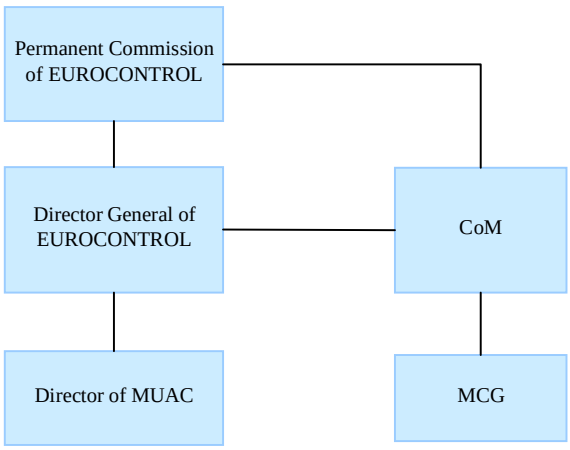
Airspace Regulation

The MCG determines a common position for the 4 States in all matters relating to the operation of ATS by MUAC concerning, inter alia, airspace organisation and sectorisation

Economic Regulation

Financial arrangements for the exploitation of MUAC are adopted by the Committee of Management. EUROCONTROL DG seeks approval of the budget, which contains a special budgetary Annex for MUAC, with the Permanent Commission

Corporate governance structure (2010)



MUAC (2010)

DIRECTOR GENERAL OF EUROCONTROL:

David McMillan

DIRECTOR OF MUAC:

Karl - Heinz Kloos

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☐ Lower Airspace	☐ MET

- Controls GAT in the upper airspace (>FL245) above Benelux and North-Western Germany
- A German ATC unit responsible for handling OAT above North-Western Germany and managed by the DFS is co-located at MUAC

Operational ATS units:

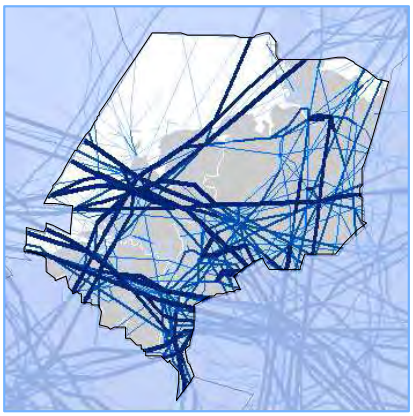
1 ACC (Maastricht)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	374
Gate-to-gate total costs (M€)	128
Gate-to-gate ATM/CNS provision costs (M€)	128
Gate-to-gate total ATM/CNS assets(M€)	79
Gate-to-gate ANS total capex (M€)	15
ATCOs in OPS	221
Gate-to-gate total staff	625
Total IFR flight-hours controlled by ANSP ('000)	581
IFR airport movements controlled by ANSP ('000)	n/appl
En-route sectors	16
Minutes of ATFM delays > 15 min ('000)	533

Size

Size of controlled airspace: 260 000 km²

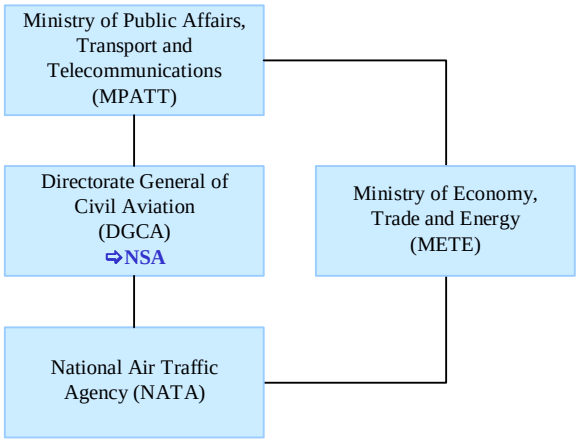


NATA Albania, Albania

National Air Traffic Agency

http://www.anta.com.al/

Institutional arrangements and links (2010)



Status (2010)

- Since May 1999 NATA is a joint-stock company
- 100% State owned

National Supervisory Authority (NSA):

Directorate General of Civil Aviation (DGCA)

Body responsible for:

Safety Regulation

MPATT and Directorate General of Civil Aviation (DGCA)

Airspace Regulation

MPATT and Directorate General of Civil Aviation (DGCA)

Economic Regulation

Ministry of Economy, Trade and Energy (METE)

Corporate governance structure (2010)

SUPERVISORY BOARD (6 members)
Chairman + 5 members
Chairman is the Director of Transport and Telecommunications (MPATT)

All 6 members are nominated by the METE,
4 members are proposed by the MPATT, 2 members by the METE.

MANAGEMENT BOARD (3 members)
Director General + 2 V/Directors

Director General appointed by MPATT through the Supervisory Board of NATA

NATA Albania (2010)

CHAIRMAN OF SUPERVISORY BOARD:

Ervin Minarolli

DIRECTOR GENERAL (CEO) OF NATA:

Petrit Sulaj

DIRECTOR OF THE ATS DEPARTMENT:

Edmond Metaj

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☑ MET

Operational ATS units:

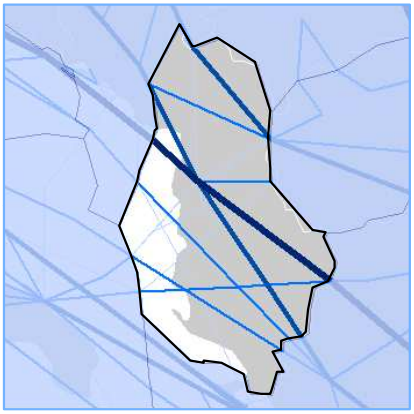
1 ACC (Tirana)
1 APP (Tirana)
1 TWR (Tirana)
1 AFIS (Tirana)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	20
Gate-to-gate total costs (M€)	16
Gate-to-gate ATM/CNS provision costs (M€)	14
Gate-to-gate total ATM/CNS assets(M€)	28
Gate-to-gate ANS total capex (M€)	11
ATCOs in OPS	41
Gate-to-gate total staff	231
Total IFR flight-hours controlled by ANSP ('000)	32
IFR airport movements controlled by ANSP ('000)	20
En-route sectors	3
Minutes of ATFM delays > 15 min ('000)	10

Size

Size of controlled airspace: 35 900 km²

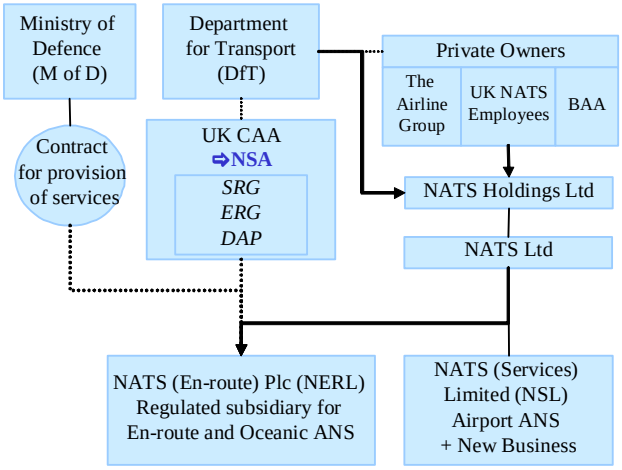


NATS, United Kingdom

NATS Ltd

www.nats.co.uk

Institutional arrangements and links (2010)



Status (2010)

- Public Private Partnership as of 2001
  - 49% State-owned (Govt retains a Golden Share)
  - 51% private-owned (42% by the Airline Group, 4% by BAA and 5% by UK NATS employees)
- The Airline Group comprises 7 UK airlines: BA, Virgin Atlantic, BMI, EasyJet, My Travel, ThomsonFly and Monarch Airlines

National Supervisory Authority (NSA):

UK CAA

Body responsible for:

Safety Regulation

UK CAA, Safety Regulation Group (SRG)

Airspace Regulation

UK CAA, Directorate of Airspace Policy (DAP)

Economic Regulation

UK CAA, Economic Regulation Group (ERG) which sets charges through a formula linked to the Retail Price Index (RPI) where "RPI minus X" targets for En-route and Oceanic Charges are set for 5 years at a time

Corporate governance structure (2010)

NATS (2010)

CHAIRMAN OF THE SUPERVISORY BOARD:

John Devaney

CEO of NATS and NERL:

Paul Barron (until 31 March 2010)
Richard Deakin (from 1st April 2010)

CEO of NSL:

Lawrence Hoskins

Scope of services

☑ GAT	☑ Upper Airspace	☑ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

Operational ATS units:

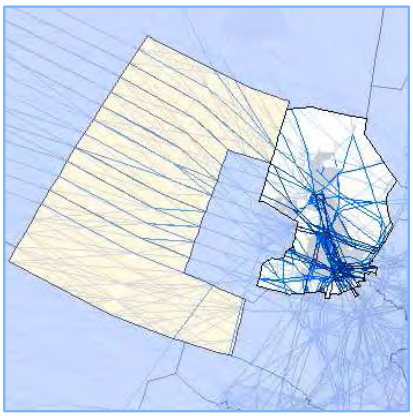
1 OAC (Shanwick)
3 ACCs (London AC, London TC, Prestwick (i.e. replacing Manchester and Scottish))
16 APPs
16 TWRs (including Gibraltar TWR)
2 AFISs

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	860
Gate-to-gate total costs (M€)	735
Gate-to-gate ATM/CNS provision costs (M€)	726
Gate-to-gate total ATM/CNS assets(M€)	826
Gate-to-gate ANS total capex (M€)	168
ATCOs in OPS	1 377
Gate-to-gate total staff	5 006
Total IFR flight-hours controlled by ANSP ('000)	1 471
IFR airport movements controlled by ANSP ('000)	1 975
En-route sectors	77
Minutes of ATFM delays > 15 min ('000)	2 292

Size

Size of controlled airspace: 2 998 000 km²



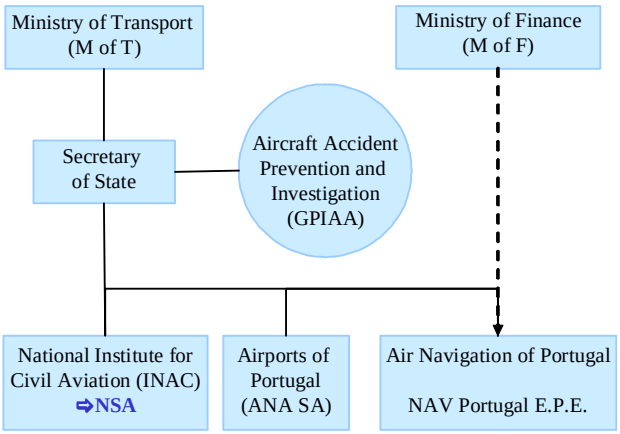
Continental: 878 000 km² - Oceanic: 2 120 000 km²

NAV Portugal, Portugal

Navegação Aérea de Portugal - NAV Portugal, E.P.E.

www.nav.pt

Institutional arrangements and links (2010)



Status (2010)

- Public Entity Corporation as of December 1998
- 100% State-owned

National Supervisory Authority (NSA):

National Institute for Civil Aviation (INAC)

Body responsible for:

Safety Regulation

National Institute of Civil Aviation (INAC)

Airspace Regulation

INAC+FA (Portuguese Air Force) + NAV Portugal in close permanent co-ordination

Economic Regulation

National Institute of Civil Aviation (INAC)

Corporate governance structure (2010)

BOARD OF ADMINISTRATION (5 members)
Chairman + 4 members

All members are appointed by the M of T for a 3 year term. Each member has executive functions within NAV Portugal. Each member is responsible to supervise one or several NAV Portugal Directorates and Advisory Bodies to the Board. There are 8 Directorates and 5 Advisory Bodies.

NAV Portugal has also a Board of Auditors composed of 3 members who are appointed by M of T for a 3 year term.

NAV Portugal (2010)

CHAIRMAN OF THE BOARD OF ADMINISTRATION:

Augusto Pereira Luis

CEO:

Augusto Pereira Luis

Scope of services

☑ GAT	☑ Upper Airspace	☑ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

Operational ATS units:

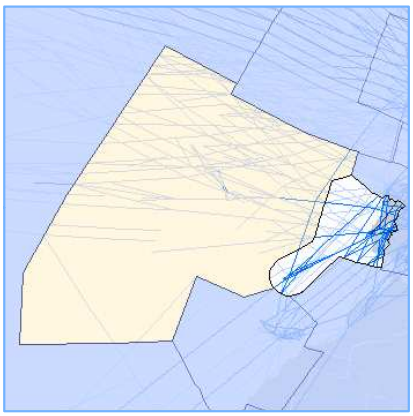
2 ACCs (Lisboa, Santa Maria)
8 APPs
10 TWRs (Lisboa, Cascais, Porto, Faro, Funchal, Porto Santo, Ponta Delgada, Santa Maria, Horta, Flores)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	153
Gate-to-gate total costs (M€)	164
Gate-to-gate ATM/CNS provision costs (M€)	149
Gate-to-gate total ATM/CNS assets(M€)	35
Gate-to-gate ANS total capex (M€)	7
ATCOs in OPS	198
Gate-to-gate total staff	725
Total IFR flight-hours controlled by ANSP ('000)	276
IFR airport movements controlled by ANSP ('000)	274
En-route sectors	7
Minutes of ATFM delays > 15 min ('000)	142

Size

Size of controlled airspace: 5 855 000 km²



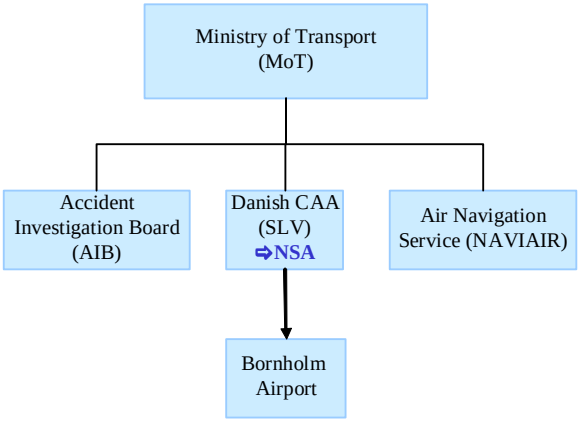
Continental: 665 000 km² - Oceanic: 5 190 000 km²

NAVIAIR, Denmark

Air Navigation Services

www.naviair.dk

Institutional arrangements and links (2010)



Status (2010)

- State enterprise
- 100% State-owned

National Supervisory Authority (NSA):

Danish CAA (SLV)

Body responsible for:

Safety Regulation

Civil Aviation Administration (SLV)

Airspace Regulation

Civil Aviation Administration (SLV)

Economic Regulation

Civil Aviation Administration (SLV)

Corporate governance structure (2010)

NO SUPERVISORY BOARD

EXECUTIVE BOARD (5 members)
CEO + 4 members
The CEO is appointed by the MoT.

NAVIAIR (2010)

DIRECTOR GENERAL (CEO):

Morten Dambæk

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

- ANS Greenland upper airspace is delegated to Isavia and NAV Canada

Operational ATS units:

(excluding Greenland)

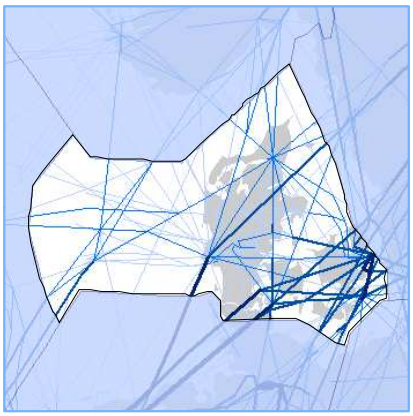
1 ACC (Copenhagen)
7 APPs
7 TWRs
1 AFIS

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	122
Gate-to-gate total costs (M€)	127
Gate-to-gate ATM/CNS provision costs (M€)	106
Gate-to-gate total ATM/CNS assets(M€)	153
Gate-to-gate ANS total capex (M€)	14
ATCOs in OPS	192
Gate-to-gate total staff	675
Total IFR flight-hours controlled by ANSP ('000)	216
IFR airport movements controlled by ANSP ('000)	363
En-route sectors	7
Minutes of ATFM delays > 15 min ('000)	1 024

Size

Size of controlled airspace: 158 000 km²

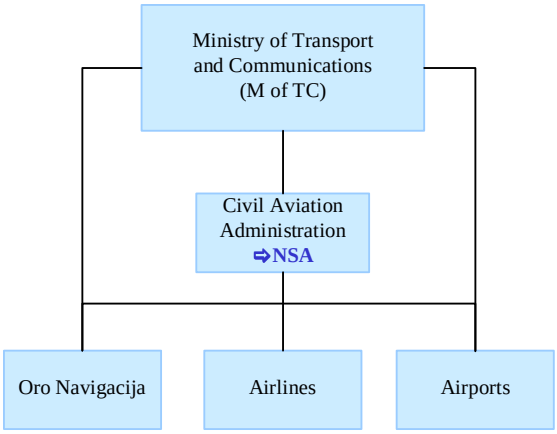


Oro Navigacija, Lithuania

State Enterprise Oro Navigacija

www.ans.lt

Institutional arrangements and links (2010)



Status (2010)

- Since July 2001
- 100% State-owned Enterprise (SOE)

National Supervisory Authority (NSA):

Civil Aviation Administration

Body responsible for:

Safety Regulation

Lithuania CAA

Airspace Regulation

Oro Navigacija in coordination with CAA and M of TC

Economic Regulation

Oro Navigacija in coordination with CAA and M of TC

Corporate governance structure (2010)

SUPERVISORY BOARD (5 members)
Chairman + 4 members
(Chairman + 3) represent M of TC
1 represent Oro Navigacija.

MANAGEMENT BOARD
Duties taken up by Director General
DG is appointed by Minister.

Oro Navigacija (2010)

CHAIRMAN OF THE SUPERVISORY BOARD:

Tomas Karpavičius

DIRECTOR GENERAL (CEO):

Algimantas Raščius

DIRECTOR ATM:

Sergej Smirnov

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

- Air Navigation Services are delegated to LGS (Latvia) above some part of the Baltic sea

Operational ATS units:

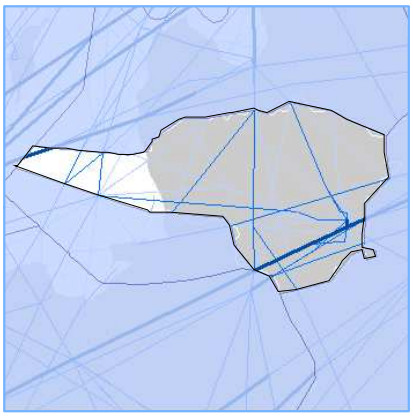
1 ACC (Vilnius)
3 APPs
4 TWRs

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	24
Gate-to-gate total costs (M€)	21
Gate-to-gate ATM/CNS provision costs (M€)	19
Gate-to-gate total ATM/CNS assets(M€)	28
Gate-to-gate ANS total capex (M€)	8
ATCOs in OPS	74
Gate-to-gate total staff	320
Total IFR flight-hours controlled by ANSP ('000)	50
IFR airport movements controlled by ANSP ('000)	46
En-route sectors	2
Minutes of ATFM delays > 15 min ('000)	0

Size

Size of controlled airspace: 76 200 km²

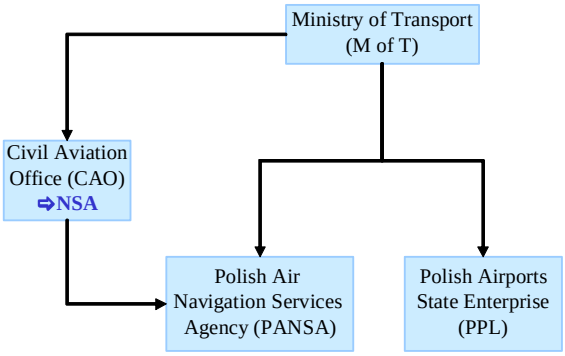


PANSA, Poland

Polish Air Navigation Services Agency (PANSA)

www.pansa.pl

Institutional arrangements and links (2010)



Status (2010)

- PANSA has been operating as an independent entity as from 1st April 2007, separated from the Polish Airports State Enterprise (PPL)
- State body (acting as a legal entity with an autonomous budget)
- 100% State owned

National Supervisory Authority (NSA):

Civil Aviation Office (CAO)

Body responsible for:

Safety Regulation

Civil Aviation Office (CAO)

Airspace Regulation

Civil Aviation Office (CAO)

Economic Regulation

Civil Aviation Office (CAO)

Corporate governance structure (2010)

NO SUPERVISORY BOARD

ADMINISTRATION
According to the Act establishing PANSA, the Agency is managed by the President and his two Vice-Presidents.
The President is nominated by the Prime Minister.
The two Vice-Presidents are nominated by the MoT

PANSA (2010)

PRESIDENT OF PANSA:

Krzysztof Banaszek

VICE PRESIDENT- AIR NAVIGATION DEPARTMENT:

Maciej Rodak

VICE PRESIDENT- FINANCE AND ADMINISTRATION DEPARTMENT:

Maciej Piotrowski

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☐ MET

- APP Kraków is providing ATC services for Kraków and Katowice
- Katowice TWR is providing only aerodrome control when APP Kraków is providing radar services for Katowice

Operational ATS units:

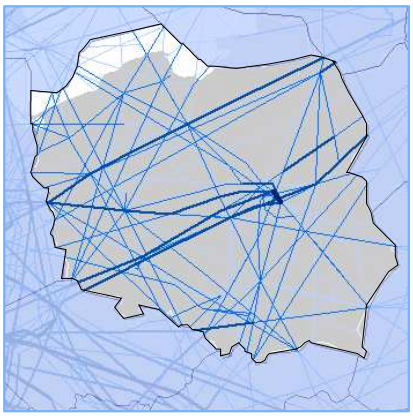
1 ACC with 8 sectors
4 APPs (Warszawa, Gdańsk, Kraków, Poznań) providing radar control
5 TWRs (Warszawa, Gdańsk, Kraków, Poznań, Katowice) providing aeodrome control
6 TWRs (Wrocław, Szczecin, Rzeszów, Łódź, Zielona Góra, Bydgoszcz) providing aeodrome control and non-radar approach control
4 FIS units (Warszawa, Kraków, Gdańsk, Poznań)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	180
Gate-to-gate total costs (M€)	170
Gate-to-gate ATM/CNS provision costs (M€)	149
Gate-to-gate total ATM/CNS assets(M€)	145
Gate-to-gate ANS total capex (M€)	17
ATCOs in OPS	372
Gate-to-gate total staff	1 612
Total IFR flight-hours controlled by ANSP ('000)	348
IFR airport movements controlled by ANSP ('000)	308
En-route sectors	8
Minutes of ATFM delays > 15 min ('000)	971

Size

Size of controlled airspace: 334 000 km²

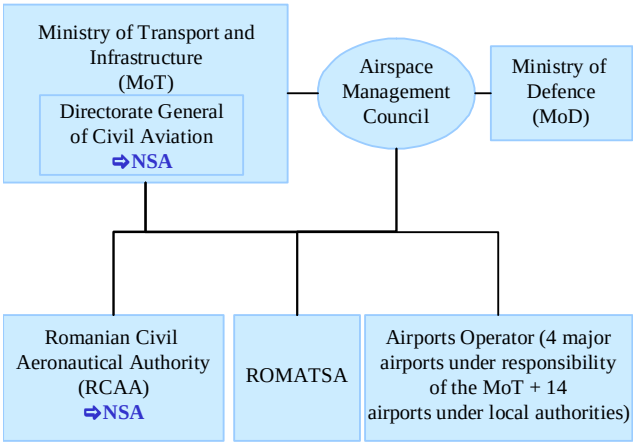


ROMATSA, Romania

Romanian Air Traffic Services Administration

www.romatsa.ro

Institutional arrangements and links (2010)



Status (2010)

- Autonomous and self-financing organisation as of 1991 (Government Resolution GR74/1991 ammended by GR731/1992, GR75/2005, GR1090/2006, GR1251/2007, GR741/2008)
- 100% State-owned

National Supervisory Authority (NSA):

- Directorate General of Civil Aviation of MoT
- Romanian Civil Aeronautical Authority (RCAA)

Body responsible for:

Safety Regulation

Ministry of Transport and Infrastructure
Enforcement and safety oversight is delegated and discharged through the RCAA

Airspace Regulation

Both Ministry of Transport and Infrastructure and Ministry of Defence, and discharged through the RCAA and Air Force Staff

Economic Regulation

Ministry of Transport and Infrastructure

Corporate governance structure (2010)

ADMINISTRATION BOARD (9 voting members)
Chairman + 8 members
Chairman is CEO.
Members represent: MoT, M of Public Finance, MoD and other members.
There are also additional non voting members representing staff.

CONSULTATIVE BOARD
Duties taken up by DG.
DG is appointed by the MoT.

Consultative (advisory) Committee
DG + 4 members (deputies of the DG).

ROMATSA (2010)

CHAIRMAN OF THE ADMINISTRATION BOARD:

Bogdan Donciu

DIRECTOR GENERAL (CEO):

Bogdan Donciu

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

Operational ATS units:

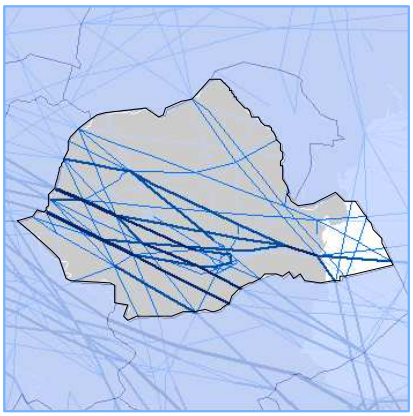
1 ACC (Bucharest + 2 secondary locations - Arad and Constanta)
2 APPs
16 TWRs

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	177
Gate-to-gate total costs (M€)	183
Gate-to-gate ATM/CNS provision costs (M€)	160
Gate-to-gate total ATM/CNS assets(M€)	132
Gate-to-gate ANS total capex (M€)	19
ATCOs in OPS	523
Gate-to-gate total staff	1 723
Total IFR flight-hours controlled by ANSP ('000)	271
IFR airport movements controlled by ANSP ('000)	160
En-route sectors	17
Minutes of ATFM delays > 15 min ('000)	1

Size

Size of controlled airspace: 254 000 km²

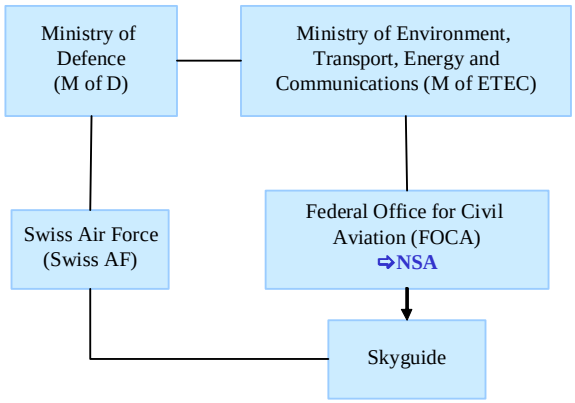


Skyguide, Switzerland

Skyguide

www.skyguide.ch

Institutional arrangements and links (2010)



Status (2010)

- Joint-stock company as of 1996. Currently 14 shareholders; 99,91% is held by the Swiss Confederation which by law must hold at least 51%
- Integrated civil/military as of 2001

National Supervisory Authority (NSA):

Federal Office for Civil Aviation (FOCA)

Body responsible for:

Safety Regulation

Federal Office for Civil Aviation

Airspace Regulation

Federal Office for Civil Aviation

Economic Regulation

The Ministry of the Environment, Transport, Energy and Communications

Corporate governance structure (2010)

GENERAL ASSEMBLY of the Shareholders

SUPERVISORY BOARD (7 members)
Chairman + 6 members
All members are appointed by the General Assembly for their expertise.

EXECUTIVE BOARD (6 members)
CEO + 5 members
The CEO is appointed by the Supervisory Board.

Skyguide (2010)

CHAIRMAN OF THE SUPERVISORY BOARD:

Guy Emmenegger

DIRECTOR GENERAL (CEO):

Daniel Weder

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☐ MET

- ATC services delegated to Geneva ACC by France

Operational ATS units:

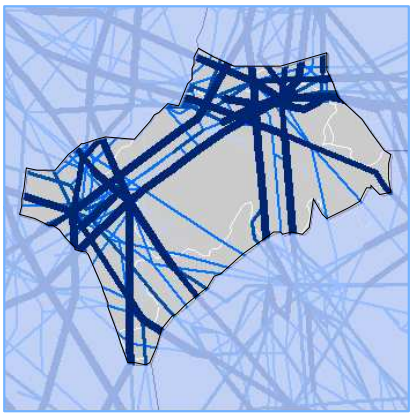
2 ACCs (Geneva, Zurich)
4 APPs (Geneva, Zurich, Lugano, Bern)
7 TWRs (Geneva, Zurich, Lugano, Bern, Buochs, Altenrhein, Grenchen)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	195
Gate-to-gate total costs (M€)	223
Gate-to-gate ATM/CNS provision costs (M€)	212
Gate-to-gate total ATM/CNS assets(M€)	279
Gate-to-gate ANS total capex (M€)	38
ATCOs in OPS	329
Gate-to-gate total staff	1 266
Total IFR flight-hours controlled by ANSP ('000)	354
IFR airport movements controlled by ANSP ('000)	476
En-route sectors	16
Minutes of ATFM delays > 15 min ('000)	1 003

Size

Size of controlled airspace: 73 300 km²

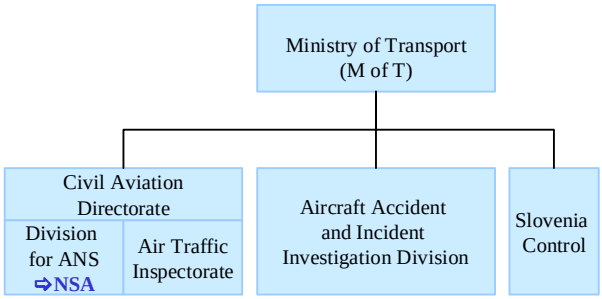


Slovenia Control, Slovenia

Slovenia Control Ltd

www.sloveniacontrol.si

Institutional arrangements and links (2010)



Status (2010)

- Since May 2004, ANS is separated from the Slovenian Civil Aviation Authority (SCAA) and became a 100% State-owned Enterprise, Slovenia Control Ltd

National Supervisory Authority (NSA):

Civil Aviation Directorate (CAD)

Body responsible for:

Safety Regulation
Ministry of Transport

Airspace Regulation
Ministry of Transport

Economic Regulation
Ministry of Finance

Corporate governance structure (2010)

MINISTER OF TRANSPORT

SUPERVISORY BOARD (6 members)
Chairman (M of T) + 3 members (M of T, M of F and M of D) appointed by the Government.
2 staff reps. appointed by "employees board".

Director General (CEO) of Slovenia Control

Appointed by the government for a period of 5 years

Slovenia Control (2010)

CHAIRPERSON OF SUPERVISORY BOARD:
Mirko Komac

DIRECTOR GENERAL (CEO):
Franc Željko Županič

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☐ MET

Operational ATS units:

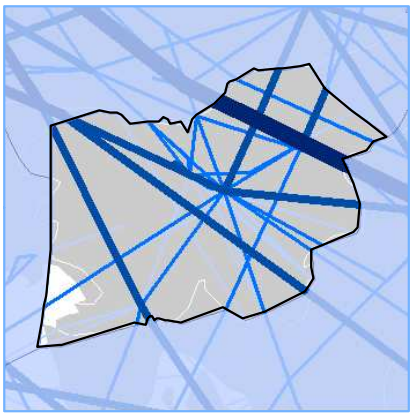
1 ACC (Ljubljana)
3 APPs (Ljubljana, Portoroz, Maribor)
3 TWRs (Ljubljana, Portoroz, Maribor)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	27
Gate-to-gate total costs (M€)	27
Gate-to-gate ATM/CNS provision costs (M€)	23
Gate-to-gate total ATM/CNS assets(M€)	19
Gate-to-gate ANS total capex (M€)	8
ATCOs in OPS	82
Gate-to-gate total staff	210
Total IFR flight-hours controlled by ANSP ('000)	41
IFR airport movements controlled by ANSP ('000)	45
En-route sectors	3
Minutes of ATFM delays > 15 min ('000)	7

Size

Size of controlled airspace: 18 400 km²

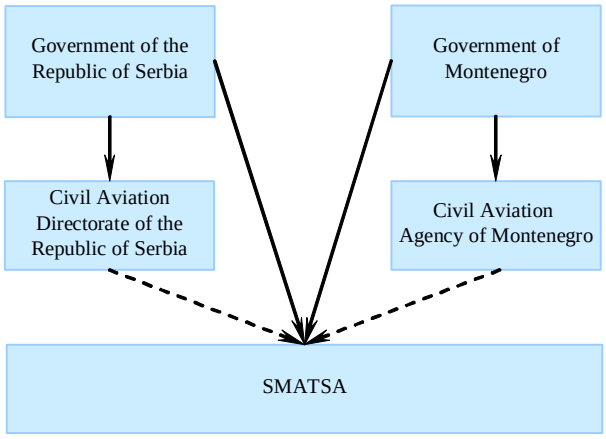


SMATSA, Serbia and Montenegro

Serbia and Montenegro Air Traffic Services Agency

http://www.smatsa.yu

Institutional arrangements and links (2010)



Status (2010)

- Limited liability company founded in 2003
- 92% owned by Serbia and 8% owned by Montenegro
- Integrated civil/military ANSP

National Supervisory Authority (NSA):

Civil Aviation Directorate Of The Republic Of Serbia
Civil Aviation Agency of Montenegro

Body responsible for:

Safety Regulation
- Civil Aviation Directorate Of The Republic Of Serbia
- Civil Aviation Agency of Montenegro

Airspace Regulation
- Civil Aviation Directorate Of The Republic Of Serbia
- Civil Aviation Agency of Montenegro

Economic Regulation

Ministry of Finance of the Republic of Serbia

Corporate governance structure (2010)

ASSEMBLY

5 members representing founders
(Government of the Republic of Serbia
and Government of Montenegro)
selected from the Ministries in charge of transport and of finance,
as well as from other bodies,
services and professional organisations.

MANAGEMENT BOARD

7 members appointed by the Assembly for a period of 5 years,
upon proposals of the Government of the Republic of Serbia (5)
and Government of Montenegro (2)
The President and CEO is appointed by the Management Board.

SMATSA (2010)

PRESIDENT OF THE ASSEMBLY:

Milutin Mrkonjić

PRESIDENT OF THE MANAGEMENT BOARD & CEO:

Nikola Stankov

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☑ MET

- ANS Services (ATM, CNS, MET, AIS) and Flight Inspection Services
- SMATSA provides ATC services in the 55% of the upper airspace of Bosnia and Herzegovina
- ANS personnel training, PANS-OPS and cartography

Operational ATS units:

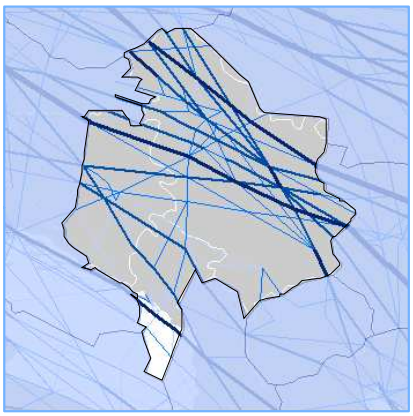
1 ACC (Belgrade)
8 APPs/TWRs (Belgrade, Batajnica, Kraljevo, Nis, Uzice, Vrsac, Podgorica, Tivat)

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	70
Gate-to-gate total costs (M€)	75
Gate-to-gate ATM/CNS provision costs (M€)	70
Gate-to-gate total ATM/CNS assets(M€)	61
Gate-to-gate ANS total capex (M€)	23
ATCOs in OPS	222
Gate-to-gate total staff	852
Total IFR flight-hours controlled by ANSP ('000)	205
IFR airport movements controlled by ANSP ('000)	68
En-route sectors	8
Minutes of ATFM delays > 15 min ('000)	3

Size

Size of controlled airspace: 144 676 km²



UkSATSE, Ukraine

Ukrainian State Air Traffic Service Enterprise

www.uksatse.ua

УКРАЕРОРУХ
UkSATSE

Institutional arrangements and links (2010)

Ministry of Transport and Communications (M of T&C)

(State Aviation Administration)

Ukrainian State Air Traffic Service Enterprise (UkSATSE)

- Regional branches
- AIS
- Ukraerocenter (civil/military integration)
- Training & Certification Center of UkSATSE
- « UkSATSE » airline
- Medical Certification Center

Status (2010)

- Self-financing enterprise
- 100% State-owned

National Supervisory Authority (NSA):

Not applicable since Ukraine is not bound by SES Regulations

Body responsible for:

Safety Regulation

State Aviation Administration

Airspace Regulation

State Aviation Administration

Economic Regulation

State Aviation Administration

Corporate governance structure (2010)

No Supervisory Board

MANAGEMENT BOARD

DIRECTOR GENERAL

UkSATSE (2010)

DIRECTOR GENERAL OF UkSATSE:

Yuriy Cherednichenko

Scope of services

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

Operational ATS units:

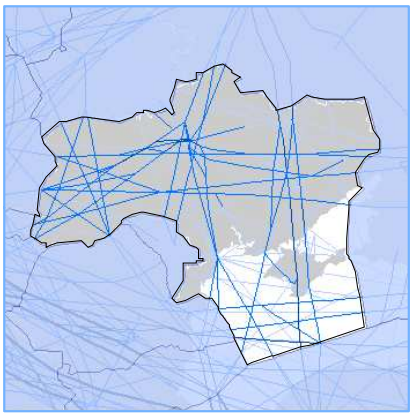
5 ACCs (Kyiv, Simpferopol', Kharkiv, Odesa, L'viv)
1 Auxiliary ACC (Dnipropetrovs'k)
12 APPs
32 TWRs

Key financial and operational figures (2008)

Gate-to-gate total revenues (M€)	160
Gate-to-gate total costs (M€)	163
Gate-to-gate ATM/CNS provision costs (M€)	150
Gate-to-gate total ATM/CNS assets(M€)	96
Gate-to-gate ANS total capex (M€)	21
ATCOs in OPS	941
Gate-to-gate total staff	5 906
Total IFR flight-hours controlled by ANSP ('000)	333
IFR airport movements controlled by ANSP ('000)	192
En-route sectors	36
Minutes of ATFM delays > 15 min ('000)	0

Size

Size of controlled airspace: 776 442 km²



GLOSSARY

ACC	Area Control Centre
ACE	Air Traffic Management Cost-Effectiveness
ADS-B	Automatic Dependent Surveillance-Broadcast
Aena	Aeropuertos Españoles y Navegación Aérea, Spain
AFIS	Airport/Aerodrome Flight Information Service
AIS	Aeronautical Information Services
ANS	Air Navigation Services
ANS CR	Air Navigation Services of the Czech Republic
LFV/ANS Sweden	ANS department of Luftfartsverket, the LFV group – Swedish airports and Air Navigation Services
ANSP	Air Navigation Service Provider
APP	Approach Control Unit
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATSA Bulgaria	Air Traffic Services Authority, Bulgaria
Austro Control	Austro Control Österreichische Gesellschaft für Zivilluftfahrt mbH, Austria
Avinor	Avinor, Norway
B	Billion
Belgocontrol	Belgocontrol, Belgium
CAPEX	Capital Expenditure
CEATS	Central European Air Traffic Services
CFMU	Central Flow Management Unit
CNS	Communications, Navigation and Surveillance
CRCO	Central Route Charges Office
Croatia Control	Hrvatska kontrola zračne plovidbe d.o.o., Croatian Air Navigation Services
DCAC Cyprus	Department of Civil Aviation of Cyprus
DFS	Deutsche Flugsicherung GmbH, Germany
DHMİ	Devlet Hava Meydanları İsletmesi, Turkey
DME	Distance-Measuring Equipment
DSNA	Direction des services de la navigation aérienne, France
EANS	Estonian Air Navigation Services
EC	European Commission
ECAC	European Civil Aviation Conference
ENAV	Ente Nazionale di Assistenza al Volo S.p.A., Italy
ERC	EUROCONTROL Research Centre
EU	European Union
FDP	Flight Data Processing system
Finavia	Finavia, Finland
FIS	Flight Information Service
FL	Flight Level
FTE	Full-Time Equivalent
GDP	Gross Domestic Product
HCAA	Hellenic Civil Aviation Authority, Greece

HMI	Human-Machine Interface
HQ	Headquarters
HungaroControl	HungaroControl, Hungary
IAA	Irish Aviation Authority, Ireland
IFR	Instrument Flight Rules
ILS	Instrument Landing System
LFV	Luftfartsverket, Sweden
LGS	Latvijas Gaisa Satiksme, Latvia
LPS	Letové Prevádzkové Služby Slovenskej Republiky, Státny Podnik, Slovak Republik
LVNL	Luchtverkeersleiding Nederland, Netherlands
M	Million
MATS	Malta Air Traffic Services Ltd
MET	Aeronautical Meteorology
MK CAA	Civil Aviation Authority of the former Yugoslav Republic of Macedonia
MoldATSA	Moldavian Air Traffic Services Authority
MSSR	Monopulse Secondary Surveillance Radar
MUAC	Maastricht Upper Air Centre
NATA Albania	National Air Traffic Agency, Albania
NATS	National Air Traffic Services, UK
NAV Portugal	Navegação Aérea de Portugal, EPE
NAVIAIR	Air Navigation Services – Flyvesikringstjenesten, Denmark
NBV	Net Book Value
NDB	Non-Directional Beacon
OAT	Operational air traffic
OPS	Operations
Oro Navigacija	State Enterprise Oro Navigacija, Lithuania
PANSA	Polish Air Navigation Services Agency
PPPs	Purchasing power parities
PRC	Performance Review Commission
PRR	Performance Review Report
PRU	Performance Review Unit
RDP	Radar Data Processing system
RPI	Retail Price Index
ROMATSA	Romanian Air Traffic Services Administration
SAR	Search and Rescue
SID	Specification for Information Disclosure
Skyguide	Skyguide, Switzerland
Slovenia Control	Slovenia Control, Slovenia
SMATSA	Serbia and Montenegro Air Traffic Services Agency
TC	Terminal Control
TWR	Traffic Controlled Tower
UK CAA	United Kingdom Civil Aviation Authority
UkSATSE	Ukrainian State Air Traffic Service Enterprise
VFR	Visual Flight Rules
VOR	Very high frequency Omni-directional Range

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