EUROCONTROL

REPORT COMMISSIONED BY THE PERFORMANCE REVIEW COMMISSION

ATM Cost-Effectiveness (ACE) 2015 Benchmarking Report with 2016-2020 outlook

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

May 2017

BACKGROUND

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

The PRC was established in 1998 by the Permanent 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.

The PRU's e-mail address is pru@eurocontrol.int

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Performance Review Commission

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Prepared by the Performance Review Unit (PRU)
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ATM Cost-Effectiveness (ACE) 2015 Benchmarking Report with 2016-2020 outlook

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Abstract

This report is the fifteenth in a series of annual reports based on mandatory information disclosure provided by 38 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 38 ANSPs for the year 2015, including high level trend analysis for the years 2010-2015. 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 analyses forward-looking information for the years 2016-2020, inferring on future financial cost-effectiveness performance at system level, and displays information on actual and planned capital expenditures.

Keywords

EUROCONTROL Performance Review Commission – Economic information disclosure – Benchmarking – Exogenous factors – Complexity metrics – ATM/CNS cost-effectiveness comparisons – European Air Navigation Services Providers (ANSPs) – Functional Airspace Blocks (FABs) – Gate-to-gate - En-route and Terminal ANS – Inputs and outputs metrics – Performance framework – Quality of service – 2015 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 systems – Five years forward-looking trend analysis (2016-2020).

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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: - Pan-European system cost-effectiveness performance in 2015 and outlook for 2016-2020	
Chapter 2: Pan-European system cost-effectiveness performance in 2015 with 2016-2020 outlook	All those who are interested in a high level analysis of economic and financial cost-effectiveness performance in 2015 at Pan-European system and ANSP level. This chapter also includes a medium-term trend analysis of ATM/CNS cost-effectiveness performance over the 2010-2015 period, and an analysis focusing on its three main economic drivers (productivity, employment costs and support costs). Chapter 2 also comprises a forward-looking analysis of ATM/CNS performance over the 2016-2020 period, including capital investment projections. Chapter 2 provides a factual analysis which is stable over time and allow for monitoring cost-effectiveness performance achievements. This chapter are particularly relevant to ANSPs' management, policy makers, regulators and NSAs in order to identify best practices, areas for improvement, and to understand how cost-effectiveness performance has evolved over time. This information is also useful to support consultation processes between ANSPs and airspace users.
Part II: - Cost-effectiveness performance focus at ANSP level	
Chapter 3: Focus on ANSPs individual cost-effectiveness performance	All those who are interested in obtaining an independent and comparable analysis of individual ANSP historic performance (2010-2015) in terms of economic and financial cost-effectiveness. This chapter is particularly relevant to ANSPs' management, airspace users, regulators and NSAs in order to identify how cost-effectiveness performance has evolved and which have been the sources of improvement. This chapter also includes information on ANSPs historic and planned capital investments, as well as a benchmarking analysis of financial cost-effectiveness with a set of comparators for each ANSP. This information is also useful to support consultation processes between ANSPs and airspace users.
Annexes:	With a view to increase transparency, this report comprises several annexes including the data used in the report. This information is relevant to support cost-benefit analysis of ATM research projects like the SESAR programme. The data comprised in these annexes is also useful to academic researchers for the purposes of empirical analysis.

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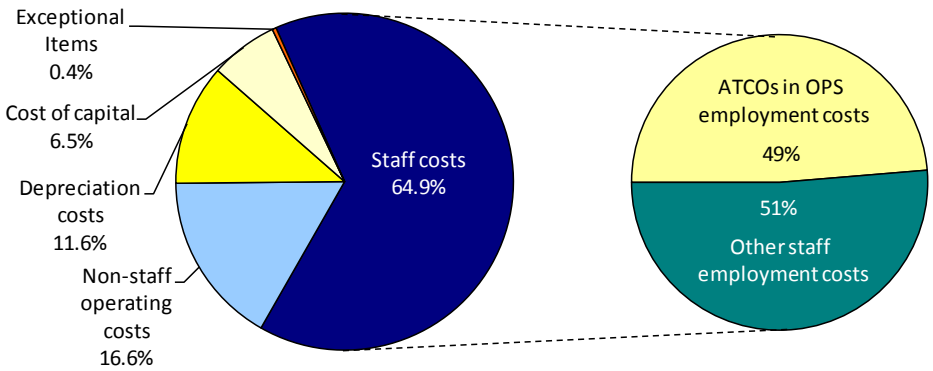
EXECUTIVE SUMMARY

This ATM Cost-Effectiveness (ACE) 2015 Benchmarking Report, the fifteenth in the series, presents a review and comparison of ATM cost-effectiveness for 38 Air Navigation Service Providers (ANSPs) in Europe. The ACE benchmarking work is carried out by the Performance Review Commission (PRC) supported by the Performance Review Unit (PRU) and is based on information provided by ANSPs in compliance with Decision No. 88 of the Permanent Commission of EUROCONTROL on economic information disclosure and in the context of Annex IV 2.1(a) of EC Regulation N°691/2010 (Performance Scheme) replaced by EC Regulation N°390/2013.

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 Performance Review Unit (PRU). This enabled participants to share experiences and gain a common understanding of underlying assumptions and limitations of the data.

The Pan-European system analysed in this report comprises ANSPs, National Supervisory Authorities (NSAs) and other regulatory and national authorities, national MET providers and the EUROCONTROL Agency. **From a methodological point of view, the ACE Benchmarking analysis focuses on the specific costs of providing gate-to-gate ATM/CNS services which amounted to €8 124M in 2015**. Operating costs (including staff costs, non-staff operating costs and exceptional cost items) accounted for some 82% of total ATM/CNS provision costs, and capital-related costs (depreciation and cost of capital) represented some 18%.



Total ATM/CNS provision costs: € 8 124 M

	En-route		Terminal		Gate-to-gate	
	€ M	%	€ M	%	€ M	%
Staff costs	4 062	64.1%	1 212	67.7%	5 274	64.9%
ATCOs in OPS employment costs	2 021	-	547	-	2 567	-
Other staff employment costs	2 041	-	666	-	2 707	-
Non-staff operating costs	1 041	16.4%	307	17.2%	1 348	16.6%
Depreciation costs	778	12.3%	165	9.2%	944	11.6%
Cost of capital	437	6.9%	91	5.1%	527	6.5%
Exceptional Items	17	0.3%	14	0.8%	31	0.4%
Total ATM/CNS provision costs	6 335	100.0%	1 790	100.0%	8 124	100.0%

Figure 0.1: Breakdown of ATM/CNS provision costs in 2015

ACE 2015 presents information on performance indicators relating to the benchmarking of cost-effectiveness and productivity performance for the year 2015, and shows how these indicators changed over time (2010-2015). It examines both individual ANSPs and the Pan-European ATM/CNS system as a whole. In addition, ACE 2015 analyses forward-looking information covering the 2016-2020 period based on data provided by ANSPs in November 2016.

The ACE factual and independent benchmarking sets the foundation for a normative analysis to quantify the potential scope of cost-efficiency improvements for ANSPs. The ACE data analysis and the gathering of business "intelligence" on ANSPs cost-efficiency performance directly feed core processes of the Single European Sky (SES) Performance Scheme.

For ANSPs operating in SES States, 2015 is the first year of the second Reference Period (RP2) of the SES. These ANSPs apply the "determined costs" method which comprises specific risk-sharing arrangements aiming at incentivising ANSPs to better control costs and to improve their economic performance. In December 2016, the PRB released reports on the monitoring of SES performance targets for 2015 based on information provided in June 2016. This ACE 2015 Benchmarking Report complements the PRB monitoring activity by providing a detailed benchmarking of cost-effectiveness performance at ANSP level including a trend analysis of three main economic drivers (productivity, employment costs and support costs) over the 2010-2015 period.

Although benchmarking cost-effectiveness is key, looking at costs in isolation of the quality of service is not sufficient. The PRC introduced in its ACE Benchmarking Reports the concept of economic cost-effectiveness indicator in order to better capture the trade-offs between ATC capacity and costs. This indicator is defined as gate-to-gate ATM/CNS provision costs plus the costs of ground ATFM delays for both en-route and terminal ANS, all expressed per composite flight-hour. This economic performance indicator is meant to capture trade-offs between ATC capacity and costs.

The analysis of economic cost-effectiveness performance in 2015, the last year of available data, shows that composite flight-hours rose faster (+1.7%) than ATM/CNS provision costs (+0.5% in real terms). As a result, unit ATM/CNS provision costs reduced by -1.2%. However, since the unit costs of ATFM delays substantially increased (+38.8%), unit economic costs rose by +3.2% compared to 2014 (which was the year with the lowest unit economic costs since the start of the ACE benchmarking analysis). As a result, unit economic costs amounted to €501 in 2015.

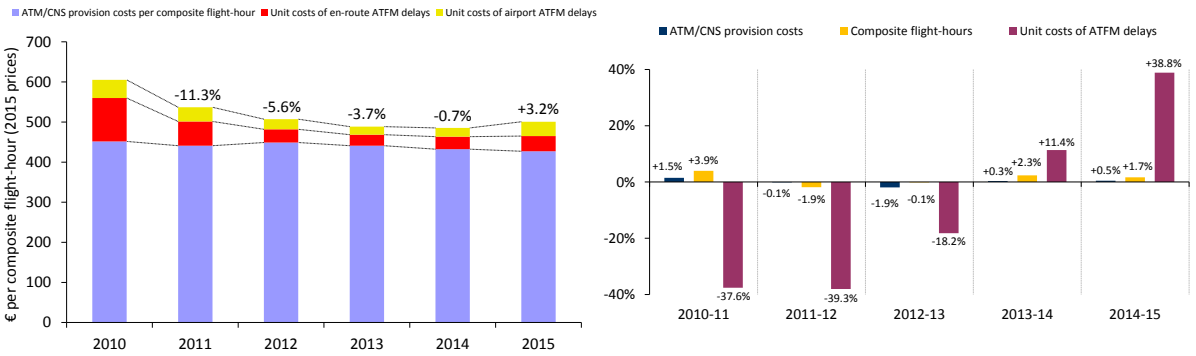


Figure 0.2: Changes in unit economic costs, 2010-2015 (real terms)

The right-hand side chart in Figure 0.2 shows that **the trend of decreasing unit costs of ATFM delays stopped in 2013, and that a new cycle characterised by higher delays started (+11.4% in 2014 and +38.8% in 2015)**. This trend continued in 2016 since en-route ATFM delays were +20.9% higher than in 2015.

Detailed analysis indicates that the higher ATFM delays observed at system level in 2015 mainly reflects very large increases for a few ANSPs. Indeed, more than 90% of the total increase is generated by only five ANSPs (DSNA, DHMI, HCAA, MUAC and LVNL).

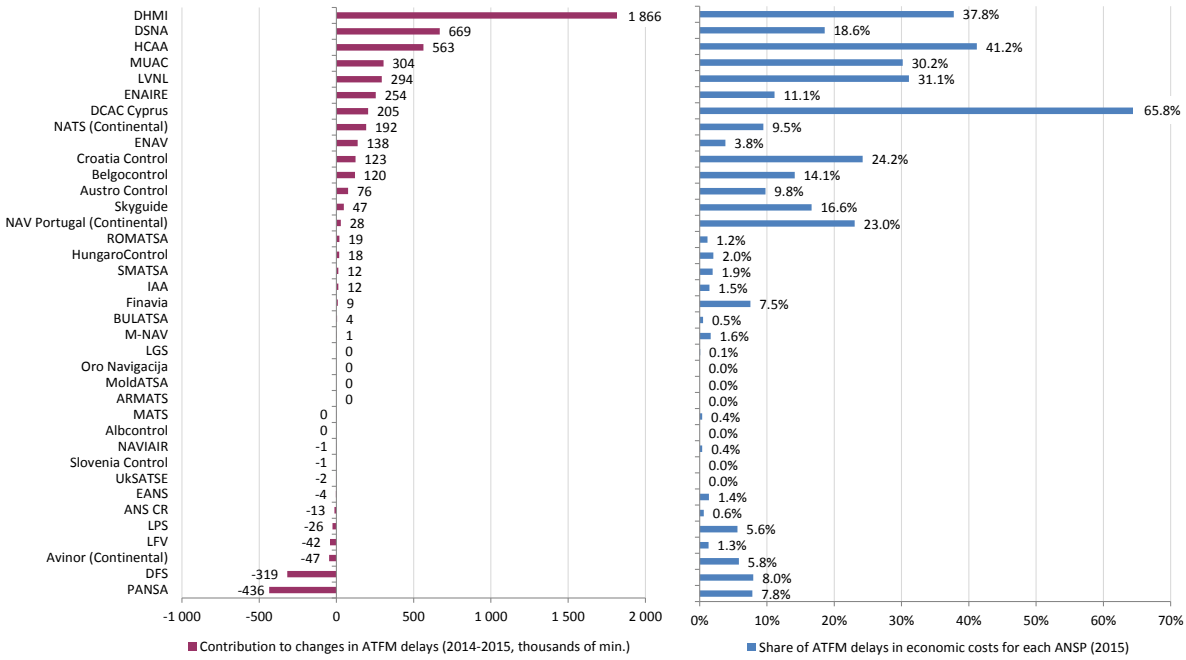


Figure 0.3: ANSPs contribution to ATFM delays increase at Pan-European system level in 2015

In 2015, ATM/CNS provision costs increased for 25 out of 37 ANSPs. Although 22 out of these 25 ANSPs experienced traffic increases in 2015, only nine could reduce unit costs (see the green dots in the top right quadrant of Figure 0.4).

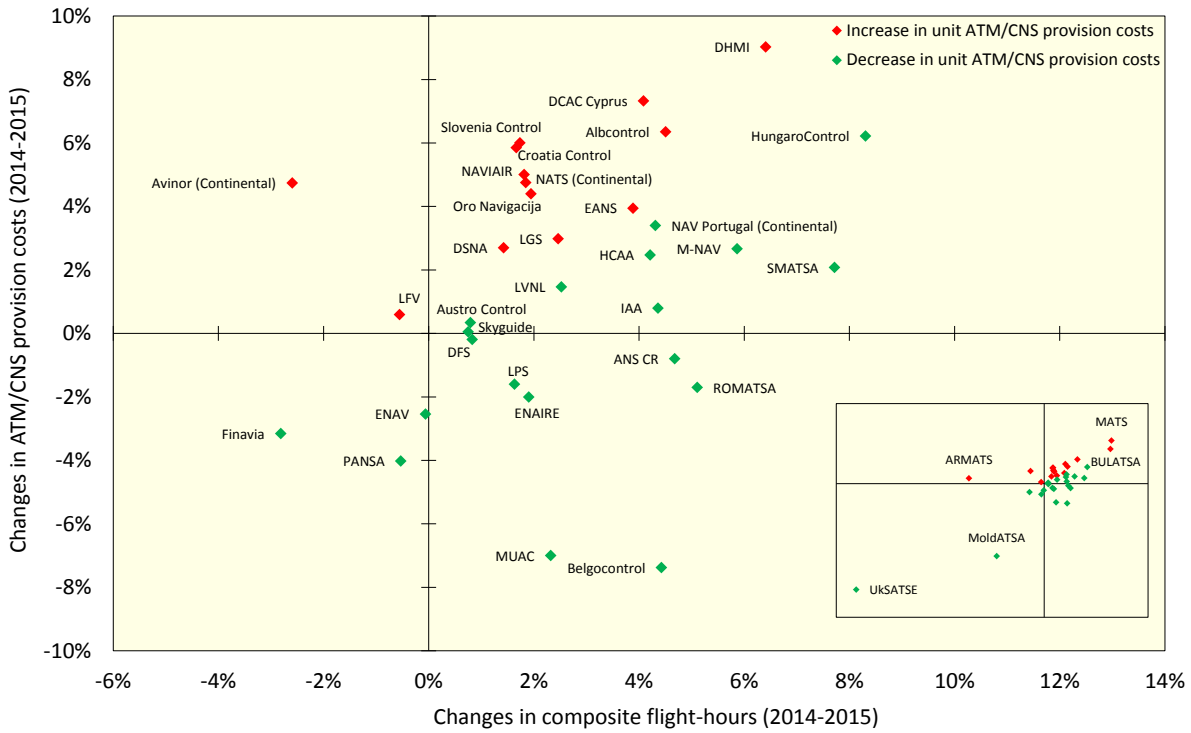
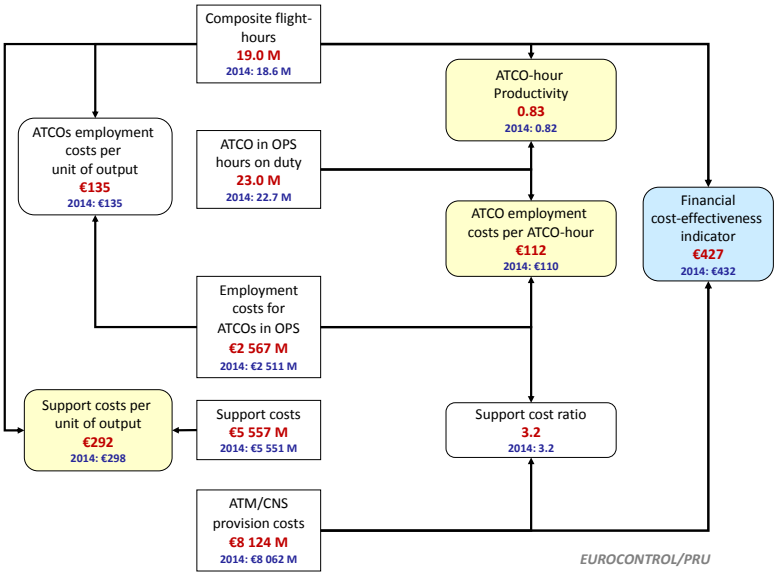


Figure 0.4: Changes in ATM/CNS provision costs and traffic volumes, 2014-2015 (real terms)

In 2015, three ANSPs experienced a sharp traffic decrease: UkSATSE (-36.1%), ARMATS (-14.5%) and MoldATSA (-9.1%). These sharp traffic reductions mainly reflects the establishment of restricted/prohibited areas in UkSATSE airspace following the accident of Malaysia Airlines flight MH17 and military conflicts in the Eastern region of Ukraine.

It is noteworthy that in 2015 ATM/CNS provision costs rose by more than +10.0% for two ANSPs: MATS (+16.2%) and BULATSA (+13.0%). The main drivers for these significant increases are provided in Part I of this report.



At Pan-European system level, unit ATM/CNS provision costs amounted to €427 in 2015.

According to the ACE performance framework, this cost-effectiveness performance indicator can be broken down into three main components:

a) ATCO-hour productivity (0.83 composite flight-hours per ATCO-hour);
b) ATCO employment costs per ATCO-hour (€112); and,
c) support costs per unit output (€292).

Figure 0.5: ACE performance framework, 2015

Around 31% of ATM/CNS provision costs directly relates to ATCOs in OPS employment costs while 69% relate to "support" functions including non-ATCOs in OPS employment costs, non-staff operating costs and capital-related costs such as depreciation costs and the cost of capital.

In 2015, ATCO employment costs per ATCO-hour rose faster (+1.8%) than productivity (+1.4%). As a result, ATCO employment costs per composite flight-hour increased by +0.5% compared to 2014. In the meantime, unit support costs fell by -1.9% since the number of composite flight-hours (+1.7%) rose while support costs slightly reduced (-0.3%). As a result, unit ATM/CNS provision costs decreased by -1.2% in 2015.

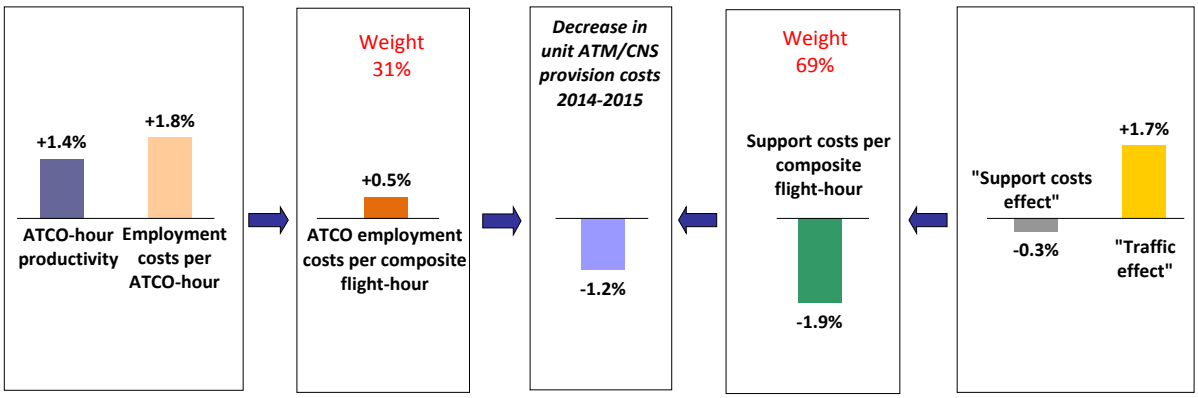


Figure 0.6: Changes in the financial cost-effectiveness indicator, 2014-2015 (real terms)

Figure 0.7 shows the changes in the different components of support costs (see the "support costs effect" bar on the right-hand side of Figure 0.6) between 2014 and 2015.

Overall, support costs slightly reduced in 2015 (-0.3% or -€17.2M). Higher support staff costs (+1.1% or +€29.8M) were more than compensated by substantially lower exceptional costs (-62.9% or -€49.9M). In the meantime, non-staff operating costs (+0.3% or +€4.5M), depreciation costs (+0.2% or +€1.8M) and the cost of capital (-0.6% or -€3.3M) remained relatively close to their 2014 levels.

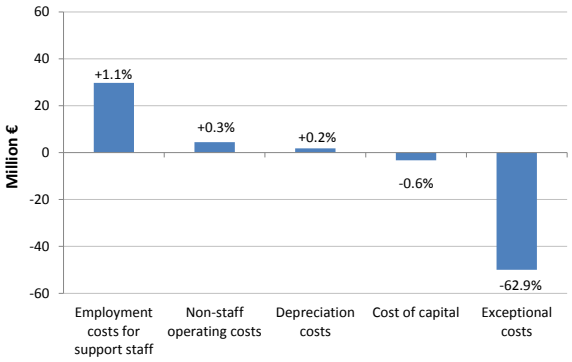


Figure 0.7: Changes in the components of support costs, 2014-2015 (real terms)

Support costs represent some 69% of ATM/CNS provision costs and are therefore an important driver of cost-effectiveness performance. It is expected that in the future, improvements in cost-effectiveness could arise from greater competition for support services which could be available on a central basis, physically distant from the ANSPs HQs and ATC facilities and supported by innovation in IT technology.

At Pan-European system level, after decreasing by -1.2% in 2015, gate-to-gate unit ATM/CNS provision costs are expected to slightly increase in 2016 (+0.4%) and then to fall by -2.1% p.a. until 2019.

Overall, gate-to-gate unit ATM/CNS provision costs are expected to fall by -1.4% p.a. between 2015 and 2019. This mainly reflects the fact that over this period traffic is planned to increase faster (+3.2% p.a.) than ATM/CNS provision costs (+1.7% p.a.).

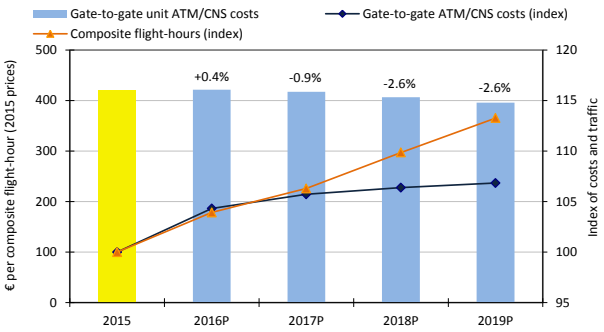


Figure 0.8: Forward-looking cost-effectiveness (2015-2019, real terms)

All categories of costs are planned to rise over the 2015-2019 period, with significant increases foreseen for capital-related costs (+4.3% p.a. and +4.0% p.a. for the depreciation costs and the cost of capital, respectively).

The cumulative capex planned for the period 2016-2019 amounts to some €4 664M or an average of €1 166M per year. Figure 0.9 shows that the average capex to depreciation ratio planned over 2016-2019 (1.27) is higher than that observed over the 2010-2015 period (1.10). This indicates that, overall, ANSPs asset bases are expected to grow faster than in the past six years.

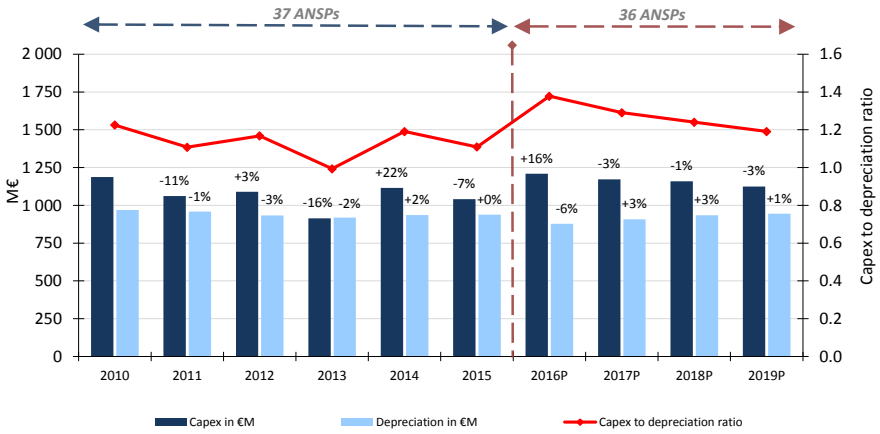


Figure 0.9: Capital expenditures and depreciation costs (2010-2019, real terms)

Additional information on the nature and magnitude of the major investment projects for each ANSP is provided in Part II of this Report.

1 INTRODUCTION

The Air Traffic Management Cost-Effectiveness (ACE) 2015 Benchmarking Report commissioned by EUROCONTROL's independent Performance Review Commission (PRC) is the fifteenth in a series of reports comparing the ATM cost-effectiveness of EUROCONTROL Member States' Air Navigation Service Providers (ANSPs)[1].

In September 2010, the PRC, supported by the EUROCONTROL Performance Review Unit (PRU), was designated Performance Review Body (PRB) of the European Commission (EC).

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 Economic Information Disclosure[2] (SEID), in all EUROCONTROL Member States.

It should also be noted that the ACE benchmarking work is carried out by the PRC in the context of Articles 3.3(i), 3.6(b)(c), and 3.8 of EC regulation N°691/2010 (Performance Scheme) replaced by EC Regulation N°390/2013.

This report does not address performance relating to:

- oceanic ANS;
- services provided to military operational air traffic (OAT); or,
- airport (landside) management operations.

The analysis developed in the ACE Reports is particularly relevant in order to identify best practices and areas for improvement. It is also useful in order to understand how cost-effectiveness performance has evolved over time for the Pan-European system as a whole, and for individual ANSPs.

The focus of this report is primarily on a cross-sectional analysis of ANSPs cost-effectiveness performance for the year 2015. In addition, this report makes use of previous years' data from 2010 onwards to examine changes over time, where relevant and valid. It is particularly useful to have a medium-term perspective given the characteristics of the ANS industry which requires a long lead time to develop ATC capacity and infrastructure.

After the economic recession of 2009, which affected the aviation industry with an unprecedented -7% traffic decrease, 2010 was marked by a modest traffic recovery and the implementation of genuine cost containment measures by several ANSPs. In addition, for the ANSPs operating in SES States, the year 2012 marks the implementation of the SES performance and charging schemes which introduced financial incentives for ANSPs. For these reasons, it is particularly relevant to examine changes in cost-effectiveness performance over the 2010-2015 period.

[1] Previous reports in the series from ACE 2001 (Sept. 2003) to ACE 2013 (May 2015) can be found on the PRC web site at http://www.eurocontrol.int/articles/prc-and-prb-publications.

[2] PRC Specification for Economic Information Disclosure - Version 3.0, December 2012, can be found on the PRC web site.

1.1 Organisation of the report

The structure of the present ACE 2015 Benchmarking Report is made of two parts and three chapters:

Chapter 1 provides an overview of the participating ANSPs and outlines the processes involved in the production of this report.

Part I and Chapter 2 provide a high level analysis of economic and financial cost-effectiveness performance in 2015 at Pan-European system and ANSP level. This chapter also analyses changes in ATM/CNS cost-effectiveness performance between 2010 and 2015. A particular focus is put on the three main economic drivers of cost-effectiveness (productivity, employment costs and support costs). Chapter 2 also comprises a forward-looking analysis of ATM/CNS performance, including information on planned capital expenditures.

Part II and Chapter 3 provide a two-page summary for each ANSP participating to the ACE programme. This summary includes an individual trend analysis of ANSPs' cost-effectiveness performance between 2010 and 2015, and comprises a benchmarking analysis of each ANSP's financial cost-effectiveness with a set of comparators. It also examines the capital expenditure planned by ANSPs for the period 2016-2020 and how these plans compare to the previous capex cycles.

Finally, this report also 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, 38 ANSPs reported 2015 data in compliance with the requirement from Decision No. 88 of the Permanent Commission of EUROCONTROL.

Georgia has been integrated into the Multilateral Agreement for Route Charges on the 1st of January 2014. After a trial period last year, Sakaeronavigatsia, the Georgian ANSP, is now fully included in the ACE 2015 benchmarking analysis.

Table 1.1 below shows the list of the ANSPs participating to the ACE 2015 benchmarking analysis, describing both their organisational and corporate arrangements, and the scope of ANS services provided.

It should be noted that the information reported under the column "delegated ATM" reflects the cases of ANS delegation to or from an ANSP based on an explicit financial agreement.

	ANSP	Code	Country	Organisational & Corporate Arrangements	OAT Services	Oceanic	MUAC	Delegated ATM	Internal MET	Ownership and management of airports
1	Albcontrol	AL	Albania	Joint-stock company (State-owned)	x				x	
2	ANS CR	CZ	Czech Republic	State-owned enterprise						
3	ARMATS	AM	Armenia	Joint-stock company (State-owned)						
4	Austro Control	AT	Austria	Limited liability company (State-owned)					x	
5	Avinor	NO	Norway	Joint-stock company (State-owned)	x	x				x
6	Belgocontrol	BE	Belgium	State-owned enterprise			x		x	
7	BULATSA	BG	Bulgaria	State-owned enterprise					x	
8	Croatia Control	HR	Croatia	Joint-stock company (State-owned)	X			x	x	
9	DCAC Cyprus	CY	Cyprus	State body						
10	DFS	DE	Germany	Limited liability company (State-owned)	x		x			
11	DHMİ	TR	Turkey	Autonomous State enterprise						x
12	DSNA	FR	France	State body (autonomous budget)				x		
13	EANS	EE	Estonia	Joint-stock company (State-owned)						
14	ENAIRE	ES	Spain	State-owned enterprise						
15	ENAV	IT	Italy	Joint-stock company (State-owned), listed company since July 2016					x	
16	Finavia	FI	Finland	State-owned enterprise	x			x	x	x
17	HCAA	GR	Greece	State body						x
18	HungaroControl	HU	Hungary	State-owned enterprise					x	
19	IAA	IE	Ireland	Joint-stock company (State-owned)		x				
20	LFV	SE	Sweden	State-owned enterprise	x			x	x	
21	LGS	LV	Latvia	Joint-stock company (State-owned)					x	
22	LPS	SK	Slovak Republic	State-owned enterprise						
23	LVNL	NL	Netherlands	Independent administrative body			x			
24	MATS	MT	Malta	Joint-stock company (State-owned)						
25	M-NAV	MK	F.Y.R. Macedonia	Joint-stock company (State-owned)	x				x	
26	MoldATSA	MD	Moldova	State-owned enterprise	x				x	
27	MUAC			International organisation						
28	NATS	UK	United Kingdom	Joint-stock company (part-private)		x		x		
29	NAV Portugal	PT	Portugal	State-owned enterprise		x				
30	NAVIAIR	DK	Denmark	State-owned enterprise	x					
31	Oro Navigacija	LT	Lithuania	State-owned enterprise						
32	PANSA	PL	Poland	State body (acting as a legal entity with an autonomous budget)				x		
33	ROMATSA	RO	Romania	State-owned enterprise					x	
34	Sakaeronavigatsia	GE	Georgia	Limited liability company (State-owned)					x	
35	Skyguide	CH	Switzerland	Joint-stock company (part-private)	x			x		
36	Slovenia Control	SI	Slovenia	State-owned enterprise	x					
37	SMATSA	RS	Serbia	Limited liability company	x			x	x	
		ME	Montenegro							
38	UkSATSE	UA	Ukraine	State-owned enterprise					x	

States covered by the SES Regulations
States part of the ECAA
States that signed a CAA agreement with the EU
States not covered by the SES Regulations

Table 1.1: States and ANSPs participating in ACE 2015

Table 1.1 also indicates (coloured yellow) which ANSPs were at 1 January 2015 part of the 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 signature of an agreement relating to the establishment of a European Common Aviation Area (ECAA)[3], to cooperate in the field of ATM, with a view to extending the SES regulations[4] to the ECAA States.

In addition, the European Union signed comprehensive air transport agreements with Georgia (December 2010) and Moldova (June 2012).

[3] 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 former Yugoslav Republic of Macedonia, the Republic of Iceland, the Republic of Montenegro, the Kingdom of Norway, and the Republic of Serbia.

[4] This includes the second package of SES regulations (EC No 1070/2009), the amended Performance Scheme Regulation (EC No 390/2013) and amended Charging Scheme Regulation (EC No 391/2013).

Hence, in principle all the en-route ANSPs of EUROCONTROL States[5] and other States disclosing information to the PRC are to some extent covered by the SES regulations, except Armenia, 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 were excluded to the maximum possible extent.

1.3 Data submission

The SEID (see footnote 2) requires that participating ANSPs submit their information to the PRC/PRU by the 1st of July in the year following the year to which it relates. The ACE 2015 data have been submitted in the SEID Version 3.0 template which started to be used in the ACE 2014 Benchmarking Report. The information gathered remains fully compatible with Version 2.6, so that the time series analysed in this report are not affected by the use of Version 3.0.

Figure 1.1 indicates that 18 out of 38 ANSPs provided ACE 2015 data on time by the 1st July 2016. A number similar to that observed during the ACE 2014 data collection process.

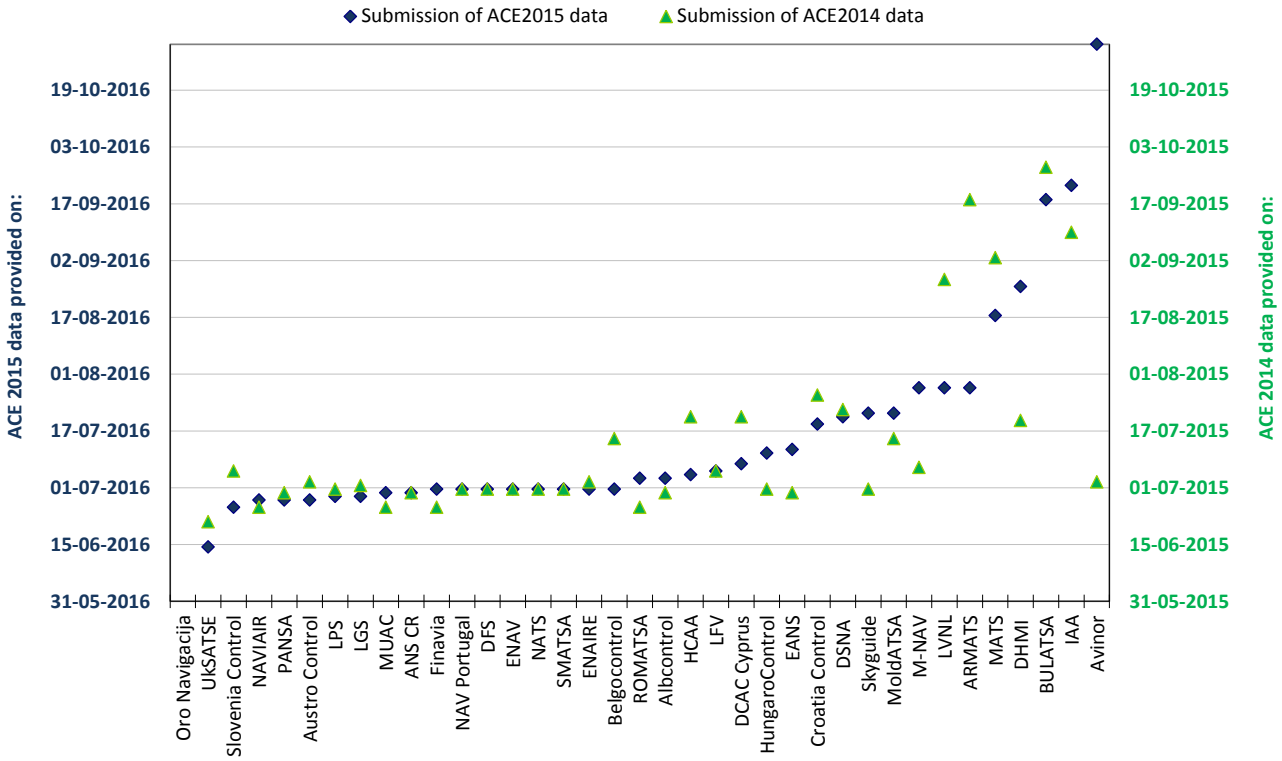


Figure 1.1: Progress with submission of 2015 data

It is important that the timely submission of ACE data is sustained and even improved. Robust ACE benchmarking analysis should be available in a timely manner since several stakeholders, most

[5] In 2015, en-route ANS in Bosnia and Herzegovina were provided by BHANSA from FL100 to FL325 and by Croatia Control and SMATSA between FL325 and FL660. BHANSA is not included in the ACE 2015 analysis but as it is becoming a full-fledged ANSP, it is expected to participate to the ACE benchmarking programme in the future.

notably ANSPs' management, regulatory authorities (e.g. NSAs) and airspace users, have a keen interest in receiving the information in the ACE reports as early as possible. Clearly, the timescale for the production of the ACE Benchmarking Report is inevitably delayed if data are not submitted on time.

The general and gradual improvement in the quality and the timing of the ACE data submission is marred by some problems relating to few individual ANSPs. For instance, DSNA and HCAA are still not in a position to provide complete balance-sheet data, although capital-related costs are charged to airspace users.

1.4 Data analysis, processing and reporting

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

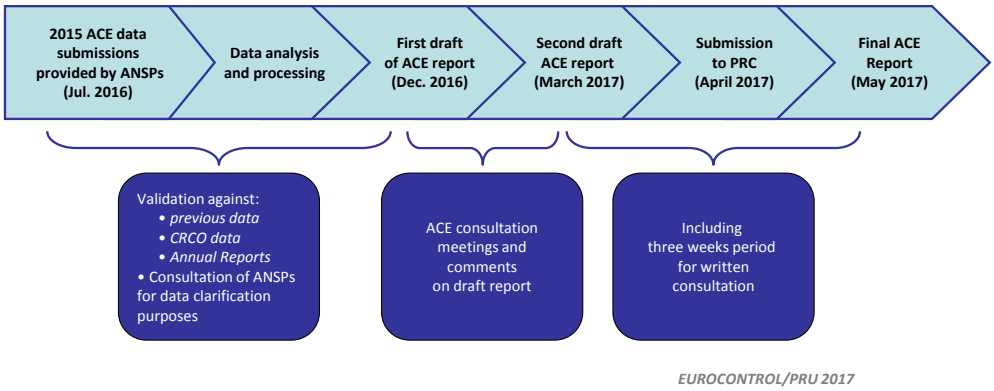


Figure 1.2: Data analysis, processing and reporting

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

During this process a number of issues emerged:

- Annual Reports with disclosure of financial accounts are not available for some ANSPs (see Section 1.5 below). This 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 provided under the En-route and Terminal columns in the ACE data submissions cannot be fully reconciled.

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 gradually overcome (see also Section 1.5 below).

In most cases, data recorded in the Network Manager (NM) database have 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.

1.5 ANSPs' Annual Reports

ANSPs' Annual Reports provided a valuable means of validating the 2015 information disclosure data.

The SES Service Provision Regulation (SPR) (EC No 550/2004) came into force on 20 April 2004 and is applicable to 2015 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 or a Common Aviation Area agreement with the European Union (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); and,
- 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 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 Avinor, Finavia, HCAA, and DHMI[6].

Figure 1.3 displays the status of ANSPs 2015 Annual Reports and indicates that 31 out of 38 participating ANSPs have published an Annual Report for the year 2015.

It is generally considered 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.

At the time of writing this report, seven ANSPs[7] (including three which are subject to SES Regulations) have not published Annual Reports for 2015.

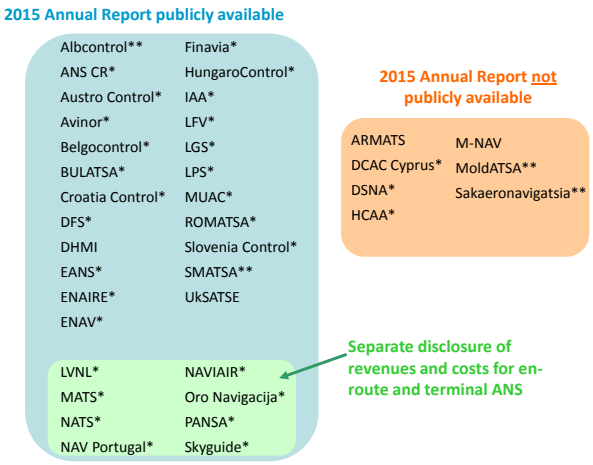


Figure 1.3: Status of 2015 Annual Reports

[6] Although it should be noted that DHMI is not covered by the SES regulations.

[7] It should be noted that Sakaeronavigatsia provided a document comprising the financial statements for the year 2015 and detailed notes to these statements.

ANSPs' Annual Accounts are prepared 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). Table 1.2 shows the 28 ANSPs whose 2015 Annual Accounts were partly or fully prepared according to IFRS[8].

ANSPs reporting according to IFRS in 2015	
Albcontrol	LVNL
ANS CR	MATS
ARMATS	MUAC
Austro Control	NATS
Avinor	NAVIAIR
BULATSA	NAV Portugal
Croatia Control	Oro Navigacija
DFS	PANSA
EANS	ROMATSA
ENAIRE	Sakaeronavigatsia
ENAV	Skyguide
HungaroControl	Slovenia Control
LGS	SMATSA
LPS	UkSATSE

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[9, 10] (such as different treatment of costs related to the pension scheme, and changes in depreciation rules), hence it is very important to identify and understand the impact of changes in the accounting principles used to draw the financial accounts.

1.6 ANSP benchmarking and the SES Performance Scheme

The SES Performance Scheme includes Union-wide performance targets which are "transposed" into binding national/FAB targets for which clear accountabilities must be assigned within performance plans. Following the PRB recommendations, Union-wide targets for Safety, Environment, Capacity and Cost-Efficiency were adopted by the EC on 11 March 2014 for RP2 (2015-2019)[11]. It should be noted that the Union-wide Cost-Efficiency target is expressed in terms of en-route determined costs per service unit, and is computed at charging zone level (i.e. including ANSPs, MET, EUROCONTROL and NSAs costs). At Union-wide level, the en-route Cost-Efficiency target for RP2 corresponds to an annual average reduction of the Determined Unit Cost of -3.3%.

The ACE factual and independent benchmarking sets the foundation for a normative analysis to quantify the potential scope of cost-efficiency improvements for ANSPs[12]. Findings from the ACE Benchmarking analysis and the gathering of business "intelligence" on ANSPs cost-efficiency performance directly feed three core processes of the SES Performance Scheme:

[8] Skyguide Annual Accounts are prepared according to the Swiss GAAP which are close to IFRS.

[9] From 2007 onwards, this has been the case 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.

[10] Following the amendment of IAS 19 in 2013, any gains/losses arising from a change in actuarial assumptions have to be directly reflected in financial statements. This contrasts with the methodology that was used by some ANSPs until 2012 (i.e. corridor approach) according to which only a part of the actuarial gains/losses were recognised in the financial statements.

[11] The EC decision (2014/132/EU) setting RP2 performance targets is available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014D0132&from=EN.

[12] Examples of econometric analysis of cost-efficiency performance can be found on the PRC website.

1. Union-wide cost-efficiency target setting;
2. assessment of the cost-efficiency part of FABs/National Performance Plans; and,
3. monitoring of the cost-efficiency performance during a Reference Period.

For ANSPs operating in SES States, the year 2015 marked the start of RP2. As in RP1, SES States/ANSPs operate under the determined costs method which comprises specific risk-sharing arrangements aiming at incentivising ANSPs economic performance. As part of the determined costs method, the costs planned for the reference period (RP) are set in advance and frozen for the length of the RP. If actual costs are lower than the determined costs, then the State/ANSP can keep the difference. On the contrary, if actual costs are higher than determined, then the State/ANSP has to bear a loss. This mechanism provides incentives for States/ANSPs to effectively control their costs and to flexibly adapt to unforeseen changes in traffic volumes.

The 2015 PRB monitoring report[13] shows that for the first year of RP2, SES States were on average able to outperform their en-route cost-efficiency targets (-4.5%) since they managed to achieve cost savings (-2.5%) while benefiting from more traffic than expected (+2.0%).

This ACE 2015 Benchmarking Report complements the PRB monitoring activity by providing a detailed comparison of cost-effectiveness performance at ANSP level including a trend analysis of three main economic drivers (productivity, employment costs and support costs) over the 2010-2015 period. Performance indicators at FAB level are also presented in Annex 9.

Annex 3 provides explanations on the differences between ACE and SES economic indicators and illustrates how these can be reconciled.

[13] Available at: http://ec.europa.eu/transport/modes/air/single_european_sky/ses-performance_en.

PART I: PAN-EUROPEAN SYSTEM COST-EFFECTIVENESS PERFORMANCE IN 2015 AND OUTLOOK FOR 2016-2020

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2 PAN-EUROPEAN SYSTEM COST-EFFECTIVENESS PERFORMANCE IN 2015 WITH 2016-2020 OUTLOOK

2.1 Overview of European ANS system data for the year 2015

In 2015, gate-to-gate ATM/CNS provision costs amounted to some €8.1 billion, and the 38 ANSPs employed a total of some 56 300 staff (31% of them being ATCOs working on operational duties).

The Pan-European ANS system analysed in this report comprises 38 participating ANSPs, excluding elements related to services provided to military operational air traffic (OAT), oceanic ANS, and landside airport management operations. The Pan-European ANS system also includes National Supervisory Authorities (NSAs) and other regulatory and governmental authorities, national MET providers and the EUROCONTROL Agency.

Figure 2.1 below shows that the main component of gate-to-gate ANS costs (€9.3 billion) is ATM/CNS provision costs which represent 87.8%. Other ANS costs include the costs of aeronautical meteorology services (4.8%), the costs of the EUROCONTROL Agency (5.3%) and the costs associated to regulatory and governmental authorities (2.1%).

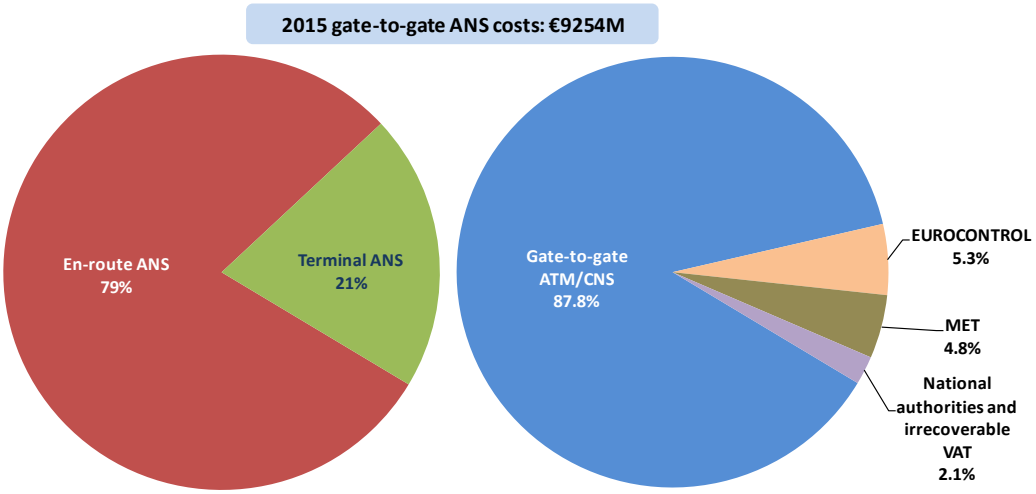


Figure 2.1: Gate-to-gate ANS costs for the Pan-European system, 2015

Table 2.1 below presents key ANSP data for the years 2014 and 2015. It should be noted that the figures shown for MET costs, EUROCONTROL costs and the payments to national authorities and irrecoverable VAT in Table 2.1 only represent the costs **passing through ANSPs financial accounts**. This is a smaller scope than in Figure 2.1 where the total ANS costs at State level were displayed, even those not passing through ANSPs' accounts.

Table 2.1 shows that the gate-to-gate ANS revenues amounted to €9 550M in 2015 and increased by +2.5% compared to 2014. The Pan-European ANSPs employed some 56 343 staff. Overall, at system level each staff generated an average of some €170 000 in terms of revenues.

Some 17 682 staff (31%) were ATCOs working on operational duty, split between ACCs (56%) and APP/TWR facilities (44%). On average, 2.2 additional staff are required for every ATCO in OPS in Europe.

	2014	2015	15/14
	37 ANSPs	38 ANSPs	37 ANSPs
Gate-to-gate ANS revenues (not adjusted by over/under recoveries) (in € M):	**9 284**	**9 550**	**2.5%**
En-route ANS revenues	7 348	7 584	2.9%
Terminal ANS revenues	1 936	1 966	1.1%
Gate-to-gate ATM/CNS provision costs (in € M):	**8 062**	**8 124**	**0.5%**
En-route ATM/CNS costs	6 296	6 335	0.3%
Terminal ATM/CNS costs	1 766	1 790	0.9%
Institutional costs passing through ANSPs accounts (in € M):	**772**	**722**	**-6.7%**
MET costs (including internal MET costs)	312	295	-5.5%
EUROCONTROL Agency costs	305	289	-5.3%
Payment to national authorities and irrecoverable VAT	155	137	-11.8%
Gate-to-gate ANS staff:	**55 446**	**56 343**	**0.3%**
ATCOs in OPS	17 533	17 682	0.3%
ACC ATCOs	9 810	9 879	0.3%
APPs + TWRs ATCOs	7 723	7 802	0.3%
NBV of gate-to-gate fixed assets (in € M)	**7 446**	**7 418**	**-0.8%**
Gate-to-gate capex (in € M)	**1 115**	**1 049**	**-6.7%**
Outputs (in M)			
Distance controlled (km)	10 271	10 509	1.9%
Total flight-hours controlled	14.6	14.9	1.6%
ACC flight-hours controlled	13.1	13.4	1.8%
IFR airport movements controlled	15.0	15.2	1.7%
IFR flights controlled	9.6	9.8	1.5%
Gate-to-gate ATFM delays ('000 min.)	**9 881**	**13 946**	**41.1%**

Table 2.1: Key ANSP data for 2014 and 2015, real terms[14]

ACE also analyses indicators derived from ANSP balance sheets and capital expenditures. The total Net Book Value (NBV) of fixed assets used by the Pan-European ANSPs to provide ATM/CNS services is valued at some €7 418M, which means that overall €0.8 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 relate to ATM/CNS systems and equipment in operation or under construction. In 2015, the total ANSP capex at Pan-European system level amounted to some €1 049M.

Some elements of ANS provision are outside the control of individual ANSPs. These elements include the costs of aeronautical MET services, the costs of the EUROCONTROL Agency and costs associated to regulatory and governmental authorities[15]. Therefore, from a methodological point of view, the ACE Benchmarking analysis focuses on the specific costs of providing gate-to-gate ATM/CNS services which amounted to €8 124M in 2015.

Figure 2.2 shows for each ANS segment the costs distribution between staff costs, non-staff operating costs, depreciation costs, the cost of capital and exceptional costs.

[14] It should be noted that in Table 2.1, the calculation of the changes between 2014 and 2015 exclude the Georgian ANSP (Sakaeronavigatsia) which is included in ACE 2015 for the first time.

[15] It is important to note that the large decrease in the payment to national authorities and irrecoverable VAT is mainly due to the fact that the costs relating to the Spanish Air Force (Ministry of Defence) are not passing through ENAIRE financial accounts anymore.

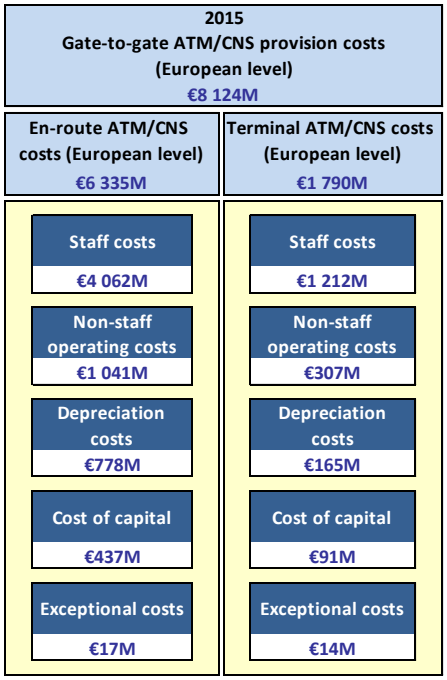


Figure 2.2: Breakdown of ATM/CNS provision costs, 2015

Staff costs are by far the largest costs category (65%), followed by non-staff operating costs (17%), depreciation costs (12%), the cost of capital (6%) and exceptional costs (below 1%).

Figure 2.2 also shows that gate-to-gate ATM/CNS provision costs can be broken down into en-route and terminal representing respectively 78% and 22% of gate-to-gate costs.

Despite the existence of common general principles, there are inevitably discrepancies in cost-allocation between en-route and terminal ANS across the European ANSPs. This lack of consistency might distort performance comparisons carried out separately for en-route and terminal. For this reason, the focus of the cost-effectiveness benchmarking analysis in this report is "gate-to-gate". For the sake of completeness, Annex 2 of this report provides the breakdown of the gate-to-gate cost-effectiveness indicator into en-route and terminal.

ANSPs' ATM/CNS provision costs are then divided by an output metric to obtain a measure of performance – the **financial cost-effectiveness indicator**. The output metric is the composite flight-hour, a "gate-to-gate" measure which combines both en-route flight-hours controlled and IFR airport movements controlled. More information on the calculation of the output metric can be found in Annex 2.

2.2 Factors affecting performance

ANSPs in Europe operate in very diverse environments, both in terms of operational conditions (e.g. traffic complexity and traffic variability) and socio-economic conditions (e.g. cost of living, labour laws).

There are also significant differences in terms of size across the ANSPs since the five largest bear 57% of the total Pan-European ATM/CNS provision costs while the five smallest represent less than 1% of the costs.

Many factors contribute to observed differences in unit costs between ANSPs. Some of these factors are measurable; others (such as regulatory constraints) are less obviously quantifiable.

Methods have been developed by the PRU to measure a subset of exogenous factors. Currently, three relevant factors outside ANSPs control are consistently measured in the ACE Benchmarking Reports. As shown in Figure 2.3 below, these include the traffic complexity and the seasonal traffic variability. The third factor is the cost of living prevailing in the different countries where ANSPs operate.

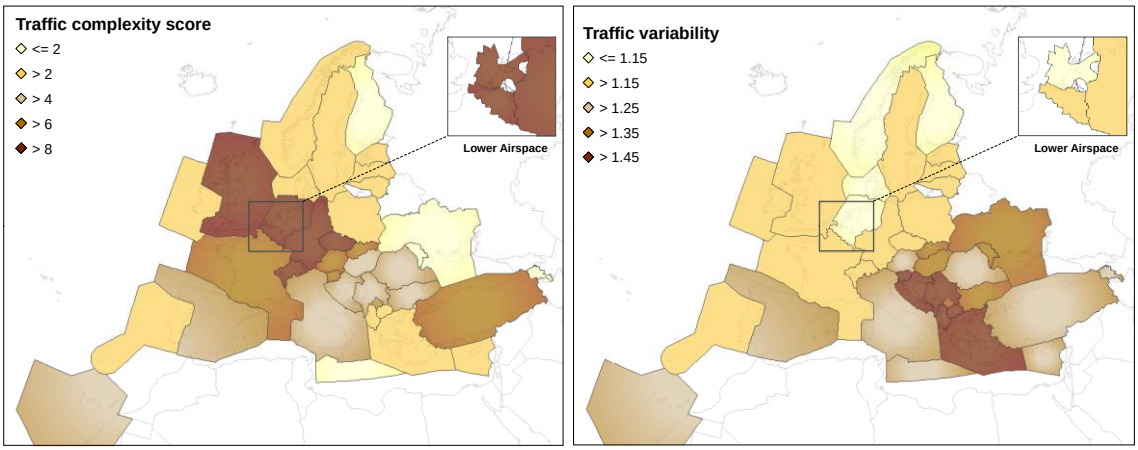


Figure 2.3: Exogenous factors measured by the PRU, 2015

Figure 2.3 shows that traffic complexity scores tends to be very high in the core of Europe (see left-hand map), while the seasonal traffic variability tends to be very high in the South-East corner of Europe (see the right-hand map). It should be noted that in Figure 2.3, the seasonal traffic variability metric is computed as the ratio of the peak week of traffic to the average week.

Detailed information on traffic complexity and seasonal variability are provided in Annex 6 of this report.

Ideally, since the 38 ANSPs operate in very diverse environments across Europe, all the factors affecting performance should be taken into account in making fair performance comparisons, especially since many of these factors are outside the direct 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 impact of size on ANSPs performance is an important policy issue given the infrastructure characteristics of the ANS sector and the expectation that fixed costs can be more effectively exploited with larger amounts of traffic.

In 2015, the five largest ANSPs (ENAIRE, DFS, ENAV, NATS and DSNA) bear some 57% of total European gate-to-gate ATM/CNS provision costs, while their share of traffic is 49%. At first sight, this result contrasts with the expectation of some form of increasing returns to scale in the provision of ANS (the performance of larger ANSPs might benefit from their larger size).

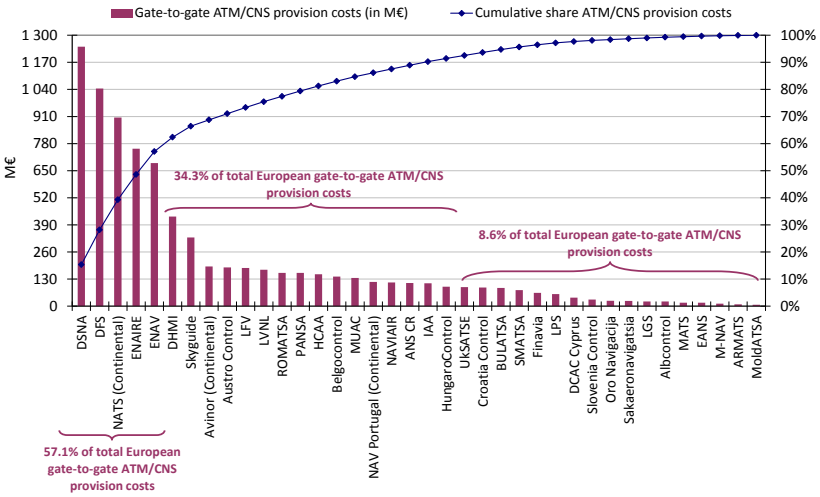


Figure 2.4: Distribution of ATM/CNS provision costs in 2015

However, it should be noted that:

- under the full cost recovery regime that applied to most ANSPs until December 2011, there was little incentive to fully exploit scale effects;
- the five largest ANSPs were substantially affected by the decrease in traffic volumes resulting from the economic recession. On average, the number of composite flight-hours controlled by the five largest ANSPs reduced by -8.5% between 2008 and 2015 while it rose by +9.5% for the other ANSPs;
- larger ANSPs tend to develop bespoke ATM systems internally which can be more costly than commercial off-the-shelf (COTS) solutions; and,
- size is not the only factor that has an impact on ANSPs costs.

It is expected that with the regulatory regime introduced by the SES II Performance Scheme and the incentive scheme embedded in the Charging Scheme regulation, the incentives to exploit scale effects will be stronger in RP2.

2.3 Pan-European economic cost-effectiveness performance in 2015

At Pan-European level, the unit economic costs amounted to €501 in 2015 which is +3.2% higher than in 2014 mainly due to an increase in the unit costs of ATFM delays (+38.8%) while unit ATM/CNS provision costs decreased by -1.2%.

An assessment of ANS performance should take into account the direct costs linked with ATM/CNS provision but also indirect costs (delays, additional flight time and fuel burn) borne by airspace users, while checking that ANS safety standards are met. The PRC introduced in its ACE Benchmarking Reports the concept of economic cost-effectiveness. This indicator is defined as gate-to-gate ATM/CNS provision costs plus the costs of ground ATFM delays[16] for both en-route and airport, all expressed per composite flight-hour. This economic performance indicator is meant to capture trade-offs between ATC capacity and costs.

[16] The cost of ATFM delays (€100 per minute in 2015, the same value as in 2014) is based on the findings of the study "European airline delay cost reference values" realised by the University of Westminster in March 2011 and updated in December 2015. Further details on the computation of the economic costs per composite flight-hour at ANSP and Pan-European system level are available in Annex 2 of this report.

Figure 2.5 below shows the comparison of ANSPs gate-to-gate economic cost per composite flight-hour in 2015. The two dotted lines represent the bottom and the top quartiles and provide an indication of the dispersion across ANSPs (there is a difference of €184 between the bottom and the top quartile).

The economic cost-effectiveness indicator at Pan-European level is €501 per composite flight-hour, and, on average, ground ATFM delays represent 15% of the total economic costs. According to the Network Operations Report[17], the three main contributors to ATFM delays in 2015 were Istanbul airports (due to capacity and weather issues), Brest ACC (due to training and implementation of the ERATO stripless environment) and recurrent capacity and staffing issues in Nicosia ACC.

Figure 2.5 below shows that in 2015 unit economic costs ranged from €870 for Skyguide to €191 for MATS; a factor of more than four. Figure 2.5 also shows that DFS had the highest unit economic costs amongst the five largest ANSPs.

It is important to note that, for ANSPs operating outside of the Euro zone (such as Skyguide), substantial changes of the national currency against the Euro may significantly affect the level of 2015 unit economic costs when expressed in Euro. More information on exchange rates variations and their impact on unit costs is provided in §2.4 below.

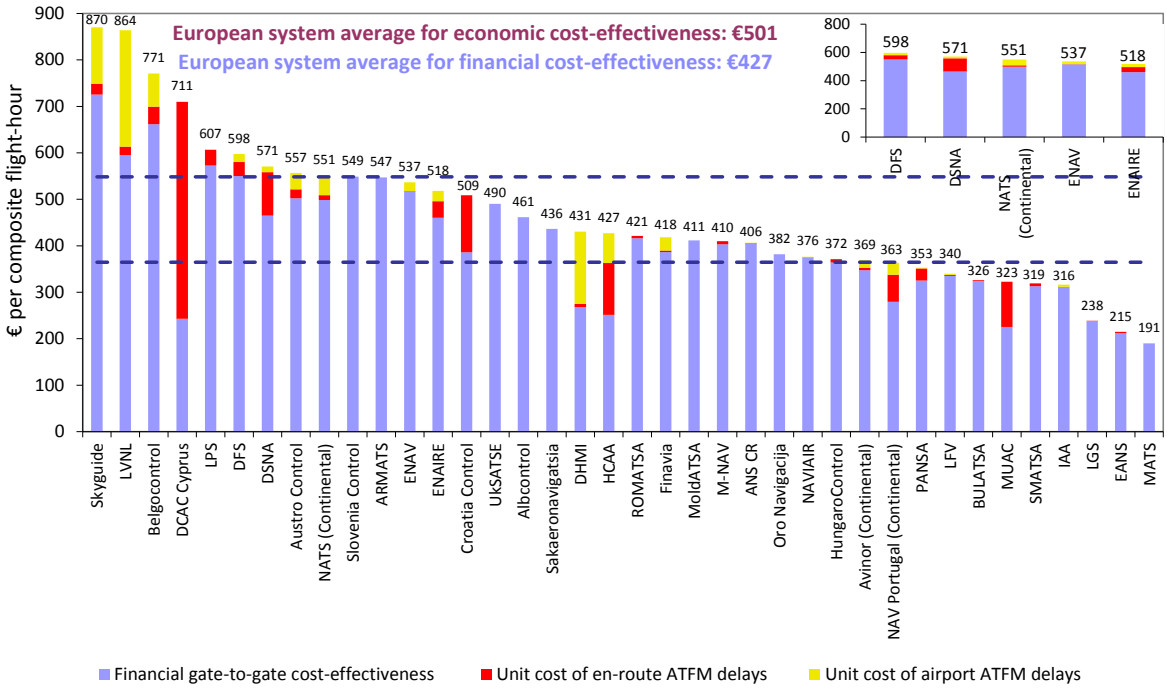


Figure 2.5: Economic gate-to-gate cost-effectiveness indicator, 2015

Figure 2.6 below analyses the changes in economic cost-effectiveness between 2010 and 2015 at Pan-European system level. The left-hand side of Figure 2.6 shows the changes in unit economic costs, while the right-hand side provides complementary information on the year-on-year changes in ATM/CNS provision costs, composite flight-hours and unit costs of ATFM delays.

[17] The Network Operations Report 2015 is available on the Network Manager's website: http://www.eurocontrol.int/publications/annual-network-operations-report-2015.

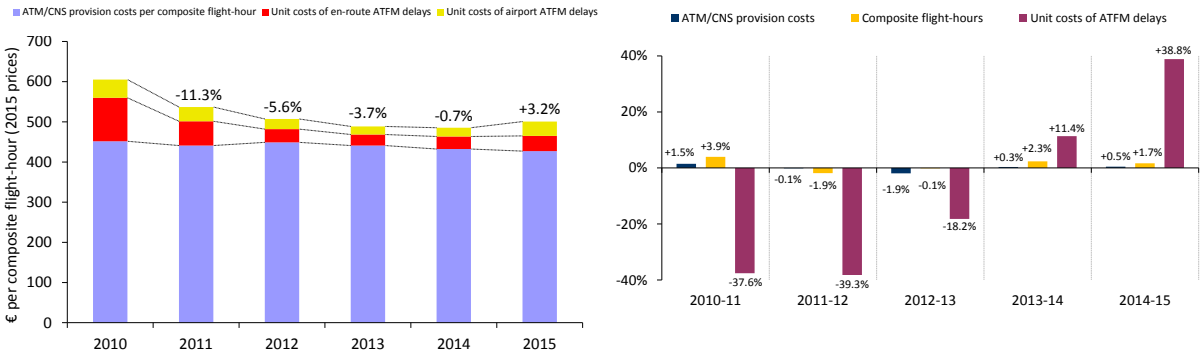


Figure 2.6: Changes in unit economic costs, 2010-2015 (real terms)

It is noteworthy that the year 2010, which is the starting point of this trend analysis, shows a relatively high level of unit economic costs for the ATM system. This mainly reflects the fact that the unit costs of ATFM delays were exceptionally high that year following a sharp increase in delays for a limited number of ANSPs.

Between 2010 and 2014, economic costs per composite flight-hour decreased by -5.4% p.a. in real terms, mainly due to substantial decreases in ATFM delays unit costs (-23.4% p.a.). Over this period, ATM/CNS provision costs remained close to their 2010 level (-0.1% p.a.) while the number of composite flight-hours slightly increased (+1.0% p.a.).

In 2015, composite flight-hours rose faster (+1.7%) than ATM/CNS provision costs (+0.5%) and as a result unit ATM/CNS provision costs reduced by -1.2%. However, since the unit costs of ATFM delays increased by +38.8%, unit economic costs rose by +3.2% compared to 2014 (which was the year with the lowest unit economic costs since the start of the ACE benchmarking analysis).

Figure 2.7 shows the long term trends in terms of ATM/CNS provision costs, composite flight-hours, ATFM delays and unit economic costs. The trend of decreasing ATFM delays which began in 2011 stopped in 2013, when a new cycle characterised by higher delays started (+14.0% in 2014 and +41.1% in 2015).

Recent analyses published in PRR 2016 indicate that this increasing trend continued in 2016 since en-route ATFM delays were +20.9% higher than in 2015.

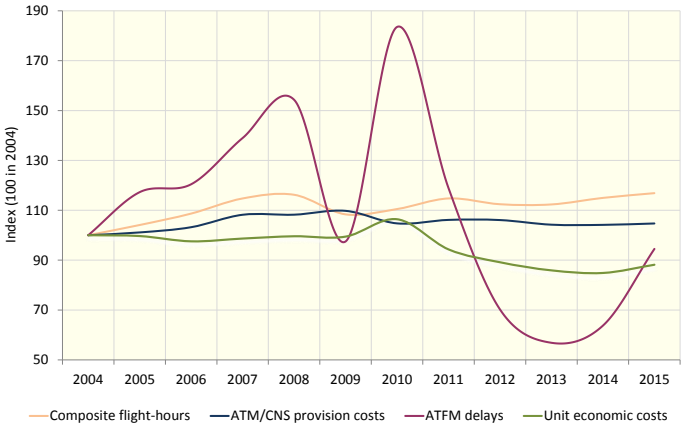


Figure 2.7: Long-term trends in traffic, ATM/CNS provision costs and ATFM delays

In Figure 2.8 below, ANSPs are classified in two groups. The upper bar chart shows ANSPs with a relatively higher aggregated complexity score (i.e. higher than the median of the sample which represents a score of 4.4) while ANSPs with a relatively lower aggregated complexity score (i.e. equal or lower than the median of the sample) are shown in the bottom bar chart. Inside each group, ANSPs are ranked by unit economic costs. More information about complexity indicators measured at ANSP level is available in Annex 6.

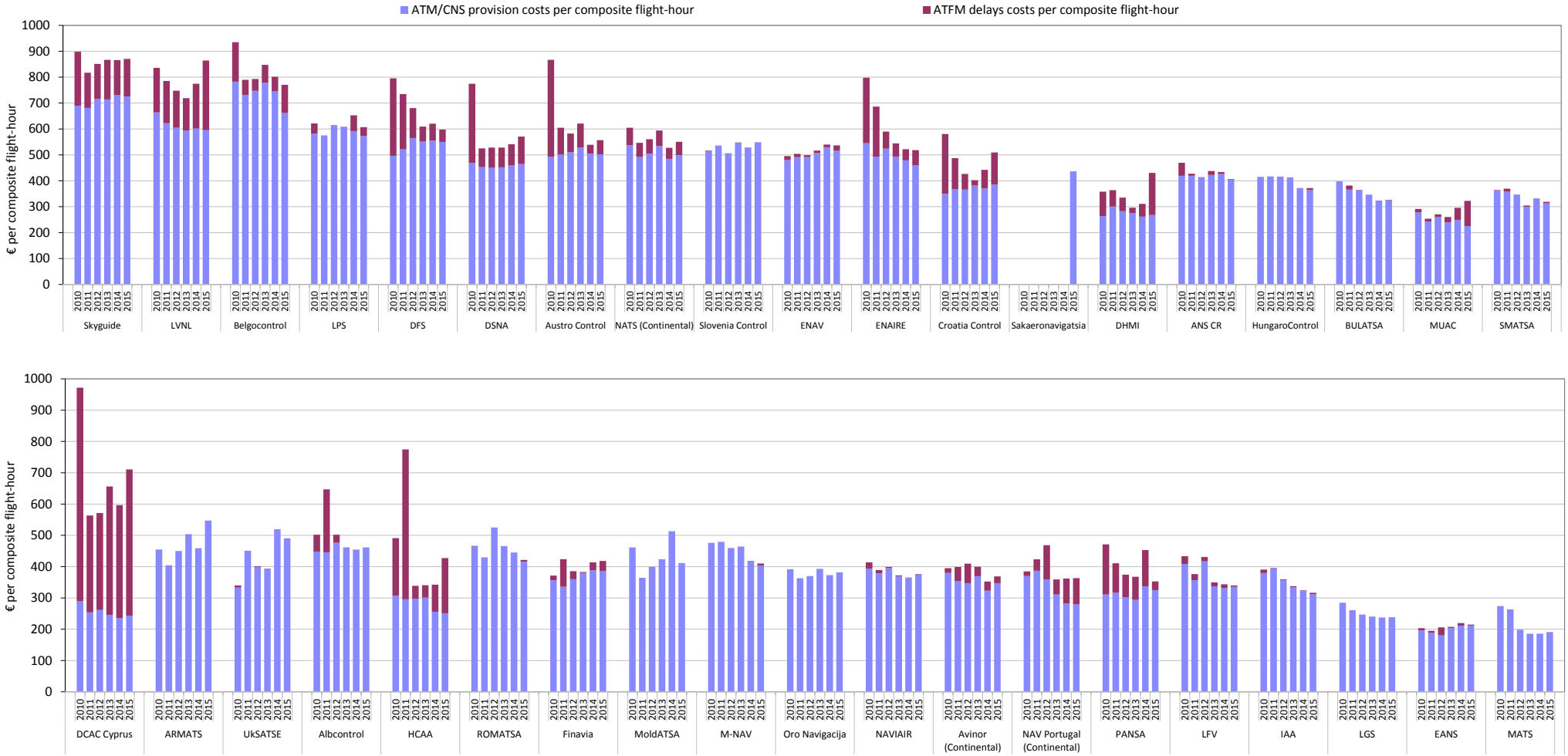


Figure 2.8: Changes in economic cost-effectiveness by ANSP, 2010-2015 (real terms)

Figure 2.8 shows that between 2014 and 2015, gate-to-gate economic costs per composite flight-hour fell for 16 ANSPs. Substantial reductions are observed for PANSA (-22.1%) and MoldATSA (-19.8%). For MoldATSA, this reduction is entirely driven by a large reduction in unit ATM/CNS provision costs. For PANSA, the observed decrease is mainly due to a substantial reduction in the unit costs of ATFM delays in 2015 (-76.1%).

On the other hand, Figure 2.8 also shows that unit economic costs rose for 21 ANSPs. For DHMI (+38.5%), HCAA (+24.7%), DCAC Cyprus (+19.2%), Croatia Control (+15.2%) and LVNL (+11.6%) the main driver for the increase in unit economic costs is linked to higher ATFM delays.

Figure 2.9 below shows the contribution of each ANSPs to the change in ATFM delays observed in 2015 at Pan-European system level (i.e. increase from 9 881 to 13 946 thousands of minutes).

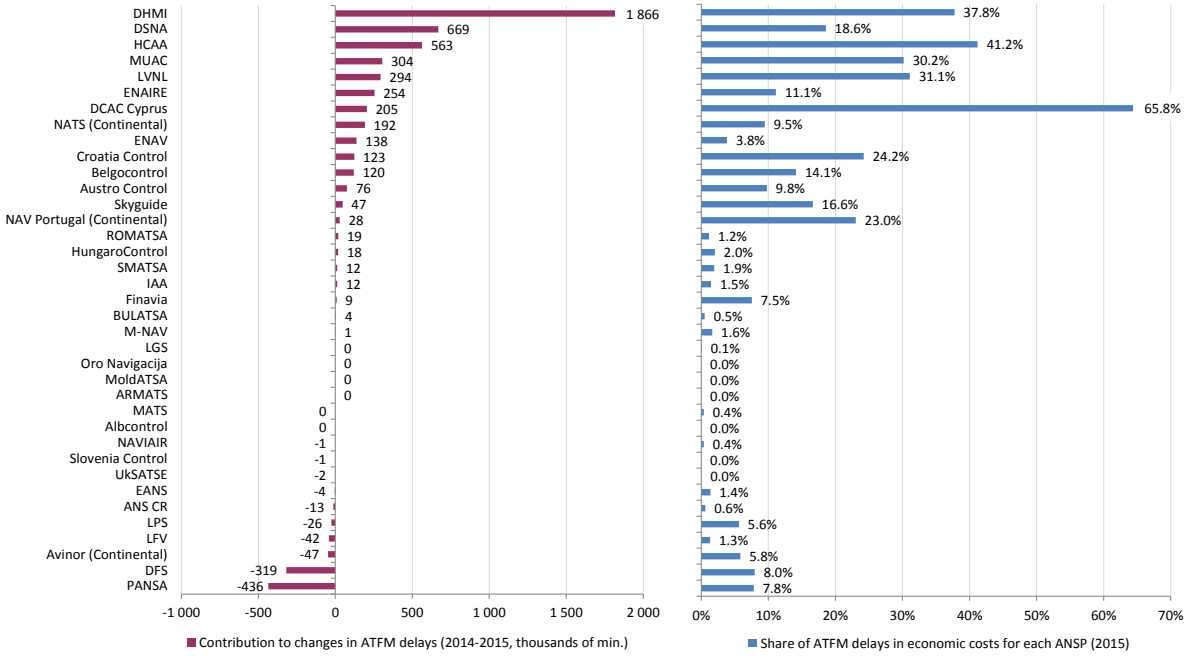


Figure 2.9: ANSPs contribution to ATFM delays increase at Pan-European system level in 2015

Figure 2.9 indicates that the increase in ATFM delays observed at system level in 2015 mainly reflects very large increases for a few ANSPs. Indeed, more than 90% of the total increase is generated by only five ANSPs (DSNA, DHMI, HCAA, MUAC and LVNL). The main factors explaining the increase in ATFM delays for the top five contributors are:

- airport capacity issues at the two Istanbul airports for DHMI;
- the training and implementation of the ERATO stripless environment in December 2015 at Brest ACC, as well as industrial action in April 2015 for DSNA;
- ACC staffing and capacity issues during the summer period for HCAA;
- capacity issues mainly due to shifting traffic flows for MUAC; and,
- weather issues at Amsterdam/Schiphol airport, as well as trials and the implementation of a new Voice Communication System for LVNL.

The right-hand side of Figure 2.9 shows that, as a result, for most of these ANSPs the share of ATFM delays in economic costs in 2015 is significantly higher than the European average (15%). This is particularly the case for HCAA (41.2%), DHMI (37.8%), LVNL (31.1%) and MUAC (30.2%).

The ANSP with the largest share of ATFM delays in economic costs is DCAC Cyprus (65.8%). DCAC Cyprus has had recurrent ATC capacity issues for several years. The implementation of capacity

enhancement measures contributed to reduce ATFM delays in 2011-2012 compared to previous years, but since then the situation deteriorated and the share of ATFM delays in DCAC Cyprus economic costs remained above 60% over the 2013-2015 period.

On the other hand, two ANSPs (DFS and PANSA) achieved significant reductions in ATFM delays.

- In the case of PANSA, the unit cost of ATFM delays reached its lowest level since the integration of PANSA in the ACE benchmarking exercise (2005). This constitutes a major improvement since ATFM delays now represent 7.8% of the total economic costs, compared to more than 25% in 2014 when PANSA generated an exceptionally high level of ATFM delays following the implementation of a new ATM system (Pegasus) in Warsaw.
- For DFS, the improvement in 2015 is mainly due to a lower level of weather-related ATFM delays in Frankfurt airport.

Figure 2.10 shows the breakdown of ATFM delays by segment and delay cause. This information reflects the data currently recorded in the Network Manager database. In 2015, airport ATFM delays represented 49% of the total ATFM delays of which 42% were caused by weather issues which may be difficult for the ANSP to influence. However, 50% of airport ATFM delays resulted from aerodrome or ATC capacity problems. This could rise up to more than 75% for individual ANSPs (see Figure 2.11 below).

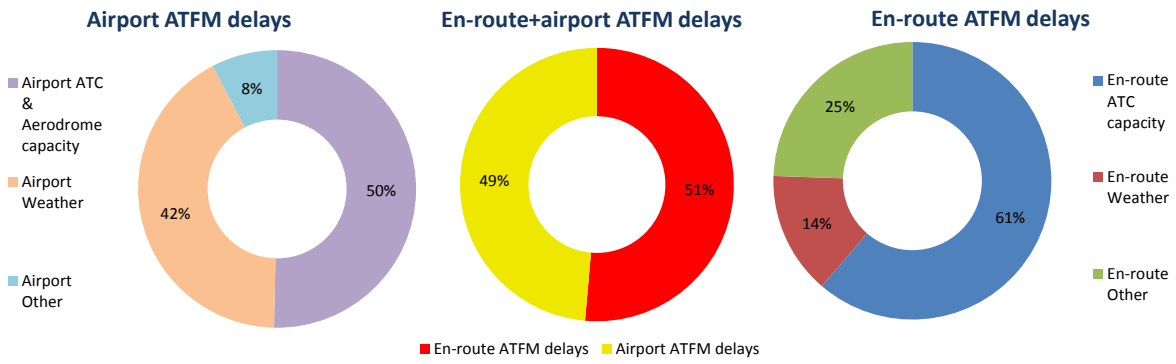


Figure 2.10: Causes of en-route and airport ATFM delays at system level, 2015

Most of the en-route ATFM delays generated at Pan-European system level are associated to ATC capacity issues (61%).

Figure 2.11 shows the distribution of delays by cause for the 17 ANSPs which generated more than 100 000 minutes of ATFM delays in 2015.

The right-hand side of Figure 2.11 indicates that, for the most of the ANSPs, en-route ATFM delays are mainly associated with ATC capacity issues (see blue bar). For three ANSPs, en-route ATFM delays were mostly reported under the "Other" category: ENAV (100%), Belgocontrol (71%) and DSNA (46%).

For ENAV, these delays are mainly relating to issues associated with ATC equipment and industrial actions. For Belgocontrol, the ATFM delays reported under the "Other" category mainly reflect a technical issue in December 2015 which prevented the switch from night to day time sector configuration. For DSNA, the "Other" en-route ATFM delays were associated to industrial actions and to the training in view of the implementation of the ERATO stripless environment in Bordeaux and Brest ACCs.

For Austro Control, DFS and NATS, en-route ATFM delays in 2015 were mainly associated with weather issues.

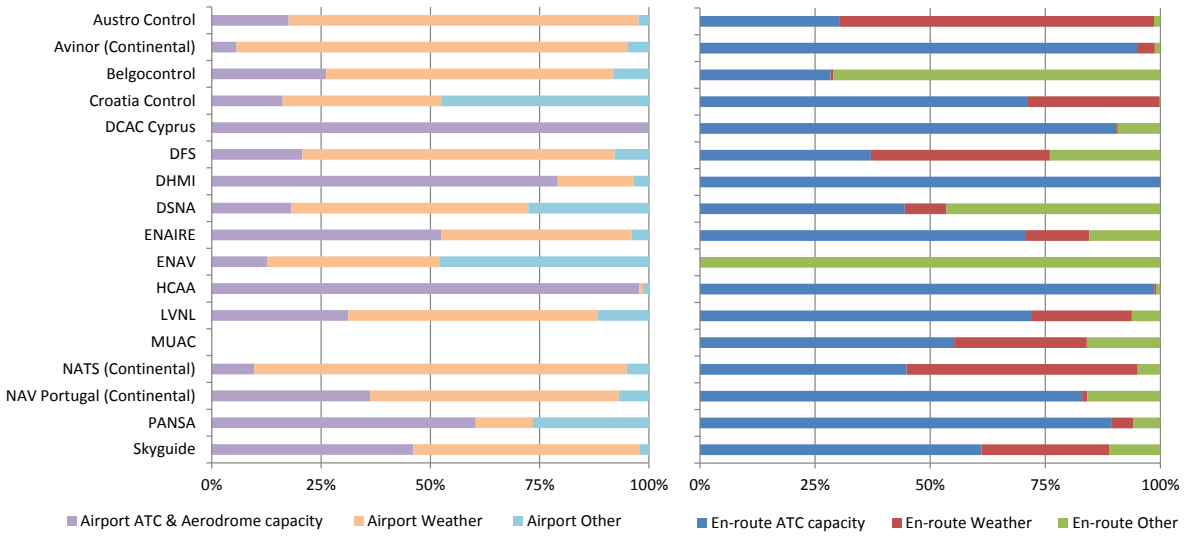


Figure 2.11: Causes of en-route and airport ATFM delays at ANSP level, 2015

The left-hand side of Figure 2.11 shows that the airport ATFM delays recorded for DCAC Cyprus, DHMI, ENAIRE, HCAA and PANSA were mainly related to aerodrome capacity issues (see light purple bar). On the other hand, the airport ATFM delays for Austro Control, Avinor, Belgocontrol, DFS, DSNA, LVNL, NATS, NAV Portugal and Skyguide were mainly due to weather (see orange bar). This reflects the impact of the adverse weather conditions faced by these ANSPs during the year 2015.

It is important to note that airport ATFM delays, and associated costs, may also arise from airport constraints, which are outside the direct control of the respective ANSP (such as compliance with environmental constraints or issues associated with airport infrastructure).

In absence of exceptional events (i.e. severe weather, industrial actions, etc.), the level of ATFM delays should mainly depend 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.).

More details on the changes in ATFM delays for individual ANSPs are provided in Part II of this Report and delay causes are further analysed in the PRR 2015 report as well as in the Network Operations Report 2015 (see footnote 17).

2.4 Pan-European financial cost-effectiveness performance in 2015

In 2015, unit ATM/CNS provision costs range from €725 (Skyguide) to €190 (MATS). Although the five largest ANSPs operate in relatively similar economic and operational environments, there is a substantial variation in unit ATM/CNS provision costs, ranging from DFS (€550) to ENAIRE (€460).

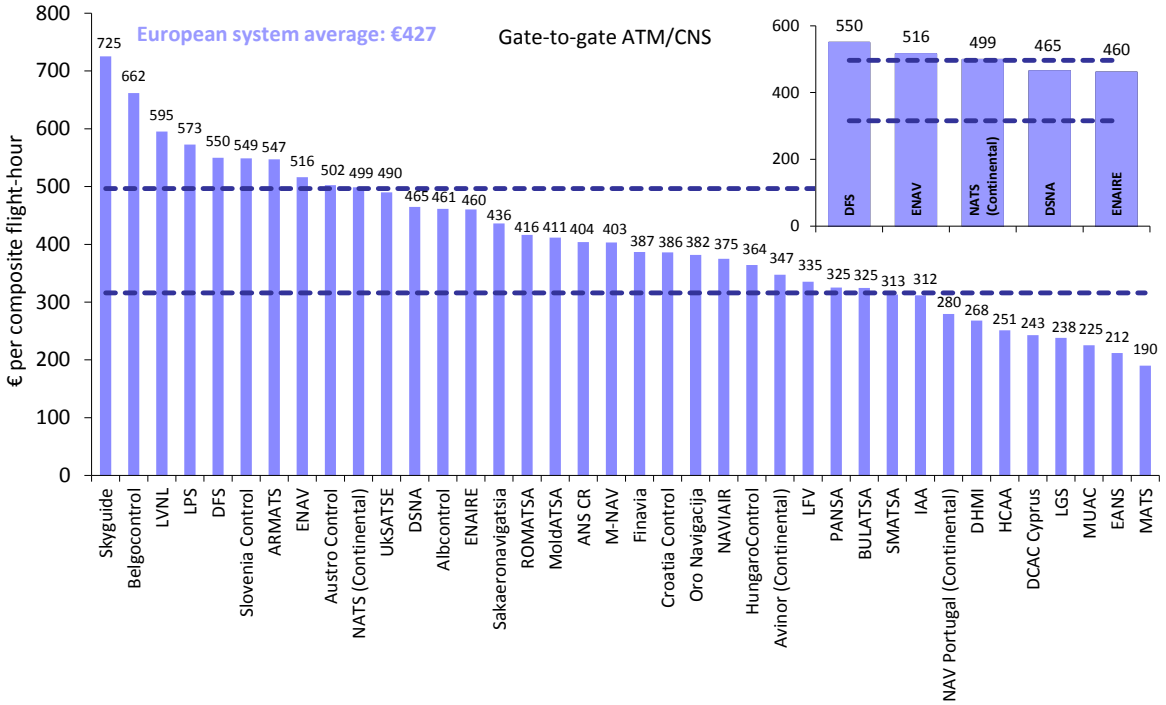


Figure 2.12: ATM/CNS provision costs per composite flight-hour, 2015

It is important to note that, for ANSPs operating outside the Euro zone, substantial changes of the national currency against the Euro may significantly affect the level of unit ATM/CNS provision costs when expressed in Euros. For example, the level of Skyguide unit costs (€725) is negatively affected by the appreciation of the Swiss Franc in 2015 (some +20% in January 2015 and +14% over the whole year). Assuming that the Swiss Franc had remained at its 2014 level, Skyguide 2015 unit ATM/CNS provision costs would amount to some €638, and Skyguide would rank at the second position just below Belgocontrol.

A detailed analysis of the impact of the changes in exchange rates on the level of ANSPs 2015 unit ATM/CNS provision costs is available in Annex 7.

Figure 2.12 indicates that in 2015 the unit ATM/CNS provision costs of various ANSPs operating in Central and Eastern European countries (LPS, Slovenia Control, ARMATS, UkSATSE and Albcontrol) are higher than the Pan-European system average and in the same order of magnitude as the unit costs of ANSPs operating in Western European countries where the cost of living is much higher.

Because of their weight in the Pan-European system and their relatively similar operational and economic characteristics (size, scope of service provided, economic conditions, presence of major hubs), the ACE Benchmarking Reports place a particular focus on the results of the five largest ANSPs (ENAIRE, DFS, DSNA, ENAV and NATS).

Figure 2.12 shows that although the five largest ANSPs operate in relatively similar economic and operational environments, there is a substantial difference (19%) in unit ATM/CNS provision costs, ranging from DFS (€550) to ENAIRE (€460).

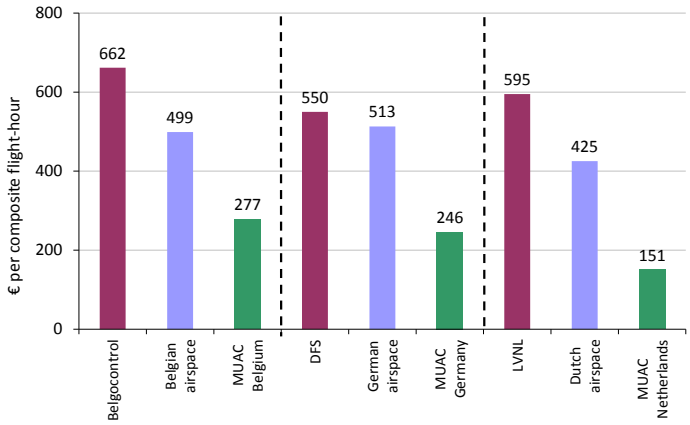
Belgocontrol and LVNL are amongst the ANSPs with the highest unit costs, ranking second and third in Figure 2.12 above. It is noteworthy that although these two ANSPs operate in relatively similar operational (both exclusively provide ATC services in lower airspace) and economic conditions, the unit ATM/CNS provision costs of Belgocontrol have always been higher than those of LVNL in the past five years (+23% on average over 2010-2014). The gap has however significantly reduced in 2015 (+11%).

It should also be noted that these ANSPs own infrastructure which is made available to MUAC. To better assess the cost-effectiveness of ATM/CNS provided in each of the Four States (Belgium, Germany, the Netherlands, and Luxembourg) national airspaces, MUAC costs and outputs are consolidated with the costs and outputs of the national providers. This adjustment is presented in Figure 2.13 below.

The bottom of Figure 2.13 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 are based on those controlled by MUAC in the three FIRs (Belgium, Netherlands and Germany).

The top of Figure 2.13 provides a view of this consolidated ATM/CNS provision costs per composite flight-hour in the airspace of Belgium, the Netherlands and Germany (see blue bars).

After this adjustment, the unit costs in Belgium airspace (€499) remain higher (17%) than in the Dutch airspace (€425).



MUAC	Belgium	Germany	Netherlands
Flight-hours allocated to:	157 642	261 854	181 474
Costs allocated to:	€43.7M	€64.4M	€27.3M

Figure 2.13: Adjustment of the financial cost-effectiveness indicator for ANSPs operating in the Four States airspace, 2015

2.5 Changes in financial cost-effectiveness 2004-2015 and 2014-2015

At Pan-European system level, composite flight-hours (+1.7%) rose faster than ATM/CNS provision costs (+0.5%). As a result, unit ATM/CNS provision costs reduced by -1.2% in real terms compared to 2014.

Since Sakaeronavigatsia is included in the benchmarking analysis for the first time in ACE 2015, the analysis of the changes in financial cost-effectiveness is made on a sample excluding the Georgian ANSP.

The ACE 2014 report presented for the first time a long-term trend analysis (2004-2014) showing the changes in traffic, ATM/CNS provision costs and unit costs before and after the 2009 economic crisis. Figure 2.14 below provides an update of this analysis with the addition of the year 2015.

Figure 2.14 shows that between 2004 and 2015, ATM/CNS provision costs rose by +0.4% p.a. which is significantly less than the +1.4% p.a. increase in traffic. As a result, unit ATM/CNS provision costs per composite flight-hour decreased by -1.0% p.a. on average.

Between 2004 and 2008, a period of sustained traffic growth, the number of composite flight-hours rose faster (+3.8% p.a.) than ATM/CNS provision costs (+2.0% p.a.). As a result, unit

ATM/CNS provision costs reduced by -1.8% p.a. over this period. This demonstrated the ability of the ATM industry to reduce unit costs in a context of robust and continuous traffic growth.

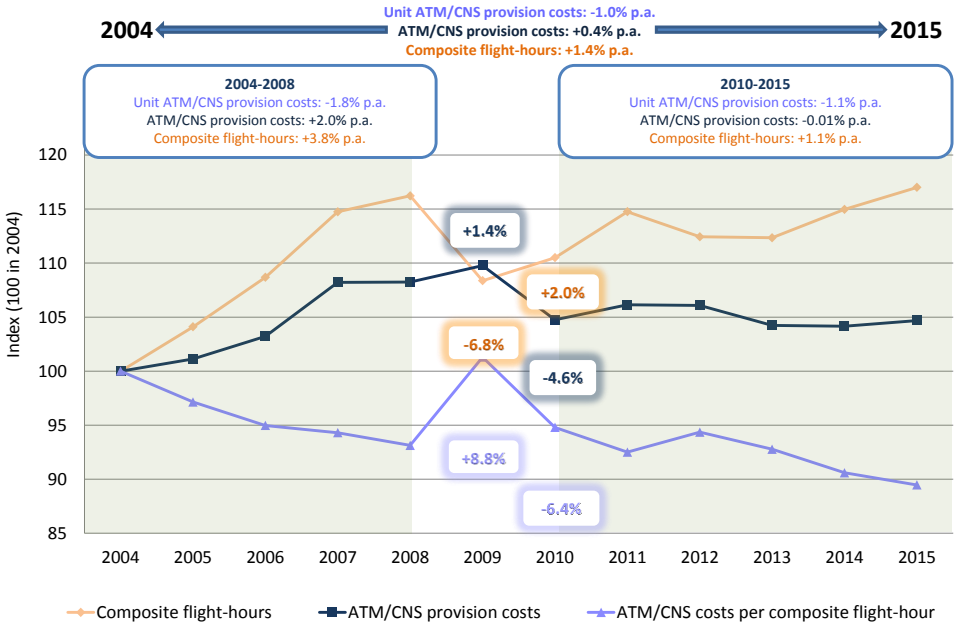


Figure 2.14: Long-term trends in traffic, ATM/CNS provision costs and unit costs

In 2009, following the economic recession traffic fell by -6.8%. In the meantime, ATM/CNS provision costs continued to grow by +1.4%. As a result, unit ATM/CNS provision costs increased by +8.8% and all the cost-effectiveness improvements achieved since 2004 were cancelled out.

In 2010, ATM/CNS provision costs reduced by -4.6% in a context of a +2.0% increase in traffic. This performance improvement reflects the impact of the cost containment measures implemented by a majority of ANSPs in the wake of the sharp traffic decrease in 2009.

Between 2010 and 2015, ATM/CNS provision costs remained fairly constant in a context of relatively low traffic growth (+1.1% p.a. compared to +3.8% over the 2004-2008 period). As a result, unit ATM/CNS provision costs reduced by -1.1% p.a. between 2010 and 2015.

Figure 2.15 below provides a detailed analysis of the changes in cost-effectiveness at ANSP level between 2014 and 2015, identifying the cost and the traffic effects. It shows that in 2015, ATM/CNS provision costs increased for 25 out of 37 ANSPs (top quadrants of Figure 2.15). Although 22 out of these 25 ANSPs experienced traffic increases in 2015, only nine could reduce unit costs (see the green dots on the top right quadrant of Figure 2.15).

In 2015, ATM/CNS provision costs decreased for 12 out of 37 ANSPs compared to 2014 (see bottom quadrants of Figure 2.15). Two of these ANSPs experienced a sharp traffic decrease: UkSATSE (-36.1%) and MoldATSA (-9.1%).

For UkSATSE, traffic significantly fell for the second year in a row (-36.1% in 2015 following a -36.8% decrease in 2014). These sharp traffic reductions mainly reflects the establishment of restricted/prohibited areas in UkSATSE airspace following the accident of Malaysia Airlines flight MH17 and military conflicts in the Eastern region of Ukraine. A new event negatively affecting the level of traffic in the last quarter of 2015 is that Russian airlines are not allowed anymore to operate to/from Ukrainian airports and to overfly the Ukrainian airspace.

In an attempt to adjust to these unfavourable events, UkSATSE reduced its ATM/CNS provision costs by -39.7% mainly through a reduction in the number of staff (-13.9%) and a very large decrease in non-staff operating costs (-49.9%). It is important to note that the large variations in

costs expressed in real terms are affected by a high level of inflation in 2015 (+48.7%). When expressed in nominal terms, UkSATSE ATM/CNS provision costs are -10.3% lower than in 2014.

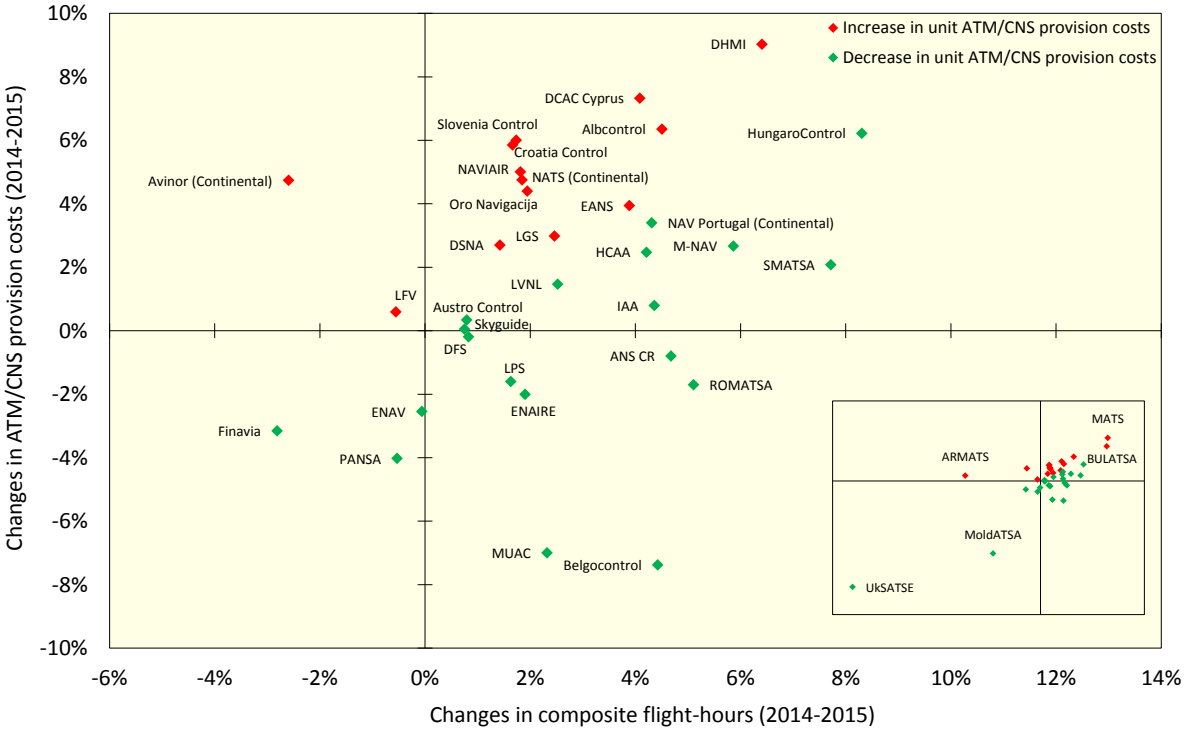


Figure 2.15: Changes in ATM/CNS provision costs and traffic volumes, 2014-2015 (real terms)

The traffic flows controlled by MoldATSA were also adversely affected (-9.1% compared to 2014) by the situation in Ukraine. Since ATM/CNS provision costs reduced by -27.2%, MoldATSA unit costs fell by -19.8% in 2015. The main driver for this decrease is a large reductions in staff costs (-38.1% in real terms).

Some ANSPs such as Belgocontrol (-7.4%) and MUAC (-7.0%) managed to substantially reduce ATM/CNS provision costs in a context of increasing traffic (+4.4% and +2.3%, respectively). For Belgocontrol, the lower costs (-€11.3M) mainly reflect substantial decreases in exceptional costs (-€4.7M) and non-staff operating costs (-€4.2M). For MUAC, the main driver for the observed decrease in ATM/CNS provision costs (-€10.2M) is a reduction of staff costs (-€11.2M).

On the other hand, it is noteworthy that ATM/CNS provision costs rose by more than +10.0% for two ANSPs: MATS (+16.2%) and BULATSA (+13.0%).

- In the case of MATS, the primary driver for the observed increase is higher staff costs (+28.1% or +€1.8M, mainly reflecting higher wages and salaries). A significant increase is also observed for the cost of capital (+28.9% or +€0.2M). The increase in MATS ATM/CNS provision costs should be seen in the context of a substantial traffic increase (+13.0%).
- For BULATSA, the higher ATM/CNS provision costs reflect increases in all cost categories: staff costs (+11.0% or +€5.9M), non-staff operating costs (+30.9% or +€2.5M), depreciation costs (+4.9% or +€0.4M) and the cost of capital (+15.5% or +€1.3M). As for MATS, the increase in BULATSA ATM/CNS provision costs should be seen in the context of a substantial traffic increase (+12.8%). As a result, unit ATM/CNS provision costs remained fairly constant in 2015 (+0.2%).

Among the five largest ANSPs, DFS (-1.0%), ENAV (-2.5%) and ENAIRE[18] (-3.8%) could achieve reductions in unit ATM/CNS provision costs in 2015. These reductions were achieved in the context of stagnating traffic for ENAV (-0.1%), and traffic increases for DFS (+0.8%) and ENAIRE (+1.9%).

DFS ATM/CNS provision costs remained fairly constant in 2015 (-0.2%). This average trend masks contrasting changes amongst the different cost categories. Indeed, higher staff costs (+5.9% or +€42.6M following an increase in pension costs) were compensated by the reporting of negative exceptional costs (-€1.3M while an amount of €47.0M was disclosed in 2014).

These exceptional costs mainly include two elements: a) the IFRS transition costs (€51.5M), and (b) a negative amount (-€50.0M) reflecting a contribution of the German State in DFS equity for the year 2015. It is understood that between 2015 and 2019, the German State will contribute for a total of €500M in order to strengthen DFS capital structure (€50M in 2015 and €112.5M per year between 2016 and 2019). If the German State contribution to DFS equity would not be taken into account, then DFS unit ATM/CNS provision costs would amount to some €576 instead of €550.

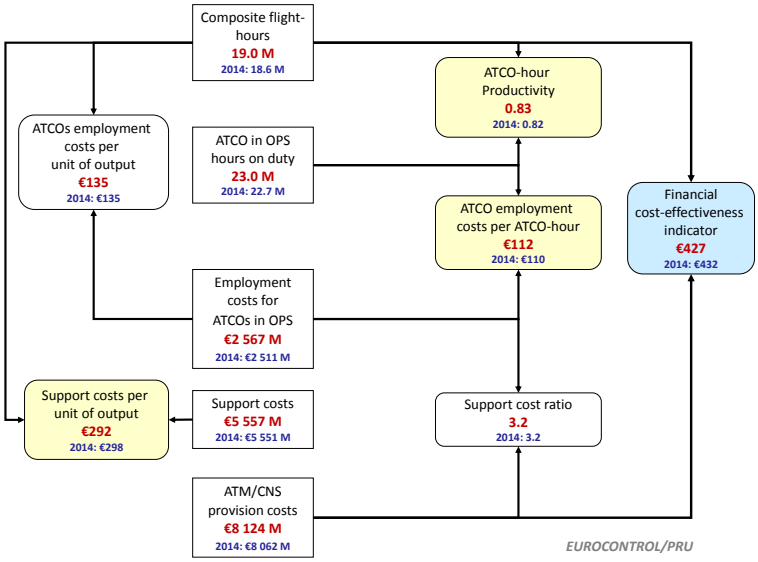
On the other hand, for DSNA and NATS, ATM/CNS provision costs increased faster than traffic, leading to an increase in unit costs (+1.3% and +2.9%, respectively).

- For DSNA, ATM/CNS provision costs rose by +2.7% (or +€32.7M) reflecting increases in all cost categories: staff costs (+2.5% or +€20.6M), non-staff operating costs (+3.0% or +€7.0M), depreciation costs (+2.1% or +€2.4M) and the cost of capital (+5.6% or +€2.7M).
- In the case of NATS, ATM/CNS provision costs rose by +4.8% (or +€41.1M) between 2014 and 2015. This reflects increases in all the cost categories (except the cost of capital): staff costs (+2.2% or +€11.2M), non-staff operating costs (+11.7% or +€17.2M), depreciation costs (+15.9% or +€19.6M). It should also be noted that in 2015, NATS reported exceptional costs (€8.7M) which were mainly relating to redundancy costs for Terminal ANS staff.

More details on the changes in unit ATM/CNS provision costs for individual ANSPs are provided in Part II of this Report.

Figure 2.16 below shows the analytical framework which is used in the ACE analysis to break down the financial cost-effectiveness indicator into basic economic drivers.

[18] ENAIRE 2015 ATM/CNS provision costs comprise costs relating to ATM/CNS infrastructure shared with the military authority (€16.8M), which are charged to civil airspace users. It should be noted that these costs, which are borne by the Spanish Air Force (Ministry of Defence), as well as the corresponding revenues, are not passing through ENAIRE Accounts from 2014 onwards.



Key drivers for the financial cost-effectiveness performance include:

a) ATCO-hour productivity (0.83 composite flight-hours per ATCO-hour);
b) ATCO employment costs per ATCO-hour (€112); and,
c) support costs per unit output (€292).

These three economic drivers are analysed in details in the next Sections of this document.

Figure 2.16: ACE performance framework, 2015 (real terms)

Around 31% of ATM/CNS provision costs directly relates to ATCOs in OPS employment costs while 69% relate to "support" functions including non-ATCOs in OPS employment costs, non-staff operating costs and capital-related costs such as depreciation costs and the cost of capital.

Figure 2.17 below shows that in 2015, ATCO employment costs per ATCO-hour (+1.8%) rose slightly faster than ATCO-hour productivity (+1.4%), and as a result ATCO employment costs per composite flight-hour increased by +0.5%. In the meantime, unit support costs fell by -1.9% since support costs remained close to 2014 levels (-0.3%) while the number of composite flight-hours increased (+1.7%). As a result, in 2015 unit ATM/CNS provision costs reduced by -1.2% at Pan-European system level.

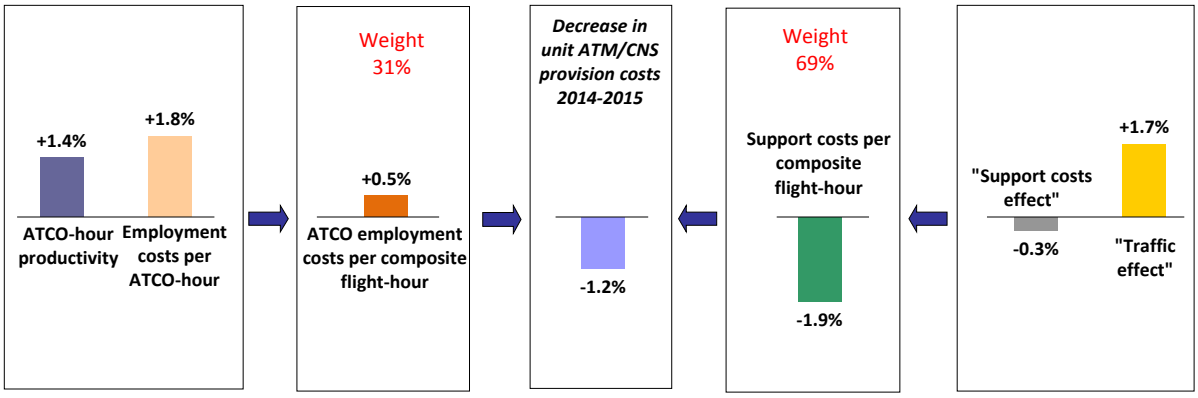


Figure 2.17: Changes in the financial cost-effectiveness indicator, 2014-2015 (real terms)

A detailed analysis of the changes in the key drivers of cost-effectiveness between 2010 and 2015 is provided hereafter (see sections 2.6, 2.7 and 2.8 below).

2.6 ATCO-hour productivity

At Pan-European level, an average of 0.83 composite flight-hour was controlled per ATCO-hour in 2015. ATCO-hour productivity rose by +7.3% between 2010 and 2015 since the increase in traffic (+6.0%) was absorbed with fewer ATCO-hours on duty (-1.2%).

Figure 2.18 indicates that ATCO-hour productivity substantially increased in 2011 (+2.9%), remained fairly constant in 2012 (+0.1%) and then continuously rose in 2013 (+0.9%), 2014 (+1.9%) and 2015 (+1.4%).

ATCO-hour productivity rose by +1.4% p.a. over the 2010-2015 period. As a result, the Pan-European system productivity in 2015 is +7.3% higher than in 2010.

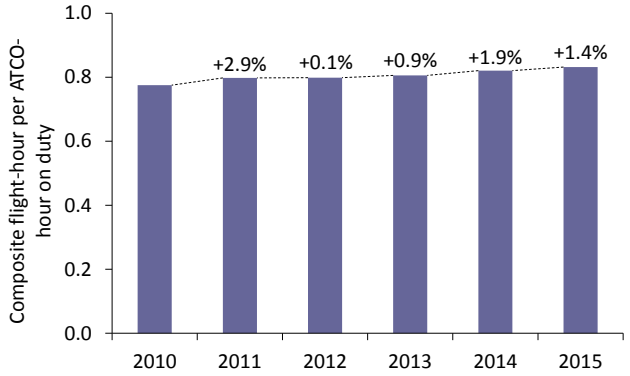


Figure 2.18: Changes in ATCO-hour productivity, 2010-2015

Figure 2.19 shows that over the 2010-2015 period, improvements in ATCO-hour productivity were proportionally higher for ANSPs[19] operating in Central and Eastern European States (see green dots in Figure 2.19). Indeed, ATCO-hour productivity rose by +3.0% p.a. for these ANSPs since 2010.

A robust traffic growth (+3.6% p.a.) significantly contributed to the observed improvement for these ANSPs while the number of ATCO-hours on duty slightly increased by +0.6% p.a. on average.

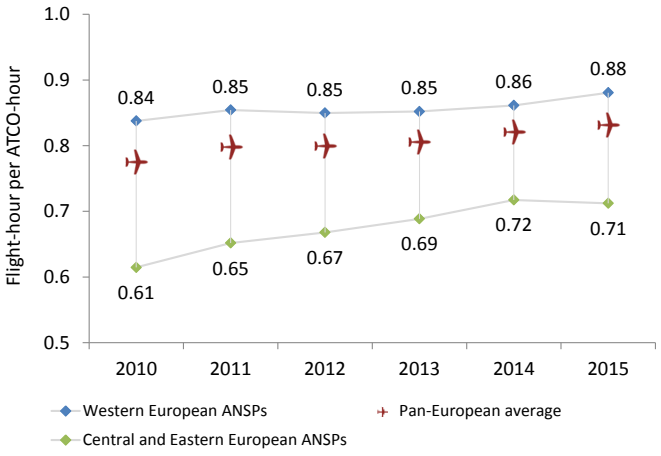


Figure 2.19: Convergence in ATCO-hour productivity levels, 2010-2015

On the other hand, the productivity increase for ANSPs operating in Western European States (see blue dots in Figure 2.19) is much lower (+1.0% p.a.). This mainly reflects the fact that, over the 2010-2015 period, traffic growth was much lower for these ANSPs (+0.4% p.a.) while they could achieve reductions in ATCO-hours on duty (-0.6% p.a.).

As a consequence, the substantial gap in ATCO-hour productivity observed between the two ANSP groups in 2010 (36%) significantly reduced over the years to reach 24% in 2015. This result is an indication of the convergence in ATCO-hour productivity that took place since 2010 in the ATM industry.

[19] Albcontrol, ANS CR, ARMATS, BULATSA, Croatia Control, DCAC Cyprus, DHMI, EANS, HungaroControl, LGS, LPS, MATS, M-NAV, MoldATSA, Oro Navigacija, PANSA, ROMATSA, Slovenia Control, SMATSA and UkSATSE.

At Pan-European system level, the increase in productivity achieved between 2014 and 2015 (+1.4%) is due to the fact that traffic rose faster (+1.7%) than ATCO-hours on duty (+0.3%). In order to understand the factors underlying the productivity increase at Pan-European system level, the change in each ANSP's productivity indicator has been broken down in Figure 2.20 below, into a traffic volume effect and an ATCO-hours effect. For presentation purposes, in Figure 2.20, ANSPs have been ranked by their level of productivity in 2015.

ANSPs		(A)	(B)	(C)	
	ATCO-hour productivity in 2014	Changes in ATCO-hour productivity 2014-2015	"Traffic effect"	"ATCO-hour effect"	ATCO-hour productivity in 2015
MUAC	1.96	0.4%	2.3%	1.9%	1.97
DFS	1.08	3.6%	0.8%	-2.7%	1.11
IAA	1.08	2.9%	4.4%	1.5%	1.11
NATS (Continental)	1.03	6.2%	1.8%	-4.1%	1.10
NAV Portugal (Continental)	1.00	2.4%	4.3%	1.8%	1.02
DHMI	1.04	-2.1%	6.4%	8.7%	1.02
NAVIAIR	0.99	0.8%	1.8%	1.0%	1.00
Skyguide	1.00	-2.1%	0.8%	2.9%	0.98
ANS CR	0.87	9.8%	4.7%	-4.7%	0.96
Avinor (Continental)	0.89	5.0%	-2.6%	-7.2%	0.93
HungaroControl	0.88	5.7%	8.3%	2.4%	0.93
Austro Control	0.90	2.5%	0.8%	-1.7%	0.92
EANS	0.89	1.3%	3.9%	2.5%	0.91
PANSA	0.90	-0.4%	-0.5%	-0.1%	0.89
LGS	0.72	21.1%	2.5%	-15.4%	0.88
DCAC Cyprus	0.94	-7.8%	4.1%	12.9%	0.87
MATS	0.72	15.1%	13.0%	-1.9%	0.83
BULATSA	0.75	8.6%	12.8%	3.8%	0.82
ENAIRE	0.79	0.1%	1.9%	1.8%	0.79
LVNL	0.76	2.7%	2.5%	-0.2%	0.78
LPS	0.81	-5.8%	1.6%	7.9%	0.77
DSNA	0.74	3.5%	1.4%	-2.0%	0.77
SMATSA	0.72	3.5%	7.7%	4.1%	0.74
HCAA	0.69	6.4%	4.2%	-2.0%	0.74
Croatia Control	0.68	6.9%	1.7%	-4.9%	0.73
ENAV	0.73	-1.8%	-0.1%	1.8%	0.72
Belgocontrol	0.67	3.2%	4.4%	1.2%	0.69
ROMATSA	0.67	3.6%	5.1%	1.4%	0.69
LFV	0.71	-3.2%	-0.6%	2.8%	0.69
Finavia	0.61	1.1%	-2.8%	-3.9%	0.62
Oro Navigacija	0.49	-0.4%	1.9%	2.3%	0.49
Slovenia Control	0.44	3.2%	1.7%	-1.4%	0.45
Albcontrol	0.62	-27.4%	4.5%	43.9%	0.45
M-NAV	0.33	10.6%	5.9%	-4.3%	0.36
UkSATSE	0.27	-37.7%	-36.1%	2.6%	0.17
MoldATSA	0.17	-12.2%	-9.1%	3.5%	0.15
ARMATS	0.17	-15.9%	-14.5%	1.7%	0.14
Total Pan-European System	0.82	1.4%	1.7%	0.3%	0.83

Positive values in column (A) mean that productivity improved between 2014 and 2015.

Positive values in column (B) mean that traffic volumes rose between 2014 and 2015.

Positive values in column (C) mean that the number of ATCO-hours rose between 2014 and 2015. All other things being equal, a positive value contributes to lower productivity (hence the red dot).

Productivity improves if traffic grows faster than the ATCO-hours on duty.

For example: DFS's 2015 productivity is +3.6% higher than in 2014 due to the combination of a modest increase in traffic (+0.8%) with a -2.7% decrease in the number of ATCO-hours.

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).

Figure 2.20: Annual changes in ATCO-hour productivity, composite flight-hours and ATCO-hours on duty, 2014-2015

For the sake of completeness, Figure 2.20 also shows the starting point in 2014. This allows for a better interpretation of the changes in ATCO-hour productivity observed in 2015.

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.

Changes in ATCOs in OPS hours on duty 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).

In 2015, the ATCO-hour productivity[20] of the Pan-European system as a whole amounted to 0.83 composite flight-hours per ATCO-hour. It is important to note that the metric of ATCO-hour productivity used in this report reflects the average productivity during a year for a given ANSP and does not give an indication of the productivity at peak times which can be substantially higher. The ATCO-hour productivity in 2015 for each ANSP is shown in Figure 2.21 below.

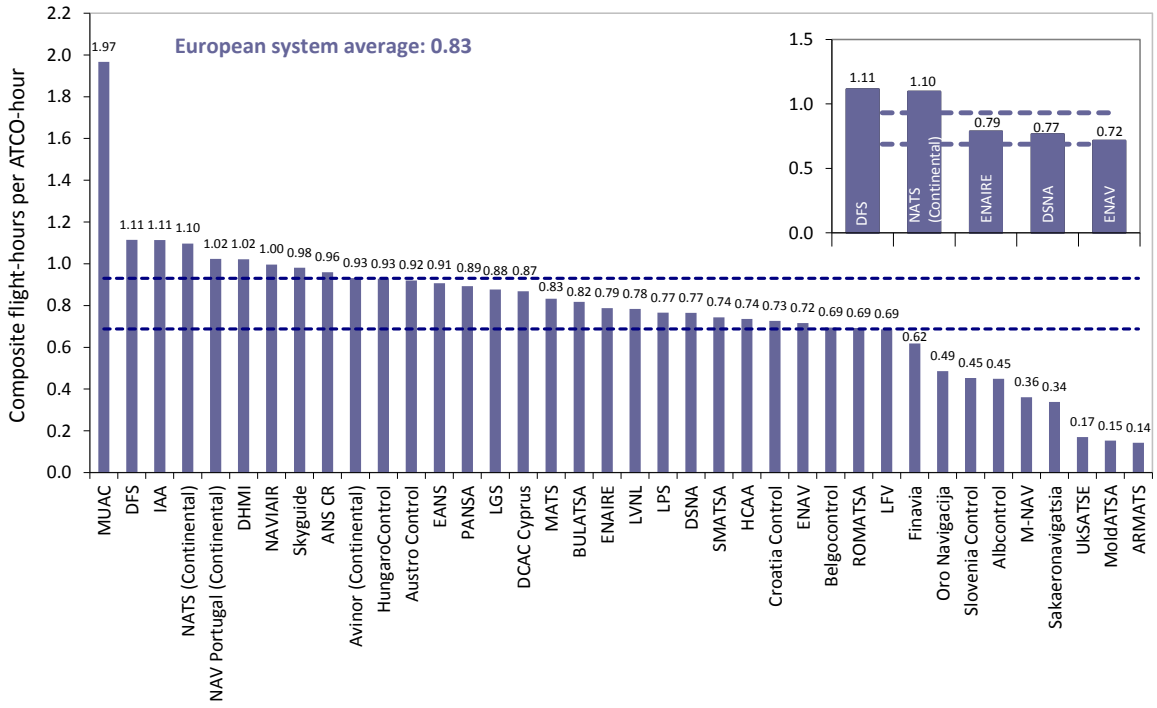


Figure 2.21: ATCO-hour productivity (gate-to-gate), 2015

There is a wide range of ATCO-hour productivity among ANSPs. The ANSP with the highest ATCO-hour productivity in 2015 is MUAC (1.97), which only provides ATC services in upper airspace, while the ANSP with the lowest ATCO-hour productivity is ARMATS (0.14), i.e. one of the smallest ANSPs in terms of traffic volumes.

Figure 2.21 also indicates that there are substantial differences in ATCO-hour productivity even among the five largest ANSPs. Indeed, DFS ATCO-hour productivity (1.11) is +55.6% higher than that of ENAV (0.72).

It is important to mention that significant gains in cost-effectiveness could be achieved if the European average productivity (0.83) was raised to the level of the top quartile in Figure 2.21 (0.93). Most of the ANSPs that achieve or are close to top quartile ATCO-hour productivity (Austro Control, ANS CR, DFS, DHMI, MUAC, NATS and Skyguide) are among the ANSPs with the most complex traffic. On the other hand, ARMATS, MoldATSA and UkSATSE, which belong to the ANSPs with the least complex traffic (see Figure 2.3) show an ATCO-hour productivity which is lower than

[20] It should be noted that the ACE benchmarking analysis focuses on IFR traffic and that it does not reflect the activity associated with the provision of ANS to VFR flights.

the bottom quartile. Low productivity in some of these ANSPs may be a consequence of their small size, and the difficulty in adapting their available ATC capacity and existing infrastructure to low traffic volumes and high seasonal variability. In the case of ARMATS, MoldATSA and UkSATSE, the sharp traffic decreases experienced in 2015 (-14.5%, -9.1% and -36.1%, respectively) had a massive adverse impact on ATCO productivity.

Improvements in ATCO-hour productivity can result from more effective OPS room management and by making a better use of existing resources, for example through the adaptation of rosters (preferably individually-based to enhance flexibility) and shift times, effective management of overtime, and through the adaptation of sector opening times to traffic demand patterns. Similarly, advanced ATM system functionalities and procedures are drivers for productivity improvements. It is also expected that SES tools such as FABs, the Network Manager, the Performance Scheme and the technological pillar (SESAR) contribute to increase ATCO productivity by a significant factor while ensuring safety standards.

More details on the changes in ATCO-hour productivity for individual ANSPs are provided in Part II of this Report.

ATCO-hour productivity measured at ANSP level reflects an average performance, which can hide large differences among ACCs even for those operating in the same country/ANSP. It is therefore important to also analyse and compare productivity at ACC level.

In Figure 2.22, the 63 ACCs for which ACE 2015 data were reported are grouped in clusters based on three operational characteristics: (1) their complexity scores, (2) the average used flight levels, and (3) their number of sectors. More information on the definition of these clusters can be found in previous ACE reports[21].

Compared to the ACE 2014 Benchmarking Report, Tbilisi ACC (operated by Sakaeronavigatsia, the Georgian ANSP) has been included in the analysis.

So far, no clear-cut statistical relationship between ATCO productivity, traffic complexity and traffic variability could be inferred because the relationships and potential trade-offs between all these metrics are not straightforward. Nevertheless, it is useful to compare the ATCO productivity of ACCs that share similar "operational" characteristics. Each cluster is briefly described below:

- **Cluster 1 (ACCs serving predominantly lower airspace with relatively high structural complexity)** has the second lowest average productivity of the four clusters (0.82 flight-hour per ATCO-hour). Palma, with the lowest productivity, has one of the highest seasonal traffic variability in Cluster 1.
- **Cluster 2 (ACCs serving dense upper airspace)** has an average productivity of 1.22 flight-hour per ATCO-hour. Within this cluster, Maastricht has significantly higher productivity (1.97 flight-hours per ATCO-hour, some +61% above the average in Cluster 2). When excluding Maastricht and Karlsruhe ACCs which exclusively provide ATC services in upper airspace, the average cluster productivity falls to 1.02.

[21] See for example the ACE 2008 Benchmarking Report on p.104. Report available on the PRC website: (http://www.eurocontrol.int/articles/prc-and-prb-publications).

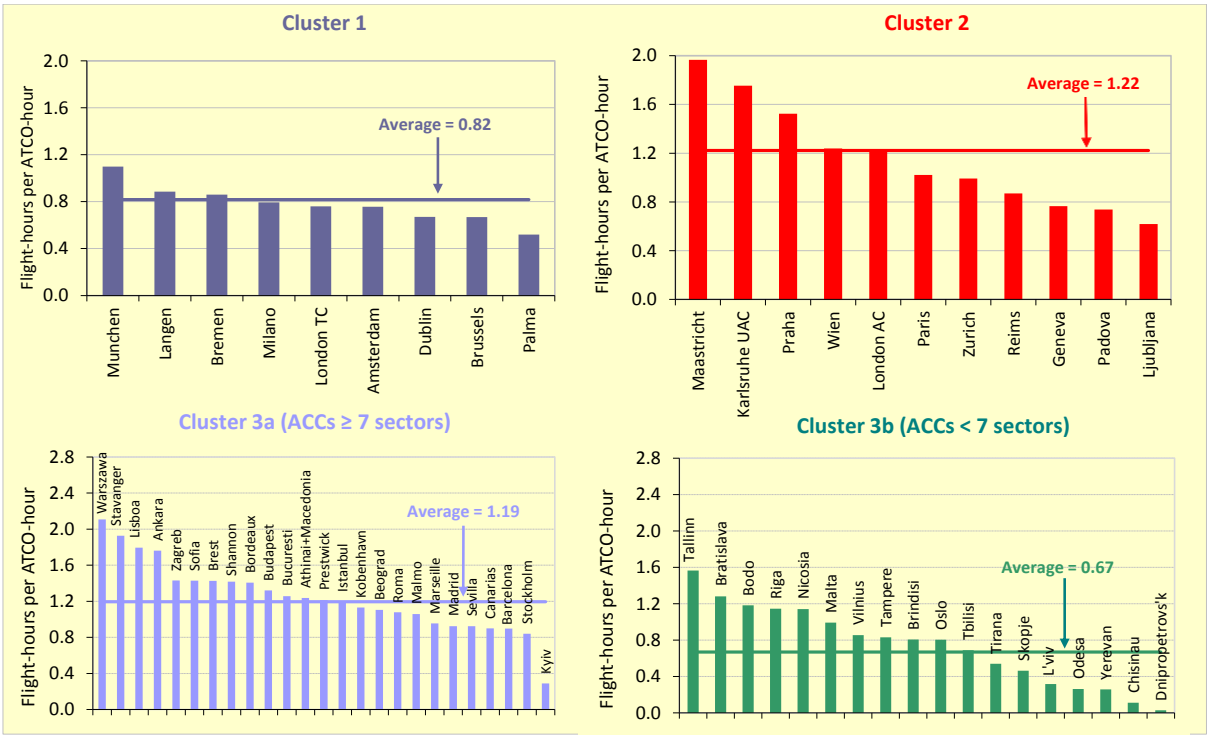


Figure 2.22: Summary of productivity results at ACC level, 2015

- **Cluster 3a (ACCs with 7 sectors or more and serving airspace with relatively lower complexity)** has an average productivity of 1.19 flight-hour per ATCO-hour. Within this cluster, Warszawa has the highest productivity (2.11 flight-hours per ATCO-hour). It should also be noted that within this cluster Brest and Bordeaux have the highest overall complexity, while Kyiv and Shannon have the lowest.
- **Cluster 3b (ACCs with less than 7 sectors serving airspace with relatively lower complexity)** has an average productivity of 0.67 flight-hour per ATCO-hour. It is important to note that Dnipropetrovs'k and Chisinau ACCs, which have the lowest ATCO-hour productivity, experienced decreases in flight-hours of -86.3% and -26.1%, respectively due to changes in traffic flows following the closure of a part of airspace over Ukraine. Excluding Dnipropetrovs'k ACC which is clearly in an exceptional situation in 2015, the average productivity of Cluster 3b would be 0.75.

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.

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. 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.

2.7 ATCO employment costs

At Pan-European system level, ATCO employment costs per ATCO-hour continuously rose between 2010 and 2015 (an average of +1.6% p.a.). As a result, in 2015 ATCO employment costs per ATCO-hour are +8.2% higher than in 2010.

The increase in ATCO employment costs per ATCO-hour between 2014 and 2015 (+1.8%) reflects the fact that ATCO employment costs rose faster (+2.1%) than ATCO-hours on duty (+0.3%).

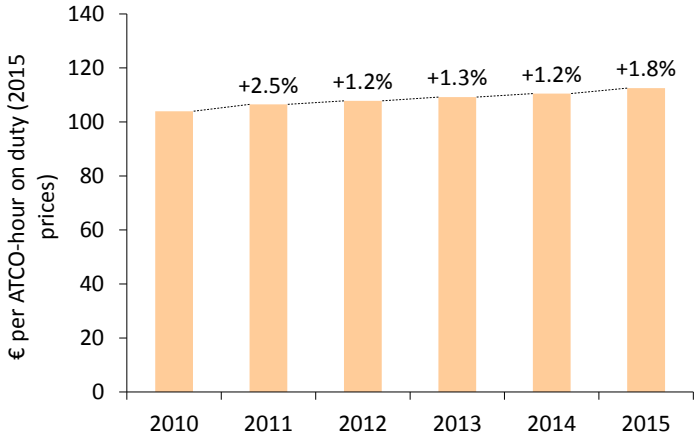


Figure 2.23: Changes in ATCO employment costs per ATCO-hour, 2010-2015 (real terms)

In 2015, ATCO employment costs per ATCO-hour rose for 24 out of the 37 ANSPs. Increases larger than +15% were observed for three ANSPs: LFV (+22.5% from €86 to €105), LGS (+18.1% from €35 to €41) and MATS (+26.1% from €30 to €38). For MATS, the main driver for this substantial increase is the implementation of a new collective agreement in 2016.

Among the five largest ANSPs, the most noticeable increases in ATCO employment costs per ATCO-hour in 2015 were observed for DFS (+14.7%, from €197 to €227) and NATS (+8.8%, from €148 to €161). For DFS, this increase mainly reflects higher employer contributions to pensions following a decrease in the discount rate in 2015.

A smaller increase was observed for ENAV (+2.0%, from €112 to €115), while DSNA employment costs per ATCO-hour remained almost stable (+0.4% from €99 to €100) and those of ENAIRE fell by -3.1% (from €172 to €166). As a consequence of these changes, the gap between DFS and DSNA in terms of employment costs per ATCO-hour further increased in 2015, reaching a factor of 2.3 (compared to 2.0 in 2014).

On the other hand, decreases in ATCO employment costs per ATCO-hour are observed for 13 ANSPs. In particular, reductions larger than -20% are observed for MoldATSA (-58.4% from €25 to €11), UkSATSE (-44.6%, from €22 to €12), DCAC Cyprus (-23.7%, from €66 to €50), and Avinor (-22.2% from €120 to €94).

The unit ATCO employment costs at Pan-European system level amounted to €112 per ATCO-hour in 2015. Figure 2.24 shows the values for this indicator for all the ANSPs. 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.

In 2015, DFS ATCO employment costs per ATCO-hour (€227) are the highest in Europe, above MUAC (€211) and Skyguide (€176).

A major exogenous factor that underlies differences in unit employment costs 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. To assess the influence of these exogenous differences, employment costs per ATCO-hour have also been examined in the context of Purchasing Power Parity (PPP). The PPPs for 2015, which are available from the EUROSTAT and IMF databases, are reported for each State/ANSP in Annex 7 of this report.

There are some limitations[22] inherent to the use of PPPs and for this reason the ACE data analysis does not put a significant weight on results obtained with PPPs adjustments. PPPs are nevertheless a useful analytical tool in the context of international benchmarking.

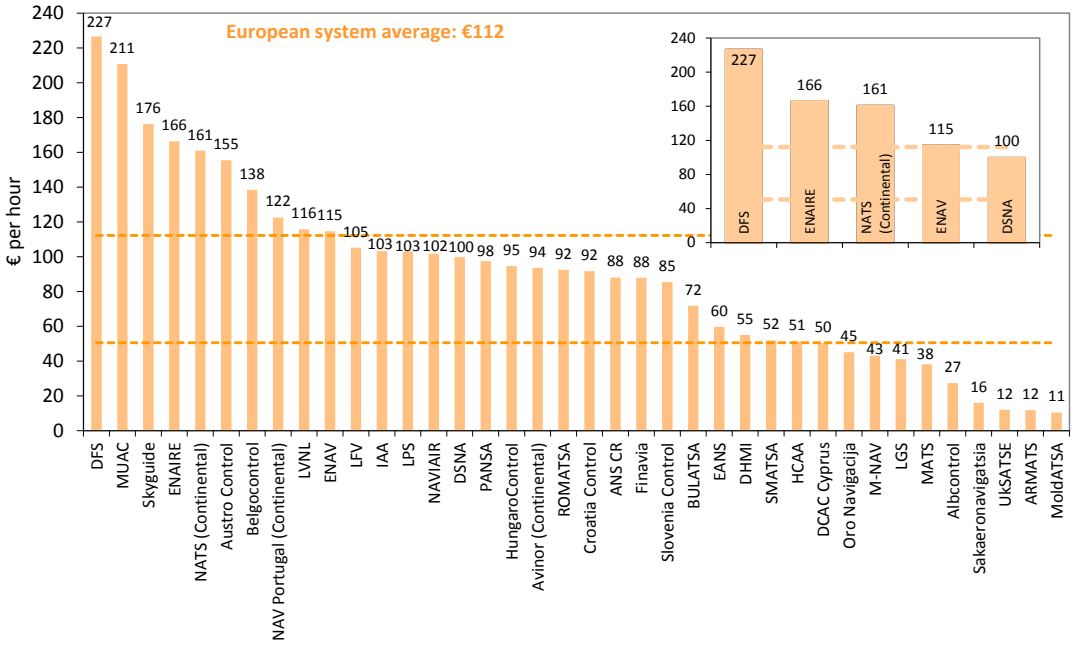


Figure 2.24: ATCO employment costs per ATCO-hour (gate-to-gate), 2015

Figure 2.25 below shows the ATCO employment costs per ATCO-hour both **before** and **after** adjustment for PPP. The adjustment reduces the dispersion of this indicator.

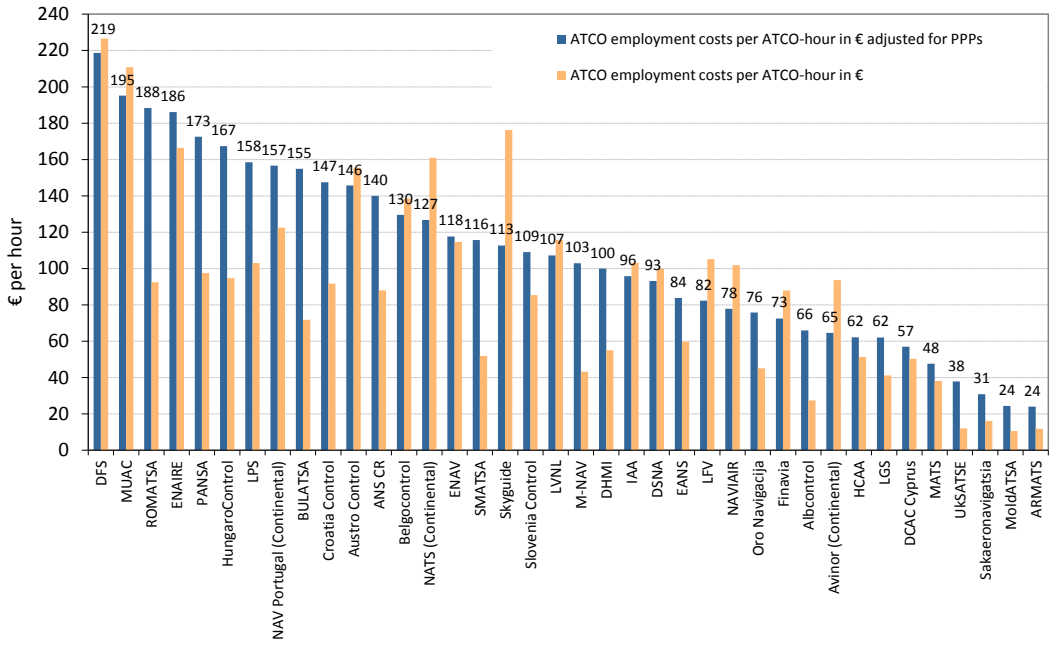


Figure 2.25: Employment costs per ATCO-hour with and without PPPs, 2015

[22] For instance, it is possible that, for a given country, the cost of living in regions where the ANSP headquarter and other main buildings (e.g. ACCs) are located is higher than the average value computed at national level.

After PPP adjustment, the average unit employment costs per ATCO-hour amounts to €121 (compared to €112 without adjustment). For many Central and Eastern European ANSPs (e.g. ANS CR, BULATSA, Croatia Control, HungaroControl, LPS, PANSA and ROMATSA) the PPP adjustment brings the unit employment costs close or higher than those operating in Western Europe.

Figure 2.26 shows the changes in ATCO employment costs per ATCO-hour for ANSPs operating in Central, Eastern and Western European countries[23].

Significant increases in ATCO employment costs per ATCO-hour are observed for ANSPs operating in Central and Eastern European countries and which started from a relatively low base in 2010.

This illustrates the gradual convergence of employment costs in Central and Eastern European economies following the strengthening of the economic integration and enhanced labour mobility.

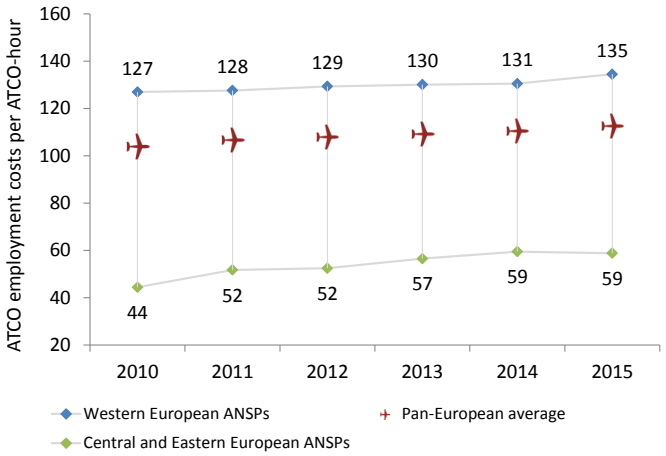


Figure 2.26: Convergence in ATCO employment costs for ANSPs operating in Eastern and Western European countries, 2010-2015 (real terms)

Figure 2.27 below shows the ATCO employment costs per composite flight-hour in 2015.

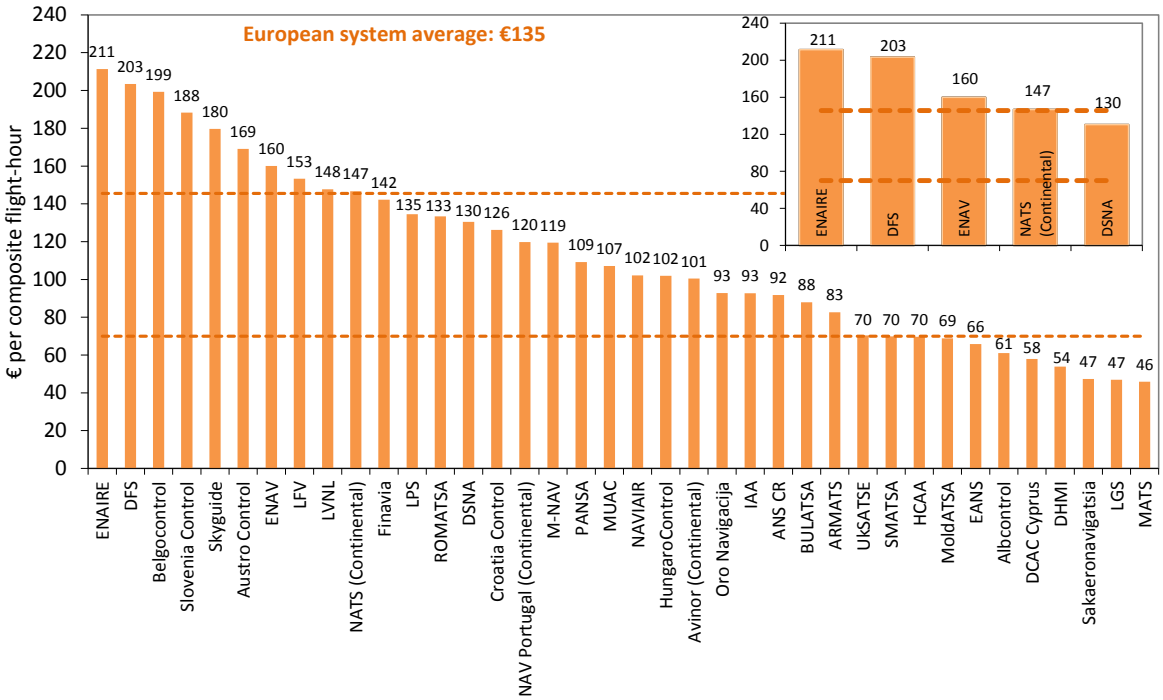


Figure 2.27: ATCO employment costs per composite flight-hour, 2015

[23] See footnote 19 for the list of ANSPs.

The ATCO employment costs per composite flight-hour result from the combination of two of the main components of the financial cost-effectiveness indicator: ATCO-hour productivity (see Figure 2.21) and employment costs per ATCO-hour (see Figure 2.24). All other things being equal, lower ATCO employment costs per unit of output will contribute to greater financial cost-effectiveness.

In order to provide an insight into the relationship between ATCO-hour productivity and employment costs, Figure 2.28 below presents the ANSPs classified in four quadrants according to their level of ATCO productivity and employment costs per ATCO-hour. The quadrants are established on the basis of the European average values for these two metrics.

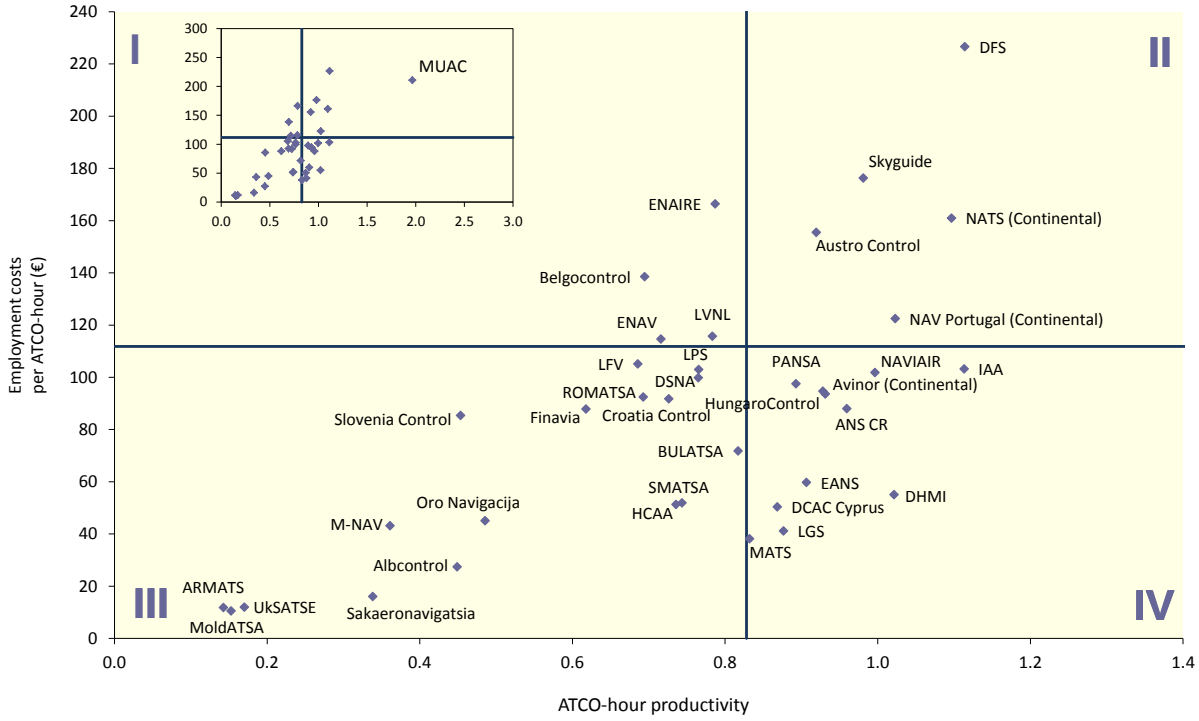


Figure 2.28: Components of ATCO employment costs per unit of output, 2015

An ANSP may have high ATCO employment costs per ATCO-hour but if its ATCOs are highly productive then it will have relatively lower employment costs per composite flight-hour. This is typically the case of MUAC (Quadrant II in Figure 2.28) which shows ATCO employment costs per ATCO-hour above the European average but ATCO employment costs per composite flight-hour below the European average (see also Figure 2.27 above).

ENAIRE and Belgocontrol (Quadrant I) combine higher ATCO employment costs with relatively lower ATCO productivity, resulting in higher ATCO employment costs per composite flight-hour (see also Figure 2.27 above).

Some ANSPs such as DHMI (Quadrant IV) have relatively higher ATCO-hour productivity and lower ATCO employment costs per ATCO-hour (without PPP adjustment).

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

Employment costs are typically subject to complex bargaining agreements between ANSPs 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 some cases salary conditions are negotiated every year. High ATCO employment costs may be compensated for by high productivity (e.g. MUAC). 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.

More details on the changes in ATCO-hour employment costs for individual ANSPs are provided in Part II of this Report.

2.8 Support costs

In 2015, at Pan-European level, unit support costs fell by -1.9% since traffic rose by +1.7% while support costs remained close to their 2014 levels (-0.3%).

As indicated in Figure 2.29, support costs per composite flight-hours fell by -8.1% between 2010 and 2015 at Pan-European system level (or -1.7% p.a.). This results from the combination of an increase in the number of composite flight-hours (+1.2% p.a.) and a slight decrease in support costs (-0.5% p.a.).

In 2015, unit support costs decreased for the third consecutive year (-1.9% after -2.5% in 2014 and -2.7% in 2013).

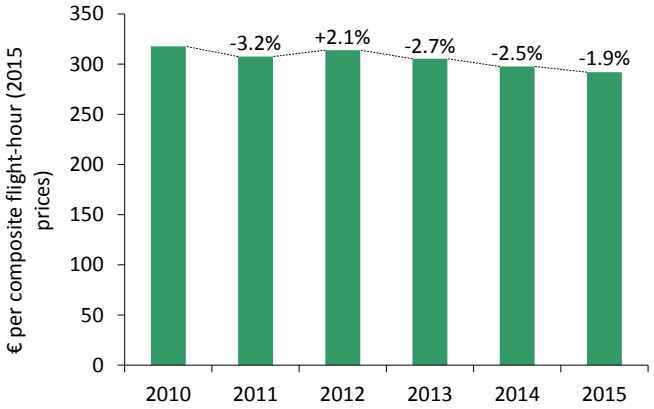


Figure 2.29: Changes in support costs per composite flight-hour, 2010-2015 (real terms)

The main drivers of the changes in support costs are further discussed in Figure 2.31 below.

Contrary to ATCO employment costs, support costs encompass a variety of cost items which require specific analysis. There is a general acknowledgement that the Pan-European system has excessive support costs due to its high level of operational, organisational, technical and regulatory fragmentation.

As shown in Figure 2.30 below, support costs can be broken down into four separate components that provide further insight into the nature of support costs:

a) **Employment costs for non-ATCO in OPS staff** (48.7% of total support costs); these cover ATCOs on other duties, trainees, technical support and administrative staff. These costs can be affected by the following factors:
- Outsourcing of non-core activities (such as maintenance of technical equipment, and professional training) could transfer costs from this category to non-staff costs.
- Research & development policies may involve ATM systems either being developed in-house, or purchased off-the-shelf. 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 in OPS.

b) **Non-staff operating costs** (24.3% of total support costs) mostly comprise expenses for energy, communications, contracted services, rentals, insurance, and taxes. These costs can be affected by the following factors:
- The terms and conditions 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).

c) **Capital-related costs** (26.5% of total support costs), comprising depreciation and financing costs for the capital employed. These costs can be affected by the following factors:
   - The magnitude of the investment programme.
   - The accounting life of the assets.
   - The degree to which assets are owned or rented.

d) **Exceptional costs** which represent some 0.6% of total support costs.

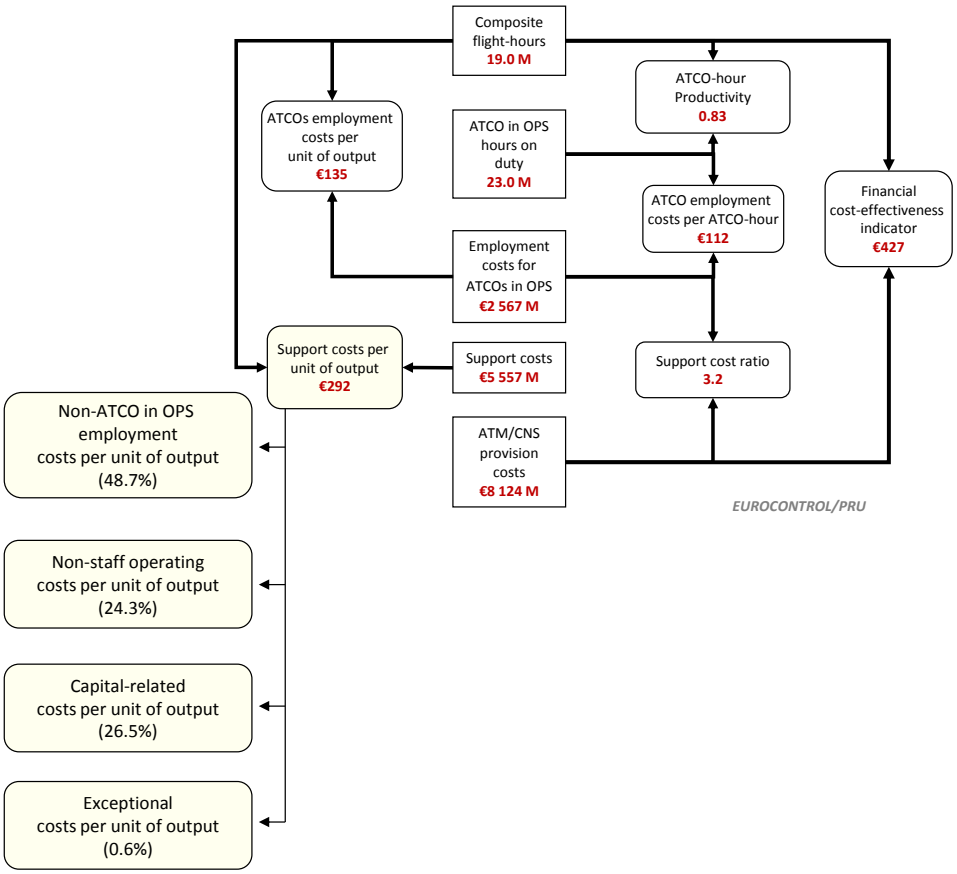


Figure 2.30: Framework for support costs analysis, 2015

Figure 2.31 shows the changes in the different components of support costs (see the "support costs effect" bar on the right-hand side of Figure 2.17) between 2014 and 2015.

Overall, support costs slightly reduced in 2015 (-0.3% or -€17.2M). Figure 2.31 indicates that higher support staff costs (+1.1% or +€29.8M) were more than compensated by substantially lower exceptional costs (-62.9% or -€49.9M). In the meantime, non-staff operating costs (+0.3% or +€4.5M), depreciation costs (+0.2% or +€1.8M) and the cost of capital (-0.6% or -€3.3M) remained relatively close to their 2014 levels.

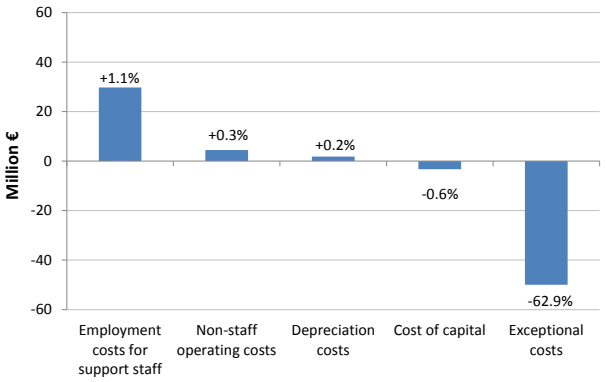


Figure 2.31: Changes in the components of support costs, 2014-2015 (real terms)

The significant reduction in exceptional costs mainly reflects the fact that an exceptional negative amount was reported by DFS in 2015 (-€1.3M) while a figure of €47.0M was recorded in 2014. DFS exceptional costs in 2015 include two elements which almost compensate each other: a) IFRS transition costs (€51.5M), and (b) a negative amount (-€50.0M) reflecting a contribution of the German State in DFS equity for the year 2015.

Support costs rose for a majority of ANSPs (22 ANSPs out of 37) with particularly large increases observed for DSNA (+4.4% or +€38.1M, mainly reflecting higher support staff costs), NATS (+4.9% or €30.0M, mainly due to higher depreciation costs and non-staff operating costs), Avinor (+28.3% or +€29.9M, mainly due to higher support staff costs) and DHMI (+9.4% or +€29.4M, mainly reflecting higher non-staff operating costs).

On the other hand, substantial decreases in support costs are observed for UkSATSE (-39.1% or -€50.1M), ENAV (-5.1% or -€25.7M) and LFV (-14.0% or -€16.2M).

In the case of UkSATSE, the main drivers for the observed decreases are a reduction in the number of support staff (-16.5%) as well as very large decreases in non-staff operating costs (-49.9%), depreciation costs (-38.2%) and in the cost of capital (-38.5%). These reductions reflect the measures implemented by UkSATSE to adapt to the sharp decreases in traffic experienced in 2014 (-36.8%) and 2015 (-36.1%). It is important to note that the large variations in costs expressed in real terms are affected by a high level of inflation in 2015 (+48.7%). When expressed in nominal terms, UkSATSE support costs are -9.4% lower than in 2014.

The reduction in ENAV support cost between 2014 and 2015 mainly reflects a significant decrease in support staff costs (-10.2%) which was partly driven by changes in national labour legislation. ENAV also recorded substantially lower non-staff operating costs (-7.5%) and depreciation costs (-4.3%) compared to 2014.

For LFV, the main drivers of the decrease in support costs are significant reductions in support staff costs (-18.5%) and non-staff operating costs (-19.0%). It should be noted that the significant decrease in LFV non-staff operating costs is mainly due to a change in data reporting.

As shown in Figure 2.30 above, employment costs is the largest component of support costs. These costs can be significantly affected by the type of pension arrangements, and particularly whether the pension scheme is based on “defined benefits” or “defined contributions”. Some ANSPs have already taken decisive actions to mitigate the risk associated with “defined benefits” pension schemes, notably changing the pension scheme for new recruits to “defined contributions” pension plans.

Figure 2.32 breaks down ANSPs staff costs (€5 274M) into different categories. Gross wages and salaries are the main component of total staff costs (74.6%). The second largest category, employer contributions to staff pensions, accounts for 16.5% (some €869M).

It should be noted that the proportion of pension contributions in total staff costs can significantly differ across the Pan-European ANSPs. These differences mainly reflect the variety of pension arrangements that are in place locally.

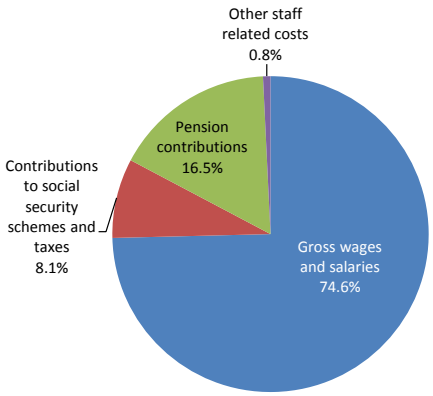


Figure 2.32: Breakdown of ANSPs staff costs, 2015

These issues require the utmost attention given the long term consequences of pensions-related decisions, their magnitude in the cost bases and their impact on unit costs.

Support costs represent some 69% of ATM/CNS provision costs and are therefore an important driver of cost-effectiveness performance. In the future, improvements in cost-effectiveness could arise from greater competition for support services which could be available on a central basis, physically distant from the ANSPs HQs and ATC facilities and supported by innovation in IT technology.

At Pan-European system level, support costs per composite flight-hour amounted to €292 in 2015. Figure 2.33 shows that the level of unit support costs varies significantly across ANSPs – a factor greater than four between Skyguide (€546) and MUAC (€118).

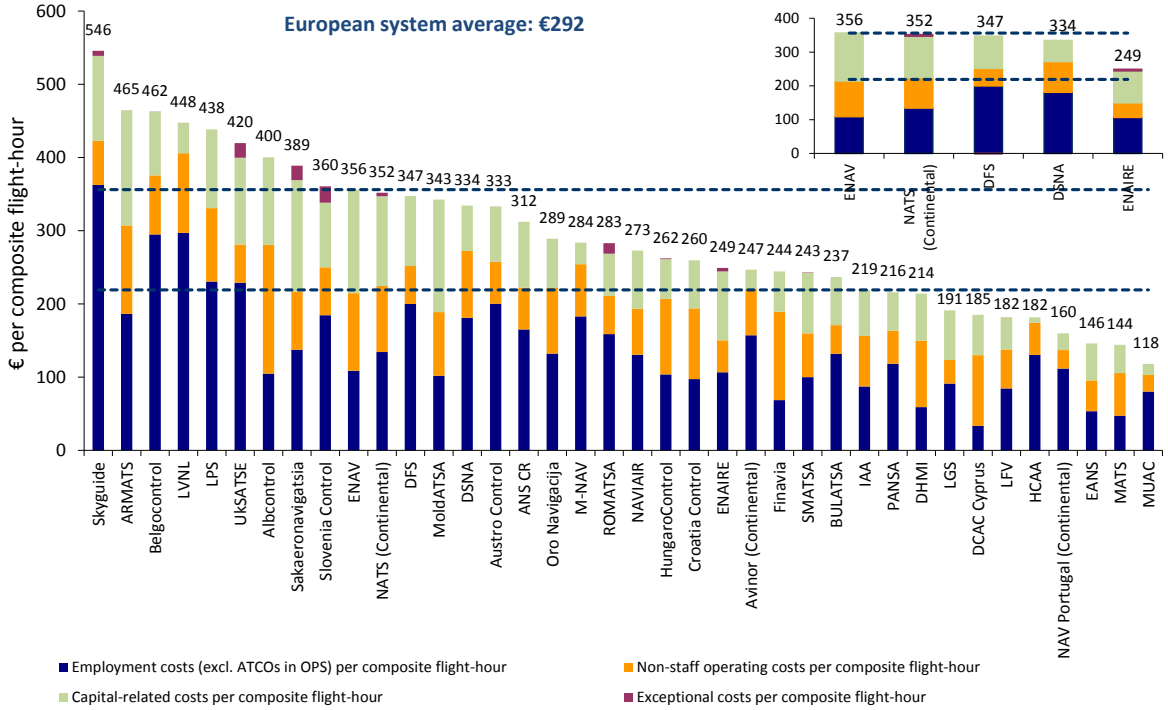


Figure 2.33: Support costs per composite flight-hour at ANSP level, 2015

As for the cost-effectiveness indicator, for ANSPs operating outside the Euro zone, substantial changes of the national currency against the Euro may significantly affect the level of unit support costs. A detailed analysis of the impact of the changes in exchange rates on the level of ANSPs 2015 unit costs is available in Annex 7.

Figure 2.33 indicates that there are significant differences in the composition of support costs amongst the 38 ANSPs[24], and in particular in the proportion of employment costs (blue bar) and non-staff operating costs (orange bar). The choice between providing some important operational support functions internally or externally has clearly an impact on the proportion of support costs that is classified as employment costs, non-staff operating costs, or capital-related costs. In some cases, the maintenance of ATM systems is outsourced and the corresponding costs are reported as non-staff operating costs. For other ANSPs, these activities are rather carried out by internal staff and the related costs appear as employment costs or as capital-related costs when, according to IFRS, the employment costs of staff working on R&D projects can be capitalised in the balance-sheet.

[24] It should be noted that the cost of capital reported by ANS CR in its ACE 2015 data submissions is higher than the costs charged to airspace users. Indeed, ANS CR did not charge any cost of capital to terminal ANS users.

Figure 2.33 also indicates that in 2015 the unit support costs of various ANSPs operating in Central and Eastern European countries (e.g. Albcontrol, ANS CR, ARMATS, LPS, MoldATSA, Sakaeronavigatsia, Slovenia Control and UkSATSE) are higher than the Pan-European system average and in the same order of magnitude as the unit support costs of ANSPs operating in Western European countries where the cost of living is much higher.

Like ATCO in OPS employment costs, employment costs for the support staff are also affected by the cost of living. Using the same methodology as in Figure 2.25, Figure 2.34 shows the impact of adjusting the non-ATCO in OPS employment costs per composite flight-hour for PPPs.

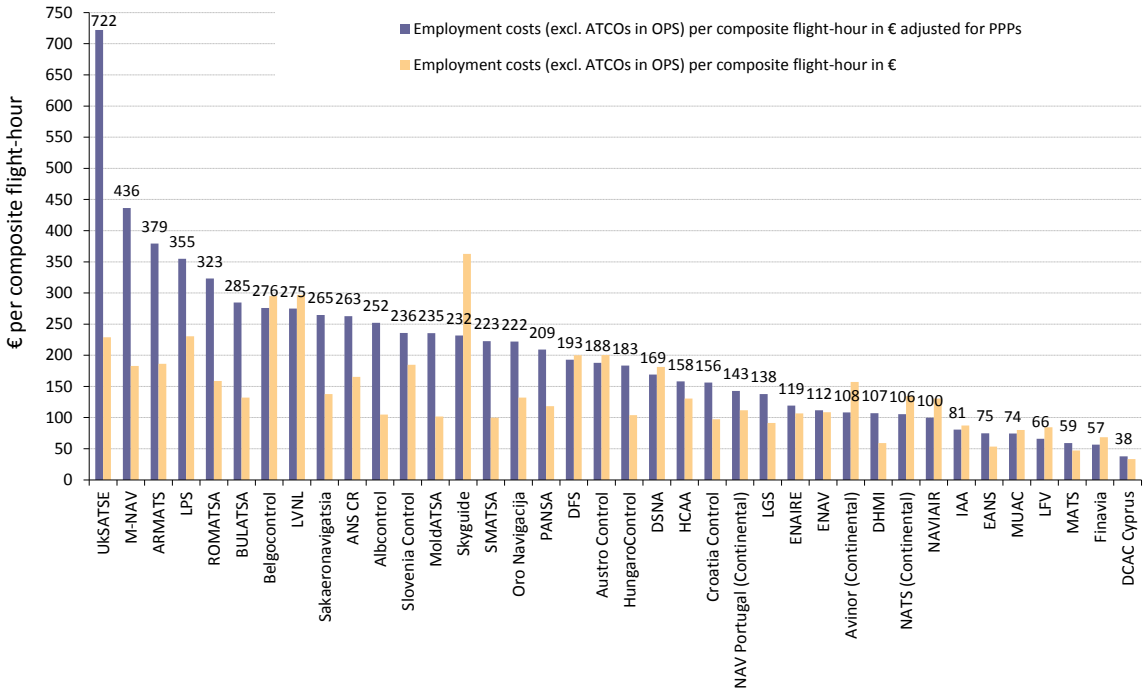


Figure 2.34: Employment costs (excl. ATCOs in OPS) with and without adjustment for PPPs, 2015

After PPP adjustment, the unit employment costs for support staff per composite flight-hour amounts to €158 (compared to €142 without adjustment).

Figure 2.34 indicates that after PPP adjustment, the unit employment costs of many Central and Eastern European ANSPs are generally higher than those operating in Western Europe. As both the cost of living and general wage levels are converging across Europe, there is an 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 in OPS employment costs.

More details on the level and changes in support costs for individual ANSPs are provided in Part II of this Report.

2.9 Forward-looking cost-effectiveness (2016-2019)

At Pan-European System level, the gate-to-gate unit ATM/CNS provision costs are planned to fall by -1.4% p.a. between 2015 and 2019. This mainly reflects the fact that over this period traffic is expected to rise faster (+3.2% p.a.) than ATM/CNS provision costs (+1.7% p.a.).

Although, according to the SEID V3.0, ANSPs are expected to report forward-looking information for the next five years (i.e. until 2020 in the ACE 2015 data submissions) seven (Austro Control, DFS, DSNA, EANS, ENAIRE, ENAV and HungaroControl) were not in a position to provide traffic and costs data for the year 2020. The analysis provided in this section is therefore limited to the 2016-2019 period. It focuses on the planned gate-to-gate unit ATM/CNS provision costs and the planned capex.

It is important to note that NATS is excluded from this analysis since forward-looking data (based on regulatory accounting rules) and historical data (based on IFRS) are not directly comparable. As a result, Figure 2.35 and Figure 2.36 below are based on a sample of 37 ANSPs.

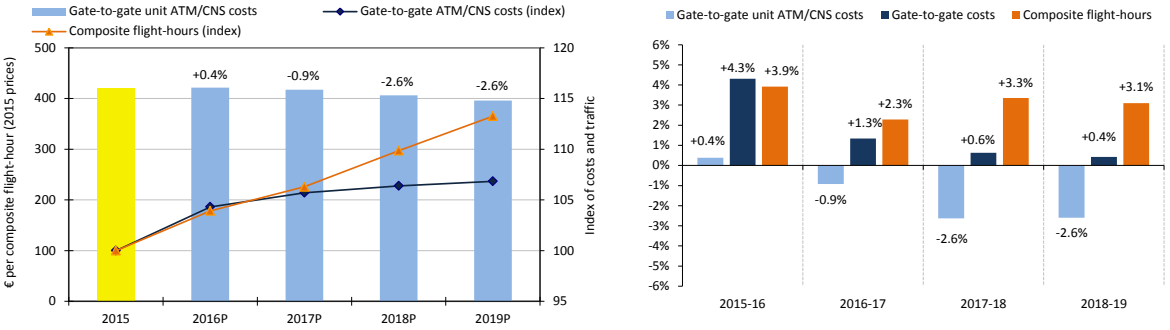


Figure 2.35: Forward-looking cost-effectiveness (2015-2019, real terms)

Figure 2.35 above shows that the gate-to-gate unit ATM/CNS provision costs are planned to fall by -1.4% p.a. between 2015 and 2019. This mainly reflects the fact that over this period traffic is expected to rise faster (+3.2% p.a.) than ATM/CNS provision costs (+1.7% p.a.).

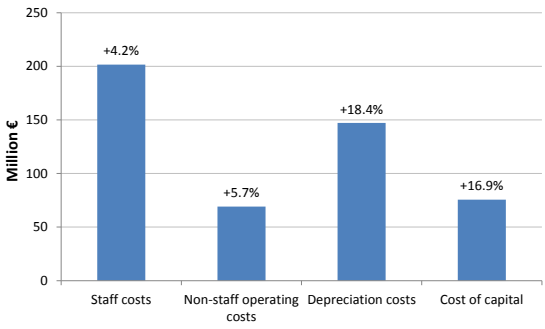


Figure 2.36: Planned changes in ATM/CNS provision costs by cost category (2015-2019)

Figure 2.36 indicates that at Pan-European level all costs categories are planned to rise between 2015 and 2019.

Although staff costs are the main contributor to the planned increase in absolute terms (+€202M or +4.2%), it is noteworthy that depreciation costs (+€147M or +18.4%) and the cost capital (+€76M or +16.9%) show the largest increases in relative terms.

The situation observed at Pan-European system level masks contrasted situations among ANSPs. Figure 2.37 below shows ANSPs planned changes in unit ATM/CNS provision costs (light blue bars) over the 2015-2019 period and identifies the costs (dark blue line) and traffic (orange line) effects.

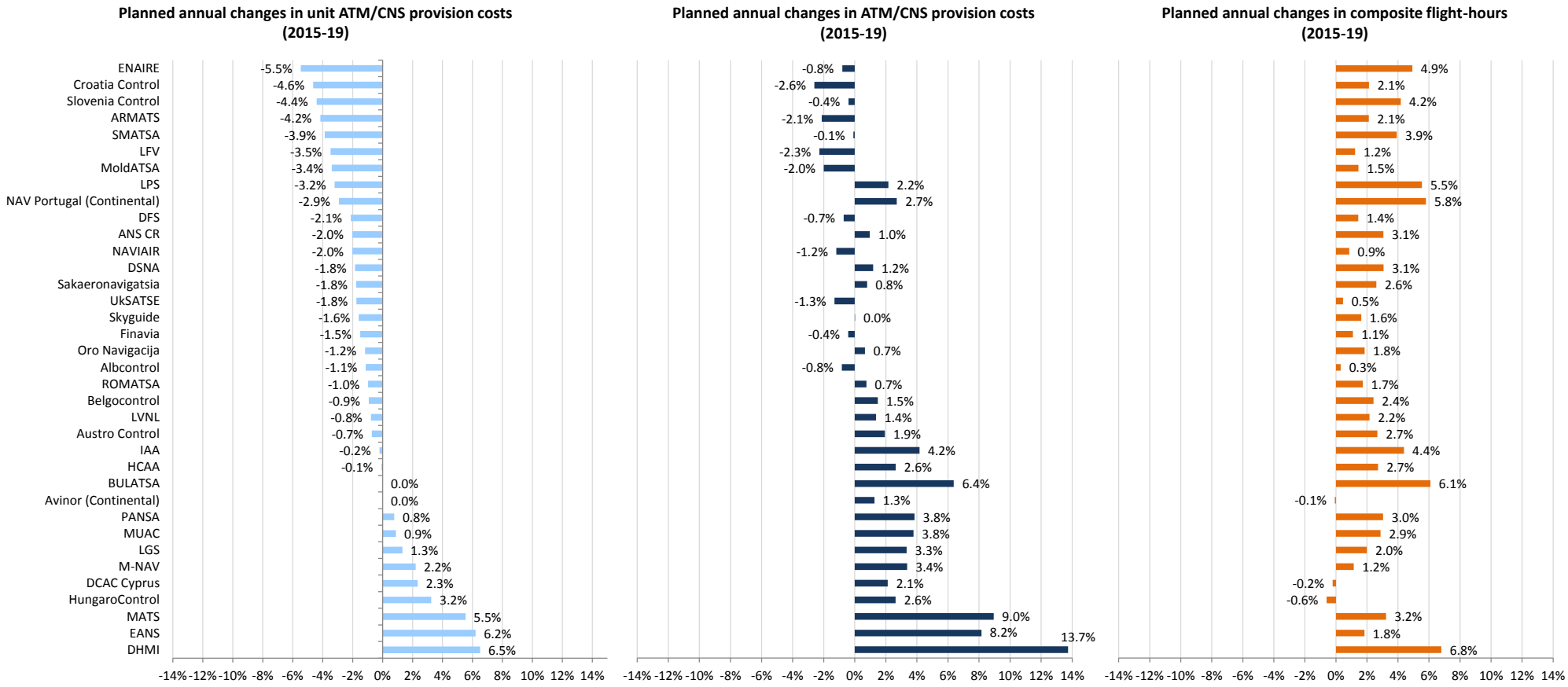


Figure 2.37: Planned annual changes in unit costs over the 2015-2019 period[25] (real terms)

[25] ENAIRE planned ATM/CNS provision costs comprise costs relating to ATM/CNS infrastructure shared with the military authority, which are charged to civil airspace users. It should be noted that these costs, which are borne by the Spanish Air Force (Ministry of Defence), as well as the corresponding revenues, are not passing through ENAIRE Accounts from 2014 onwards.

Figure 2.37 indicates that 26 ANSPs are planning for decreases in unit ATM/CNS provision costs over the 2015-2019 period. This is particularly the case for ENAIRE (-5.5% p.a.), Croatia Control (-4.6% p.a.), Slovenia Control (-4.4% p.a.) and ARMATS (-4.2% p.a.) who plan for annual decreases in unit costs greater than -4.0%.

- In the case of ENAIRE, this is mainly driven by a forecast traffic increase of +4.9% p.a. combined to a planned decrease in ATM/CNS provision costs (-0.8% p.a.).
- For Croatia Control, ATM/CNS provision costs are expected to fall by -2.6% p.a. (mainly due to planned reductions in staff costs and non-staff operating costs) in a context traffic increase (+2.1% p.a.).
- For Slovenia Control, the performance improvement planned over the 2015-2019 period is due to the fact that ATM/CNS provision costs are expected to slightly reduce (-0.4% p.a.) in a context of substantial traffic growth (+4.2% p.a.).
- In the case of ARMATS, ATM/CNS provision costs are expected to fall by -2.1% p.a. mainly due to planned reductions in non-staff operating costs, while traffic is expected to rise by +2.1% per year.

On the other hand, Figure 2.37 shows that between 2015 and 2019 unit ATM/CNS provision costs are expected to rise by more than +5.0% p.a. for three ANSPs: DHMI (+6.5% p.a.), EANS (+6.2% p.a.), and MATS (+5.5% p.a.).

- For DHMI, ATM/CNS provision costs are expected to increase faster (+13.7% p.a.) than traffic volumes (+6.8% p.a.). Detailed analysis indicates that large increases are planned for all cost categories over the 2015-2019 period. If this forecast materialises then, all else equal, DHMI ATM/CNS provision costs might be in the same order of magnitude as that of the five largest ANSPs in 2019.
- In the case of EANS, ATM/CNS provision costs are expected to rise substantially (+8.2% p.a.) due to higher staff costs, non-staff operating costs and depreciation costs planned for the 2015-2019 period. In the meantime, traffic volumes are planned to rose by +1.8% per year on average.
- Similarly, MATS ATM/CNS provision costs are expected to increase faster (+9.0% p.a.) than traffic volumes (+3.2% p.a.). The planned increase in costs mainly reflects substantially higher staff costs, non-staff operating costs and depreciation costs.

Finally, it should be noted that although ENAV data is included in the calculation of planned changes at Pan-European system level, no information is shown for this ANSPs in Figure 2.37. In July 2016, ENAV became listed on the Italian Stock Exchange (with 46.6% free float shares and 53.4% State ownership). Being now a listed company, ENAV is subject to specific laws (in particular the Italian Financial Act (Legislative Decree 58/1998)) and is also supervised by the public authority responsible for regulating the Italian financial markets (CONSOB) which oversees and monitors the compliance of all listed companies' behaviour with the financial regulations. As a result of this particular situation, ENAV is not in a position to publicly disclose forward-looking information that could have an effect on the trading levels and prices.

Figure 2.38 below shows the total actual capex and depreciation costs at Pan-European system level between 2010 and 2015 (including the 37 ANSPs contributing to the ACE report) as well as the planned capex and depreciation costs between 2016 and 2019 for the 36 ANSPs that reported planned capex and planned depreciation costs in their ACE 2015 data submission[26]. The cumulative capex planned for the period 2016-2019 amounts to some €4 664M or an average of €1 166M per year.

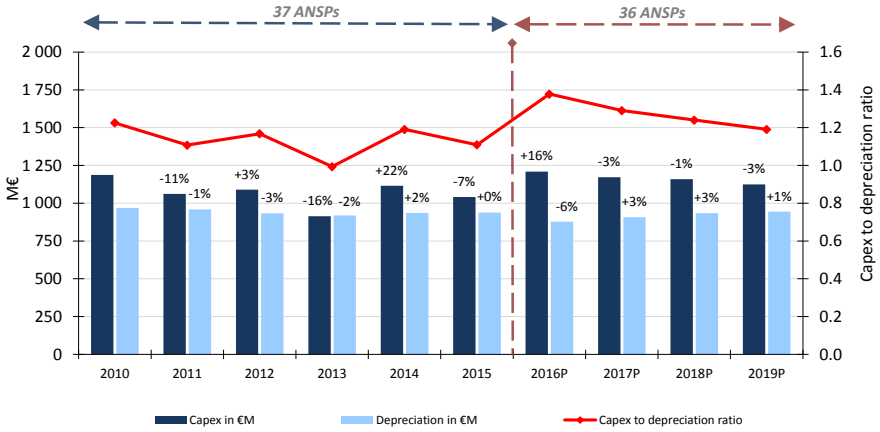


Figure 2.38: Capital expenditures and depreciation costs (2010-2019, real terms)

The average capex to depreciation ratio planned over 2016-2019 (1.27) is slightly higher than that observed over the 2010-2015 period (1.10). This indicates that, overall, ANSPs asset bases are expected to grow faster than in the past six years.

Additional information on the nature and magnitude of the major investment projects for each ANSP is provided in Part II of this Report.

[26] As explained in the introduction of Section 2.9, NATS is excluded from the capex and depreciation costs analysis since forward-looking data (based on regulatory accounting rules) and historical data (based on IFRS) are not directly comparable.

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PART II: COST-EFFECTIVENESS PERFORMANCE FOCUS AT ANSP LEVEL

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3 FOCUS ON ANSPs INDIVIDUAL COST-EFFECTIVENESS PERFORMANCE

3.1 Objective of this chapter

This chapter comprises two pagers for each ANSP participating to the ACE 2015 analysis. These two pagers include an analysis of the historical development of the financial cost-effectiveness indicator and its main components over the 2010-2015 period. Individual ANSP cost-effectiveness performance is also examined in the context of a group of ANSPs which operate in relatively similar operational and economic environments (comparator groups). Finally, these two pagers comprise historical information and projections about capital expenditures provided by each ANSP.

3.2 Historical development of cost-effectiveness performance, 2010-2015

The first page presents, for each ANSP, an assessment of its cost-effectiveness performance, and how it has developed over the five-year period 2010-2015. 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 (2015 prices). For consistency purposes, the cost of a minute of ATFM delays used for the 2010-2015 period is that of the year 2015 (€100) and is based on the findings of the study "European airline delay cost reference values" realised by the University of Westminster in March 2011, and updated in December 2015. Further details are available in Annex 2 of this report.

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.

The charts on the middle right provide additional information in order to better understand the drivers behind the changes in the three components of financial cost-effectiveness. First, the changes in ATCO-hour productivity are examined in the light of changes in composite flight-hours, number of FTE ATCOs in OPS and corresponding hours on duty. A second chart focuses on the changes in ATCO-hours on duty, and in particular on overtime hours. The third chart presents the changes in support costs are 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 costs.

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 2009-2010 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 2015 prices using national inflation rates. Finally, for comparison purposes in 2015, all national currencies are converted to euros using the 2015 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 2015 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 2015 data.

The historical inflation figures used in this analysis were obtained from EUROSTAT or from the International Monetary Fund. For the projections, the ANSPs' own assumptions concerning inflation rates were used. Details of the monetary parameters used for 2015 are given in Annex 7 to this report.

3.3 ANSP's cost-effectiveness within the comparator group, 2010-2015

The top charts of the second page present the financial cost-effectiveness indicator and its main components for individual ANSPs in comparison with their respective comparator group. The approach is to consider each ANSP in the context of a group of other ANSPs (comparators) which operate in relatively similar operational and economic environments.

The chart on the top-left shows the level and changes in unit ATM/CNS provision costs over the 2010-2015 period for each ANSP part of the comparator group. The chart on the top-right shows for each ANSP the deviations in unit ATM/CNS provision costs, ATCO-hour productivity, employment costs per ATCO-hour and unit support costs from the average of the comparator group at the start (2010) and at the end (2015) of the period considered.

The ANSP comparator groups used for the benchmarking analysis are presented in the table below. These comparator groups were determined for the purposes of the RP2 cost-efficiency target-setting process using a two-step approach combining the use of statistical tools (cluster analysis) with expert judgement. For a full description of the process, methodology and results see Annex I.C of the PRB report on RP2 EU-Wide Targets Ranges[27] released in May 2013.

Nine groups of comparators have been identified, some comprising a relatively large number of ANSPs and others only comprising two organisations. Due to the unique nature of its airspace (upper airspace only, across four States), it was determined that Maastricht (MUAC) should be considered separately and therefore this ANSP was not included in the comparator group benchmarking analysis. Finally, two groups have been designed for the ANSPs not operating in SES States. It should be noted that the names of these groups have been chosen for mnemonic purposes only.

[27] This document is available at: http://ec.europa.eu/transport/media/consultations/doc/2013-07-03-sesrp2/report.pdf

Comparator Groups	ANSPs
Five Largest	ENAIRE
	DFS
	DSNA
	ENAV
	NATS (Continental)
Central Europe	ANS CR
	HungaroControl
	LPS
	Slovenia Control
	Croatia Control
	PANSA
South Eastern Europe	HCAA
	BULATSA
	ROMATSA
South Med	DCAC Cyprus
	MATS
Western Europe	Austro Control
	NAVIAIR
	Skyguide
Atlantic	NAV Portugal (Continental)
	IAA
Baltic States	EANS
	LGS
	Oro Navigacija
Nordic States	Avinor (Continental)
	LFV
	Finavia
BelNed	Belgocontrol
	LVNL
Non-SES 1	DHMI
	UkSATSE
Non-SES 2	Albcontrol
	ARMATS
	M-NAV
	MoldATSA
	Sakaeronavigatsia
	SMATSA

Table 3.1: ANSPs comparator groups

3.4 Historical and forward-looking information on capital investment projects

The charts which are displayed in the middle and the bottom of the second page provide historical information and projections about capital expenditures provided by each ANSP.

The chart on the middle of the page shows the historical and planned evolution of capital expenditure and depreciation, highlighting the ANSP's investment cycles and their magnitude, across time. The ratio of these quantities (usually greater than one) is an indication of the rate at which the overall asset base is being expanded.

Finally, two tables present information on the nature of the main ANSP's capex projects between 2010 and 2020. The first table provides a high-level overview of the magnitude of historic and planned capital expenditures by area (i.e. ATM, Communication, Surveillance, etc.) and of the upgrade/replacement cycles of the main ATM systems for each ACC. The capex allocation by area

is not always straightforward, especially when ANSPs report under a large project several smaller investments relating to different areas. The classification disclosed in this report therefore reflects the PRU understanding based on information provided by ANSPs during the validation process. In case of a project covering several areas, the rationale was to classify the whole project into the domain where the investment project was mostly contributing. The last table provides detailed information on the top 5 capex projects in monetary terms including the domain, the financial amount and the time period of the project.

3.5 Cost-effectiveness performance focus at ANSP level

To facilitate the reading of this section, the table below displays the page number of the individual benchmarking analysis for each ANSP.

ANSP name	Country	Page
Albcontrol	Albania	54
ANS CR	Czech Republic	56
ARMATS	Armenia	58
Austro Control	Austria	60
Avinor (Continental)	Norway	62
Belgocontrol	Belgium	64
BULATSA	Bulgaria	66
Croatia Control	Croatia	68
DCAC Cyprus	Cyprus	70
DFS	Germany	72
DHMİ	Turkey	74
DSNA	France	76
EANS	Estonia	78
ENAIRE	Spain	80
ENAV	Italy	82
Finavia	Finland	84
HCAA	Greece	86
HungaroControl	Hungary	88
IAA	Ireland	90
LFV	Sweden	92
LGS	Latvia	94
LPS	Slovak Republic	96
LVNL	Netherlands	98
MATS	Malta	100
M-NAV	F.Y.R. Macedonia	102
MoldATSA	Moldova	104
MUAC		106
NATS (Continental)	United Kingdom	108
NAV Portugal (Continental)	Portugal	110
NAVIAIR	Denmark	112
Oro Navigacija	Lithuania	114
PANSA	Poland	116
ROMATSA	Romania	118
Sakaeronavigatsia	Georgia	120
Skyguide	Switzerland	122
Slovenia Control	Slovenia	124
SMATSA	Serbia and Montenegro	126
UkSATSE	Ukraine	128

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Albcontrol (Albania) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: 1 EUR = 139.546 ALL

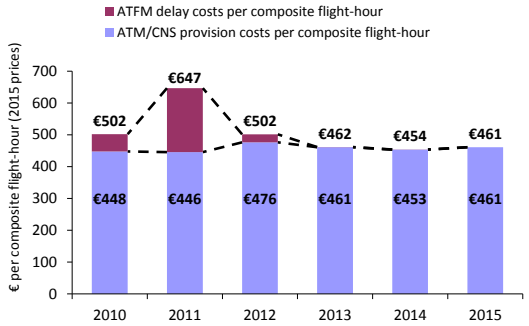
Albcontrol represents 0.3% of European system gate-to-gate ATM/CNS provision costs

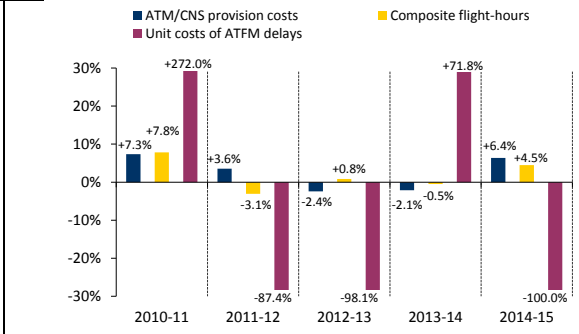
Operational conditions

Aggregated complexity score: Min — Max

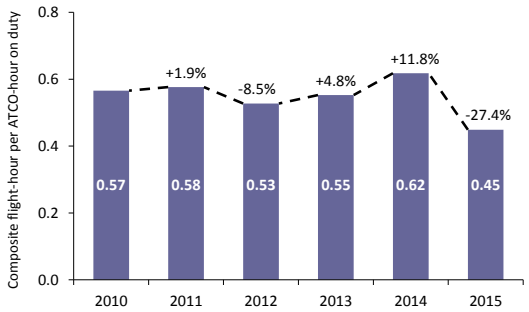
Seasonal traffic variability: Min — Max

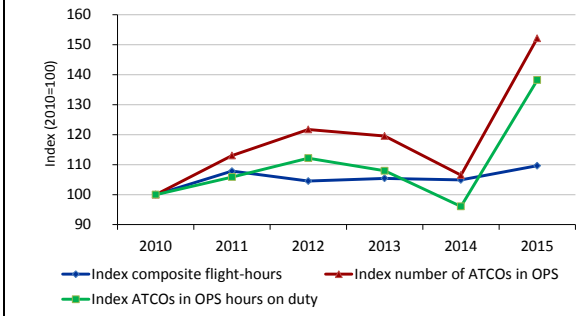
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



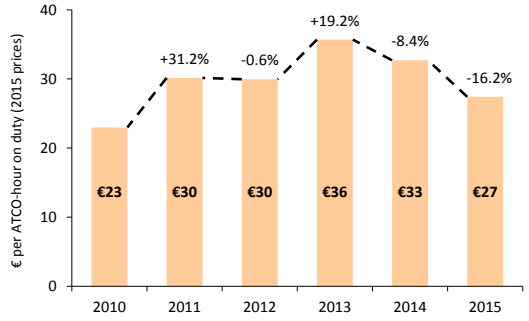


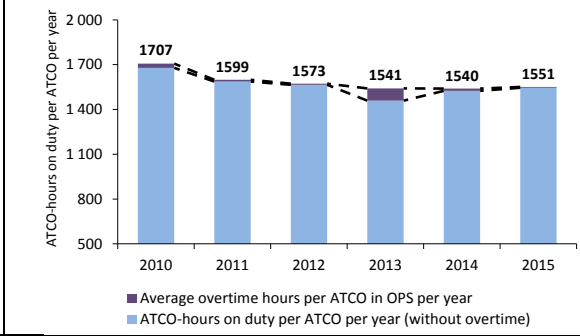
Trend in gate-to-gate ATCO-hour productivity



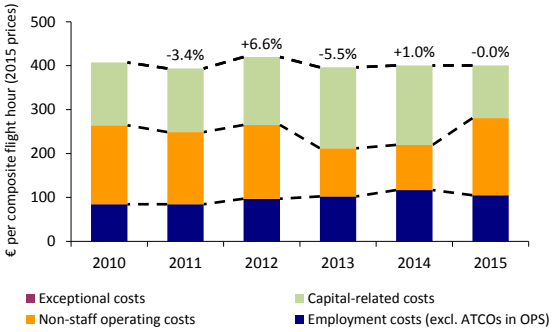


Trend in gate-to-gate employment costs per ATCO-hour

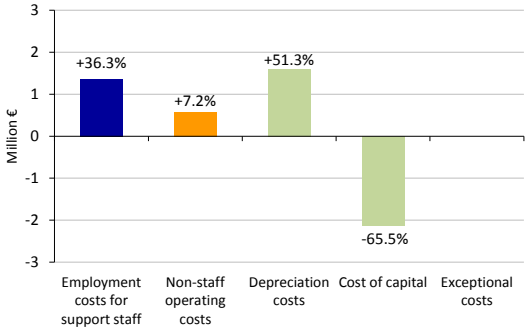




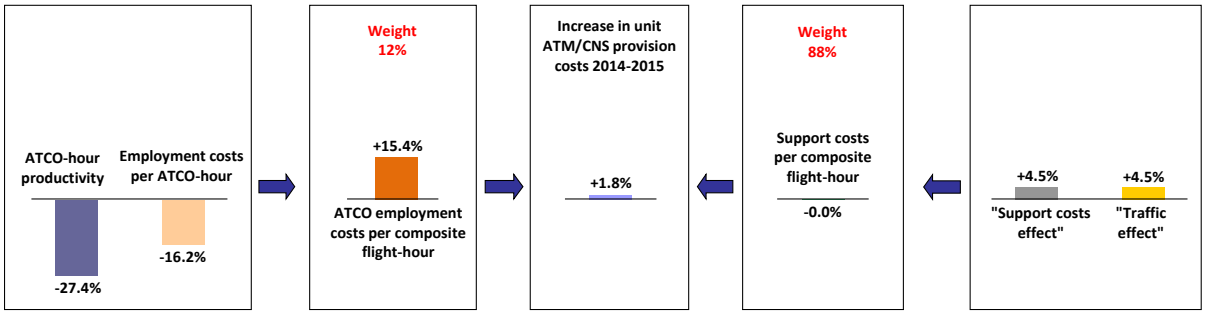
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

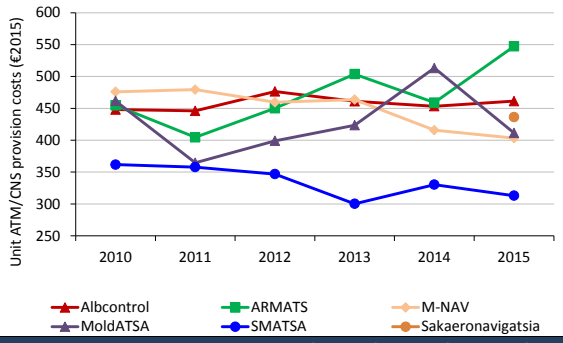


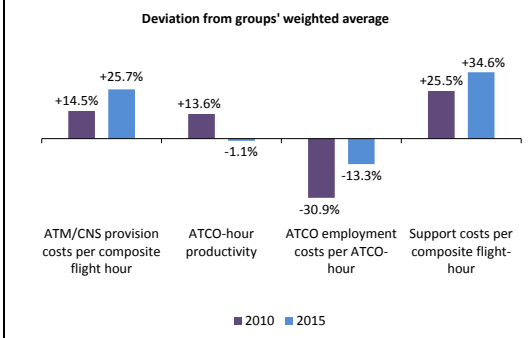
Changes in financial cost-effectiveness (2014-2015)



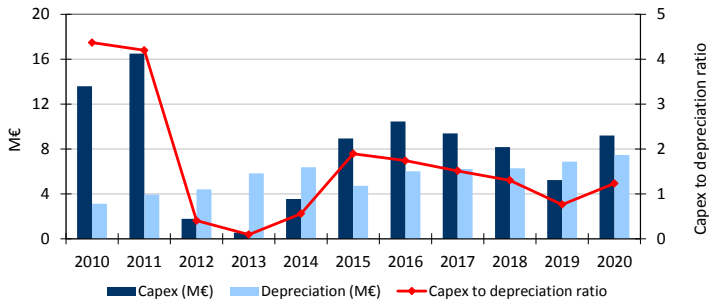
Albcontrol (Albania) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2006*	C: 2006*	C: 2012*	C: 2012*
€17.7M (2008-2012)	€2.0M (2008-2012)	€1.6M		€13.5M (2008-2011)	€0.3M	2010				
						2011				
				€0.3M		2012				
						2013				
€13.5M						2014				
	€1.3M	€3.1M		€0.6M		2015				
	€1.4M		€0.8M		€0.8M	2016				
	€1.5M	€1.9M	€11.7M		€0.7M	2017				
					€1.1M**	2018				
						2019				
						2020				

** This amount includes €0.5M related to MET

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Purchase of a new ATM system	ATM	14.5	2008	2012
2	New joint ACC/APP/TWR building located near Mother Teresa Airport	Buildings	13.5	2008	2011
3	Implement WAM (extension of MLAT)	SUR	6.0	2018	2019
4	Implement MLAT	SUR	4.9	2017	2019
5	Upgrade new Skyline technology, free route airspace, stripless, surveillance, ATCO monitoring hours on duty and implement Skyline capability to process MLAT data	ATM	4.8	2016	2017

ANS CR (Czech Republic) – Cost-effectiveness KPIs (€2015)

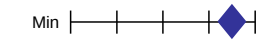
Contextual economic information

Exchange rate: 1 EUR = 27.257 CZK

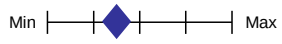
ANS CR represents 1.4% of European system gate-to-gate ATM/CNS provision costs

Operational conditions

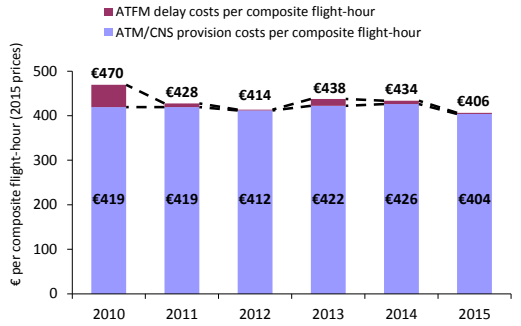
Aggregated complexity score:

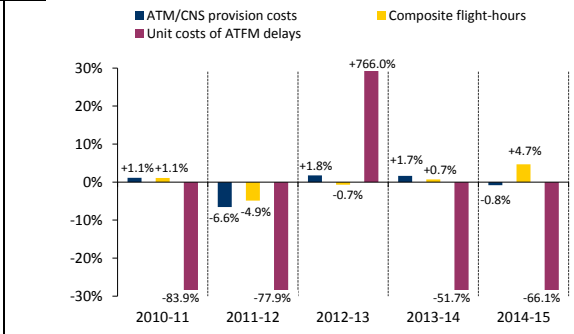


Seasonal traffic variability:

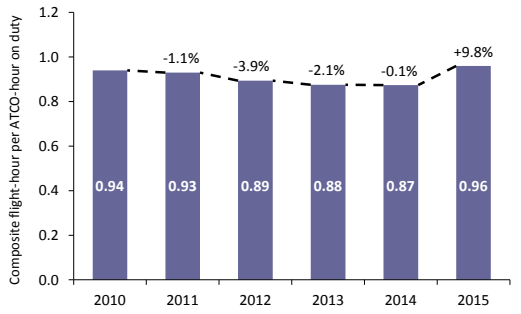


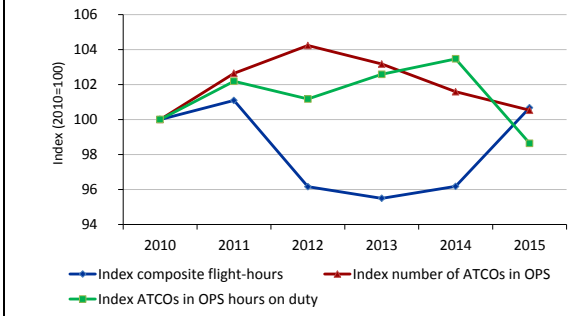
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



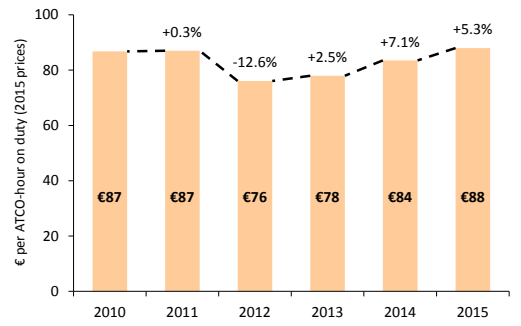


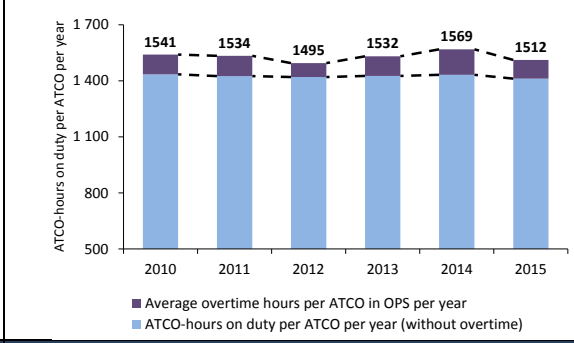
Trend in gate-to-gate ATCO-hour productivity



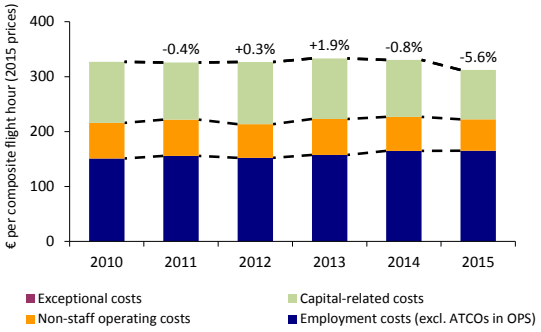


Trend in gate-to-gate employment costs per ATCO-hour

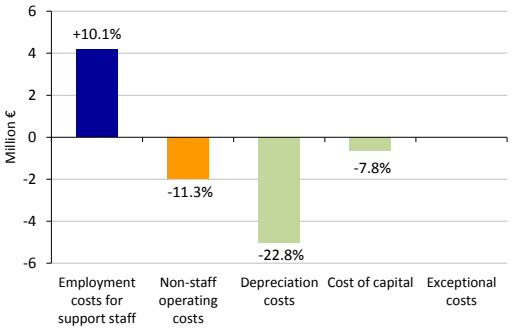




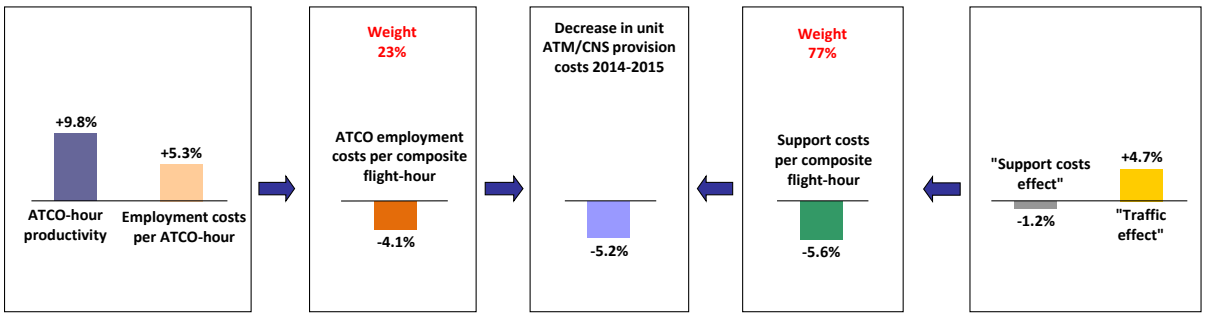
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

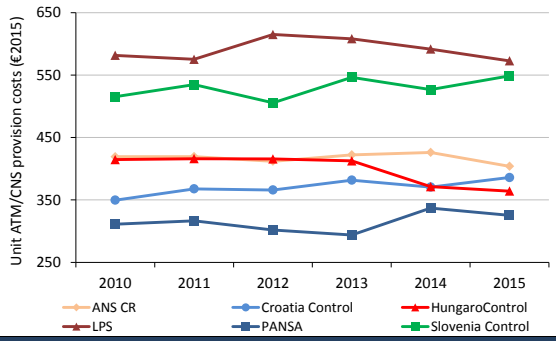


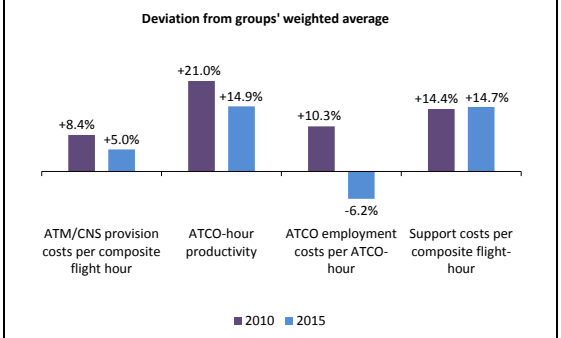
Changes in financial cost-effectiveness (2014-2015)



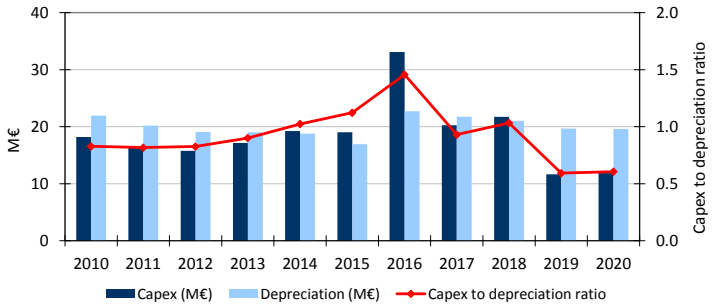
ANS CR (Czech Republic) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS C: 1994*	RDPS C: 2000*	HMI C: 2007*	VCS C: 2007*
€119.2M	€16.1M (2011-2023)	€2.1M	€7.0M	€23.8M (2008-2019)	€1.0M	2010				
						2011				
						2012				
						2013				
						2014				
						2015				
						2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Replacement of RDP and FDP systems in Praha ACC (Neopteryx)	ATM	41.3	2010	2020
2	Upgrade of E2000, ESUP and IDP	ATM	34.8	2016	2020
3	Upgrade of RDP and FDP secondary systems (approach to Neopteryx)	ATM	17.4	2015	2019
4	"TB 2007" Project involving the complete renovation of the "Technical Block Building" at Prague airport	Buildings	12.1	2008	2011
5	Replacement of radio communication equipment and replacement of VCS	COM	6.8	2011	2016

ARMATS (Armenia) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: 1 EUR = 528.500 AMD

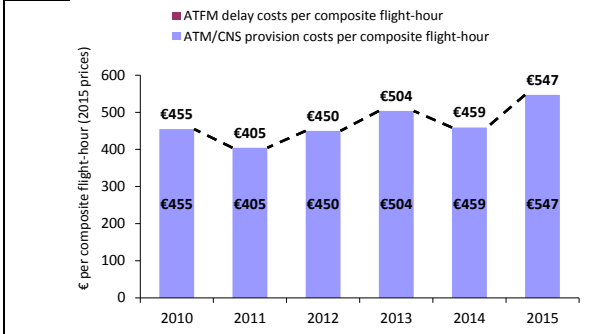
ARMATS represents 0.1% of European system gate-to-gate ATM/CNS provision costs

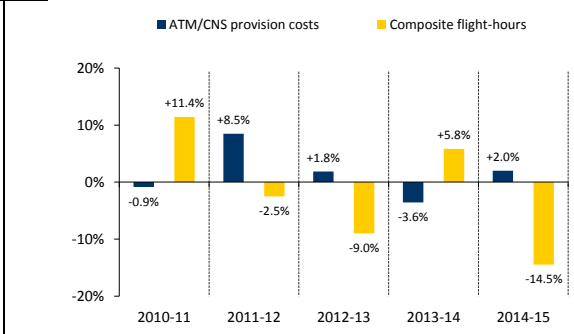
Operational conditions

Aggregated complexity score: Min — Max

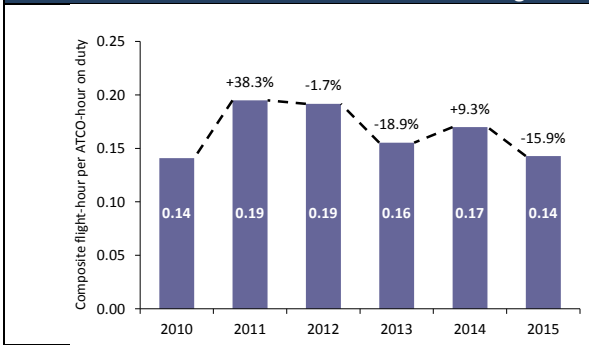
Seasonal traffic variability: Min — Max

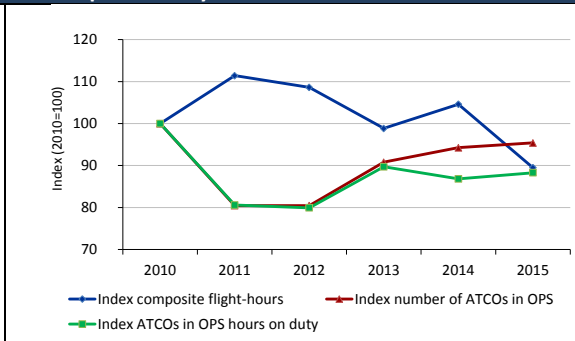
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



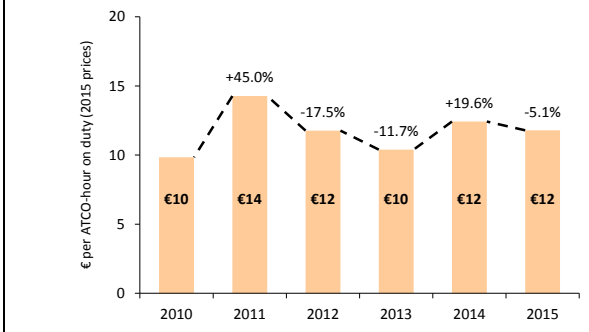


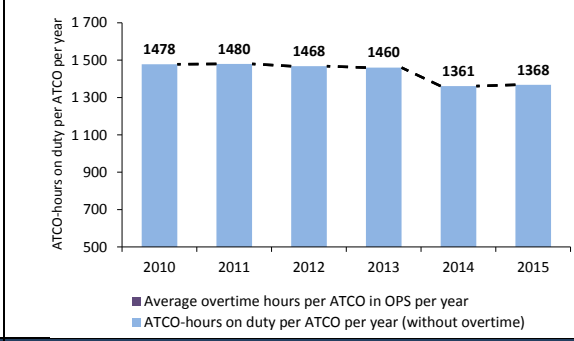
Trend in gate-to-gate ATCO-hour productivity



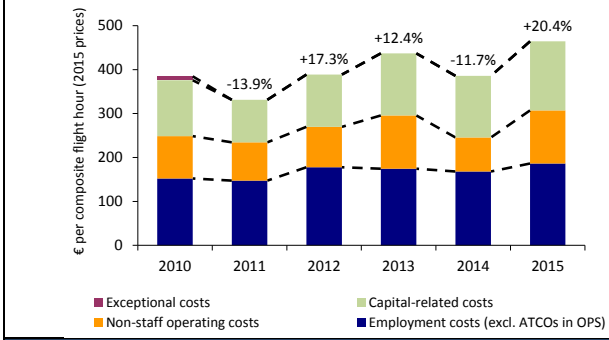


Trend in gate-to-gate employment costs per ATCO-hour

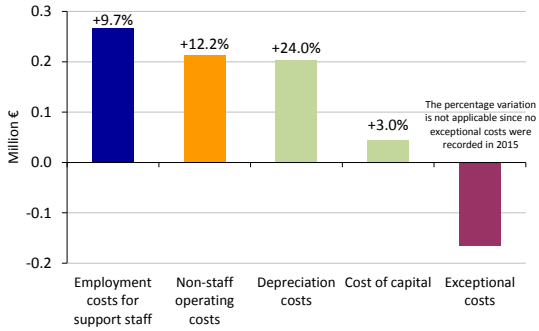




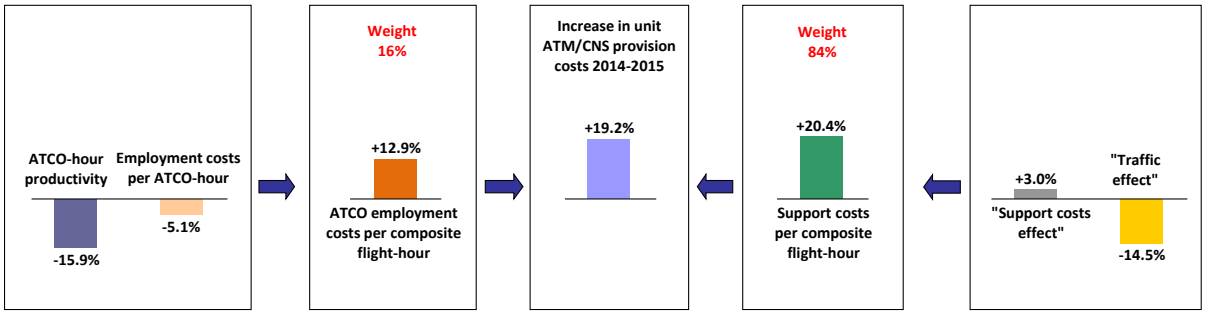
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

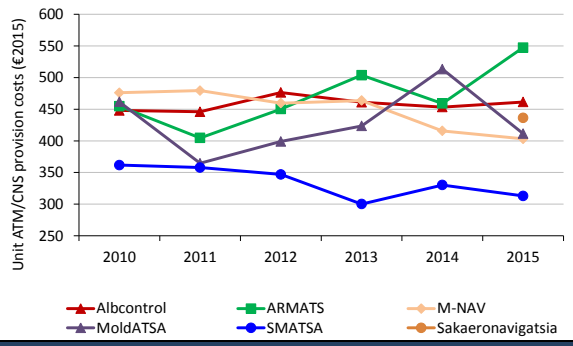


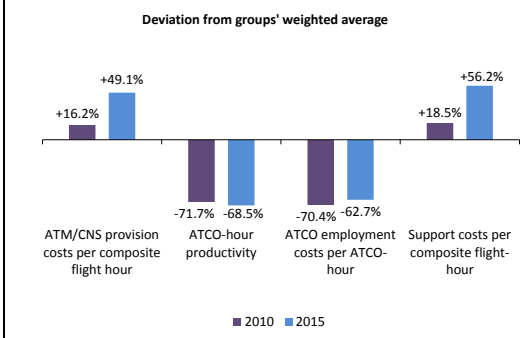
Changes in financial cost-effectiveness (2014-2015)



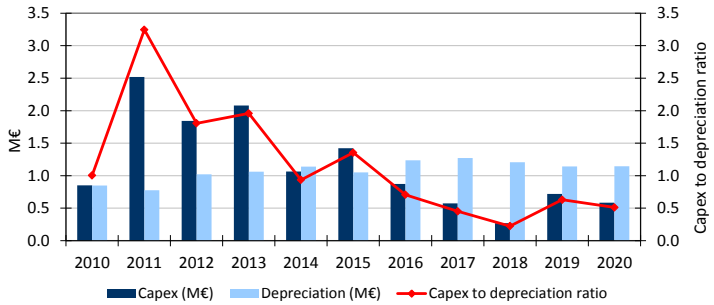
ARMATS (Armenia) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS C: 2013*	RDPS C: 2013*	HMI C: 2013*	VCS C: 2013*
						2010				
						2011				
€3.2M	€1.2M					2012				
						2013				
			€3.1M			2014				
					€0.1M	2015				
		€0.3M				2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Modernisation of ATC centre (ATM automated system and VCSS)	ATM	2.4	2012	2013
2	Procurement of a MSSR	SUR	1.3	2019	2020
3	Modernization of P3D MLAT (WAM)	SUR	1.3	2014	2016
4	Acquisition of Galaxy ATM system for Gyumri	ATM	0.5	2015	2016
5	Replacement of SSR stations of P3D MLAT (WAM) systems in Yerevan (EVN) and Gyumri (GYU)	SUR	0.3	2017	2017

Austro Control (Austria) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: Austria is within the EURO Zone

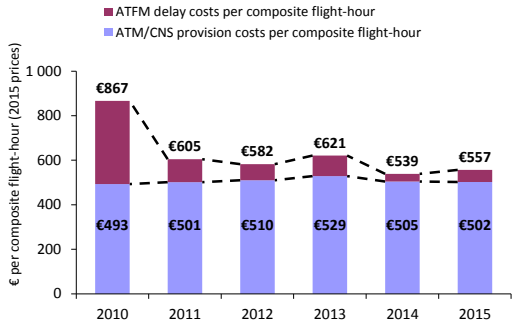
Austro Control represents 2.3% of European system gate-to-gate ATM/CNS provision costs

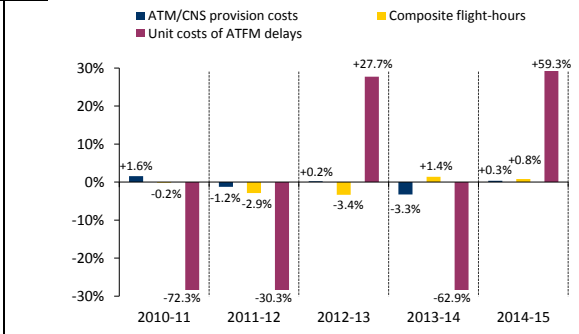
Operational conditions

Aggregated complexity score:

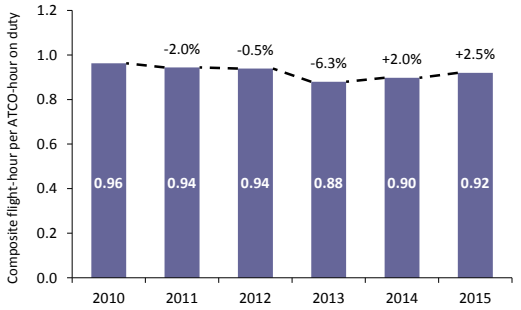
Seasonal traffic variability:

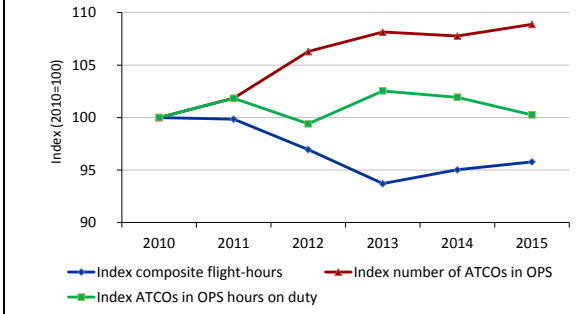
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



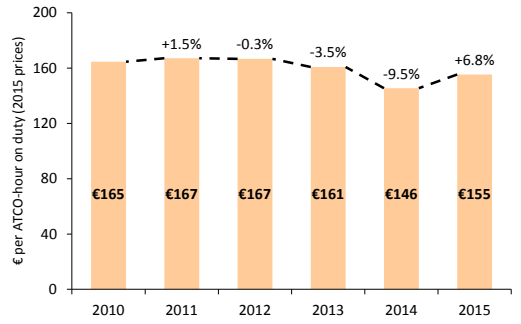


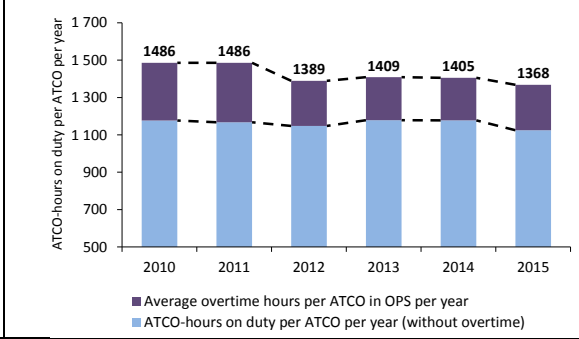
Trend in gate-to-gate ATCO-hour productivity



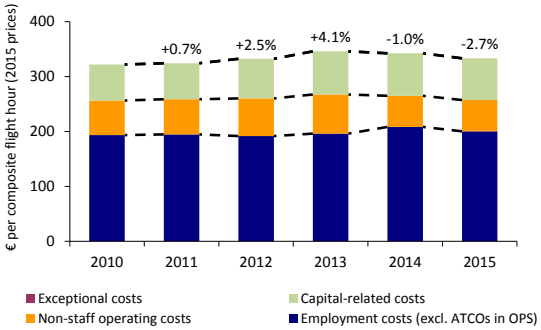


Trend in gate-to-gate employment costs per ATCO-hour

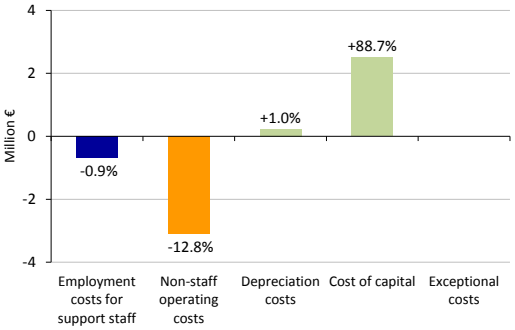




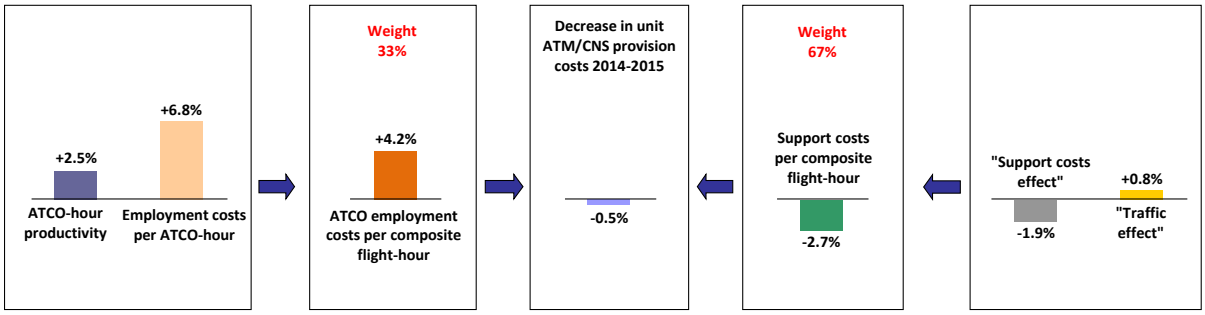
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

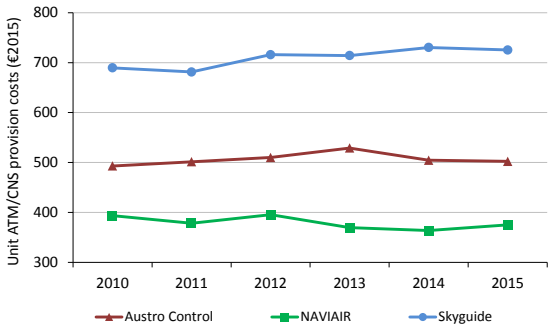


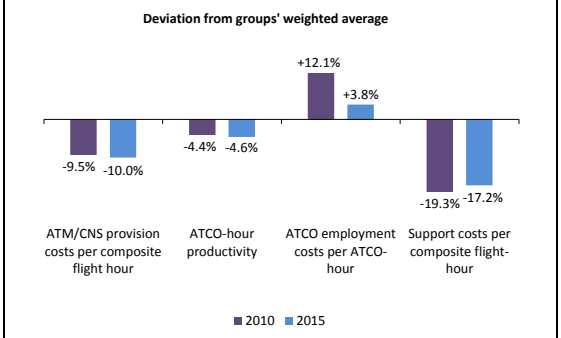
Changes in financial cost-effectiveness (2014-2015)



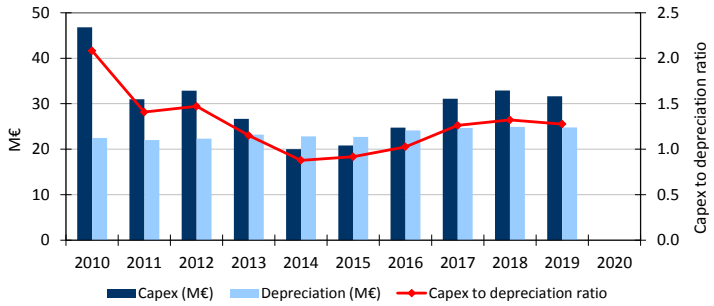
Austro Control (Austria) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2013*	C: 2013*	C: 2013*	C: 1996*
						2010				
				€13.6M		2011				
						2012				
€33.6M	€4.2M	€4.3M	€10.3M		€81.6M	2013				
						2014				
						2015				
						2016				
€68.0M	€23.7M	€11.4M	€10.5M	€27.3M	€24.7M	2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Investment associated with ATM Systems (including COOPANS, training and simulator facilities, etc.)	ATM	101.6	2011	2019
2	Investments associated with buildings and facility management (including Salzburg airport TWR)	Buildings	40.9	2010	2019
3	Investment associated with communication (including introduction of CPDLC, VoIP technology, 8.33 kHz channel separation, etc.)	COM	27.9	2013	2019
4	Investments associated with surveillance (including upgrade to Mode-S in various locations, implementation of wide-area multilateration, etc.)	SUR	20.8	2011	2019
5	Investments associated with navigation (including upgrade of NAV infrastructure, replacement of ILS, VOR, and DME equipment, etc.)	NAV	15.7	2011	2019

Avinor Continental (Norway) – Cost-effectiveness KPIs (€2015)

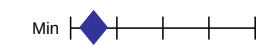
Contextual economic information

Exchange rate: 1 EUR = 8.944 NOK

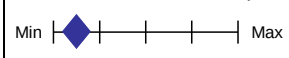
Avinor Continental represents 2.3% of European system gate-to-gate ATM/CNS provision costs

Operational conditions

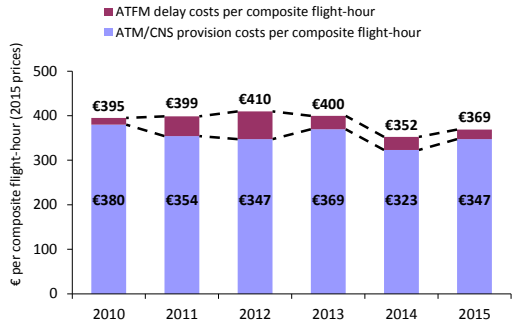
Aggregated complexity score:

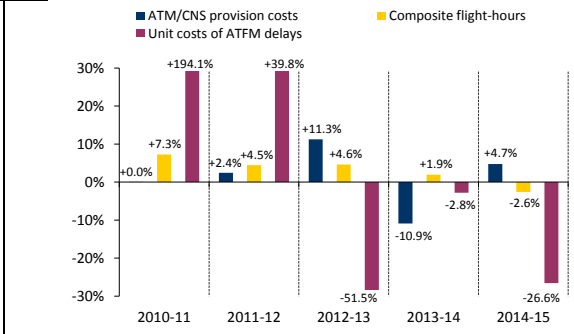


Seasonal traffic variability:

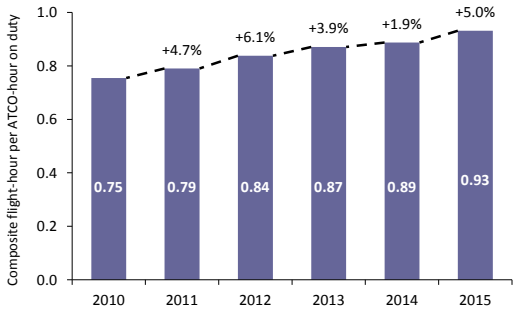


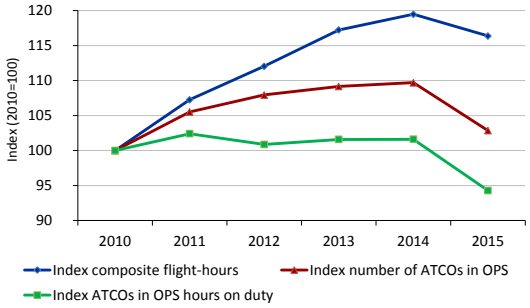
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



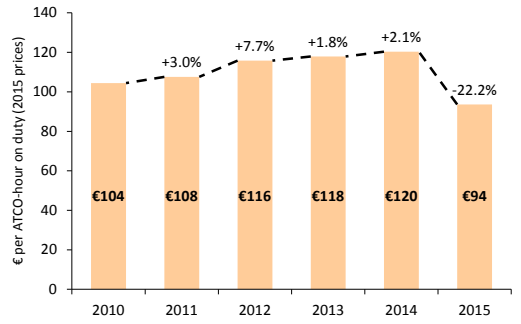


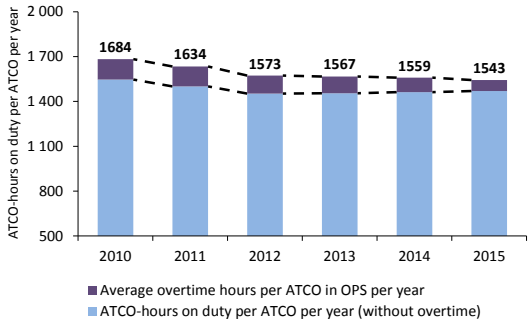
Trend in gate-to-gate ATCO-hour productivity



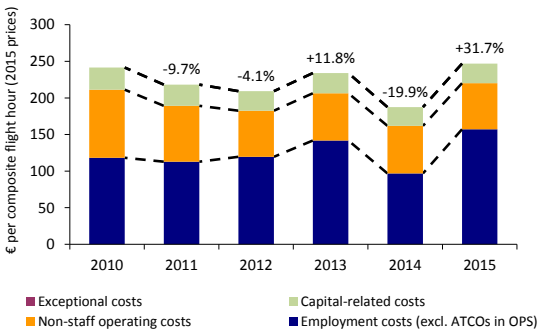


Trend in gate-to-gate employment costs per ATCO-hour

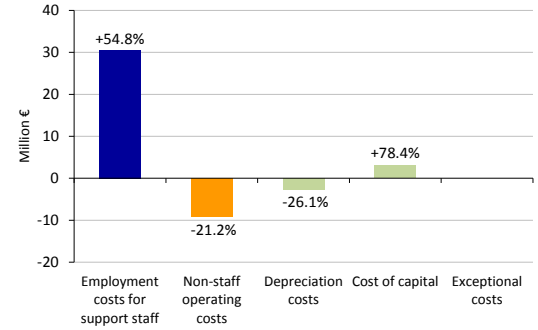




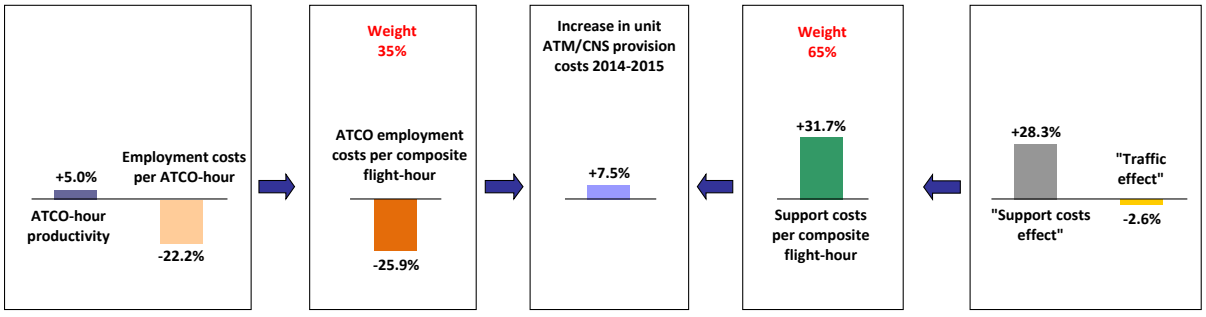
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

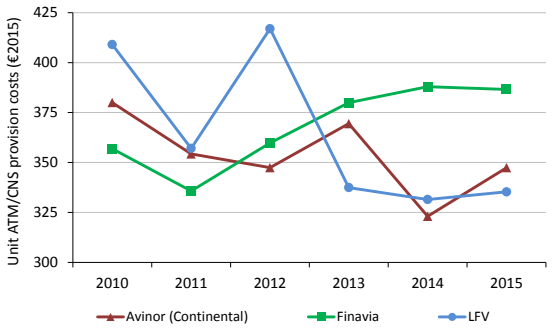


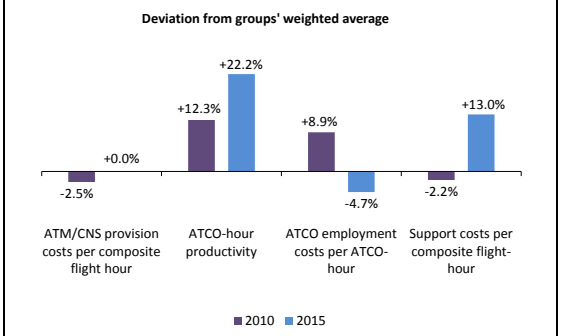
Changes in financial cost-effectiveness (2014-2015)



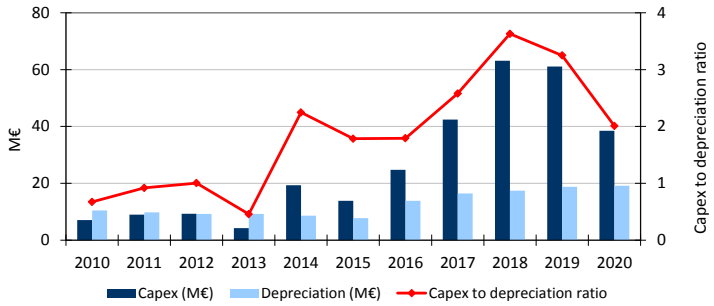
Avinor Continental (Norway) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 1996 (All ACCs)*	C: 1996 (All ACCs)*	C: 1996 (All ACCs)*	C: 2009 (All ACCs)*
€257.9M (2008-2022)			€43.7M			2010				
	€2.9M					2011				
						2012				Oslo
						2013				
						2014				Stavanger
	€11.4M	€2.0M		€1.9M	€1.8M	2015				
						2016				
						2017	All ACCs	All ACCs	All ACCs	
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Remote Towers	ATM	117.2	2015	2020
2	New ATM infrastructure (FAS ACC)	ATM	95.7	2016	2022
3	Norwegian Wide Area Multilateration (NORWAM)	SUR	25.9	2013	2019
4	SNAP (Southern Norway Airspace Project) project	ATM	14.0	2008	2016
5	Free Route Airspace	ATM	13.2	2014	2016

Belgocontrol (Belgium) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: Belgium is within the EURO Zone

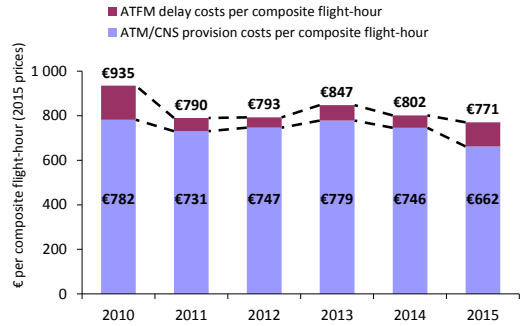
Belgocontrol represents 1.7% of European system gate-to-gate ATM/CNS provision costs

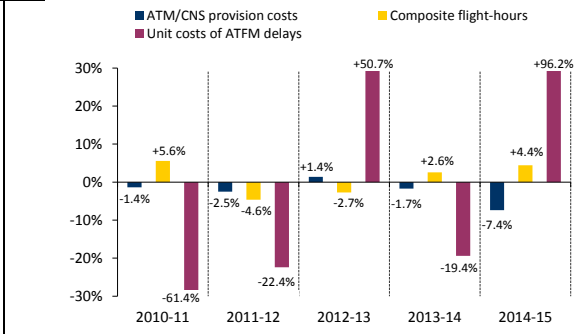
Operational conditions

Aggregated complexity score: Min — Max

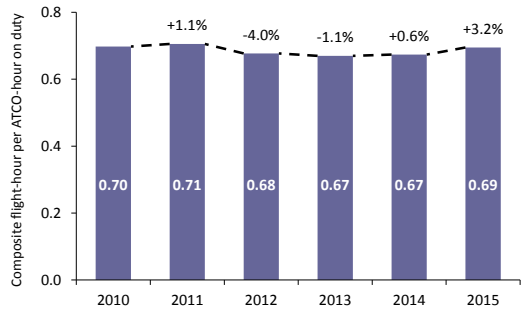
Seasonal traffic variability: Min — Max

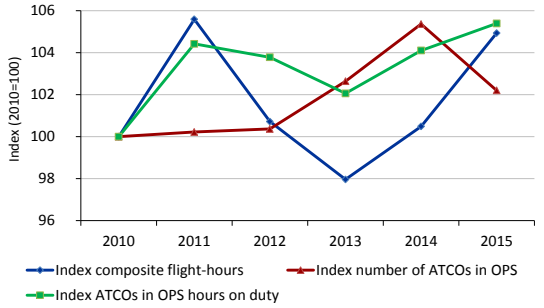
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



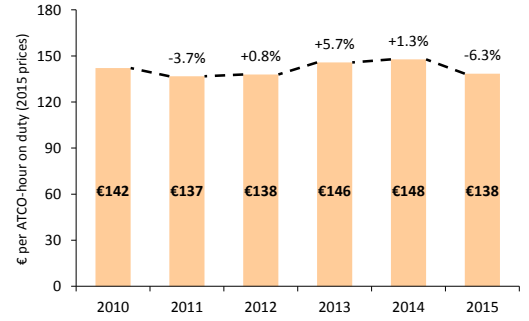


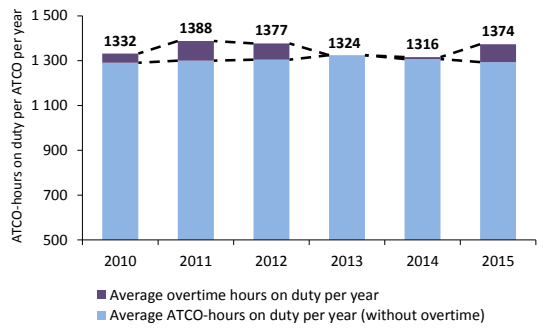
Trend in gate-to-gate ATCO-hour productivity



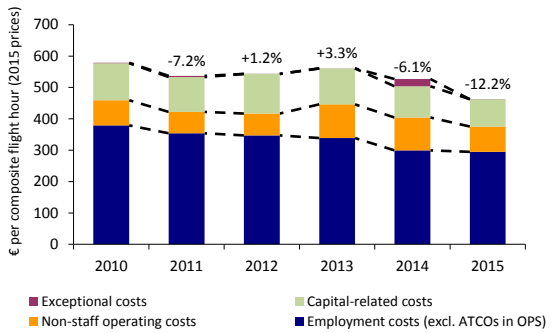


Trend in gate-to-gate employment costs per ATCO-hour

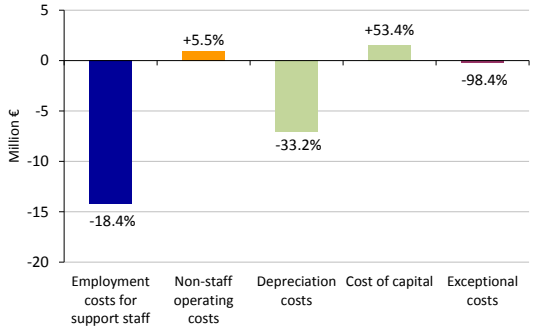




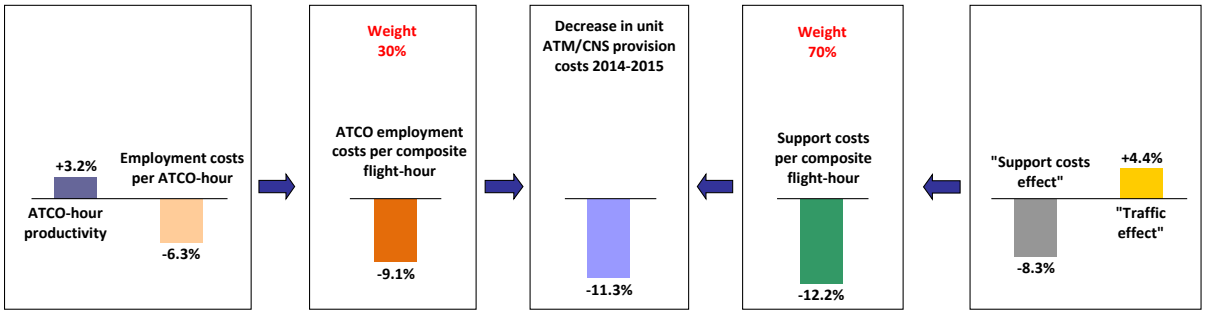
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

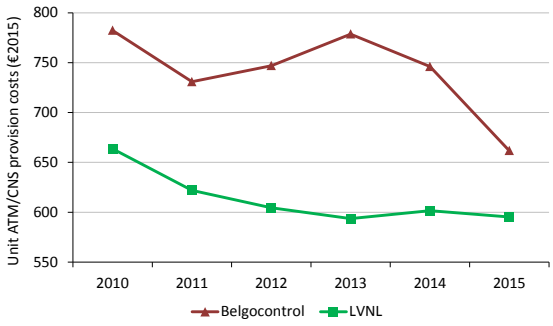


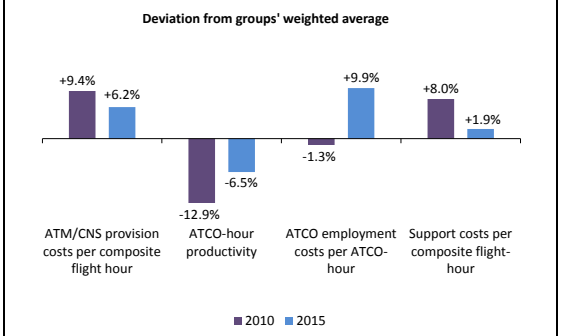
Changes in financial cost-effectiveness (2014-2015)



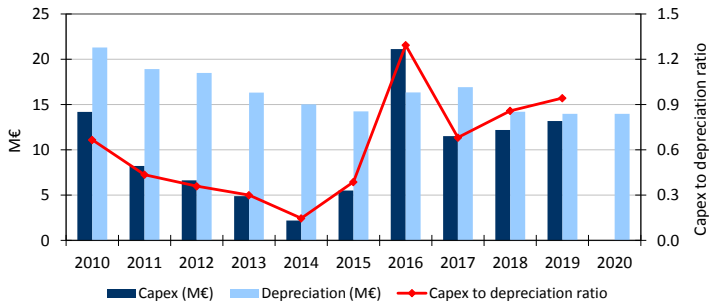
Belgocontrol (Belgium) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2009*	C: 2004*	C: 2009*	C: 2008-2009*
						2010				
						2011				
						2012				
						2013				
						2014				
€24.8M		€27.7M (2010-2027)	€41.9M			2015				
	€7.7M				€24.8M	2016				
						2017				
						2018				
						2019				
						2020	(2020-2025)		(2020-2025)	

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Continuous evolution of the ATM system (Canac 2 A/S RFC)	ATM	23.8	2011	2019
2	ILS at the Brussels, Liège, Ostend, Charleroi and Antwerp Airports	NAV	15.3	2018	2027
3	A-SMGCS at Liège and Charleroi airports	SUR	10.4	2015	2019
4	Purchase of PSR/Mode S radars	SUR	6.5	2010	2015
5	Replacement and overhaul of VOR and DME equipment	NAV	7.4	2010	2018

BULATSA (Bulgaria) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: 1 EUR = 1.955 BGN

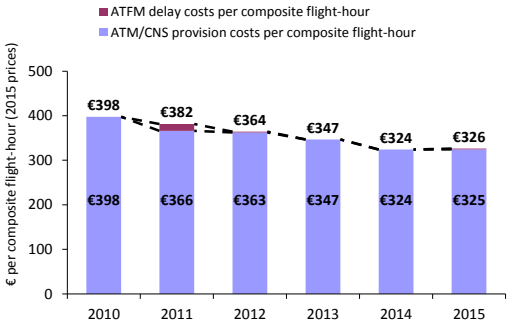
BULATSA represents 1.1% of European system gate-to-gate ATM/CNS provision costs

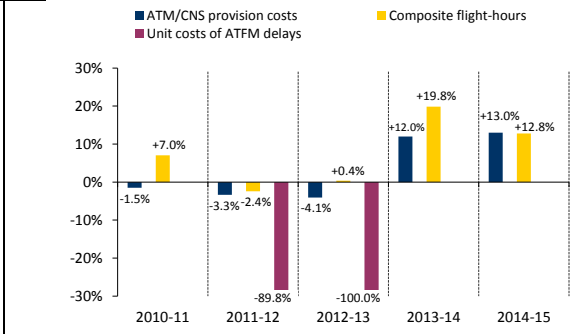
Operational conditions

Aggregated complexity score: Min — Max

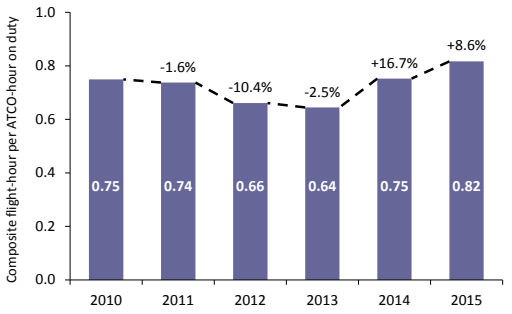
Seasonal traffic variability: Min — Max

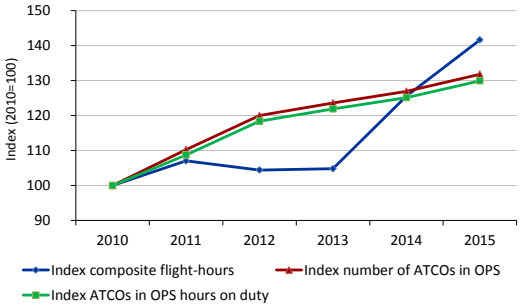
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



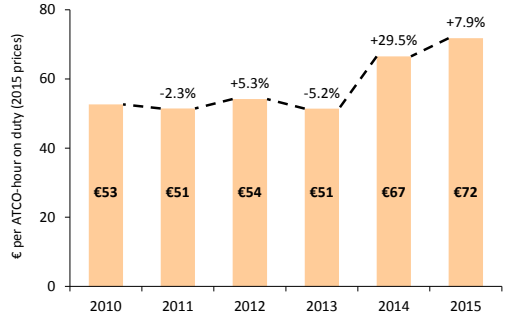


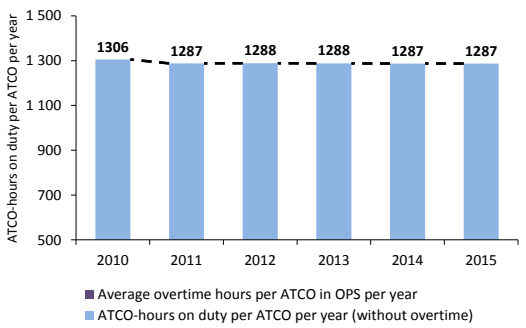
Trend in gate-to-gate ATCO-hour productivity



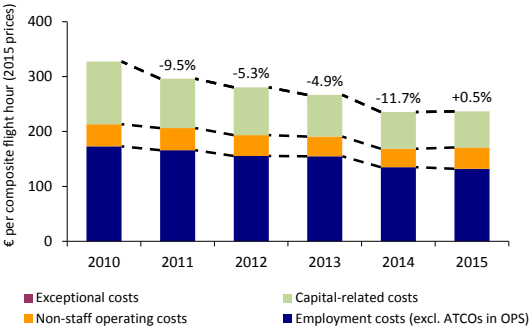


Trend in gate-to-gate employment costs per ATCO-hour

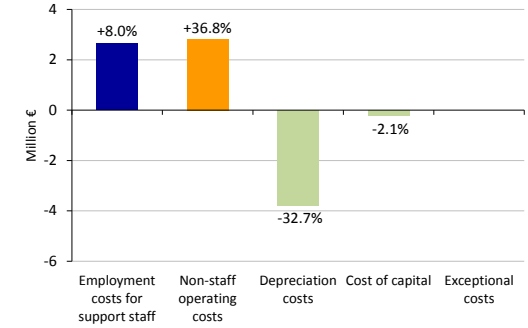




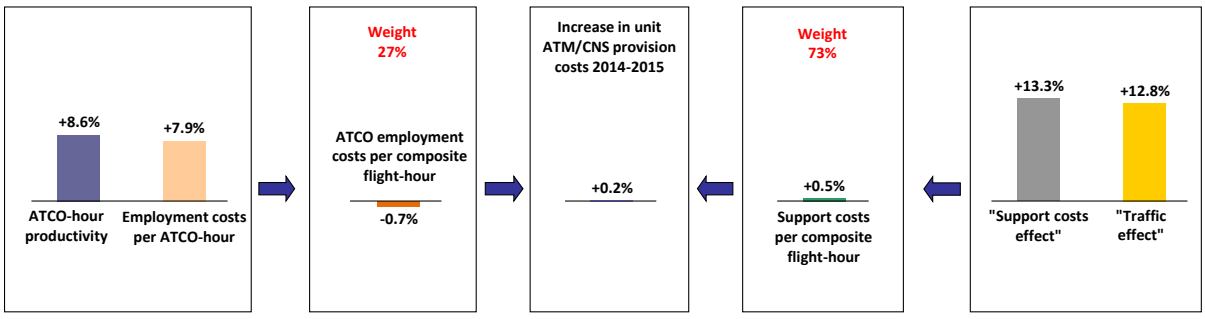
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

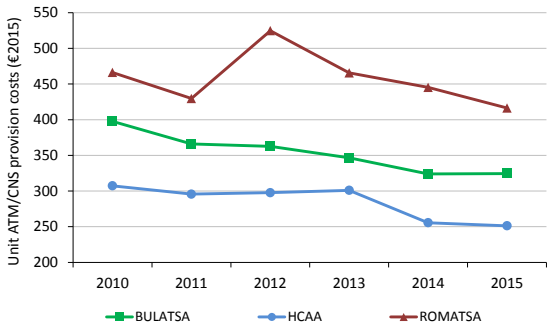


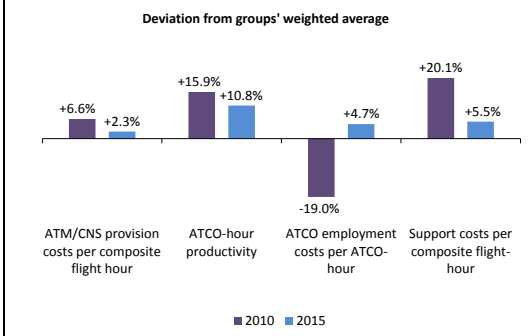
Changes in financial cost-effectiveness (2014-2015)



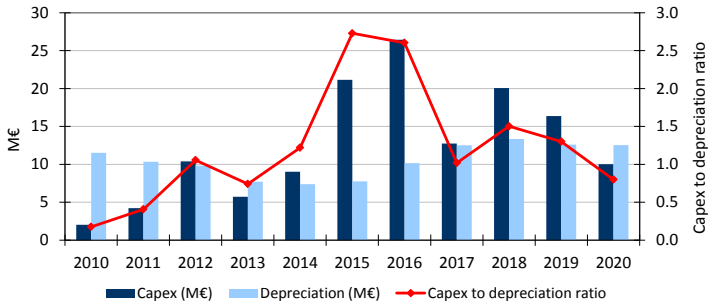
BULATSA (Bulgaria) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS C: 2005*	RDPS C: 2005*	HMI C: 2005*	VCS C: 2015*
€54.2M (2009-2021)				€7.9M (2009-2013)		2010				
						2011				
			€24.3M			2012				
	€8.1M					2013				
						2014				
		€4.0M		€1.3M		2015				
						2016				
						2017				
					€2.5M	2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	New ATM system (incl. en-route AMAN)	ATM	34.0	2018	2021
2	Modernisation of surveillance infrastructure (Mode S & PSR)	SUR	13.5	2014	2017
3	New tower at Sofia airport and its adjacent structure	Buildings	7.9	2009	2013
4	SATCAS ATM System Upgrade	ATM	5.8	2014	2016
5	Extension and upgrade of the SATCAS system	ATM	5.2	2009	2013

Croatia Control (Croatia) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: 1 EUR = 7.611 HRK

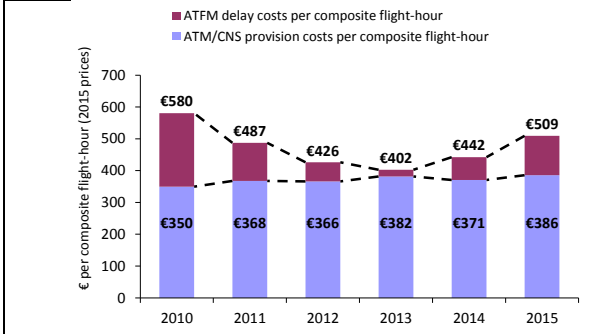
Croatia Control represents 1.1% of European system gate-to-gate ATM/CNS provision costs

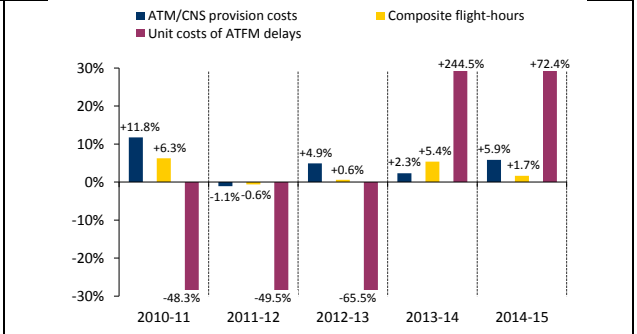
Operational conditions

Aggregated complexity score: Min — Max

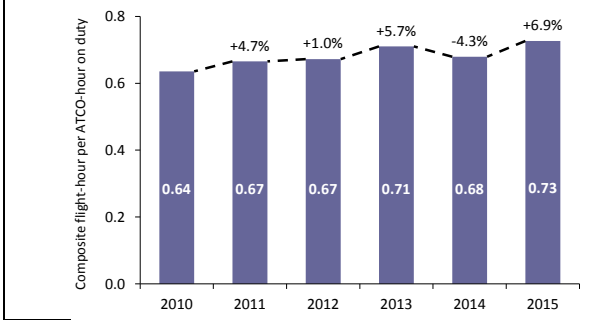
Seasonal traffic variability: Min — Max

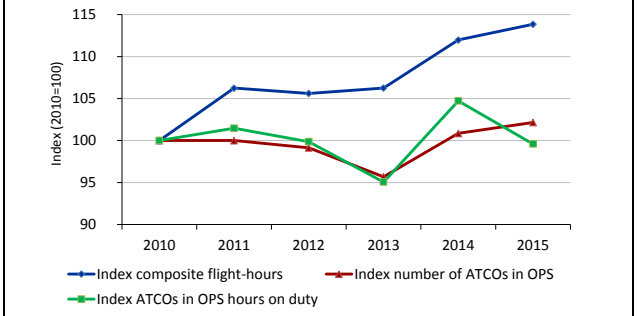
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



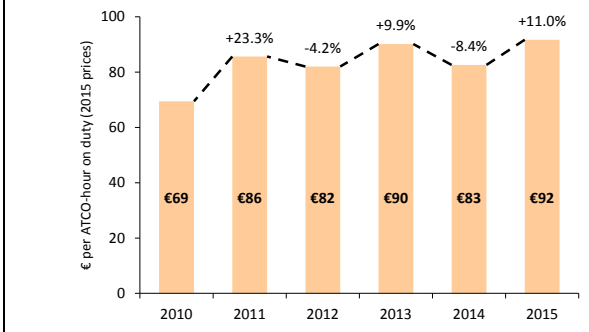


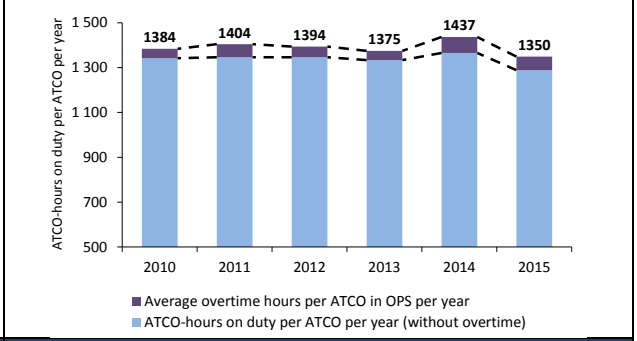
Trend in gate-to-gate ATCO-hour productivity



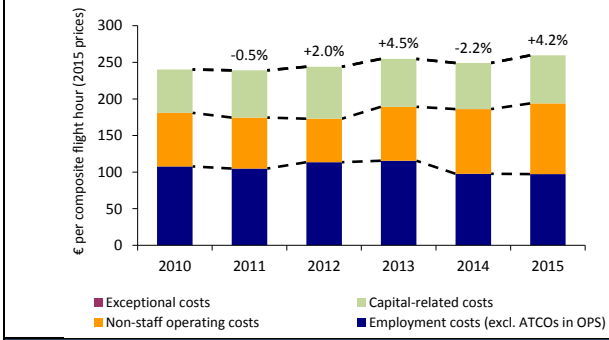


Trend in gate-to-gate employment costs per ATCO-hour

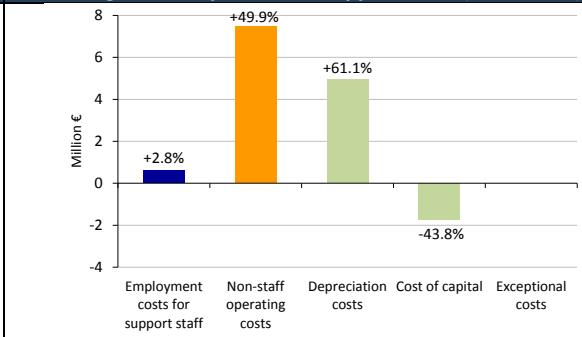




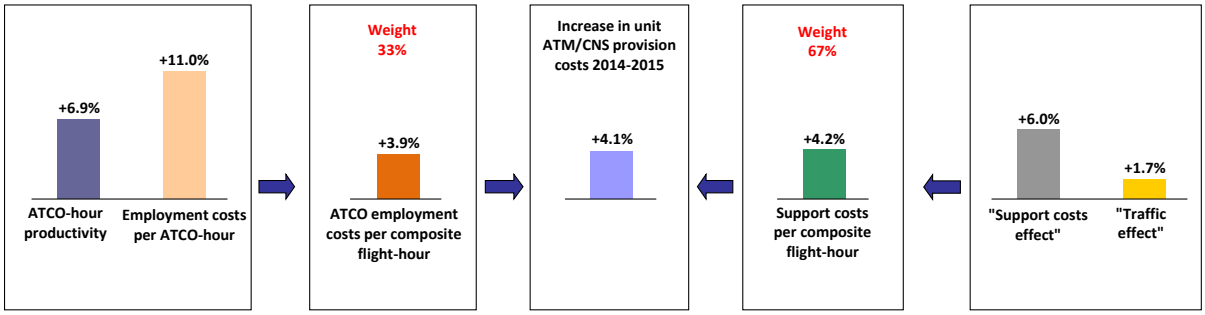
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

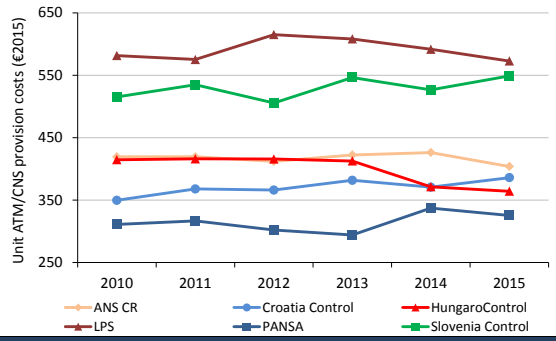


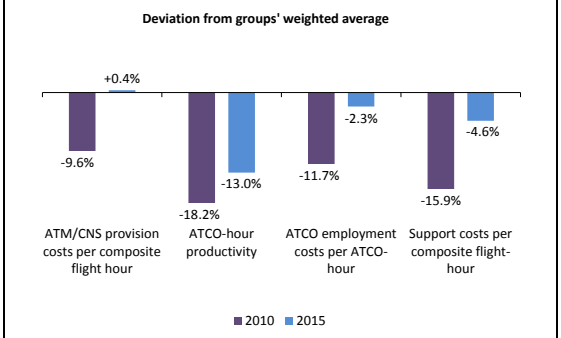
Changes in financial cost-effectiveness (2014-2015)



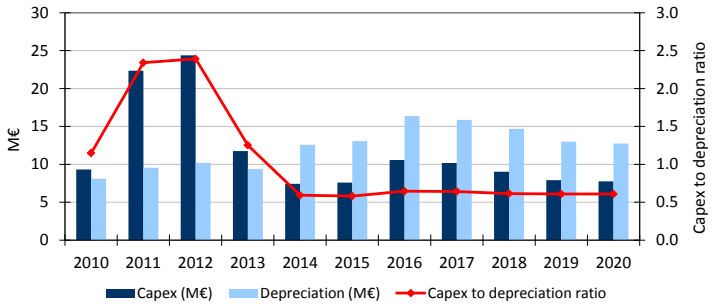
Croatia Control (Croatia) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS C: 2014*	RDPS C: 2014*	HMI C: 2014*	VCS C: 2014*
€70.7M (2009-2020)	€16.6M (2007-2020)	€7.4M (2008-2020)	€3.9M (2009-2011)	€8.5M (2009-2019)	€16.7M** (2009-2019)	2010		Upgrade		
						2011	Upgrade		Upgrade	
						2012				
						2013				
			€8.4M			2014	Replacement	Replacement	Replacement	Replacement
						2015		Upgrade		
						2016	Upgrade	Upgrade	Upgrade	
						2017	Upgrade	Upgrade	Upgrade	Upgrade
						2018				
						2019				
						2020				

**This amount includes €4.4M related to MET

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	CroATMS/COOPANS Upgrade	ATM	38.5	2011	2014
2	ATM System Upgrade	ATM	23.0	2015	2020
3	Ground-based Surveillance Systems Upgrade	SUR	8.4	2014	2020
4	CroATM (FMTP) Upgrade and Extension to Regional ATC Centres-Phase 1	ATM	8.1	2009	2011
5	Reconstruction of Old Buildings (RP2)	Buildings	7.0	2015	2019

DCAC Cyprus (Cyprus) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: Cyprus is within the EURO Zone

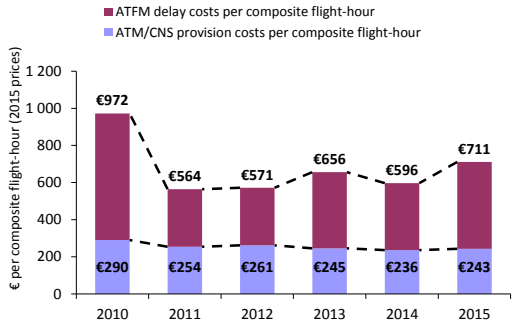
DCAC Cyprus represents 0.5% of European system gate-to-gate ATM/CNS provision costs

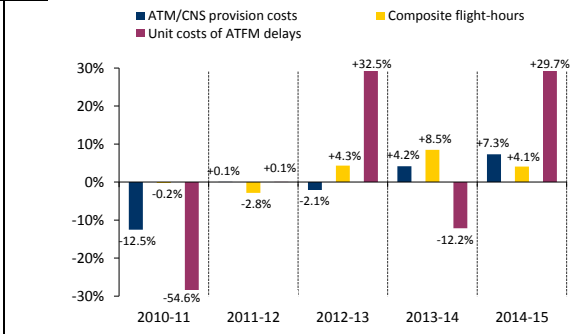
Operational conditions

Aggregated complexity score: Min — Max

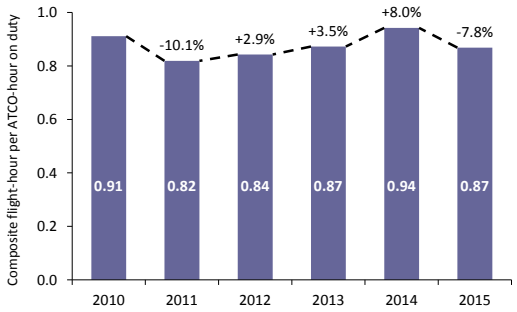
Seasonal traffic variability: Min — Max

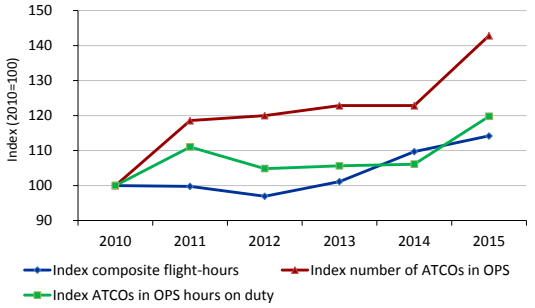
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



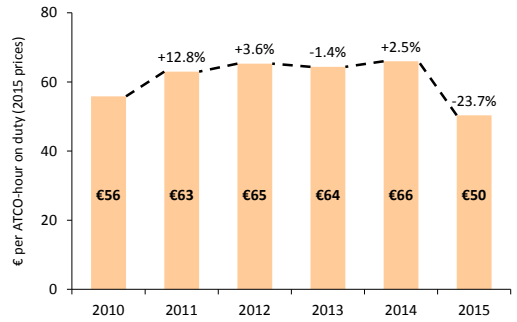


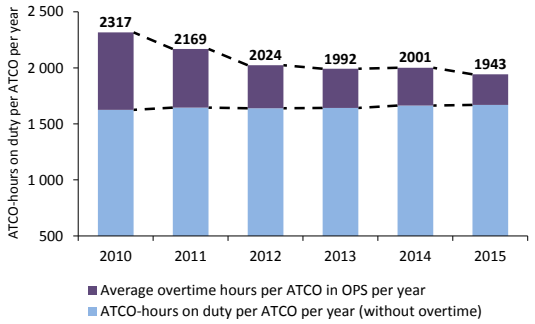
Trend in gate-to-gate ATCO-hour productivity



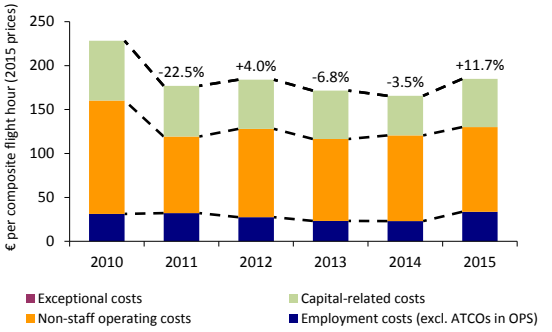


Trend in gate-to-gate employment costs per ATCO-hour

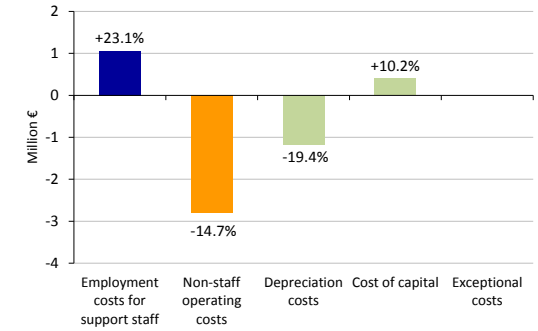




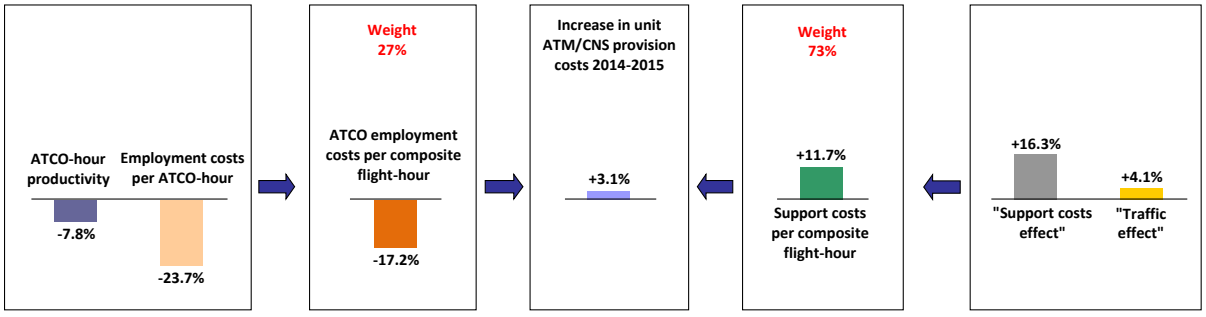
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

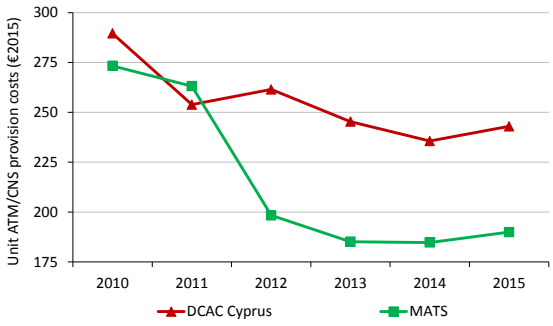


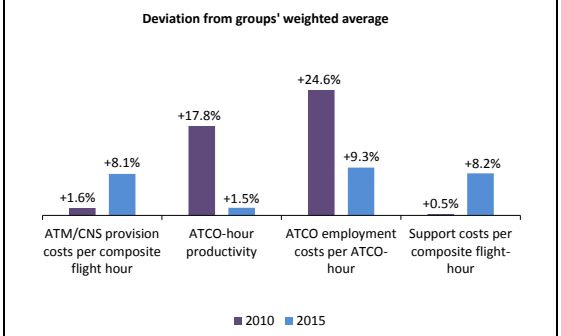
Changes in financial cost-effectiveness (2014-2015)



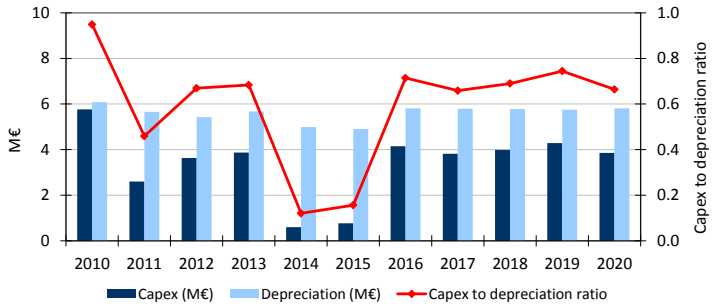
DCAC Cyprus (Cyprus) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS C: 2013*	RDPS C: 2013*	HMI C: 2013*	VCS C: 1998*
€19.5M (2003-2010)			€13.5M (2006-2018)	€8.9M (2006-2010)		2010				
€5.1M		€0.3M				2011				
						2012				
	€1.4M					2013				
						2014				
		€2.7M				2015				
€8.7M	€7.3M					2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Implementation of new ATM systems and purchase of new equipment in Nicosia ACC (LEFCO)	ATM	19.5	2003	2010
2	New Air Traffic Control Building in Nicosia	Buildings	8.9	2006	2010
3	Radar updates in Kiona	SUR	8.4	2006	2014
4	Top Sky	ATM	8.0	2016	2018
5	DATALINK	COM	4.0	2017	2018

DFS (Germany) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: Germany is within the EURO Zone

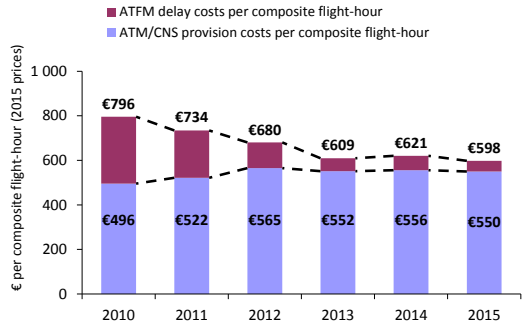
DFS represents 12.8% of European system gate-to-gate ATM/CNS provision costs

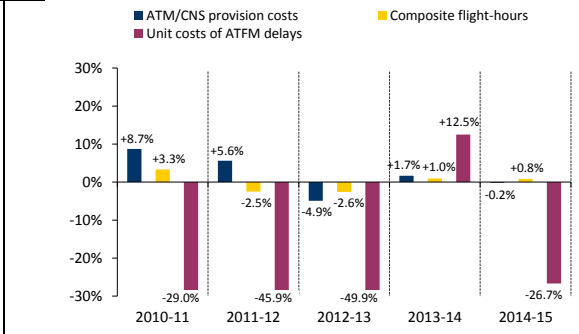
Operational conditions

Aggregated complexity score: Min — Max

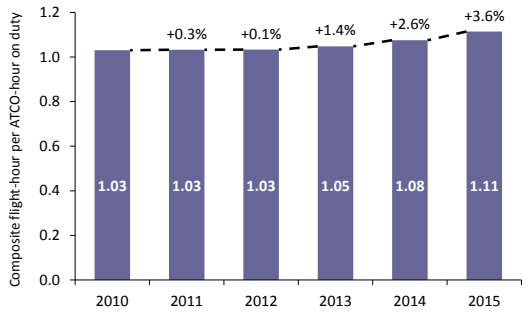
Seasonal traffic variability: Min — Max

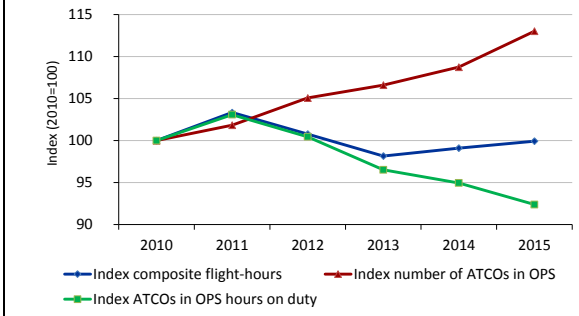
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



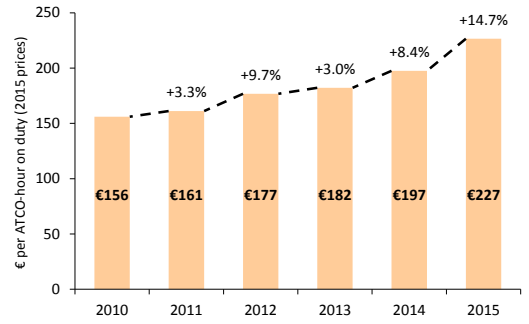


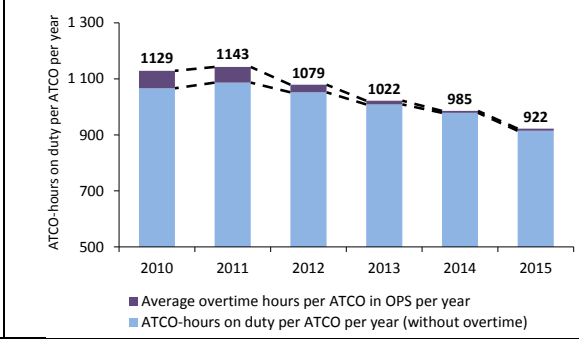
Trend in gate-to-gate ATCO-hour productivity



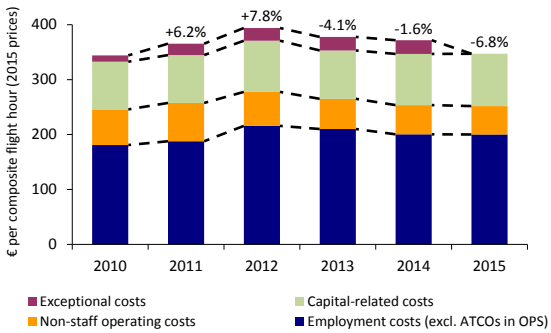


Trend in gate-to-gate employment costs per ATCO-hour

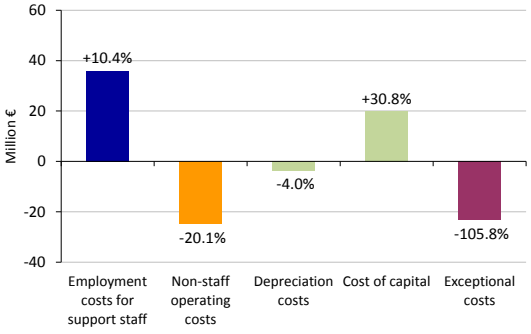




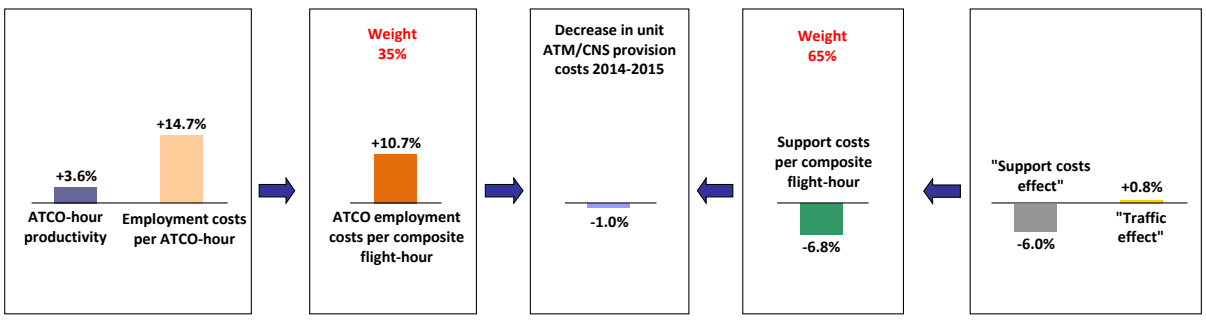
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

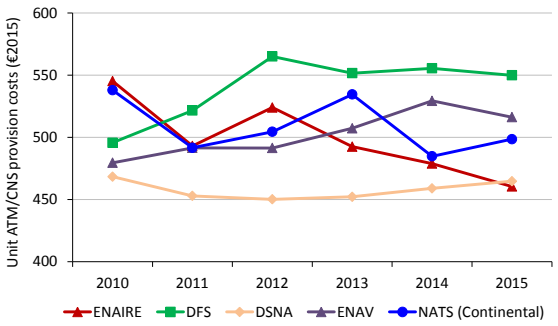


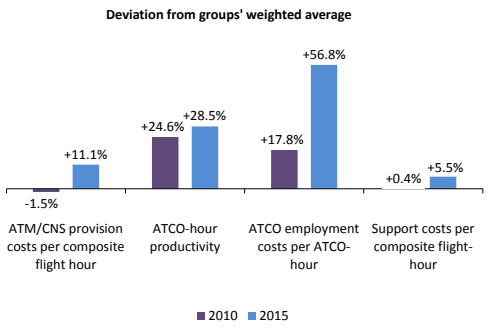
Changes in financial cost-effectiveness (2014-2015)



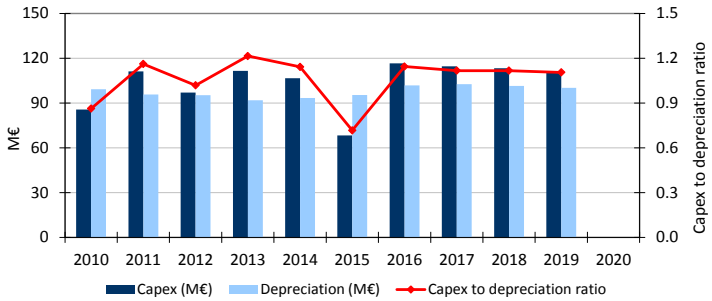
DFS (Germany) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2010 (Karl.) 2004 (Bremen) 1999 (Langen) 1999 (München)*	C: 2010 (Karl.) 2004 (Bremen) 1999 (Langen) 1999 (München)*	C: 2010 (Karl.) 2008 (Bremen) 2013 (Langen) 1999 (München)*	C: 2009 (Karl.) 2003 (Bremen) 2013 (Langen)*
€402.0M (2004-2023)	€108.9M (2007-2020)	€54.8M (1999-2022)	€185.2M (2006-2032)	€168.5M (2002-2018)		2010	Karlsruhe	Karlsruhe	Karlsruhe	
					€47.1M	2011			München	
						2012				
						2013			Langen München	
						2014	Bremen	Bremen	Bremen	
						2015	Karlsruhe Langen	Langen	Karlsruhe, München	Langen München
						2016	München	München		
						2017	Karlsruhe	Karlsruhe	Karlsruhe, Langen	Bremen
						2018				
						2019	Bremen	Bremen	Bremen	
						2020	München	München	München	

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Programme iCAS	ATM	268.5	2006	2023
2	MaRS - Modernisation and Replacement of Surveillance Infrastructure	SUR	159.3	2012	2032
3	Rasum 8.33 kHz	COM	61.1	2007	2020
4	ILS (Instrument Landing System)	NAV	54.8	1999	2022
5	Extension of München ACC	Buildings	51.8	2008	2016

DHMI (Turkey) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: 1 EUR = 3.020 TRY

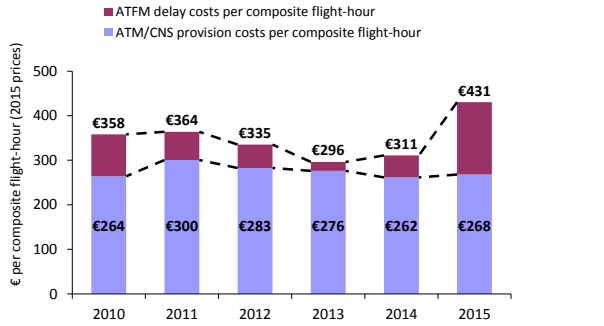
DHMI represents 5.3% of European system gate-to-gate ATM/CNS provision costs

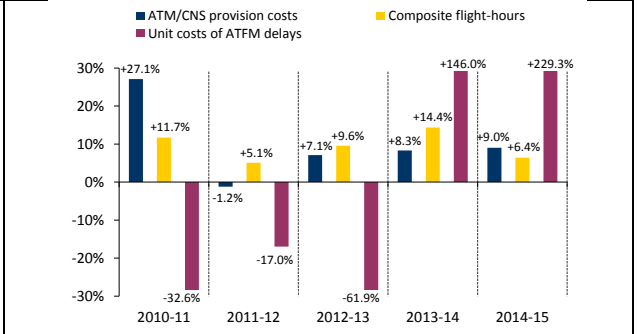
Operational conditions

Aggregated complexity score:

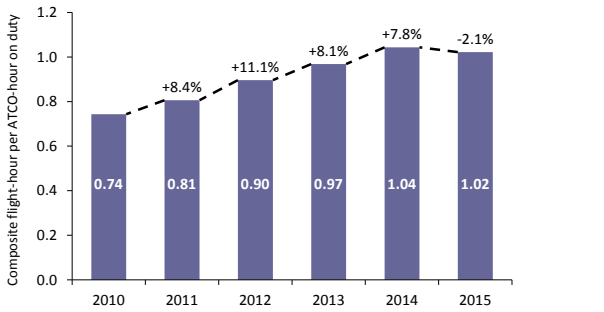
Seasonal traffic variability:

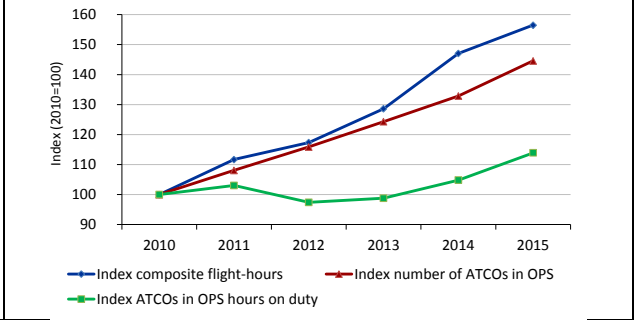
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



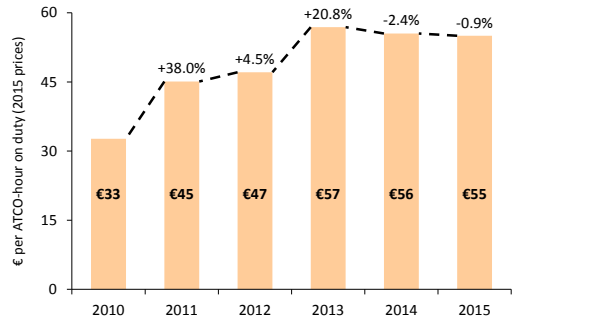


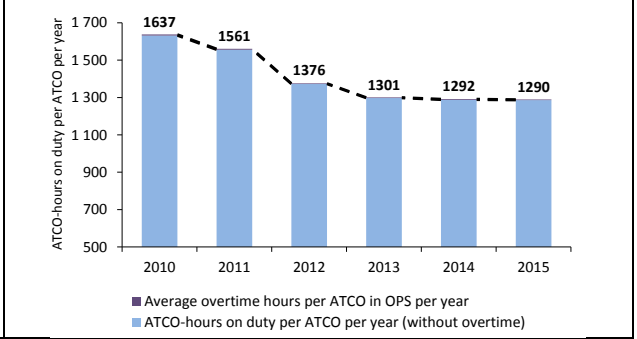
Trend in gate-to-gate ATCO-hour productivity



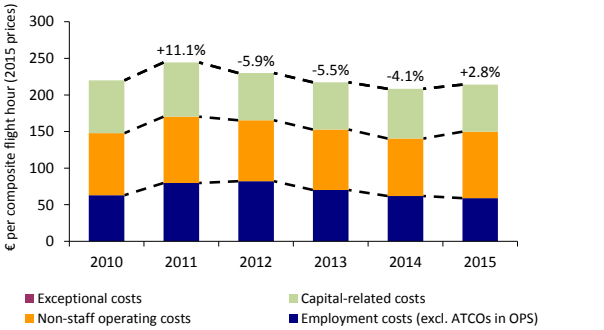


Trend in gate-to-gate employment costs per ATCO-hour

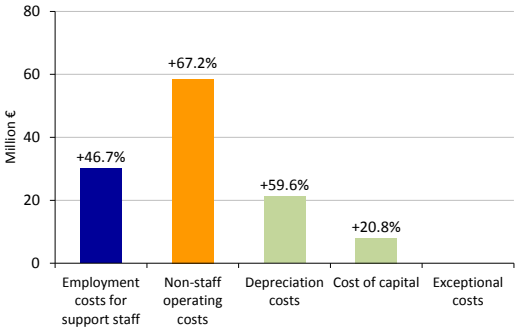




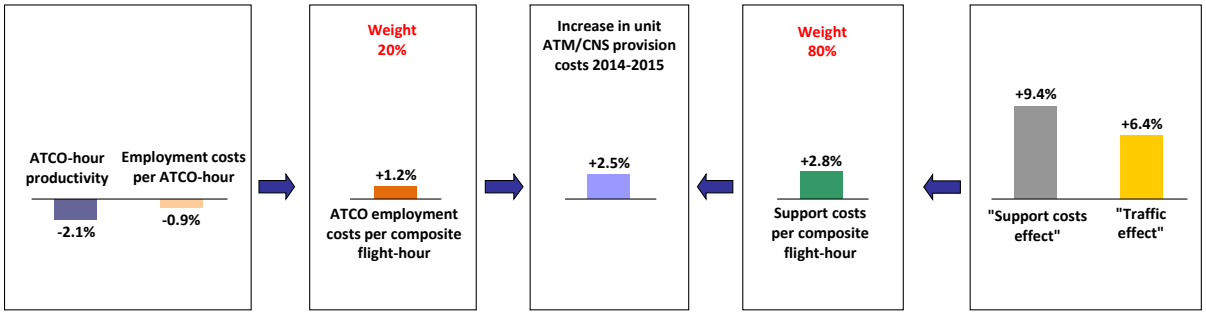
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

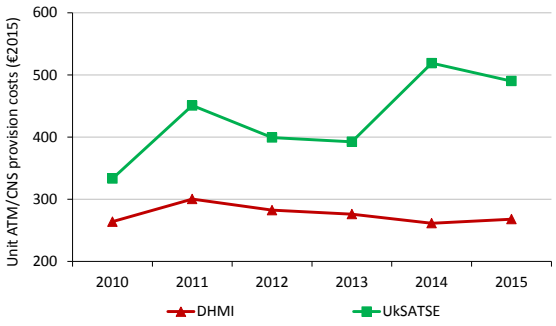


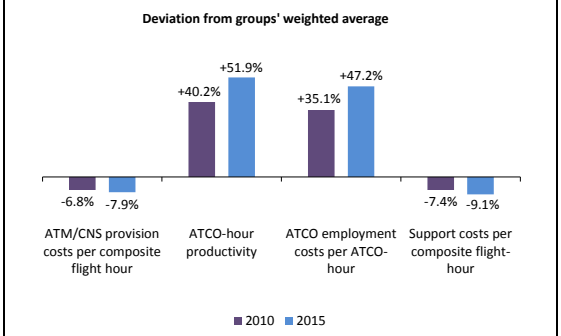
Changes in financial cost-effectiveness (2014-2015)



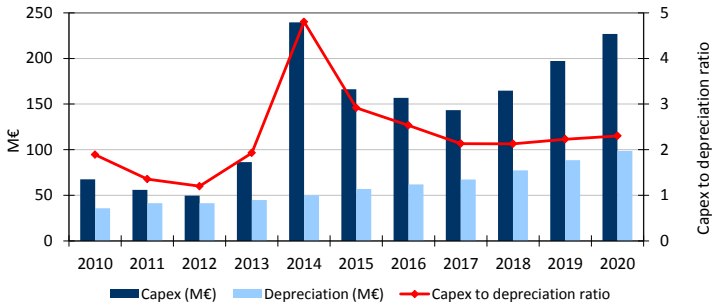
DHMI (Turkey) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2015 (All ACCs)*	C: 2015 (All ACCs)*	C: 2015 (All ACCs)*	C: 2015 (All ACCs)*
						2010				
						2011				All ACCs
						2012	All ACCs	All ACCs	All ACCs	
			€92.2M (2008-2016)		€4.7M	2013				
€358.6M (2008-2019)		€128.1M (2008-2019)		€79.1M (2008-2019)		2014				
						2015	All ACCs	All ACCs	All ACCs	All ACCs
						2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	SMART (Systematic Modernization of ATM Resources in Turkey)	ATM	112.5	2008	2016
2	ATC systems for central Ankara ACC and ATC complexes	ATM	101.3	2008	2016
3	Air Traffic System R & D Projects	ATM	64.8	2010	2019
4	Construction of air navigation technical blocks	Buildings	59.2	2008	2019
5	Air navigation, communication and terminal systems periodic modernisation	NAV	48.2	2010	2018

DSNA (France) – Cost-effectiveness KPIs (€2015)

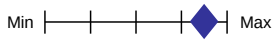
Contextual economic information

Exchange rate: France is within the EURO Zone

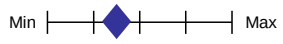
DSNA represents 15.3% of European system gate-to-gate ATM/CNS provision costs

Operational conditions

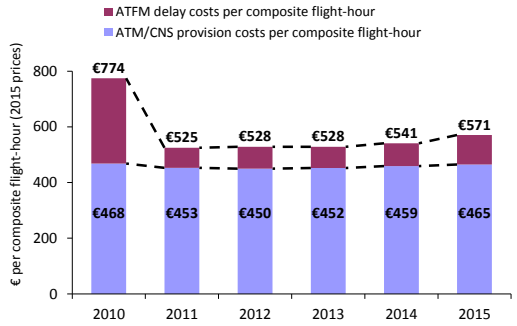
Aggregated complexity score:

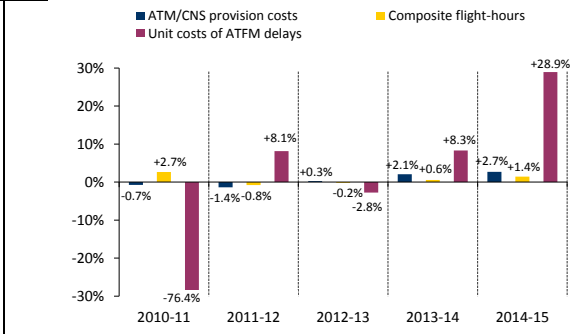


Seasonal traffic variability:

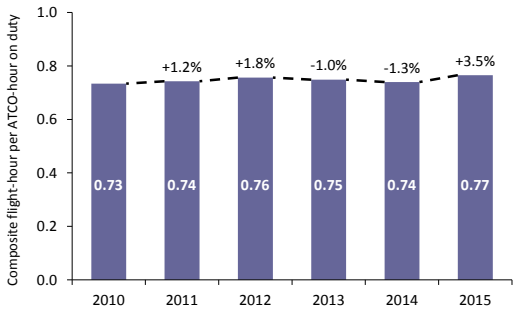


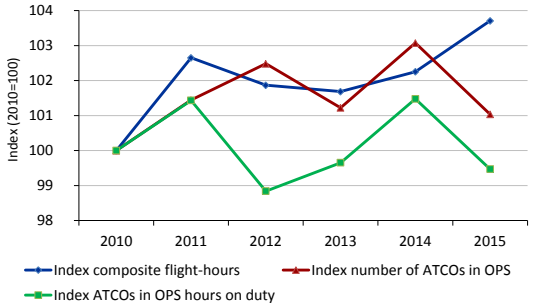
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



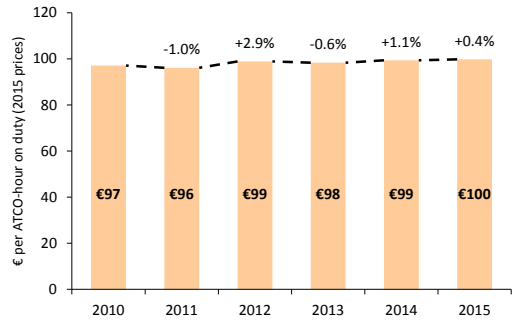


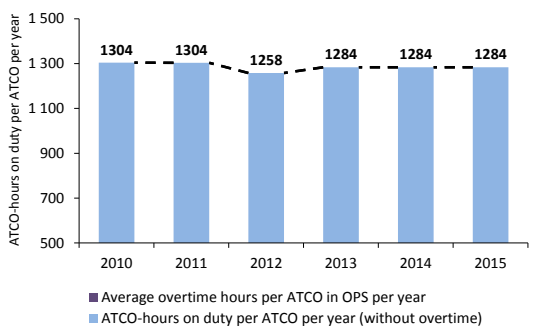
Trend in gate-to-gate ATCO-hour productivity



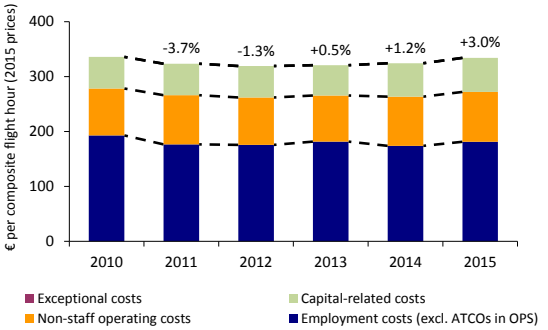


Trend in gate-to-gate employment costs per ATCO-hour

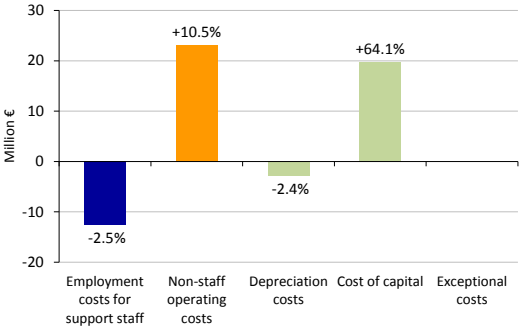




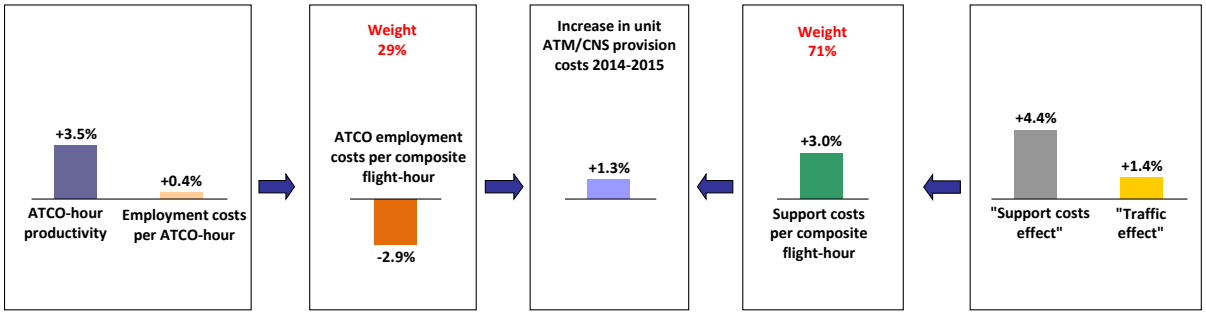
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

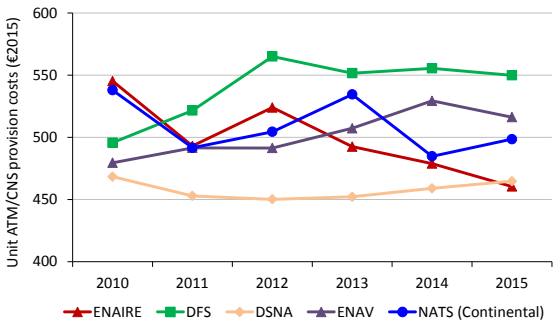


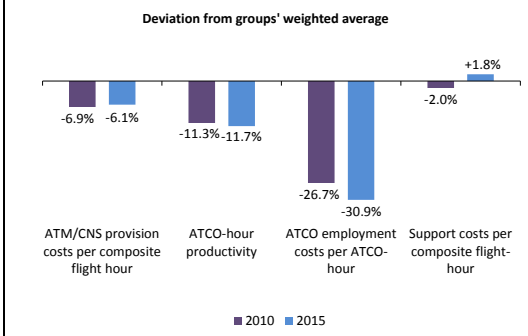
Changes in financial cost-effectiveness (2014-2015)



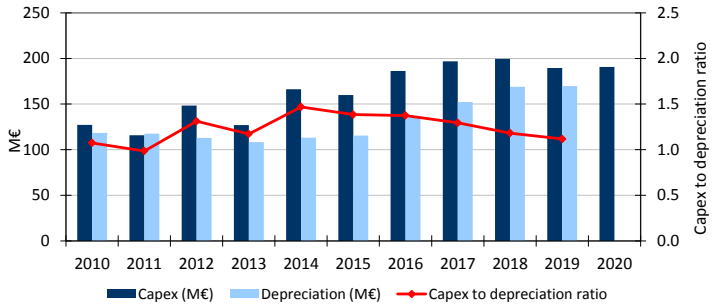
DSNA (France) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 1982 (All ACCs)*	C: 1982 (All ACCs)*	C: 2000 (All ACCs)*	C: 2000/2003 (All ACCs)*
€1 188.8M (2003-2025)	€206.6M (2003-2023)	€81.4M (2008-2020)	€27.4M		€361.2M	2010				
						2011				
						2012				
						2013				
						2014				
						2015				
						2016			Bordeaux, Brest	
						2017				
						2018				
						2019	Marseille, Reims	Marseille, Reims	Marseille, Reims	
						2020	Paris	Paris	Paris	

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	4-FLIGHT (New ATM system integrating COFLIGHT, Java HMI and advanced ATC tools in an electronic environment)	ATM	549.0	2003	2021
2	COFLIGHT (Automatic flight plan processing system forming the core of 4-flight)	ATM	273.6	2003	2021
3	SYSAT (systems for APP and TWR)	ATM	248.0	2012	2025
4	ERATO (stripless system designed in an all-electronic environment with innovative MTCD functionalities)	ATM	118.2	2003	2021
5	CSSIP (Ground to ground communications through Internet Protocol)	COM	113.0	2005	2019

EANS (Estonia) – Cost-effectiveness KPIs (€2015)

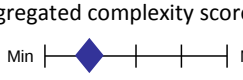
Contextual economic information

Exchange rate: Estonia is within the EURO Zone

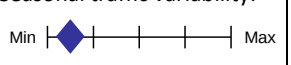
EANS represents 0.2% of European system gate-to-gate ATM/CNS provision costs

Operational conditions

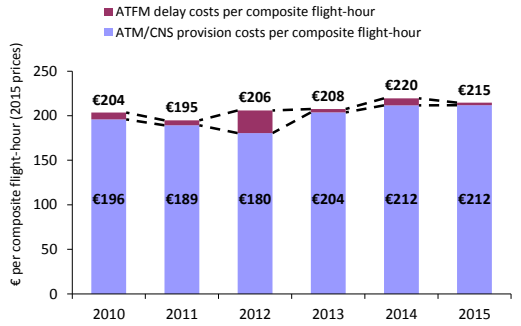
Aggregated complexity score:

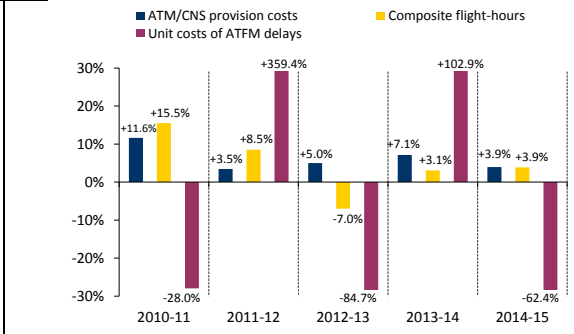


Seasonal traffic variability:

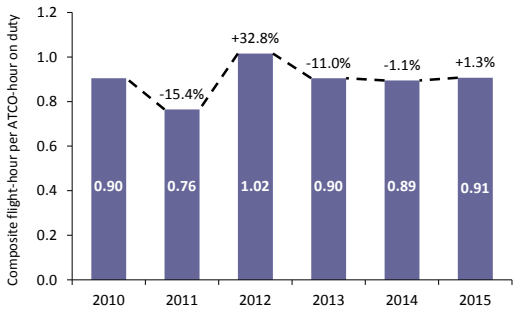


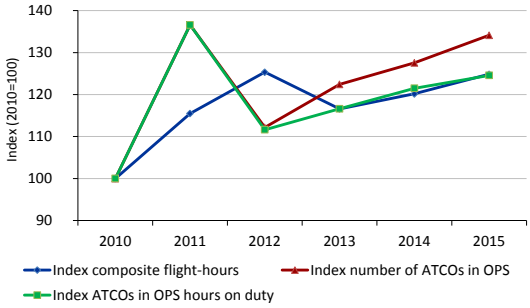
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



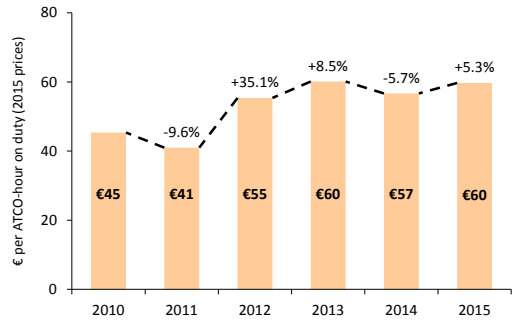


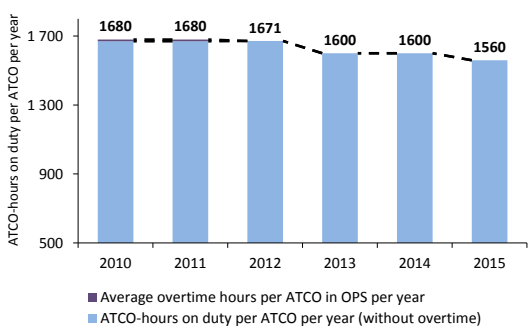
Trend in gate-to-gate ATCO-hour productivity



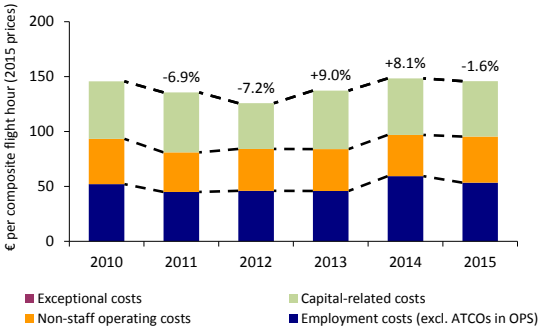


Trend in gate-to-gate employment costs per ATCO-hour

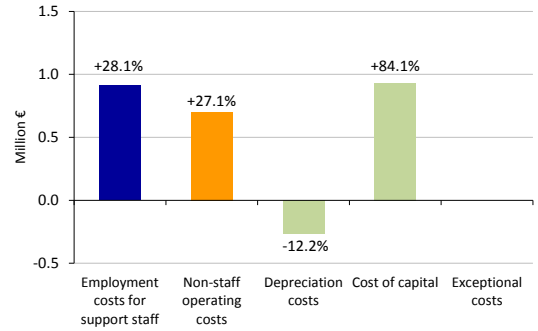




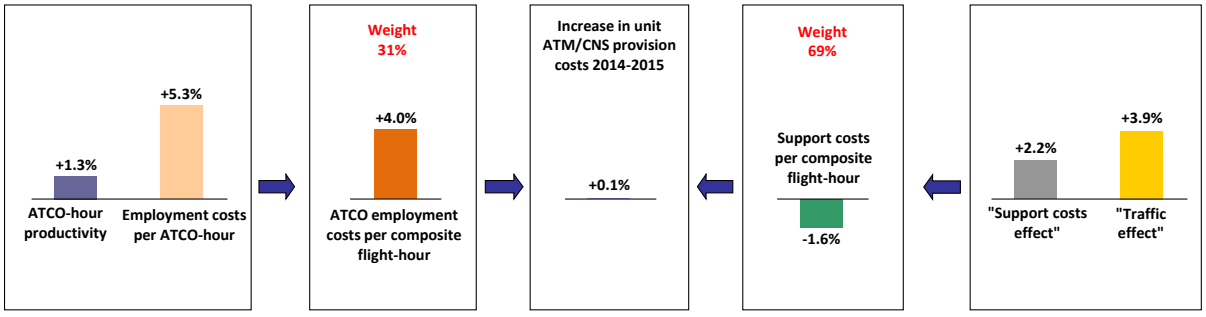
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

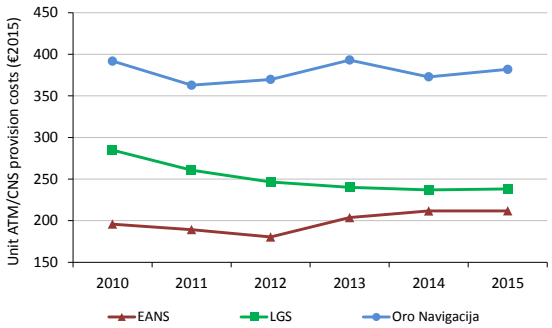


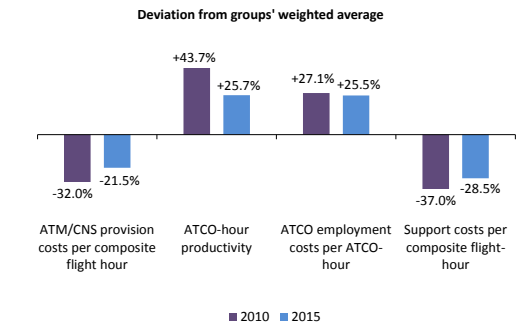
Changes in financial cost-effectiveness (2014-2015)



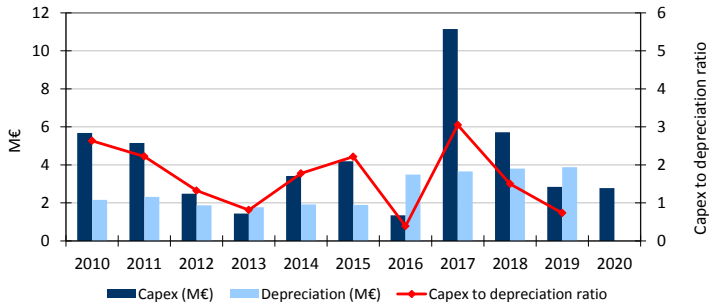
EANS (Estonia) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2012*	C: 2012*	C: 2012*	C: 2012*
€9.0M (2009-2012)		€1.0M				2010				
				€0.2M		2011				
						2012				
						2013				
						2014				
€7.3M	€1.8M	€1.0M	€1.4M	€1.3M	€0.8M	2015				
						2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Replacement EUROCAT ATM system in Tallinn ACC (including new ATCO	ATM	8.0	2009	2012
2	Expenses in ATM system covering: Cross-border operations, FRA, FUA, data recording/storage, CPDLC, messages exchange with CFMU, Tallinn Airport operations, FASTI tools, software environment for management processes	ATM	7.3	2015	2019
3	Communication, including: G-G voice upgrade with St-Petersburg ATCC, implementation of DTIS and DLC messages for Tallinn airport	COM	1.8	2015	2019
4	Expenses in surveillance, including: expansion of Tallinn airport SMR-MLAT infrastructure, exchange of surveillance data, installation of Tallinn FIR WAM system	SUR	1.4	2015	2019
5	Maintenance of buildings and installations (CNS-ATM equipment and ANS operations), technical upgrade of installations for meeting security, environment, fire etc. regulations	Buildings	1.3	2015	2017

ENAIRE (Spain) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: Spain is within the EURO Zone

ENAIRE represents 9.3% of European system gate-to-gate ATM/CNS provision costs

Operational conditions

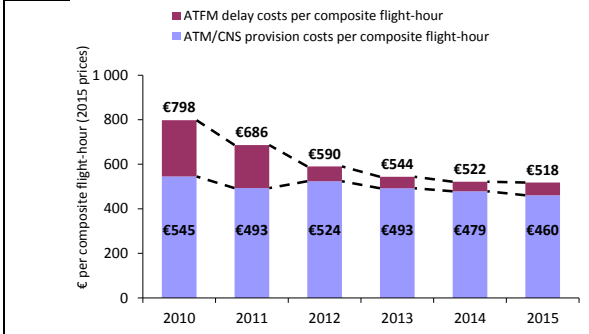
Aggregated complexity score:

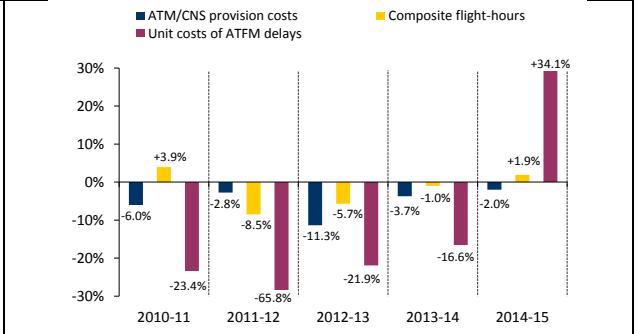
Min — Max

Seasonal traffic variability:

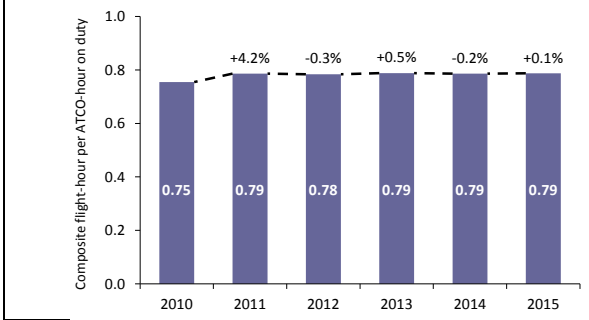
Min — Max

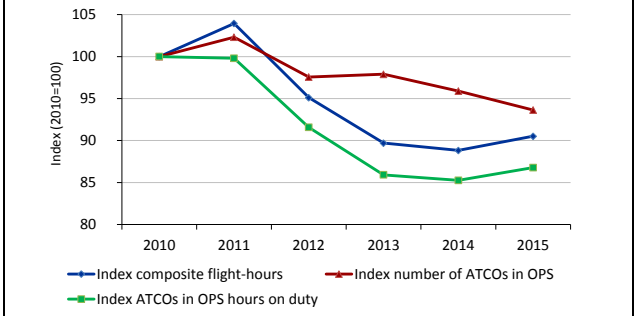
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



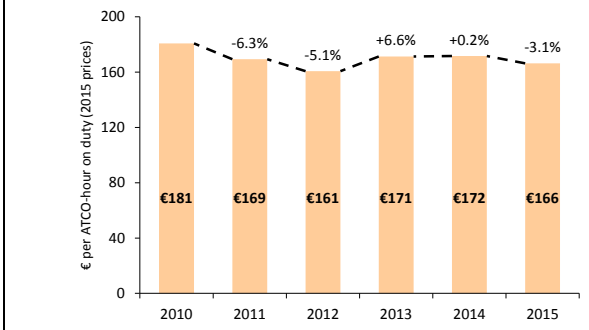


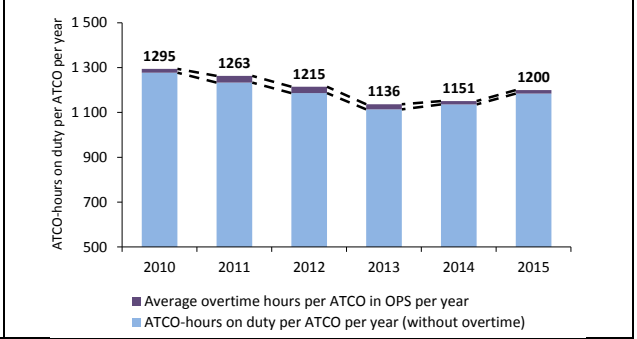
Trend in gate-to-gate ATCO-hour productivity



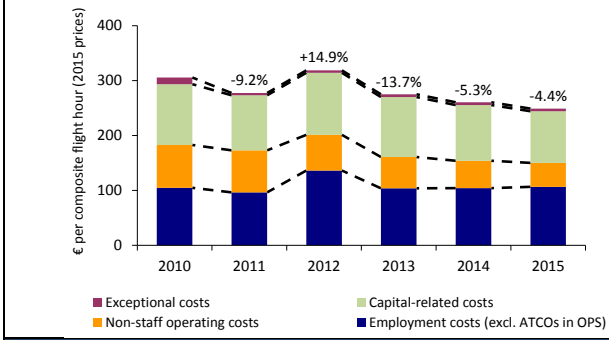


Trend in gate-to-gate employment costs per ATCO-hour

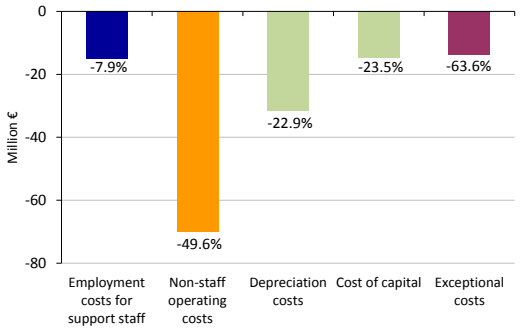




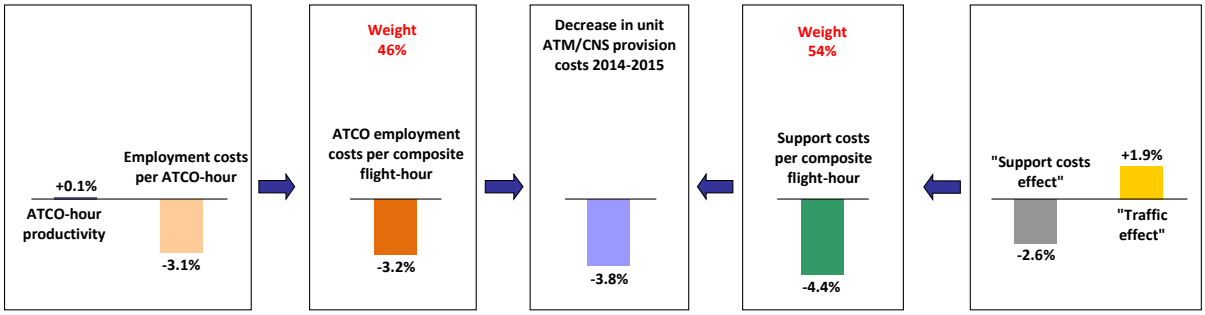
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

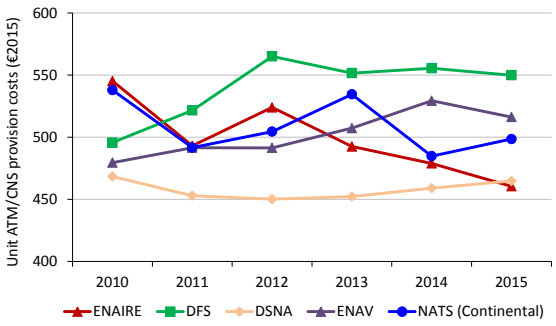


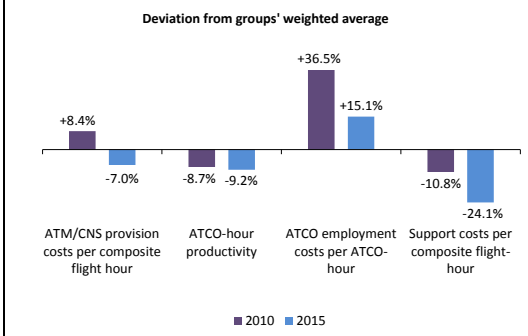
Changes in financial cost-effectiveness (2014-2015)



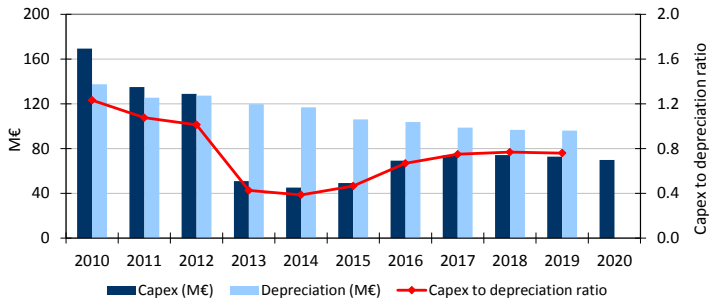
ENAIRE (Spain) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2006 (all ACCs)*	C: 2006 (all ACCs)*	C: 2006 (all ACCs)*	C: 2000 (All ACCs-TMA) 2002 (All ACCs-En-route)*
						2010	All ACCs	All ACCs	All ACCs	Barcelona
						2011				Madrid, Sevilla
						2012	All ACCs	All ACCs	All ACCs	
						2013				
						2014				Canarias
€170.3M	€54.8M	€34.8M	€17.8M		€98.9M	2015				
						2016	Canarias	Canarias	Canarias	Canarias
						2017	Barcelona, Madrid, Palma, Sevilla	Barcelona, Madrid, Palma, Sevilla	Barcelona, Madrid, Palma, Sevilla	
						2018				
						2019				Madrid
						2020				

* C = Commissioning Upgrade Replacement

**Information on major capex projects is based on data provided in South West FAB National Performance Plan for RP2 (2015-2019)

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	iTEC – Flight Data Processing	ATM/NAV	50.8	2015	2020
2	COMETA – Voice over Internet Protocol	ATM/NAV	42.8	2015	2020
3	SURVEILLANCE EVOLUTION – Mode-S, ADS-B	SUR	17.8	2015	2019
4	REDAN – Data Network	ATM/COM/NAV	16.1	2015	2018
5	8.33 – Communication Channels	ATM/COM/NAV	11.4	2015	2018

ENAV (Italy) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: Italy is within the EURO Zone

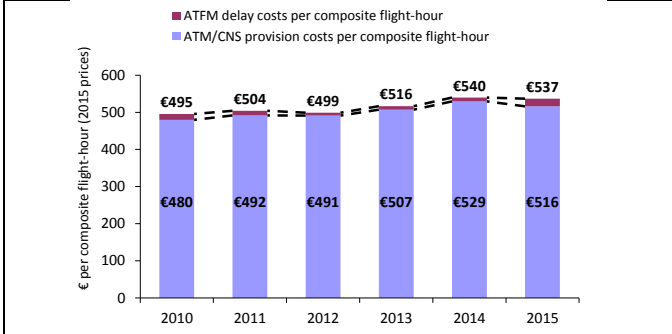
ENAV represents 8.5% of European system gate-to-gate ATM/CNS provision costs

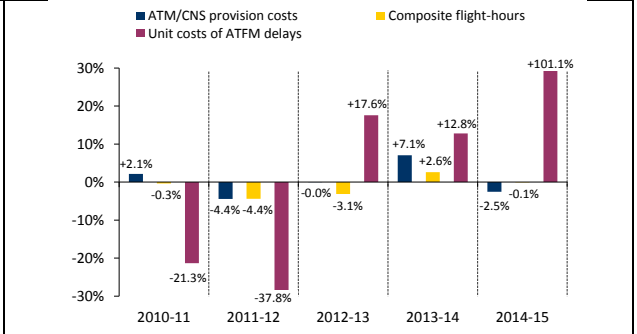
Operational conditions

Aggregated complexity score: Min — Max

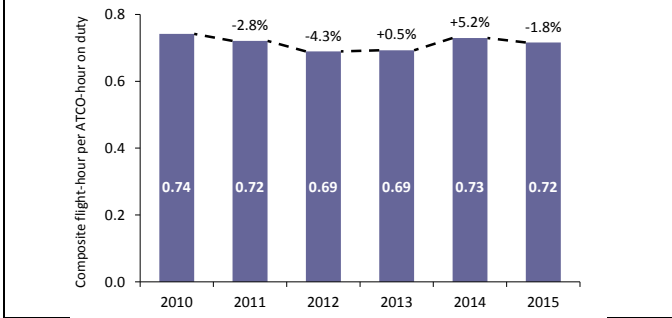
Seasonal traffic variability: Min — Max

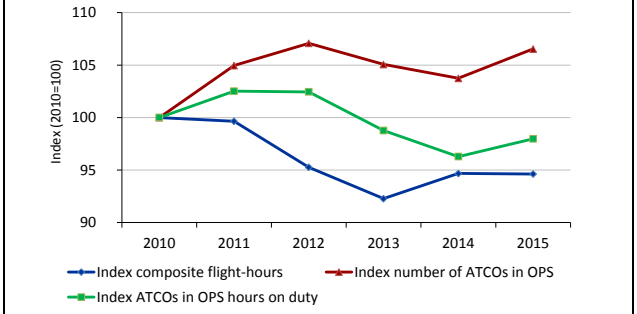
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



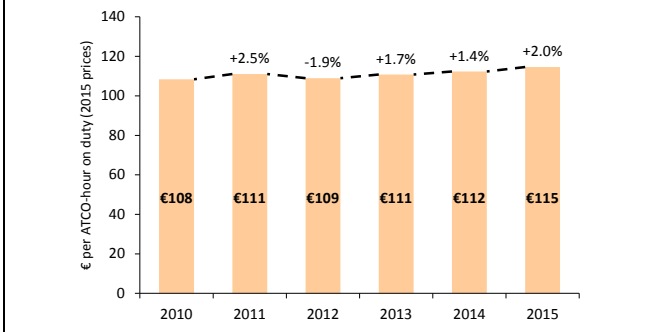


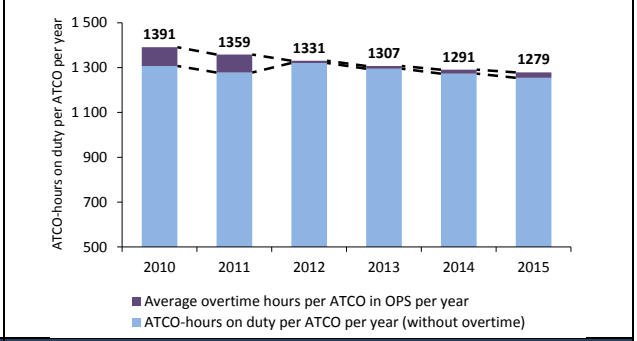
Trend in gate-to-gate ATCO-hour productivity



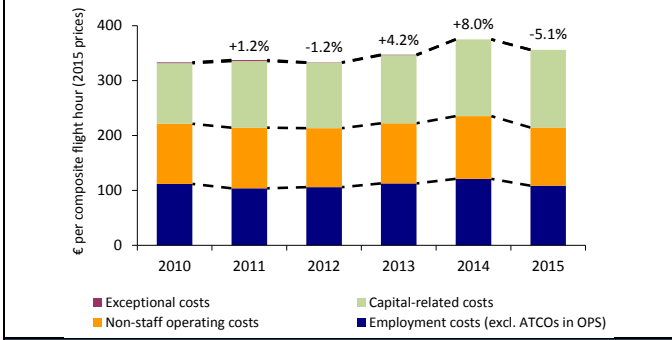


Trend in gate-to-gate employment costs per ATCO-hour

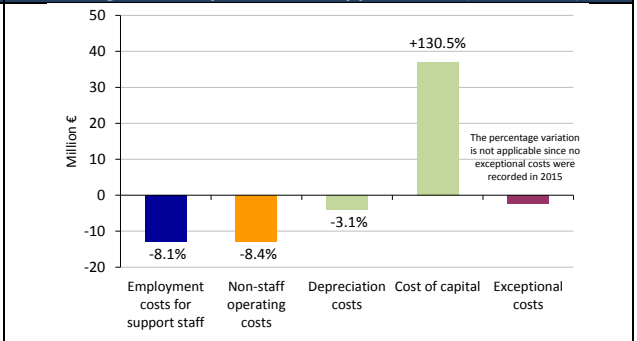




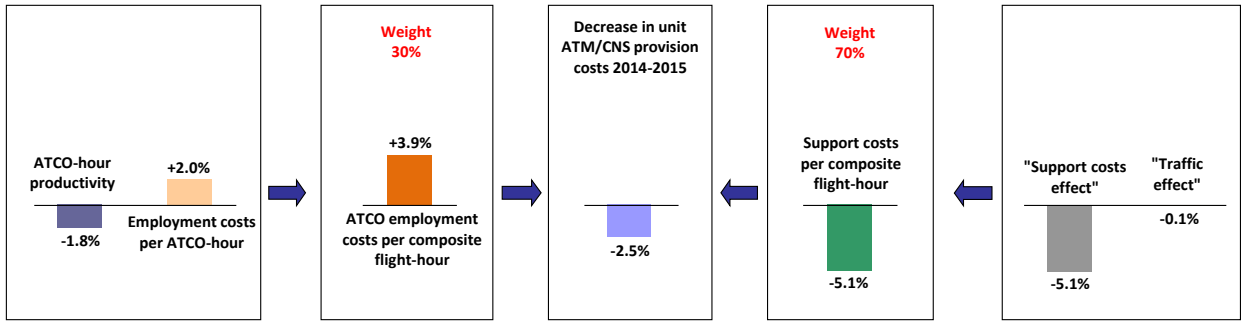
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

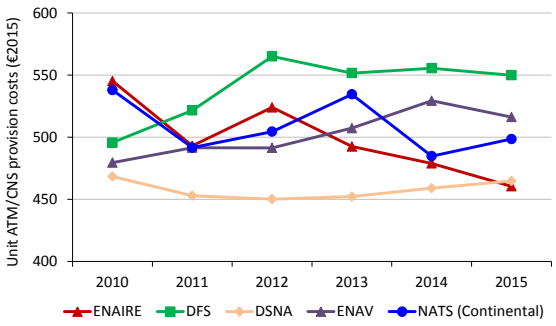


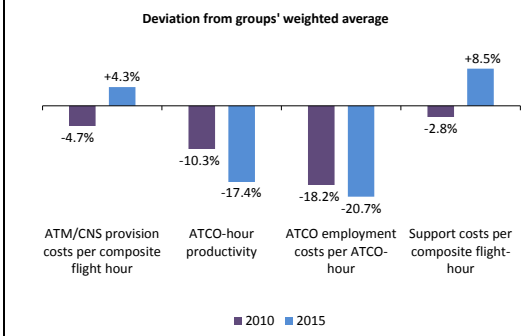
Changes in financial cost-effectiveness (2014-2015)



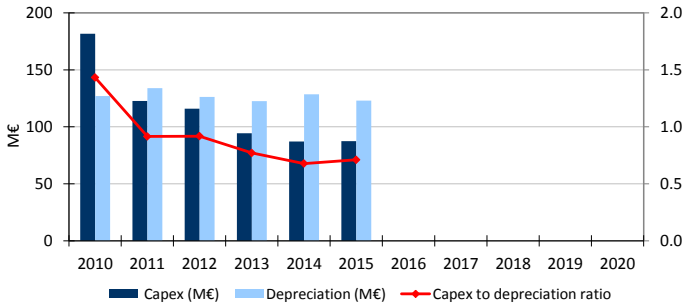
ENAV (Italy) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 1999 (All ACCs)*	C: 1999 (All ACCs)*	C: 1999 (All ACCs)*	C: 2000 (Roma) 2001 (Padova) 2005 (Brindisi, Mil.)*
						2010				
						2011				
						2012				
						2013	Roma	Roma	Roma	Roma
						2014	Padova, Milano	Padova, Milano	Padova, Milano	Padova, Milano
						2015	Brindisi	Brindisi	Brindisi	Brindisi
€173.7M	€52.3M		€25.6M		€319.1M	2016	Roma, Padova, Brindisi, Milano	Roma, Padova, Brindisi, Milano	Roma, Padova, Brindisi, Milano	Roma, Padova, Brindisi, Milano
						2017				
						2018				
						2019	All ACCs	All ACCs	All ACCs	All ACCs
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Development of an integrated platform for the management of ATM procedures and aeronautical data (program 4-FLIGHT)	ATM	119.9	2016	2019
2	COFLIGHT (Automatic flight plan processing system forming the core of 4-FLIGHT)	ATM	26.7	2016	2019
3	ENET + ENET Completion	COM	21.0	2016	2019
4	Implementation of Datalink 2000+ system in all ACCs and major Italian airports	COM	16.2	2016	2017
5	Advanced Surface Movement Guidance and Control System Level 2	SUR	10.7	2016	2019

Finavia (Finland) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: Finland is within the EURO Zone

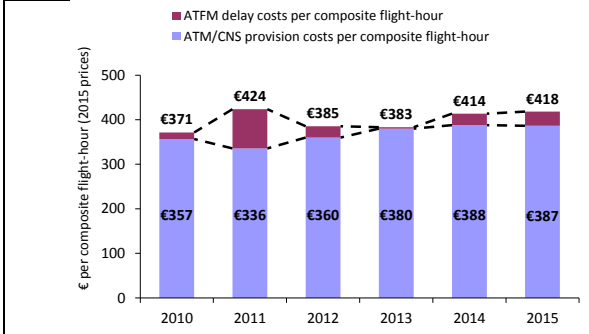
Finavia represents 0.8% of European system gate-to-gate ATM/CNS provision costs

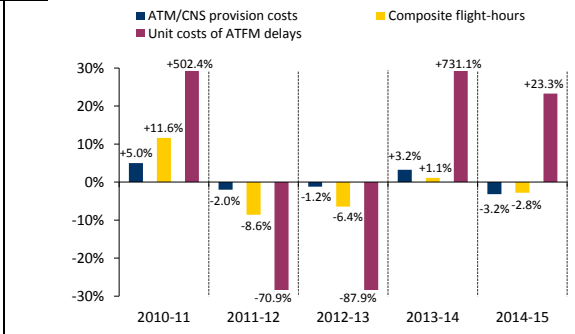
Operational conditions

Aggregated complexity score: Min — Max

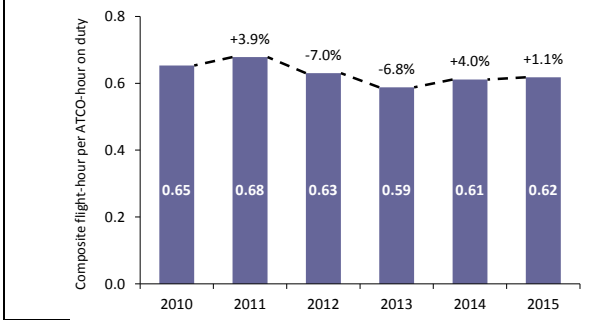
Seasonal traffic variability: Min — Max

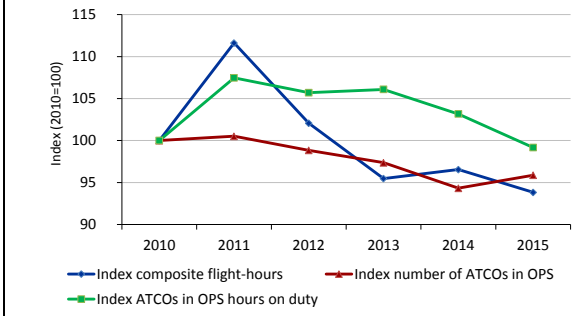
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



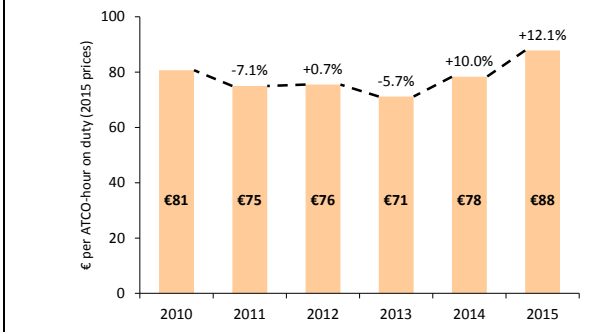


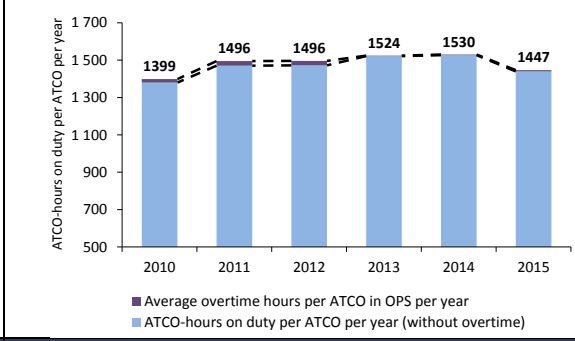
Trend in gate-to-gate ATCO-hour productivity



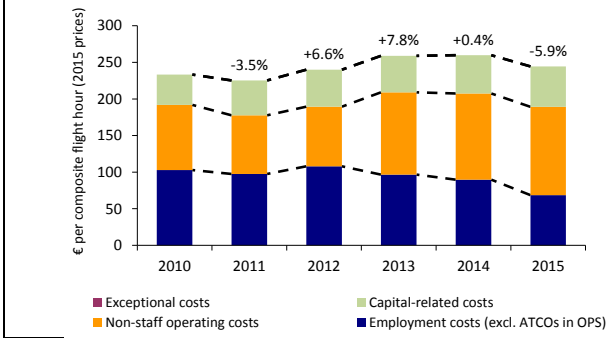


Trend in gate-to-gate employment costs per ATCO-hour

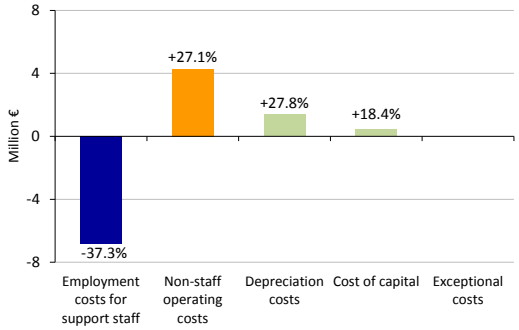




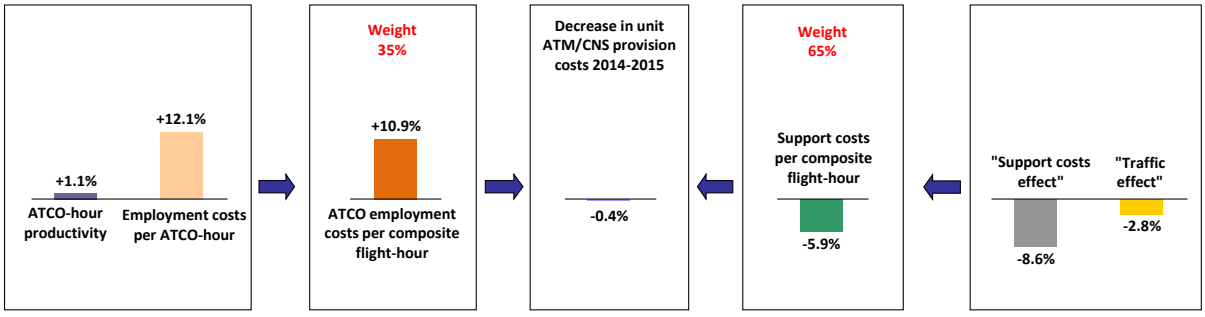
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

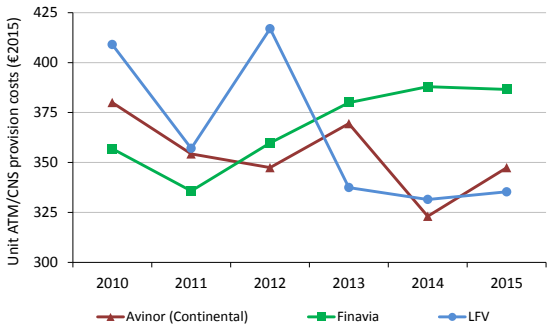


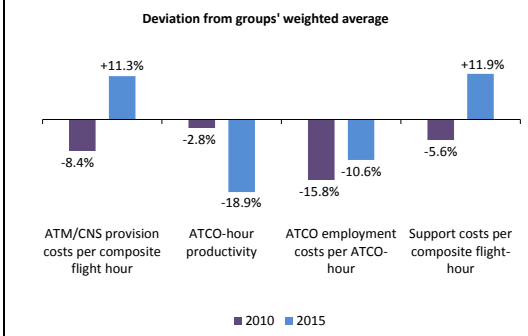
Changes in financial cost-effectiveness (2014-2015)



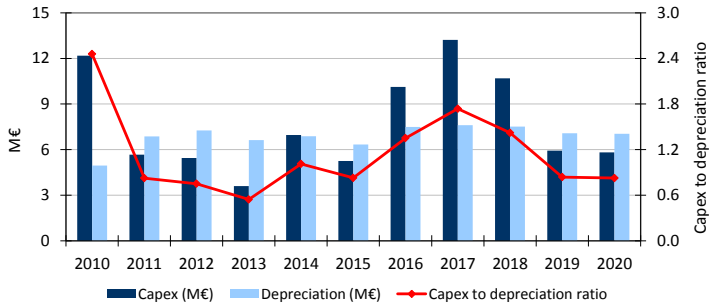
Finavia (Finland) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS C: 2012*	RDPS C: 2012*	HMI C: 2012*	VCS C: 2009*
€13.8M (2009-2013)						2010				
	€1.0M		€21.1M			2011				
						2012				
						2013				
€21.3M		€10.4M				2014				
						2015				
	€12.9M					2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Replacement of ATM systems at Tampere and Helsinki Centres	ATM	13.8	2009	2013
2	ILS/DME renewal (all airports)	NAV	10.4	2014	2019
3	MSSR-renewal for Helsinki, Rovaniemi, Tampere-Pirkkala, Kuopio, Jyvaskyla and Turku airports	SUR	9.6	2016	2019
4	VHF radio stations (8.33 kHz-channel spacing > FL195)	COM	8.9	2016	2018
5	ATM system upgrades	ATM	8.0	2016	2020

HCAA (Greece) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: Greece is within the EURO Zone

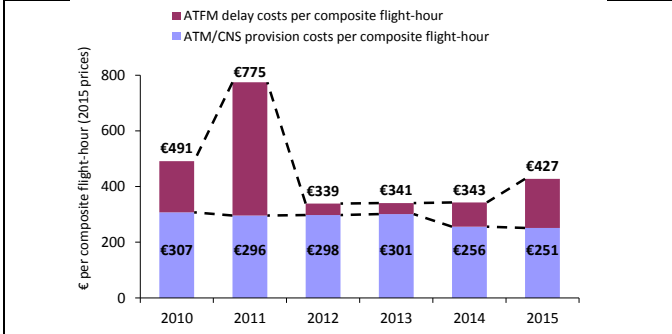
HCAA represents 1.9% of European system gate-to-gate ATM/CNS provision costs

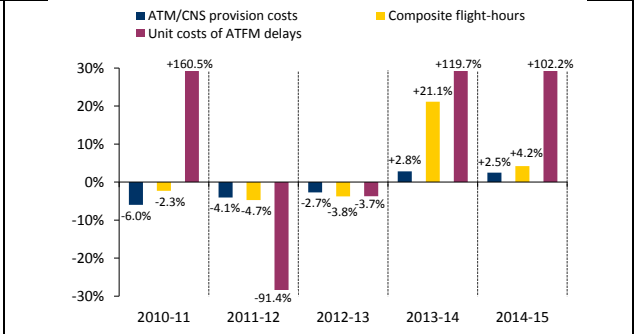
Operational conditions

Aggregated complexity score: Min — Max

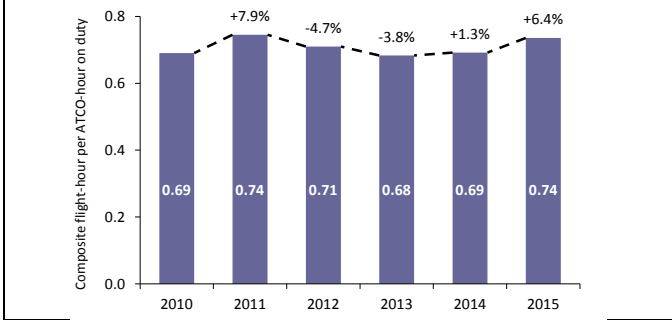
Seasonal traffic variability: Min — Max

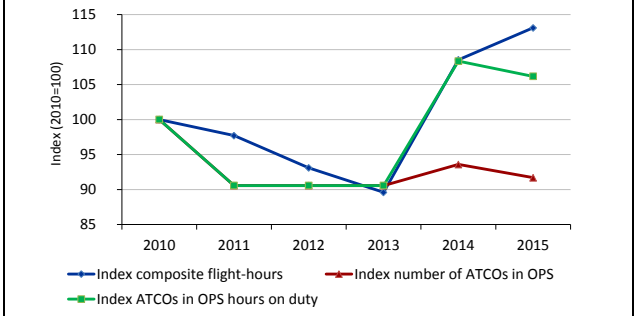
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



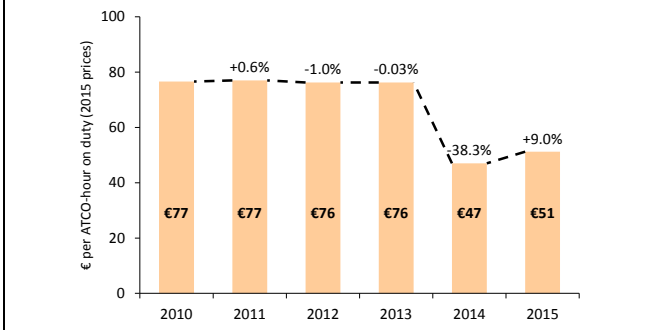


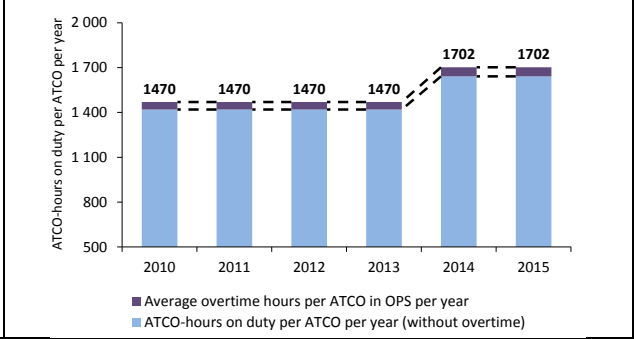
Trend in gate-to-gate ATCO-hour productivity



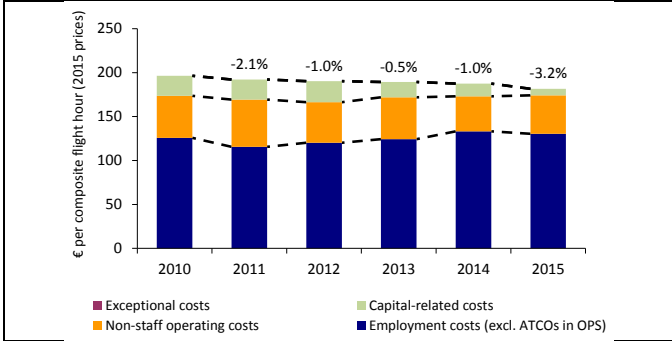


Trend in gate-to-gate employment costs per ATCO-hour

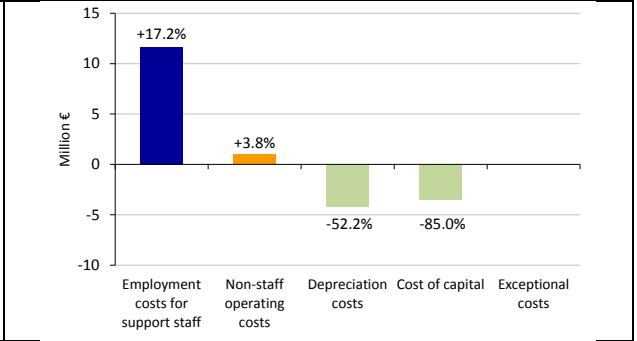




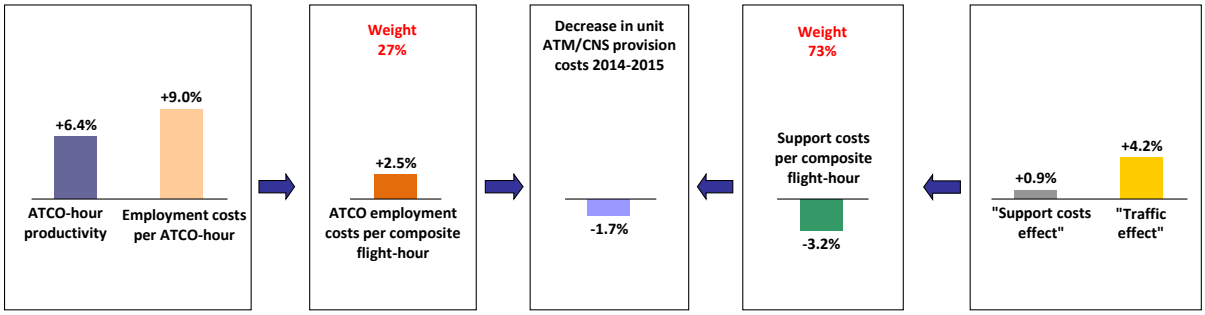
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

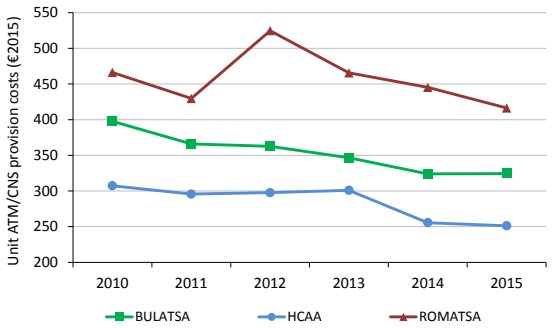


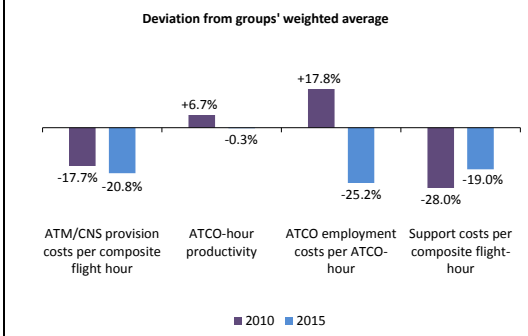
Changes in financial cost-effectiveness (2014-2015)



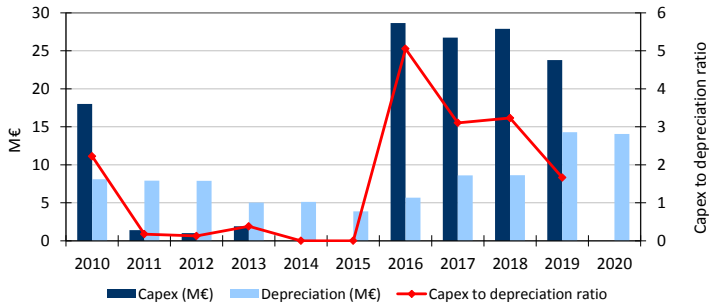
HCAA (Greece) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2000*	C: 2000*	C: 2000*	C: 1998*
€6.3M (2009-2014)						2010				
						2011				
						2012				
						2013				
						2014				
€101.5M						2015				
	€15.7M					2016				
		€8.9M	€18.1M			2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Procurement of new SDPS, FDPS & ODS system (PALLAS)	ATM	37.9	2017	2020
2	Replacement of 4 radar (PSR/EMS) systems (Thessaloniki, Iraklion, Rodos and Kerrkira airports)	ATM	19.7	2017	2020
3	Partial replacement of CNS systems at Athinai Airport	ATM	12.3	2017	2020
4	Upgrade of PALLAS system (FDPS, RDPS, ODS, HMI)	ATM	10.0	2015	2018
5	Replacement of VCS/RCS system for Athinai/Makedonia	ATM	9.5	2017	2020

HungaroControl (Hungary) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: 1 EUR = 309.475 HUF

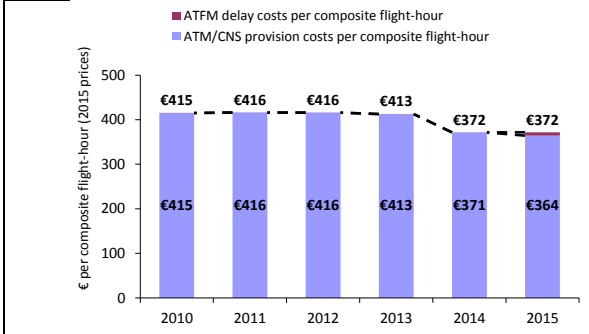
HungaroControl represents 1.2% of European system gate-to-gate ATM/CNS provision costs

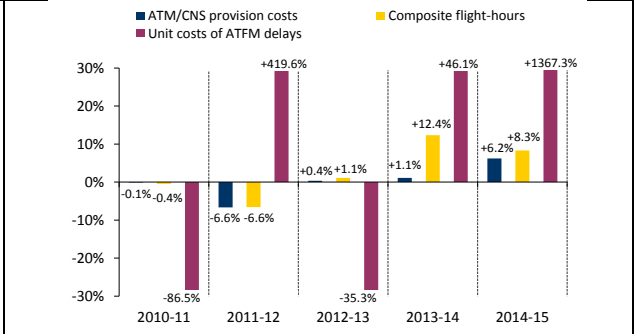
Operational conditions

Aggregated complexity score: Min — Max

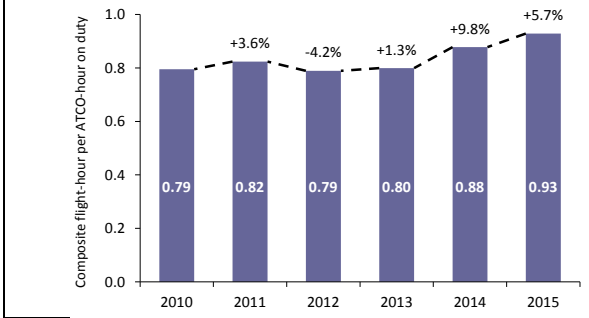
Seasonal traffic variability: Min — Max

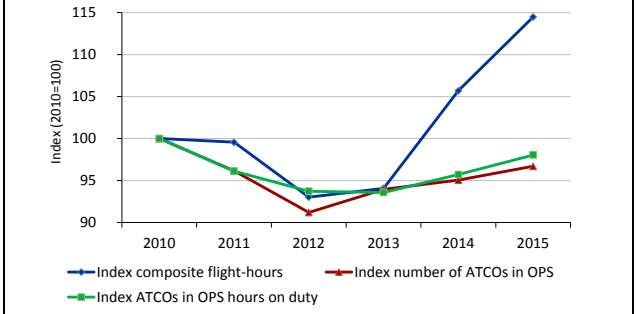
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



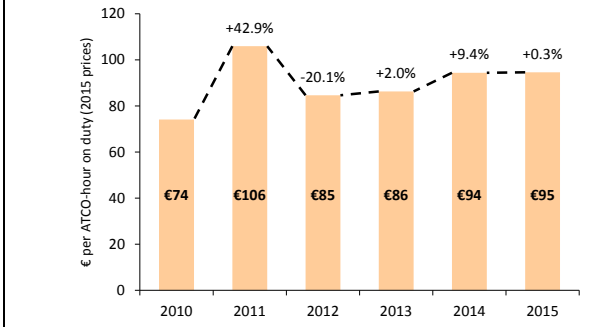


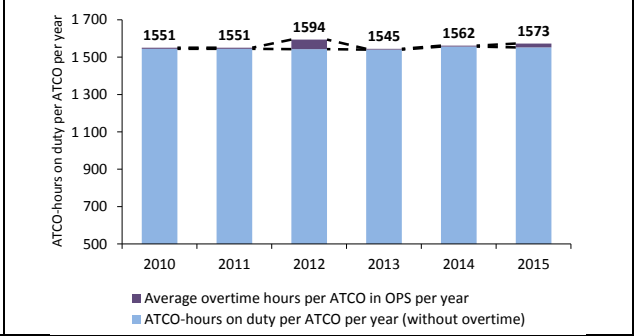
Trend in gate-to-gate ATCO-hour productivity



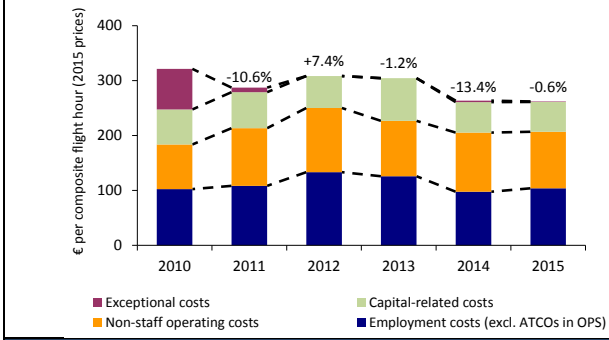


Trend in gate-to-gate employment costs per ATCO-hour

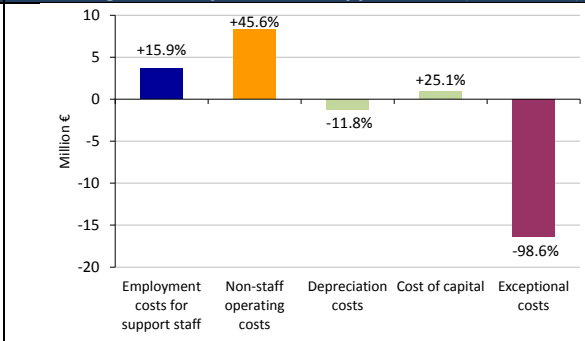




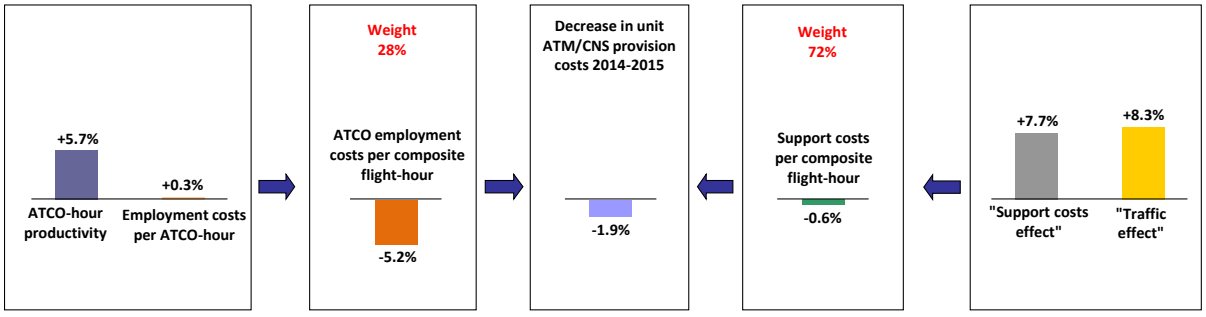
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

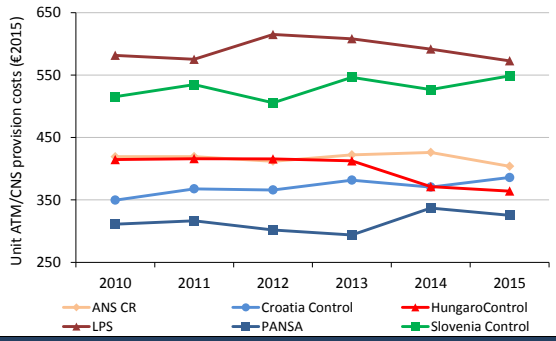


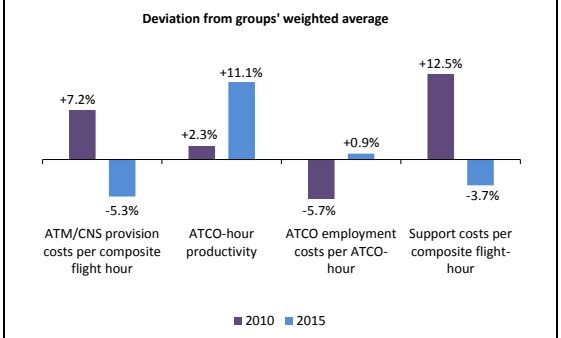
Changes in financial cost-effectiveness (2014-2015)



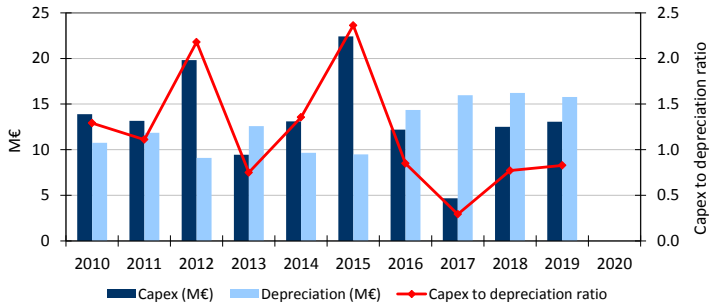
HungaroControl (Hungary) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS C: 2012*	RDPS C: 2012*	HMI C: 2012*	VCS C: 2012*
€82.9M (2008-2019)	€12.4M	€1.9M	€7.2M	€23.6M	€0.7M	2010				
						2011				
						2012				
						2013				
						2014				
						2015				
						2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Matias build 12	ATM	19.1	2018	2019
2	MATIAS SW/HW upgrade (ANS III project)	ATM	19.1	2009	2012
3	ANS III Building (ANS III project)	Buildings	14.1	2010	2012
4	Matias build 11.2	ATM	9.5	2017	2018
5	ANS I (Contingency)	Buildings	9.5	2013	2016

IAA (Ireland) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: Ireland is within the EURO Zone

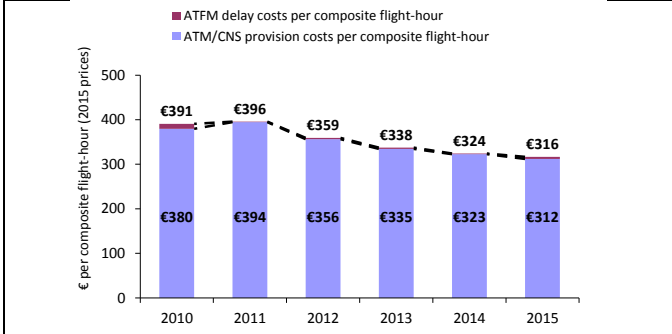
IAA represents 1.3% of European system gate-to-gate ATM/CNS provision costs

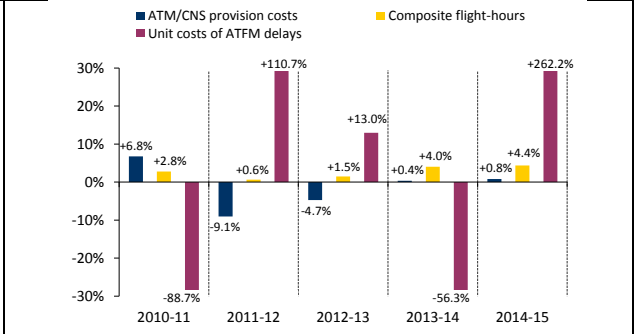
Operational conditions

Aggregated complexity score: Min — Max

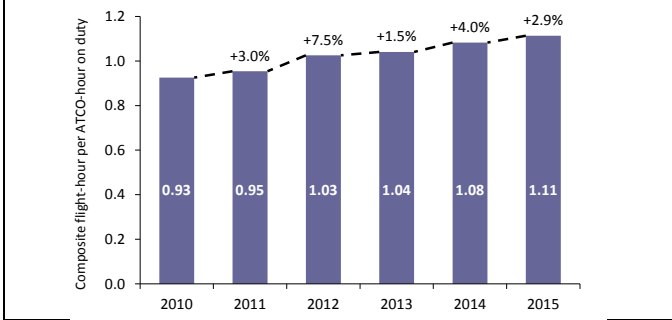
Seasonal traffic variability: Min — Max

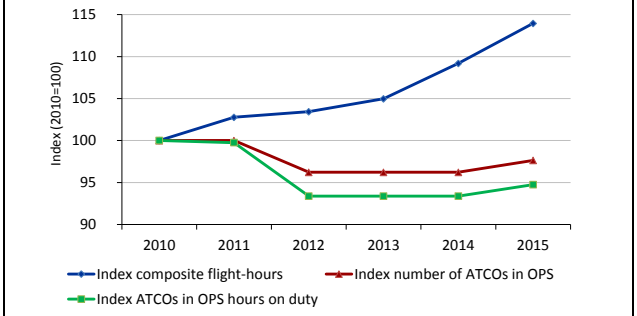
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



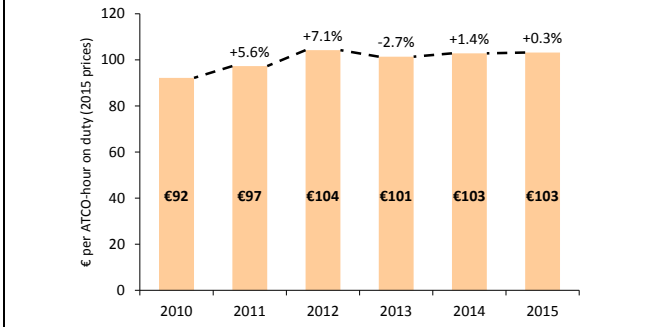


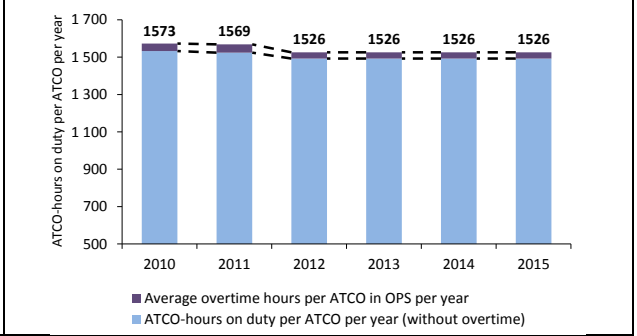
Trend in gate-to-gate ATCO-hour productivity



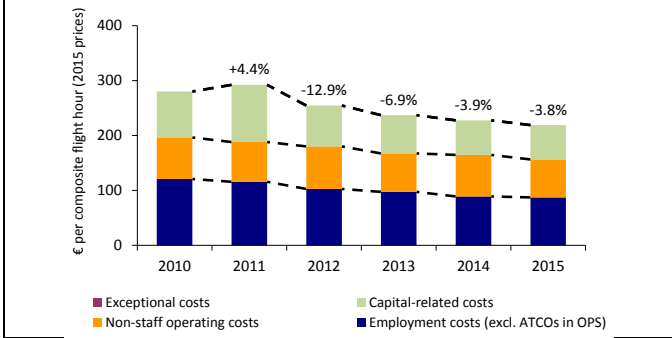


Trend in gate-to-gate employment costs per ATCO-hour

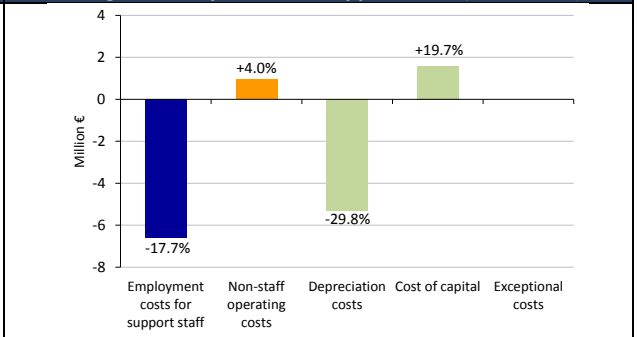




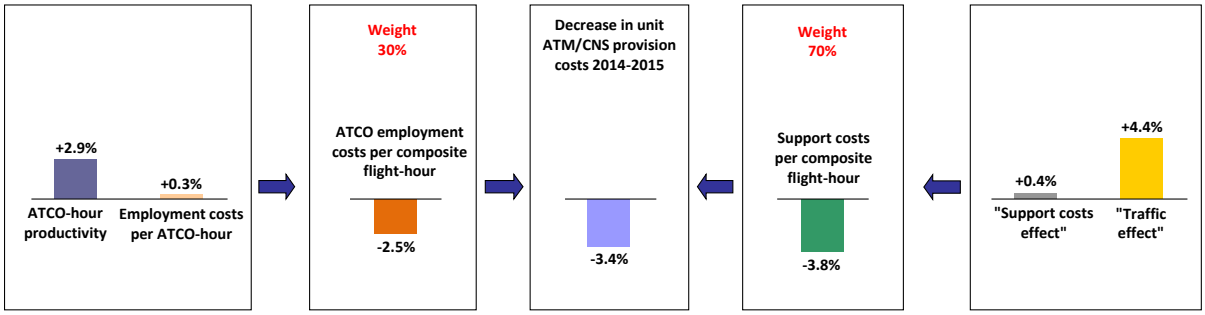
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

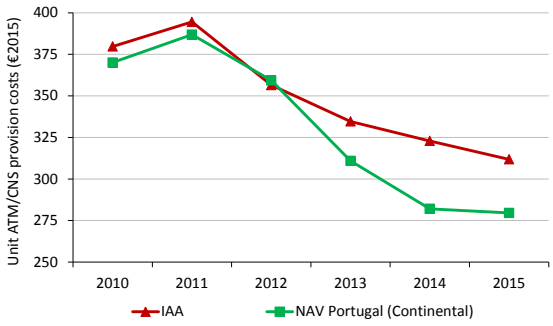


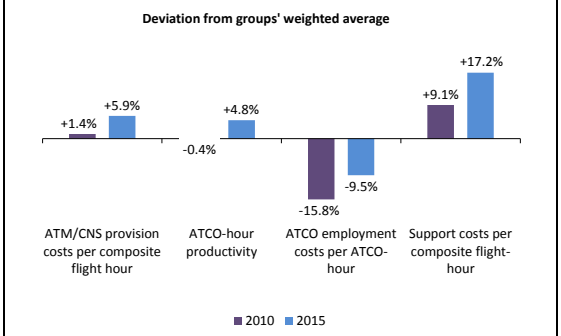
Changes in financial cost-effectiveness (2014-2015)



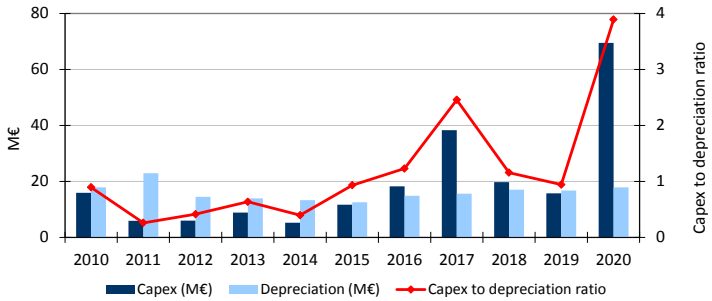
IAA (Ireland) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2011 (All ACCs)*	C: 2014 (All ACCs)*	C: 2011 (All ACCs)*	C: 2003 (All ACCs)*
€55.5M (2006-2014)	€3.6M	€44.6M (2006-2019)				2010				
					€0.8M	2011	All ACCs		All ACCs	
						2012				
						2013				
				€13.0M		2014	All ACCs	All ACCs	All ACCs	
€40.5M	€18.1M				€3.7M	2015				All ACCs
						2016	All ACCs	All ACCs	All ACCs	
						2017				
						2018				All ACCs
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	COOPANS (BUILD 1) initiative, including the replacement of the current FDP and RDP systems	ATM	49.0	2006	2012
2	FDP - COOPANS	ATM	34.5	2015	2019
3	Radar Replacement	SUR	20.0	2006	2011
4	VHFTX/RX & VCS replacement (four locations)	COM	16.9	2015	2019
5	En-route contingency centre	Buildings	13.0	2014	2017

LFV (Sweden) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: 1 EUR = 9.356 SEK

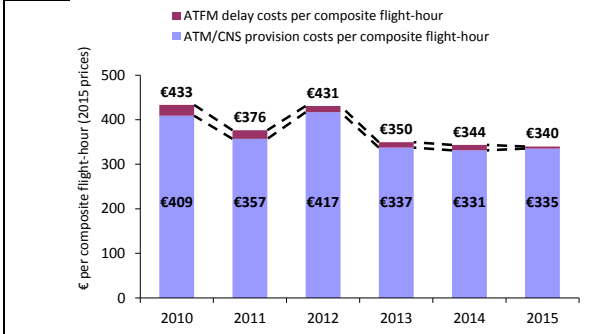
LFV represents 2.3% of European system gate-to-gate ATM/CNS provision costs

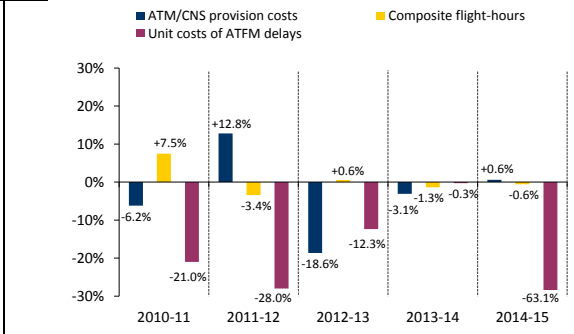
Operational conditions

Aggregated complexity score: Min – Max

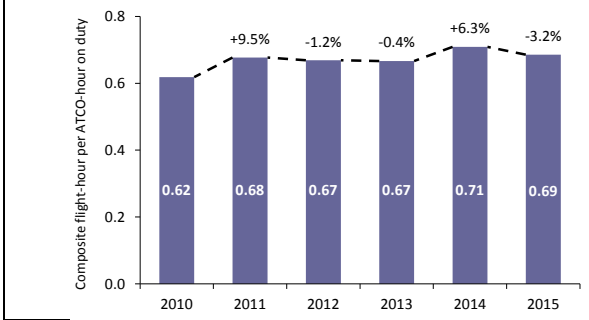
Seasonal traffic variability: Min – Max

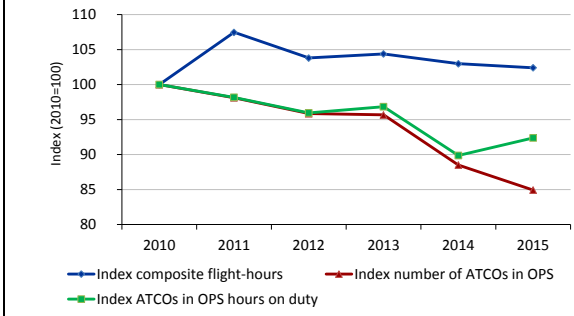
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



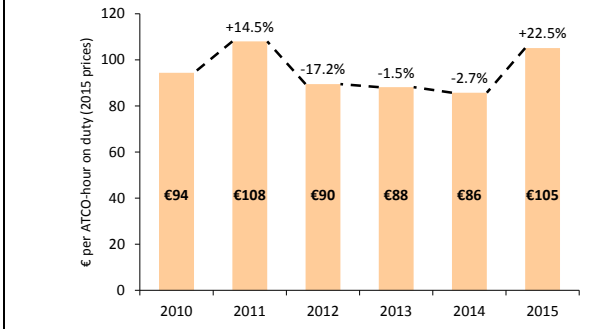


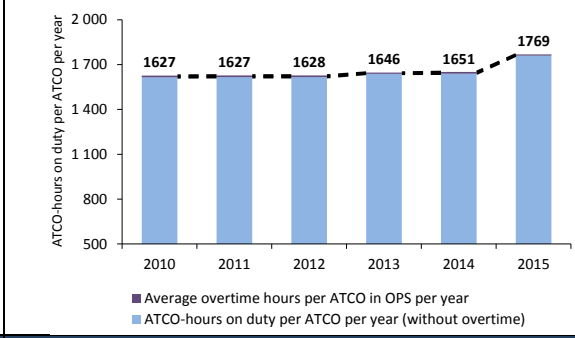
Trend in gate-to-gate ATCO-hour productivity



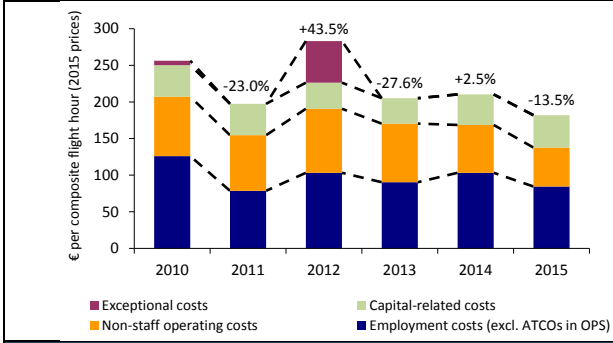


Trend in gate-to-gate employment costs per ATCO-hour

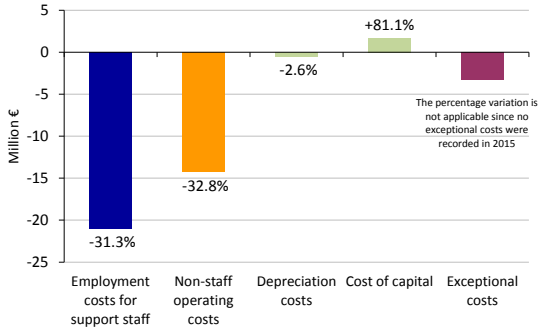




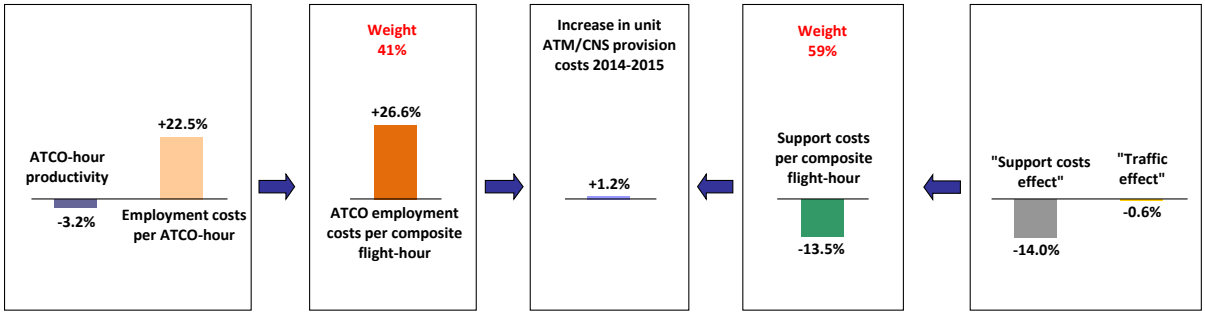
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

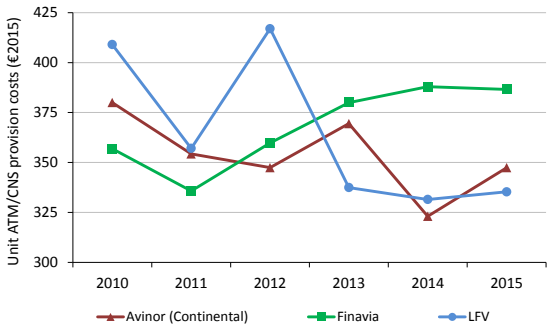


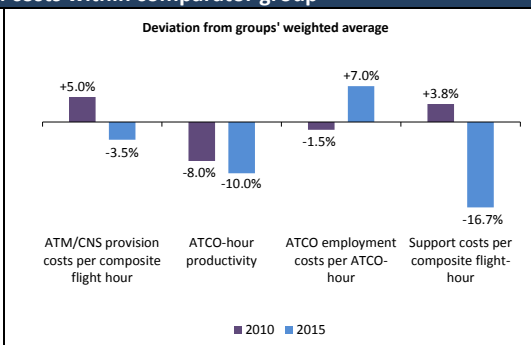
Changes in financial cost-effectiveness (2014-2015)



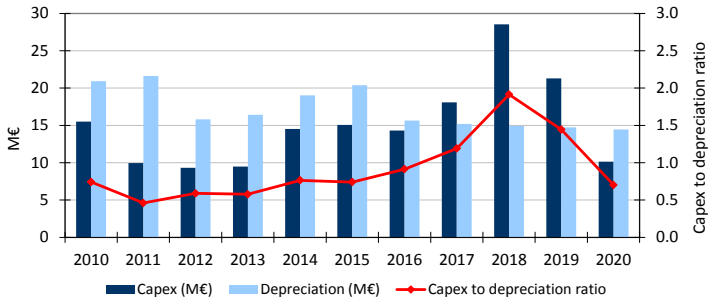
LFV (Sweden) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2012 (Malmo) 2013 (Stockholm)*	C: 2012 (Malmo) 2013 (Stockholm)*	C: 2012 (Malmo) 2013 (Stockholm)*	C: 2010 (All ACCs)*
€132.1M (2006-2020)	€19.4M (2007-2019)			€10.8M (2007-2011)		2010				All ACCs
			€27.4M		€2.4M	2011				
						2012	Malmo	Malmo	Malmo	
						2013	Stockholm	Stockholm	Stockholm	
						2014	All ACCs		All ACCs	
						2015				
						2016	All ACCs			
						2017				All ACCs
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	COOPANS	ATM	80.9	2006	2020
2	Expansion of Remote Tower Service	ATM	22.2	2017	2020
3	Remote Tower Centre (RTC)	ATM	13.4	2010	2017
4	Contingency system	ATM	13.0	2016	2020
5	Training and support building in Malmo	Buildings	10.8	2007	2011

LGS (Latvia) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: Latvia is within the EURO Zone

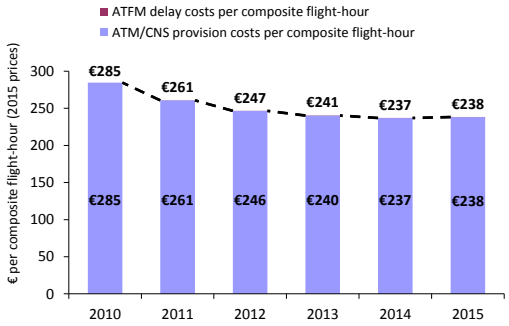
LGS represents 0.3% of European system gate-to-gate ATM/CNS provision costs

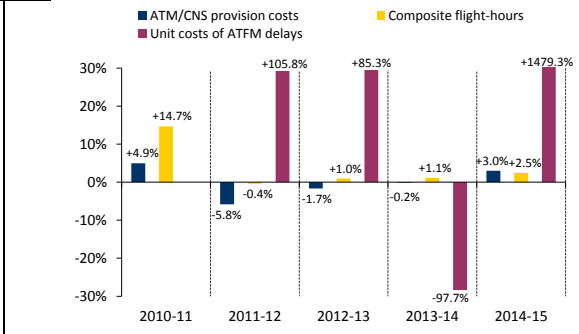
Operational conditions

Aggregated complexity score: Min — Max

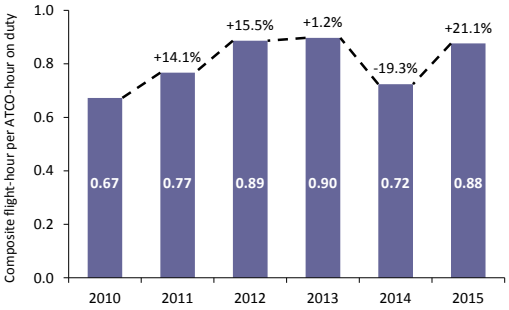
Seasonal traffic variability: Min — Max

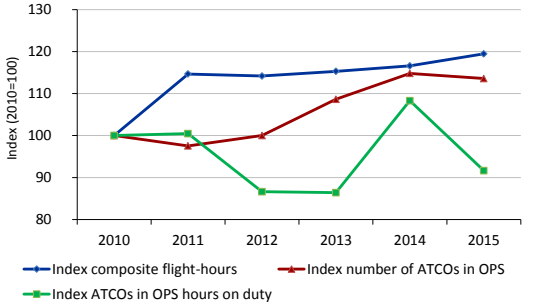
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



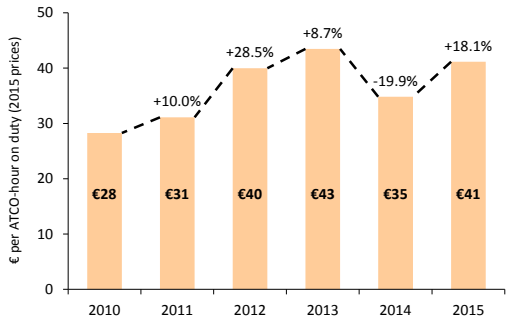


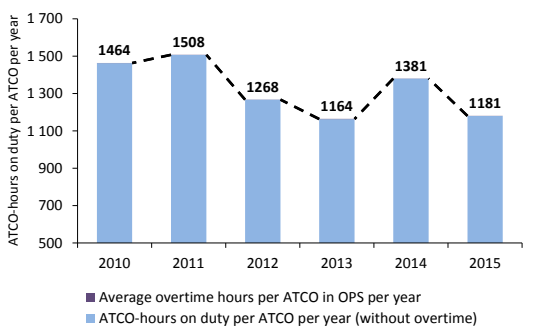
Trend in gate-to-gate ATCO-hour productivity



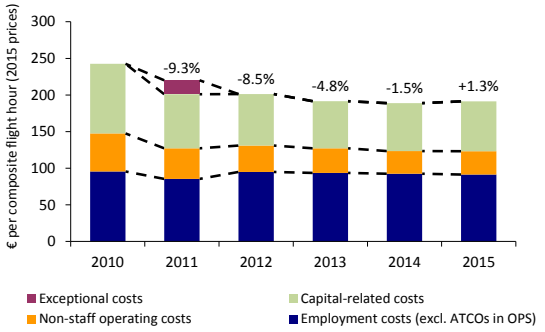


Trend in gate-to-gate employment costs per ATCO-hour

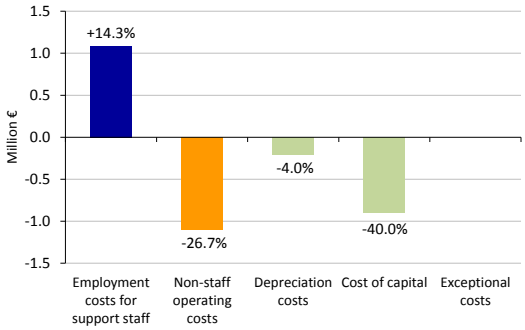




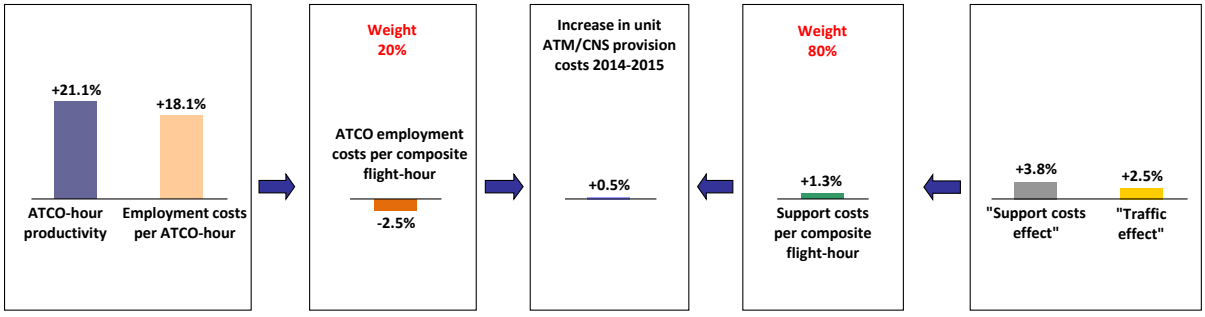
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

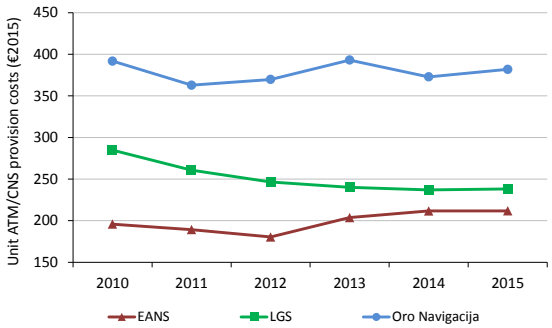


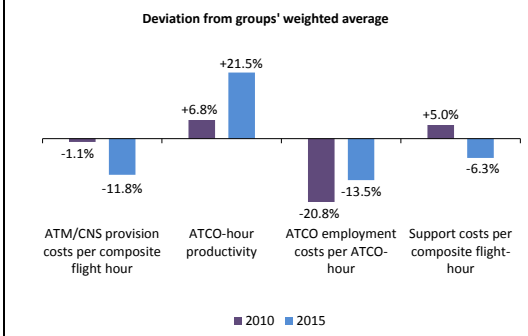
Changes in financial cost-effectiveness (2014-2015)



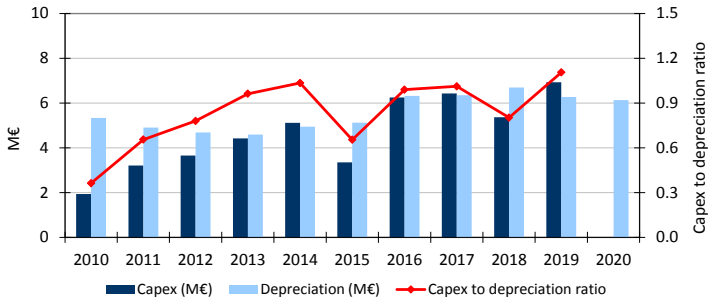
LGS (Latvia) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 1999*	C: 1999*	C: 1999*	C: 2004*
€35.3M (2007-2019)			€11.7M (2007-2019)			2010				
						2011				
	€7.0M				€4.6M	2012				
						2013				
						2014				
						2015				
						2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Collaborative Decision Making (CDM)	ATM	14.8	2015	2019
2	A-SMGCS Modernisation - Part II	SUR	8.8	2015	2019
3	PBN Implementation project	ATM	6.8	2015	2019
4	Modernization of Automated ATC system (ATRACC)	ATM	3.9	2010	2013
5	ATRACC 2014+ (Automated ATM system extension)	ATM	3.5	2014	2016

LPS (Slovak Republic) – Cost-effectiveness KPIs (€2015)

Contextual economic information

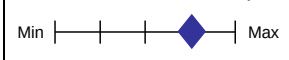
Exchange rate: Slovak Republic is within the EURO Zone

LPS represents 0.7% of European system gate-to-gate ATM/CNS provision costs

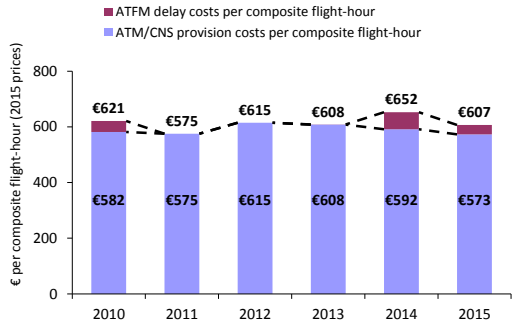
Operational conditions

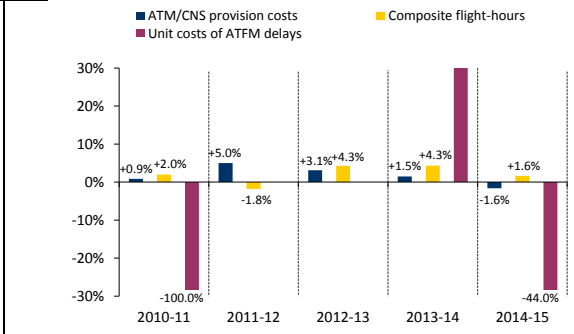
Aggregated complexity score:

Seasonal traffic variability:

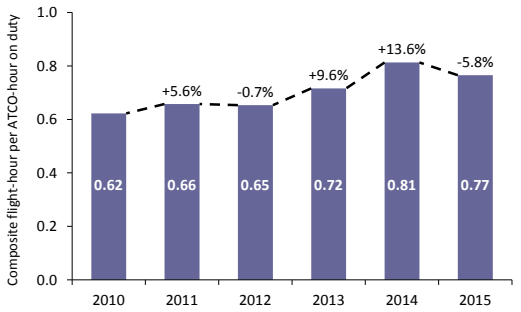


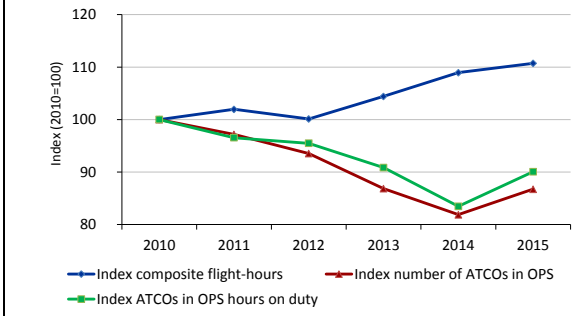
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



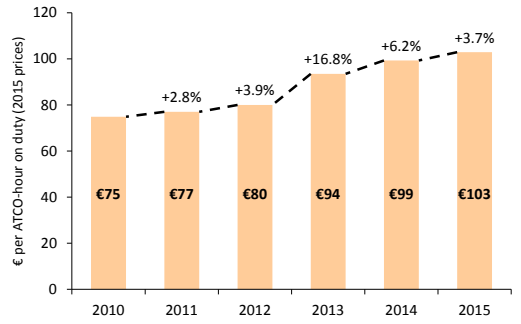


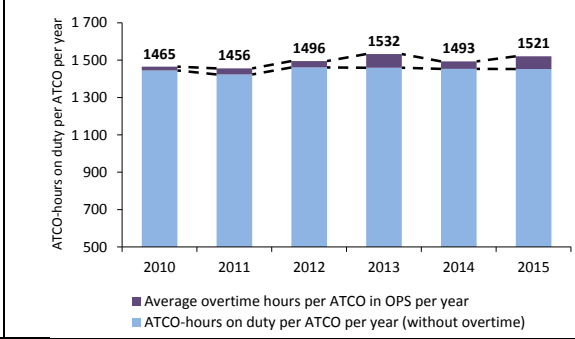
Trend in gate-to-gate ATCO-hour productivity



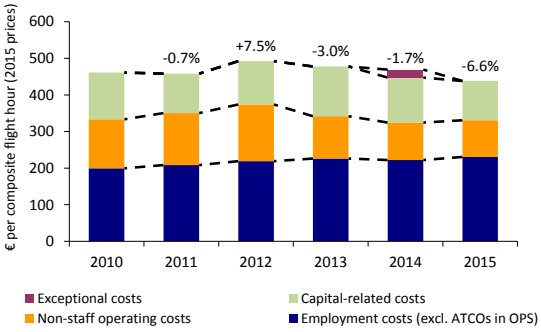


Trend in gate-to-gate employment costs per ATCO-hour

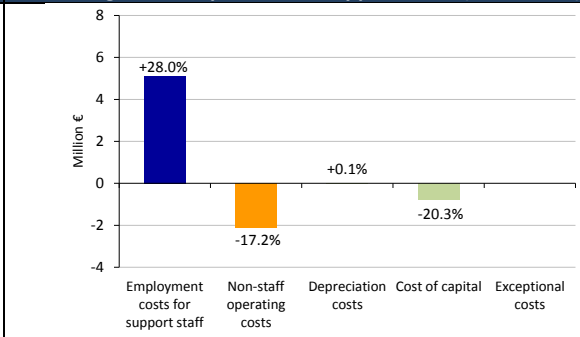




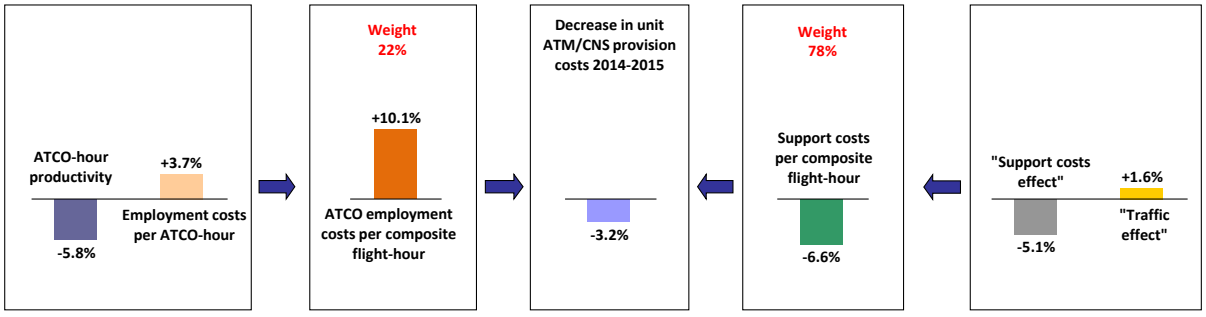
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

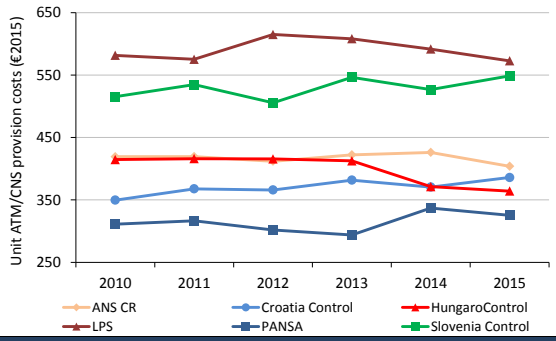


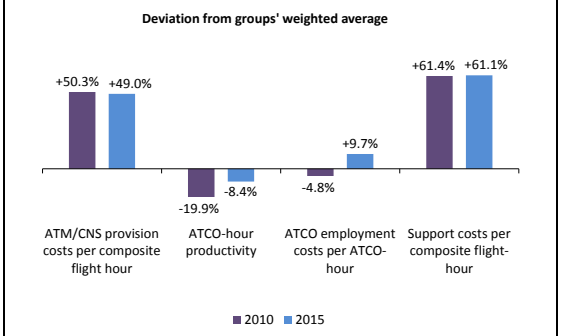
Changes in financial cost-effectiveness (2014-2015)



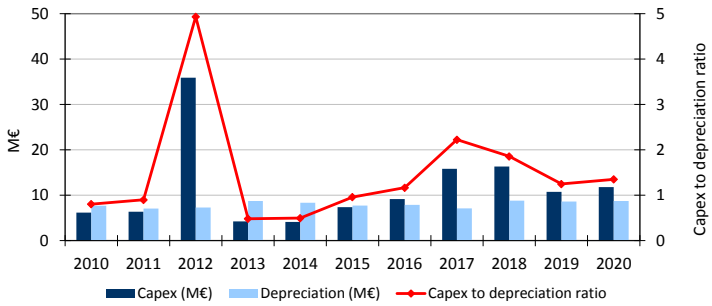
LPS (Slovak Republic) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 1999*	C: 2005*	C: 1999*	C: 2009*
						2010				
						2011				
				€33.5M (2007-2015)		2012				
						2013				
			€6.0M (2009-2018)			2014				
€30.0M	€14.5M	€14.4M			€15.3M	2015				
						2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Construction of the new ACC in Bratislava	Buildings	30.0	2007	2012
2	Upgrade of the main ATM System	ATM	20.4	2015	2020
3	Navigation Systems Upgrade	NAV	14.1	2015	2019
4	Replacement of SACON Network	COM	5.0	2015	2019
5	Upgrade of Voice Communication System - Implementation of VoIP	COM	4.5	2015	2019

LVNL (Netherlands) – Cost-effectiveness KPIs (€2015)

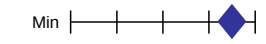
Contextual economic information

Exchange rate: Netherlands is within the EURO Zone

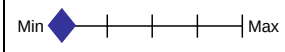
LVNL represents 2.2% of European system gate-to-gate ATM/CNS provision costs

Operational conditions

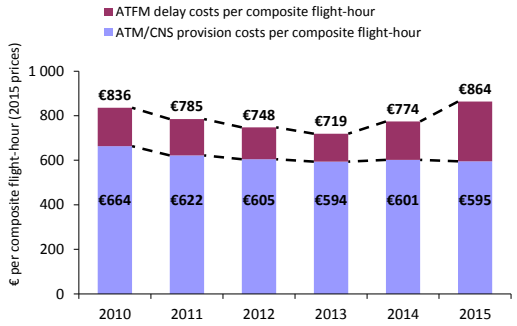
Aggregated complexity score:

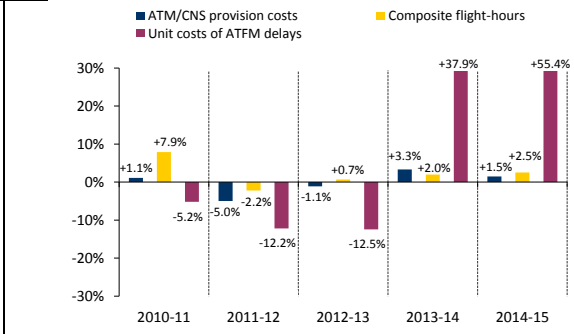


Seasonal traffic variability:

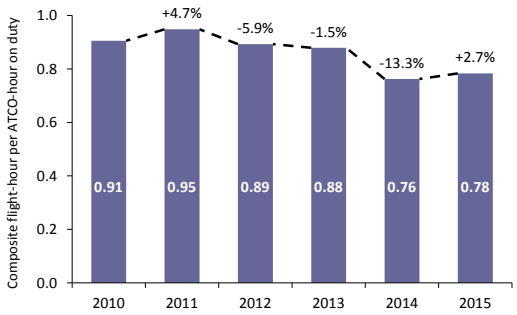


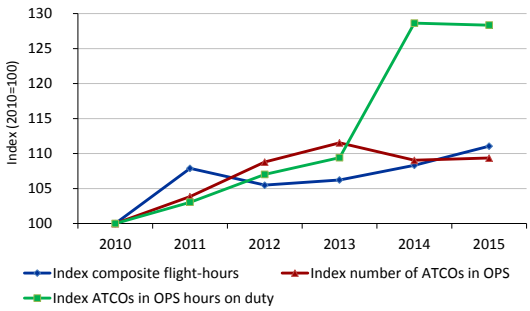
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



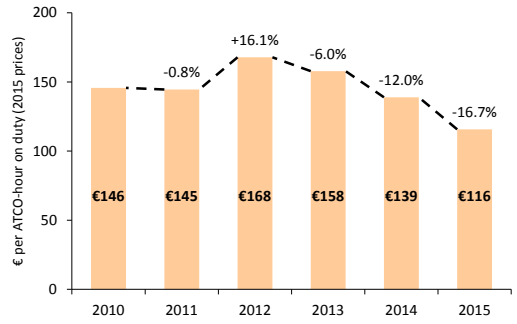


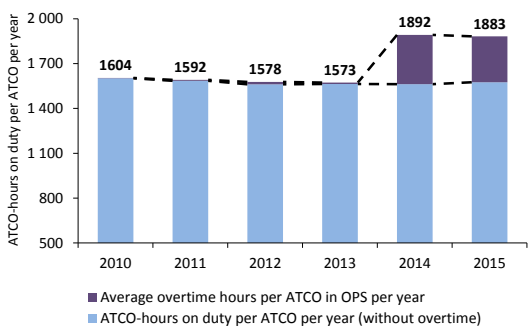
Trend in gate-to-gate ATCO-hour productivity



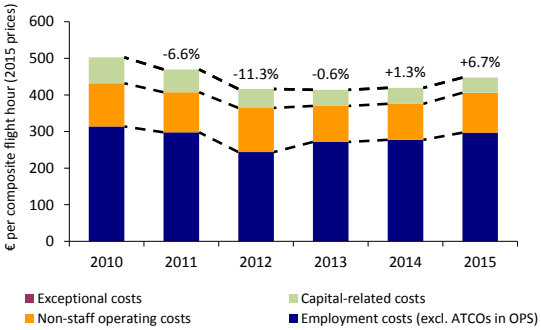


Trend in gate-to-gate employment costs per ATCO-hour

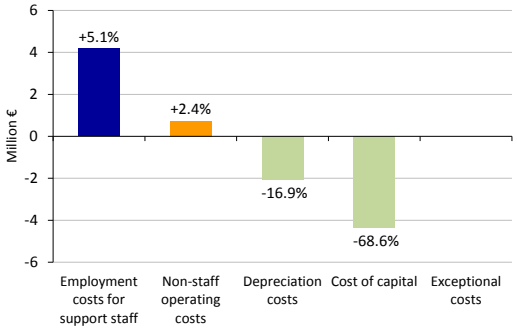




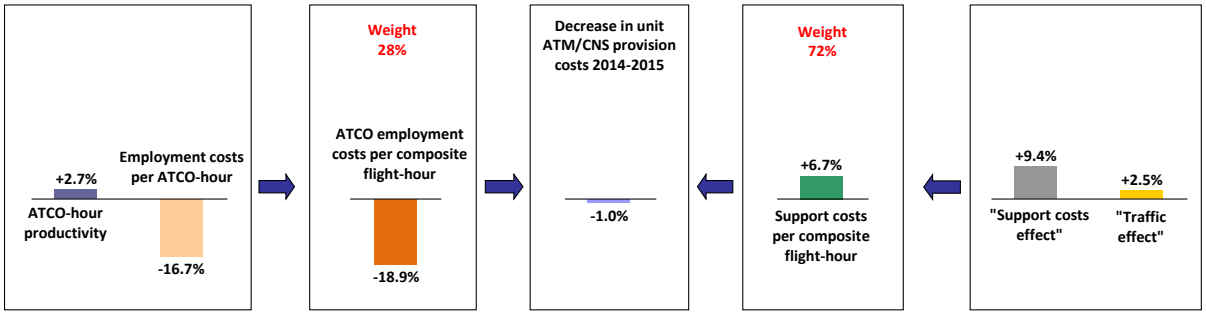
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

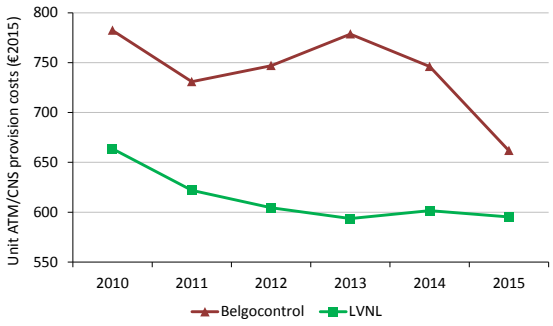


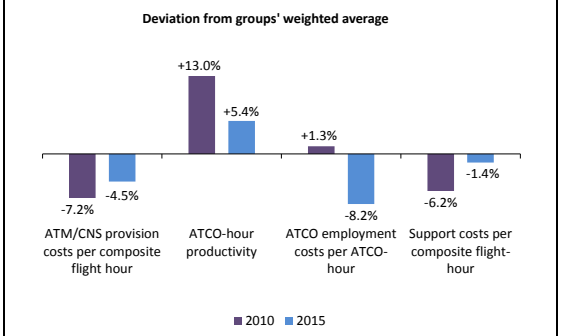
Changes in financial cost-effectiveness (2014-2015)



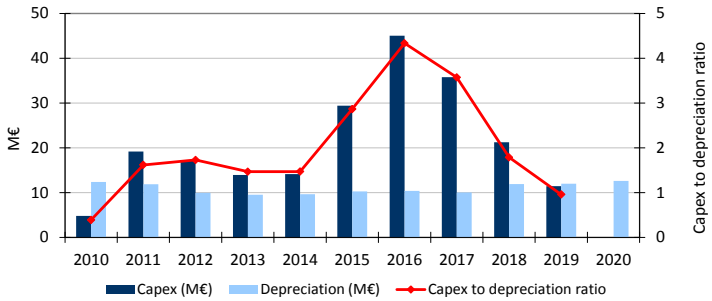
LVNL (Netherlands) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS C: 1998*	RDPS C: 1998*	HMI C: 1998*	VCS C: 1989*
€119.7M (2009-2022)	€30.8M (2007-2016)			€8.0M	€3.5M	2010				
			€15.4M			2011				
						2012				
						2013				
					€39.6M	2014				
						2015				Replacement
				€21.5M		2016				
						2017		Replacement		
						2018				
						2019				
						2020	Replacement		Replacement	

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	New ATM system ICAS (iTEC Centre Automation System)	ATM	94.6	2011	2022
2	Replacement of VCS	COM	24.6	2007	2015
3	Expansion Facilities	Buildings	21.5	2016	2017
4	Maintenance investments (systems and infrastructure)	OTHER	14.2	2015	2019
5	Replacement TAR IV (Terminal Approach Radar)	SUR	10.3	2015	2017

MATS (Malta) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: Malta is within the EURO Zone

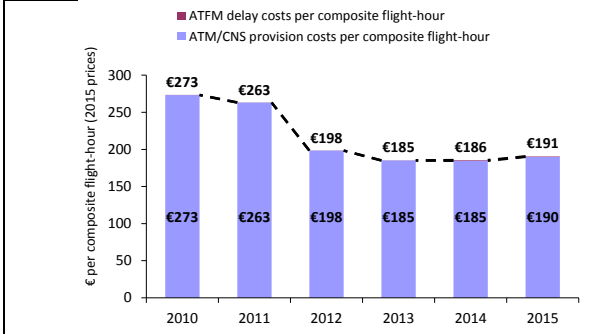
MATS represents 0.2% of European system gate-to-gate ATM/CNS provision costs

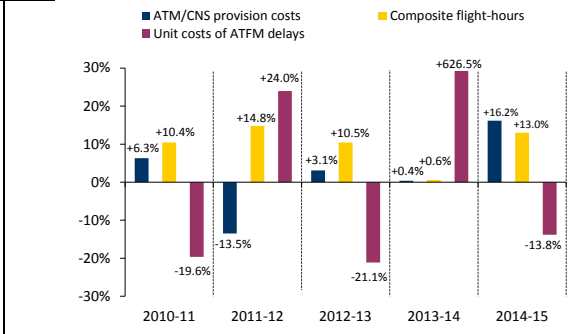
Operational conditions

Aggregated complexity score: Min — Max

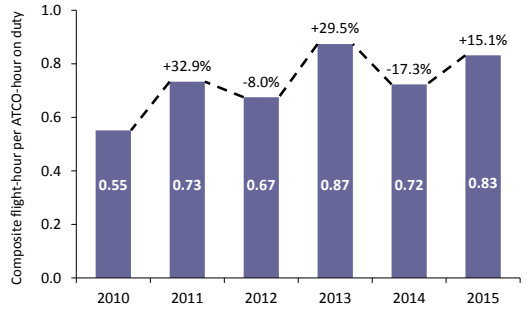
Seasonal traffic variability: Min — Max

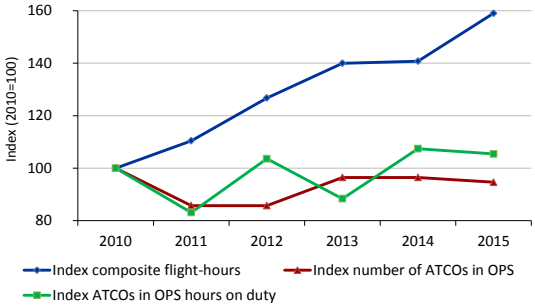
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



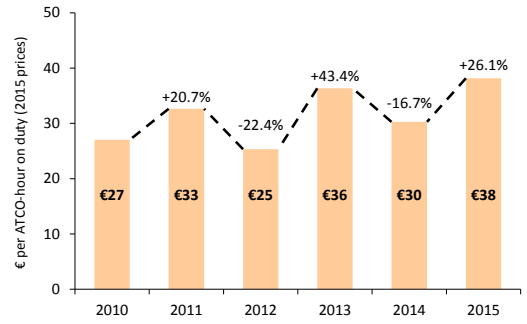


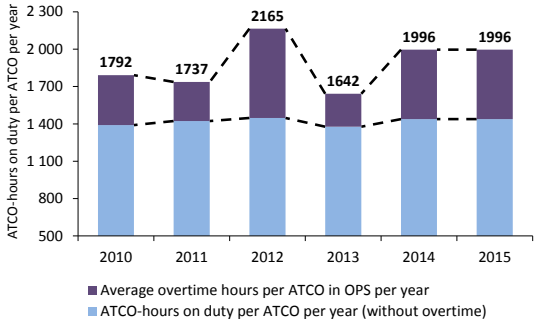
Trend in gate-to-gate ATCO-hour productivity



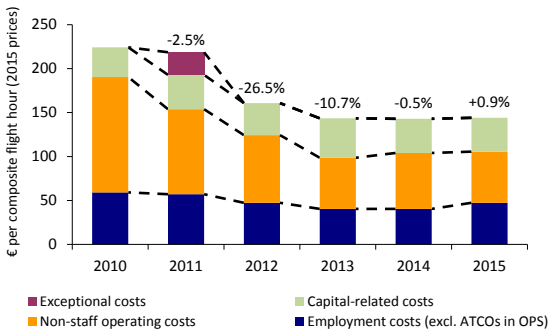


Trend in gate-to-gate employment costs per ATCO-hour

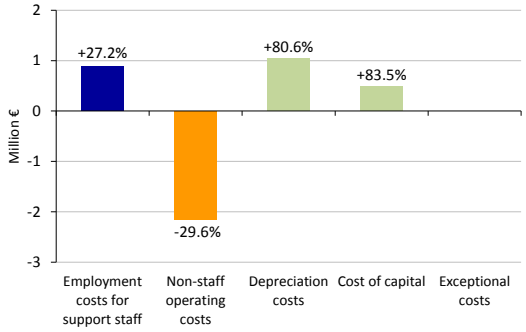




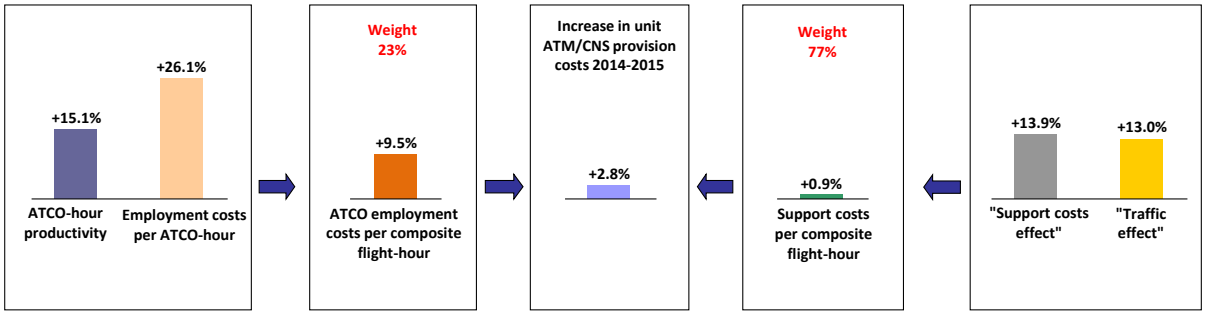
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

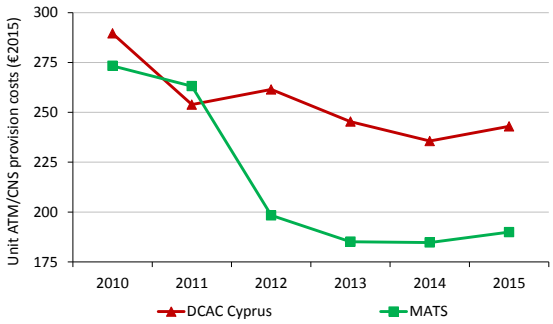


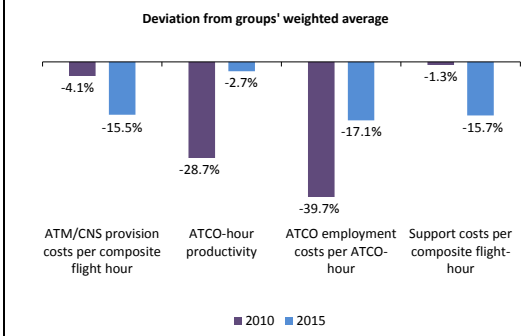
Changes in financial cost-effectiveness (2014-2015)



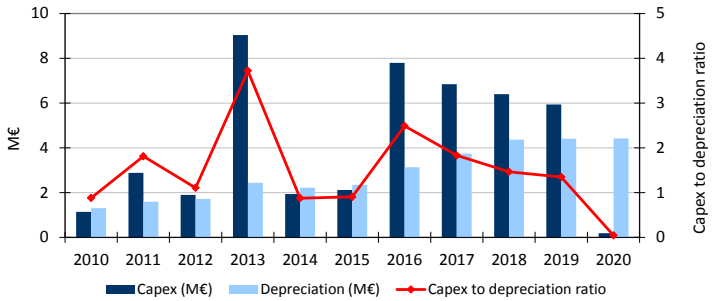
MATS (Malta) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 1996*	C: 1996*	C: 1996*	C: 2015*
						2010				
			€2.4M (2009-2013)			2011				
						2012				
						2013				
€9.0M						2014				
	€0.5M	€0.2M		€19.9M	€0.6M	2015				
			€6.2M			2016				
		€0.8M				2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	New control centre and tower	Buildings	18.0	2015	2019
2	ATM system upgrade	ATM	9.0	2012	2017
3	Dingli En-Route Primary Surveillance Radar	SUR	3.0	2015	2018
4	Purchase and installation of MSSR Halfar	SUR	2.4	2009	2013
5	Purchase and installation of MSSR Fawwara	SUR	2.4	2014	2015

M-NAV (F.Y.R. Macedonia) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: 1 EUR = 61.221 MKD

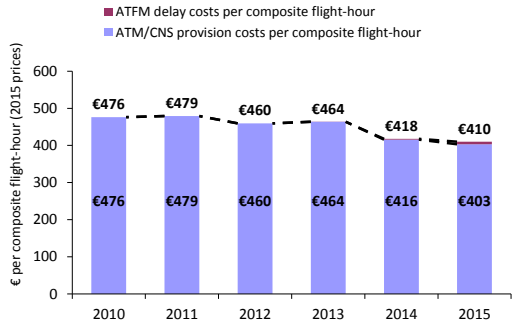
M-NAV represents 0.1% of European system gate-to-gate ATM/CNS provision costs

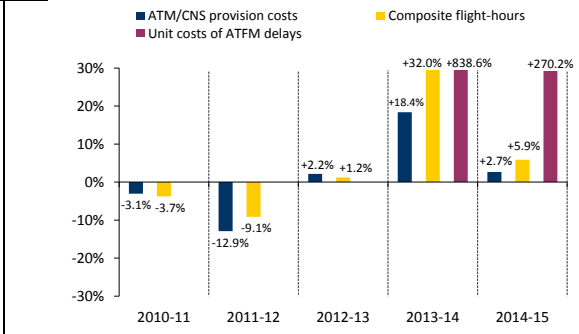
Operational conditions

Aggregated complexity score: Min — Max

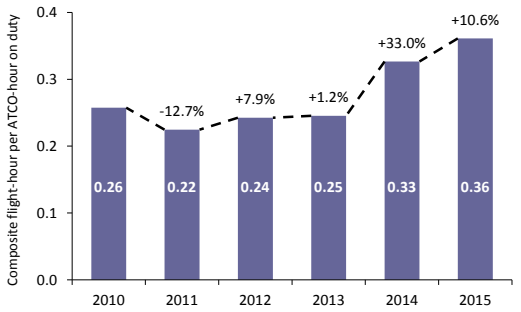
Seasonal traffic variability: Min — Max

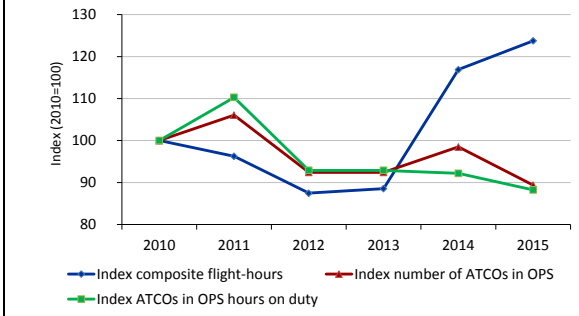
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



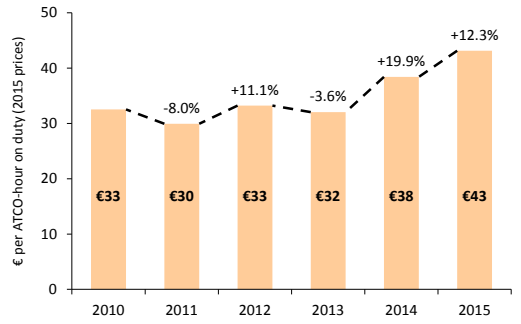


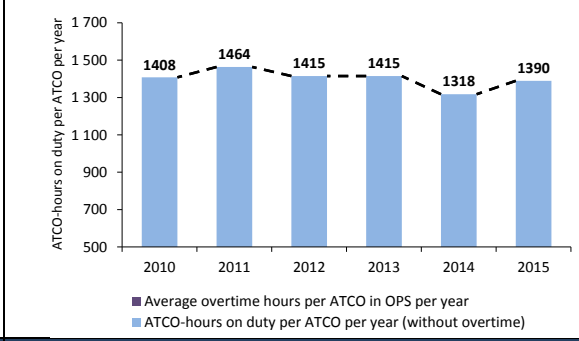
Trend in gate-to-gate ATCO-hour productivity



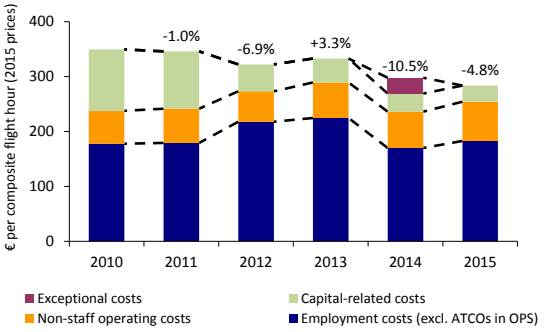


Trend in gate-to-gate employment costs per ATCO-hour

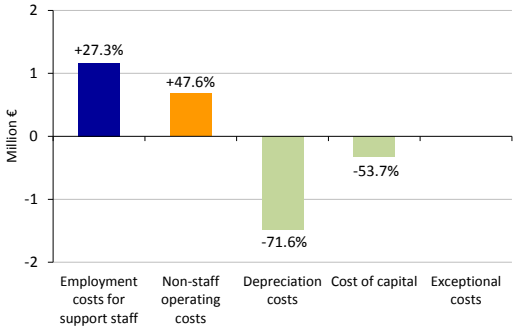




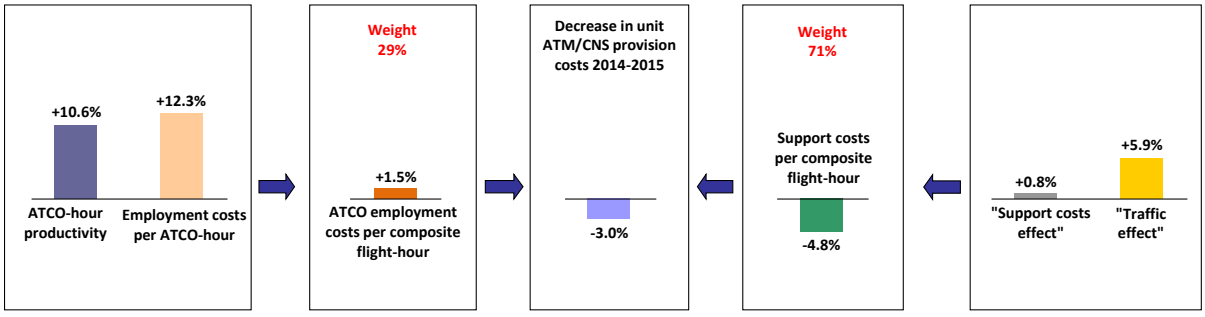
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

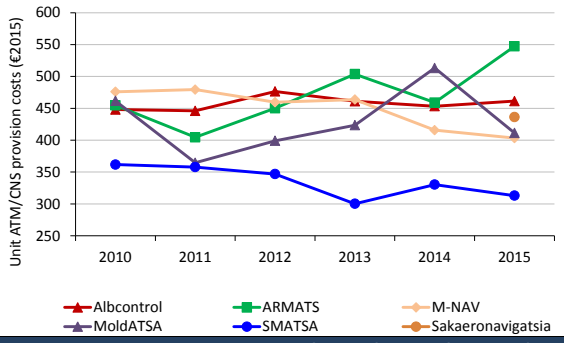


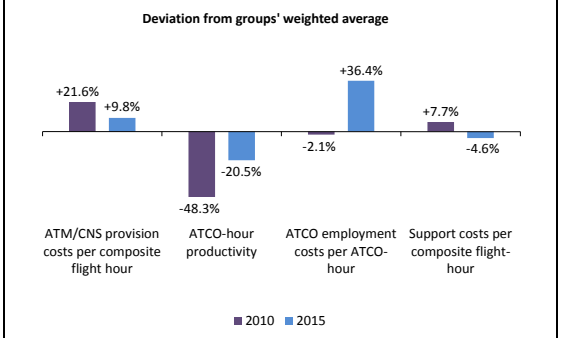
Changes in financial cost-effectiveness (2014-2015)



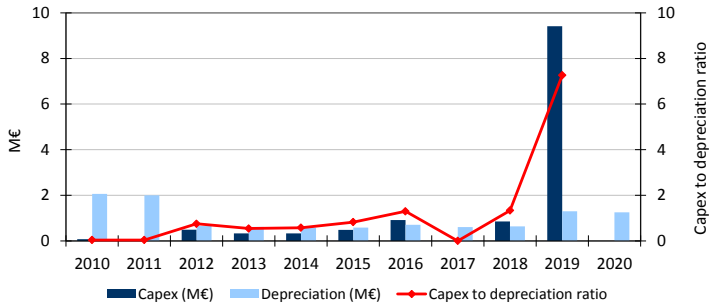
M-NAV (F.Y.R. Macedonia) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2002*	C: 2002*	C: 2002*	C: 2002*
						2010				
						2011				
						2012				
						2013				
						2014				
€9.9M	€2.3M		€3.8M	€1.0M		2015				
						2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Procurement of new ATM systems	ATM	8.1	2014	2018
2	Skopje Mode S radar	SUR	2.9	2015	2018
3	Construction of new building for ANSP headquarters	Buildings	1.0	2013	2016
4	Purchase of new VHF radio system and MW link	COM	1.0	2015	2017
5	Ohrid radar upgrade	SUR	0.9	2014	2017

MoldATSA (Moldova) – Cost-effectiveness KPIs (€2015)

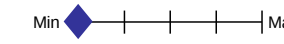
Contextual economic information

Exchange rate: 1 EUR = 20.688 MDL

MoldATSA represents 0.1% of European system gate-to-gate ATM/CNS provision costs

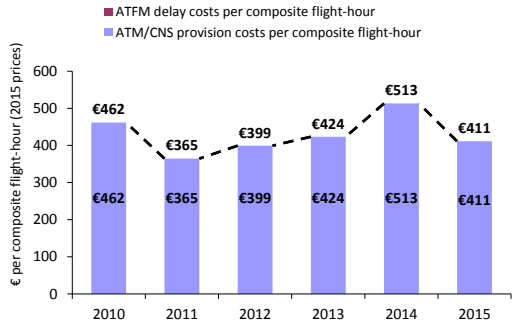
Operational conditions

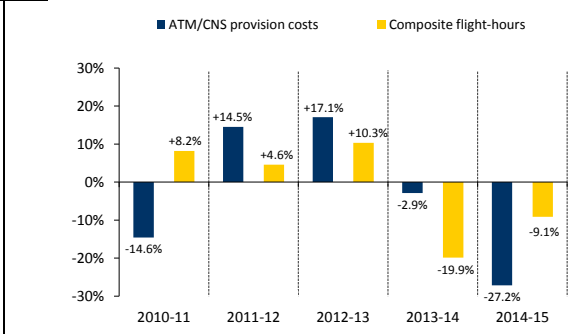
Aggregated complexity score:



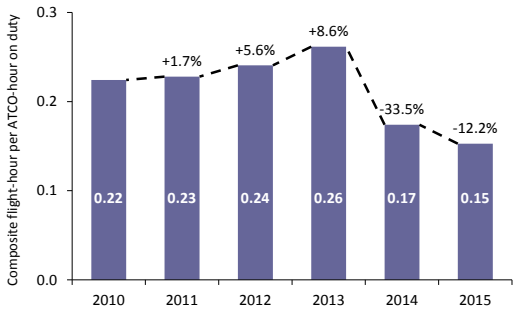
Seasonal traffic variability:

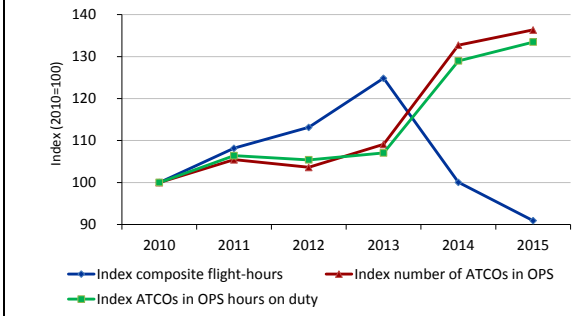
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



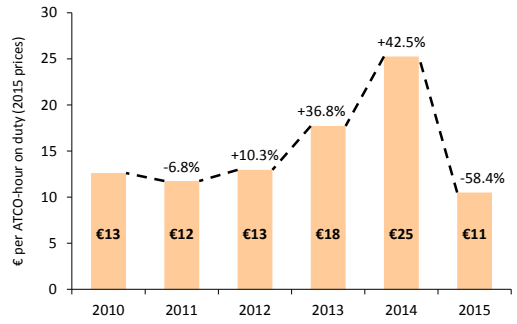


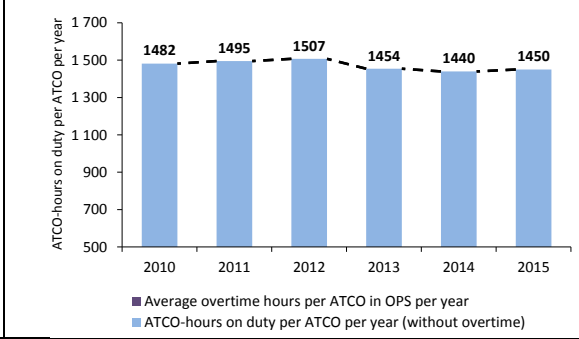
Trend in gate-to-gate ATCO-hour productivity



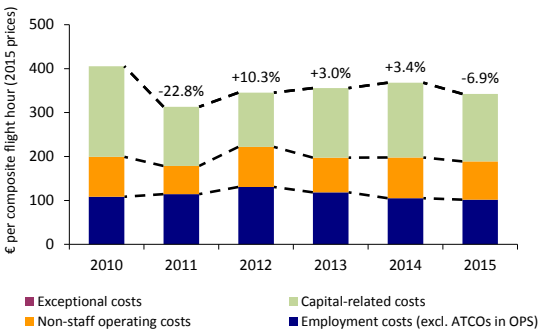


Trend in gate-to-gate employment costs per ATCO-hour

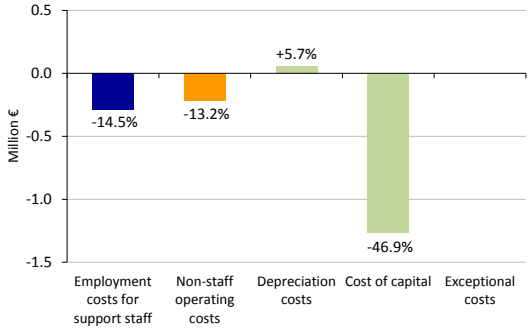




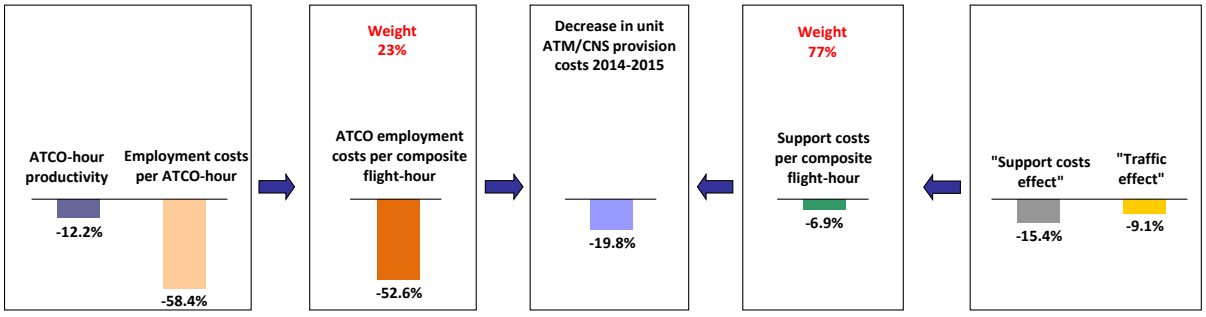
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

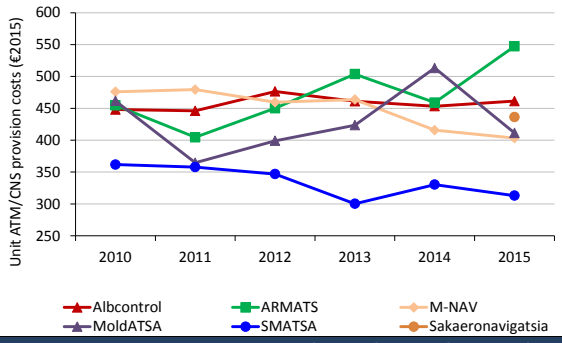


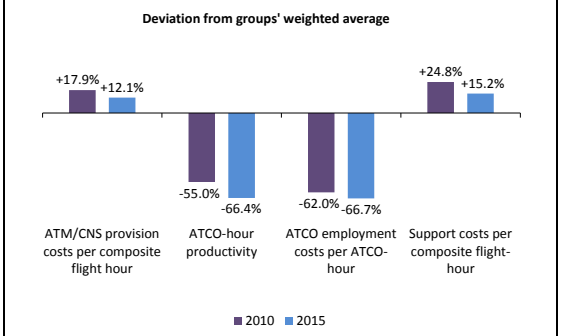
Changes in financial cost-effectiveness (2014-2015)



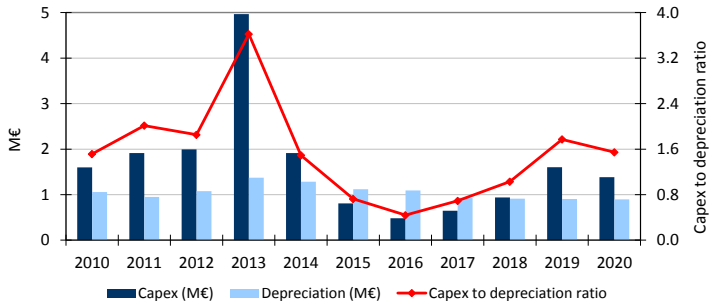
MoldATSA (Moldova) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2013*	C: 2013*	C: 2013*	C: 2013*
						2010				
						2011				
						2012				
						2013				
€4.0M (2011-2021)						2014				
	€0.4M		€1.7M			2015				
						2016				
						2017				
						2018				
		€1.6M		€4.0M	€0.4M	2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Construction and modernisation of the tower building in Chisinau	Buildings	4.0	2018	2020
2	Implementation of multilateration equipment	SUR	1.7	2014	2015
3	System ILS for Chisinau airport	NAV	1.1	2019	2020
4	Simulator for ATCOs (including 3D Tower)	ATM	1.0	2017	2018
5	GBAS for Chisinau, Balti and Cahul airports	ATM	0.8	2020	2021

MUAC (Maastricht) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: Maastricht is within the EURO Zone

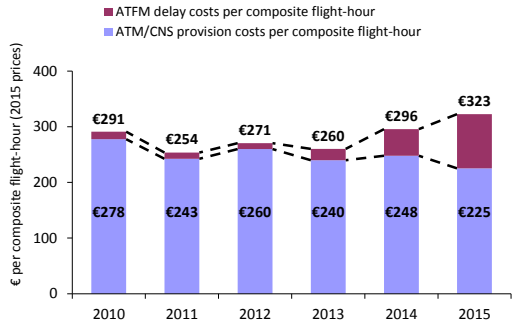
MUAC represents 1.7% of European system gate-to-gate ATM/CNS provision costs

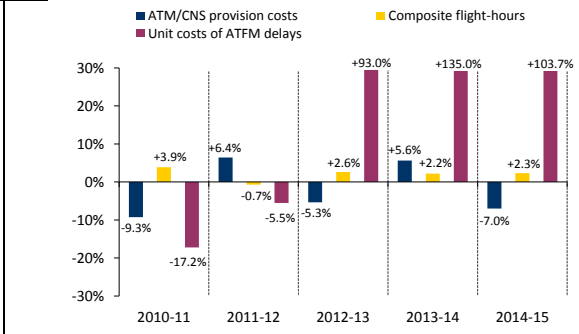
Operational conditions

Aggregated complexity score: Min — Max

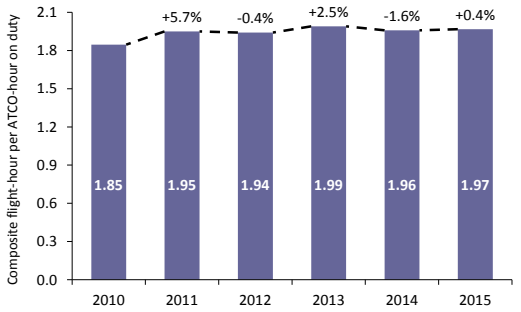
Seasonal traffic variability: Min — Max

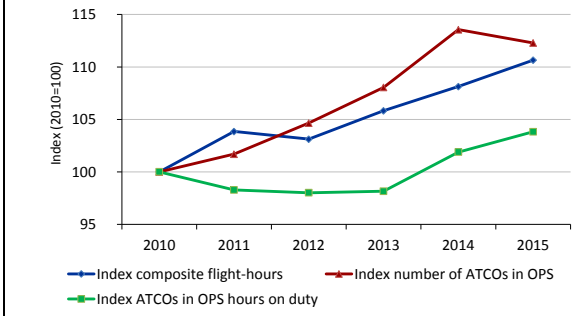
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



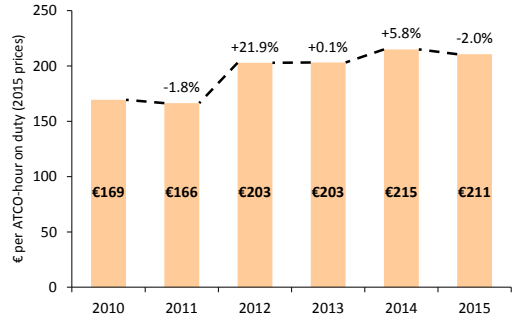


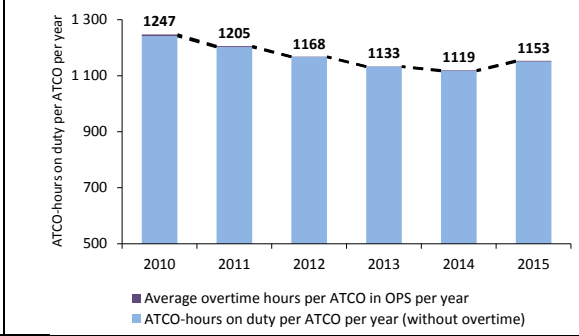
Trend in gate-to-gate ATCO-hour productivity



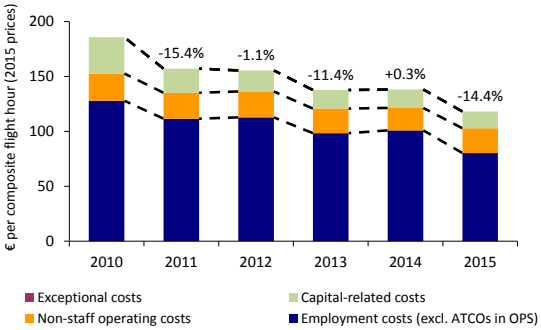


Trend in gate-to-gate employment costs per ATCO-hour

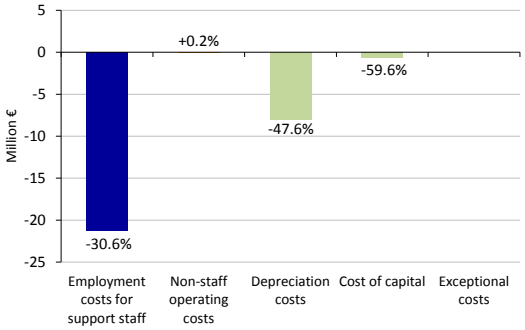




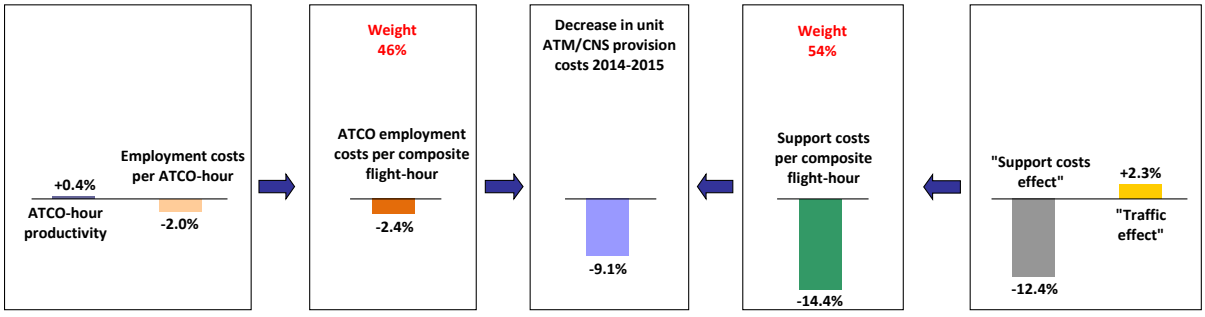
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)



Changes in financial cost-effectiveness (2014-2015)

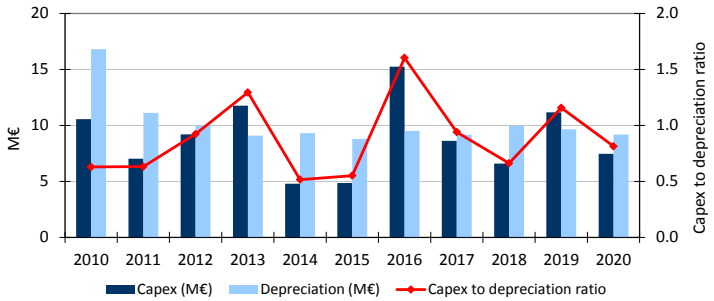


MUAC (Maastricht) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group

Due to the unique nature of its airspace (upper airspace only, across four States), it was decided that Maastricht (MUAC) should be considered separately and therefore this ANSP is not included in the comparator group benchmarking analysis

Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2008*	C: 2008*	C: 2002*	C: 1995*
€55.6M (2003-2014)				€3.6M (2009-2010)		2010				
	€5.1M					2011				
				€14.6M	€4.7M	2012				
						2013				
						2014				
€55.0M (2015-2021)	€9.0M			€14.4M (2015-2021)	€18.3M (2015-2021)	2015				
						2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Procurement of new FDPS	ATM	50.0	2003	2011
2	Other ATM investments	ATM	31.0	2015	2021
3	Building and infrastructure (RP1)	Buildings	14.6	2012	2014
4	Building and infrastructure (RP2)	Buildings	9.1	2015	2019
5	ATM SESAR Compliant (RP3)	ATM	9.0	2020	2021

NATS Continental (United Kingdom) – Cost-effectiveness KPIs (€2015)

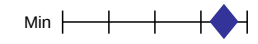
Contextual economic information

Exchange rate: 1 EUR = 0.726 GBP

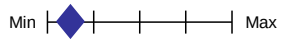
NATS Continental represents 11.1% of European system gate-to-gate ATM/CNS provision costs

Operational conditions

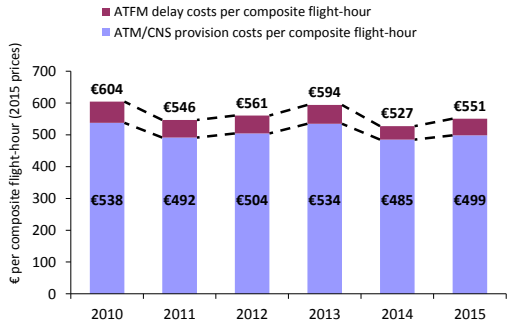
Aggregated complexity score:

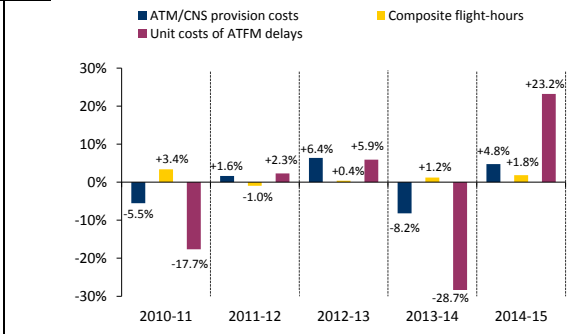


Seasonal traffic variability:

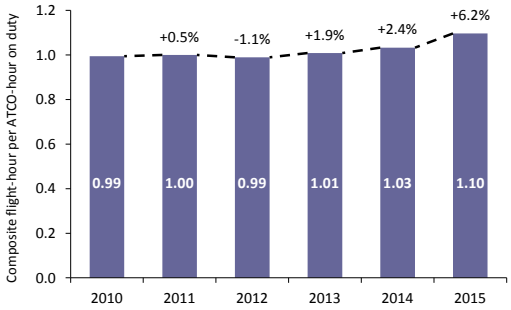


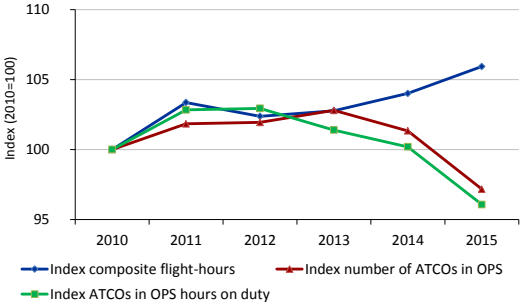
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



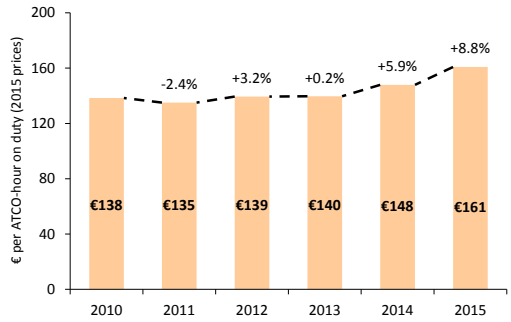


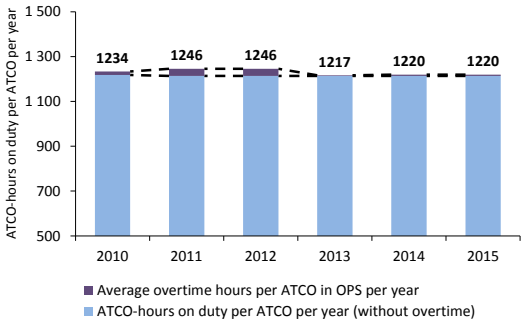
Trend in gate-to-gate ATCO-hour productivity



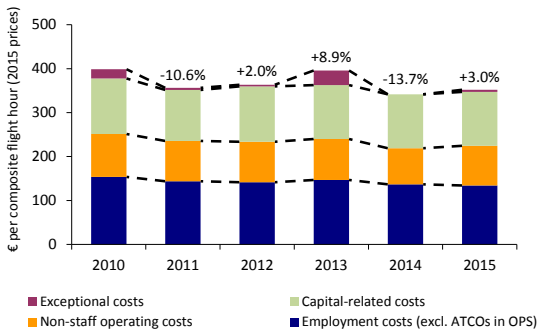


Trend in gate-to-gate employment costs per ATCO-hour

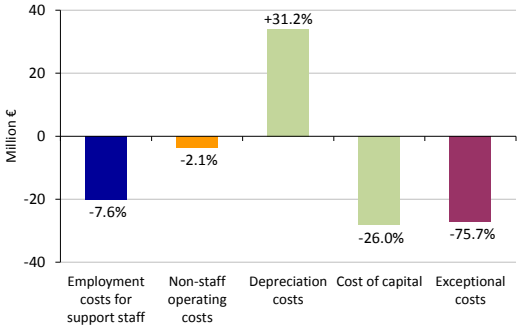




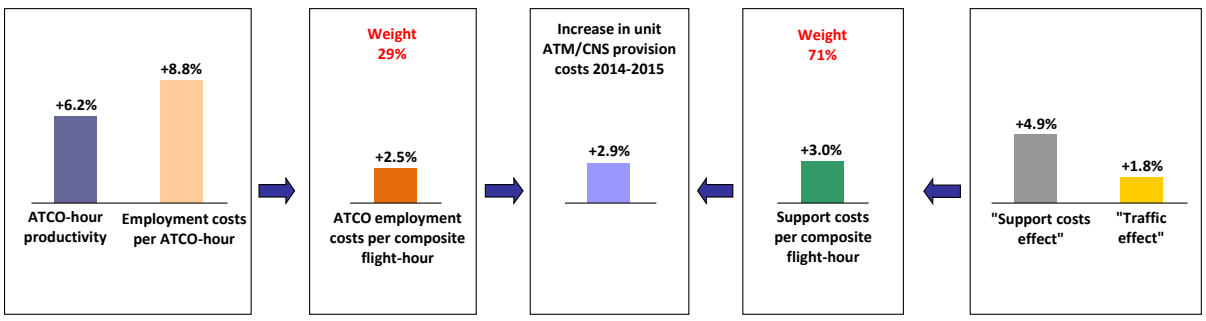
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

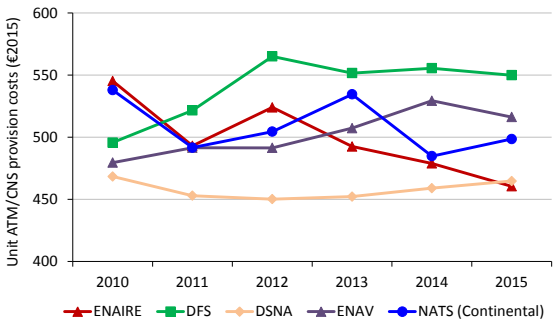


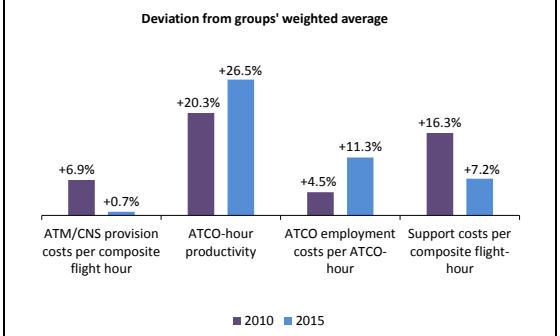
Changes in financial cost-effectiveness (2014-2015)



NATS Continental (United Kingdom) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs

Note that the planned data provided by NATS in its 2015 ACE submission reflect the figures reported in the Performance Plan for RP2, which are based on regulatory accounting rules. This is different from the methodology used by NATS to report historic and actual figures which are based on IFRS accounting.

Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2001 (Lon TC and Prest.) 2002 (Lond AC)*	C: 2002 (Lon. AC) 2007 (Lon. TC) 2009 (Prest.)*	C: 2002 (Lon. AC) 2007 (Lon. TC) 2009 (Prest.)*	C: 2002 (Lon. AC) 2007 (Lon. TC) 2008 (Prest.)*
€257.6M (2003-2011)				€21.1M (2008-2011)		2010	Prestwick	London AC+TC	London TC	
						2011	London AC and London TC		London AC	London TC
€355.3M	€92.8M				€77.7M	2012				
						2013				
						2014				
€535.5M	€134.0M				€86.6M	2015	Prestwick (upper)			
						2016	London AC+TC	London AC	London AC+TC	
						2017				
						2018		London AC + TC		London AC + TC
						2019	London AC + TC	Prestwick	All ACCs	Prestwick
						2020	Prestwick (lower)			

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Centre Systems Software Development	ATM	230.1	2015	2019
2	iTEC (including Prestwick Upper Airspace Definition)	ATM	228.2	2015	2019
3	iFACTS	ATM	223.7	2003	2011
4	CNS Infrastructure (including NERC N38 System Ethernet and MSRS Change)	CNS	134.0	2015	2019
5	Airspace Development (including Time Base Separation)	ATM	44.1	2015	2019

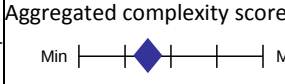
NAV Portugal Continental (Portugal) – Cost-effectiveness KPIs (€2015)

Contextual economic information

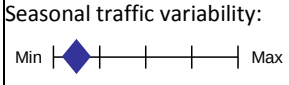
Exchange rate: Portugal is within the EURO Zone
NAV Portugal Continental represents 1.4% of European system gate-to-gate ATM/CNS provision costs

Operational conditions

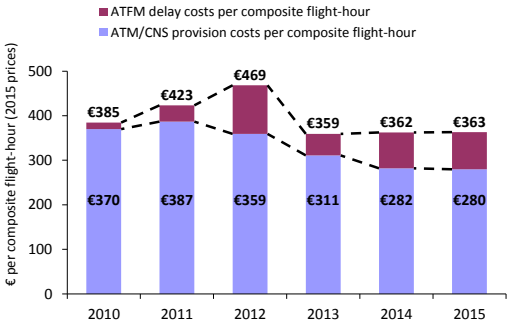
Aggregated complexity score:

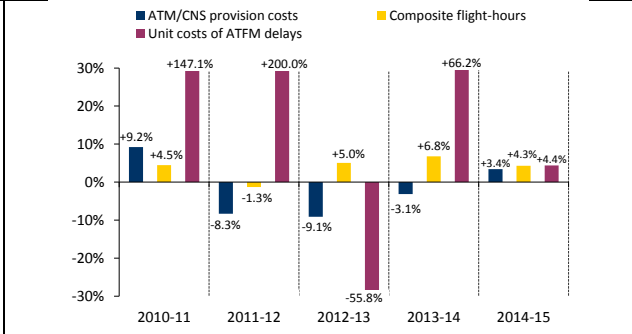


Seasonal traffic variability:

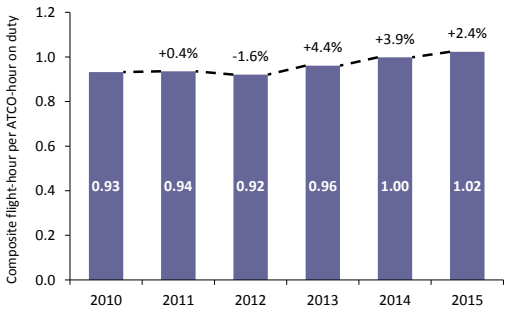


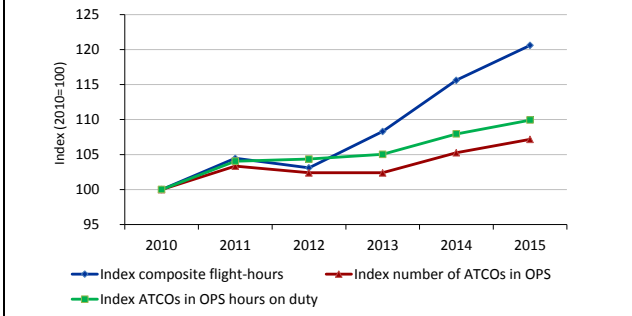
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



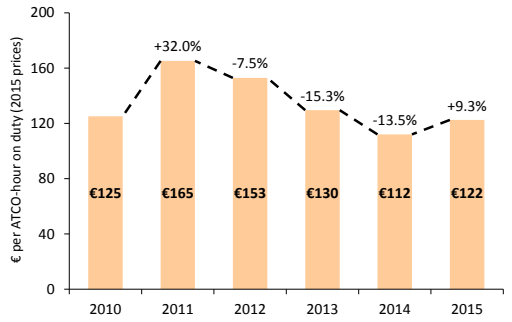


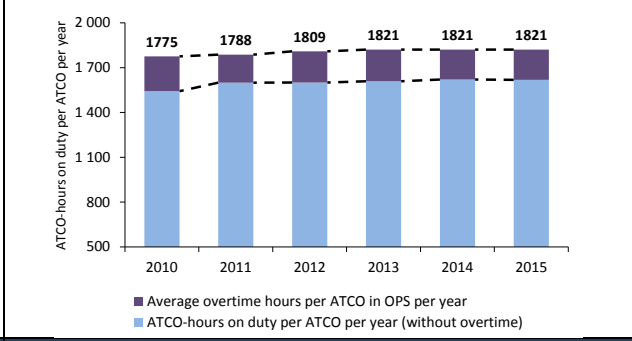
Trend in gate-to-gate ATCO-hour productivity



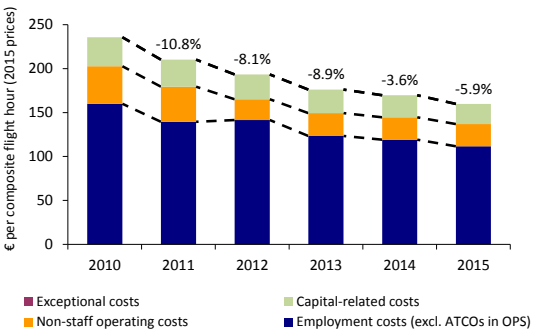


Trend in gate-to-gate employment costs per ATCO-hour

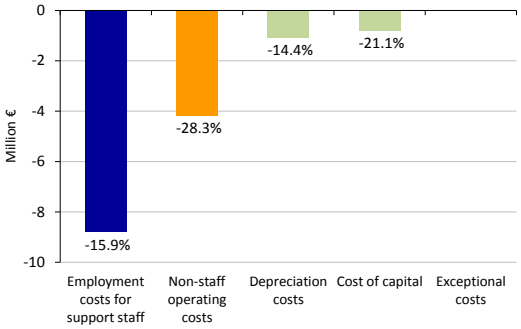




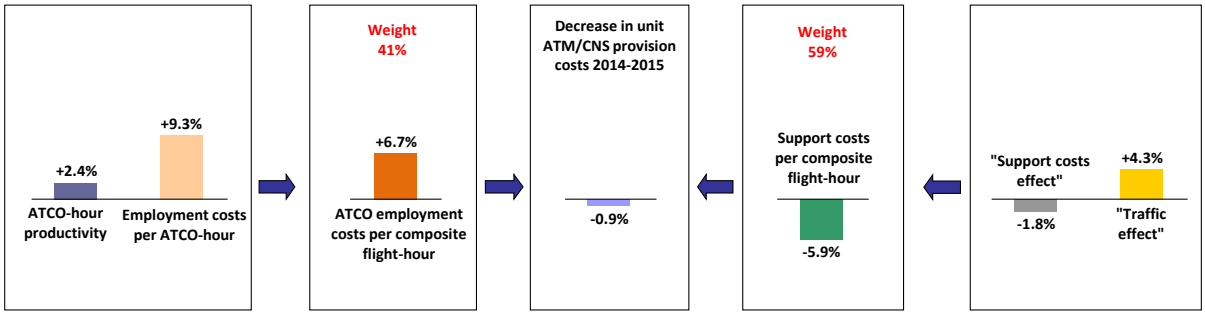
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

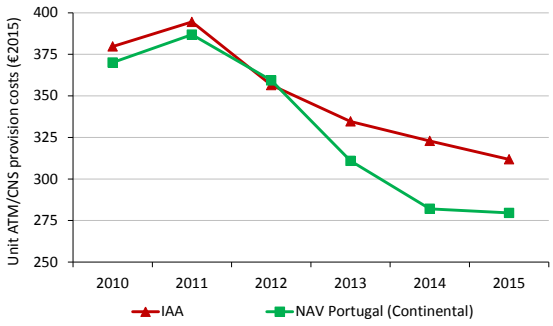


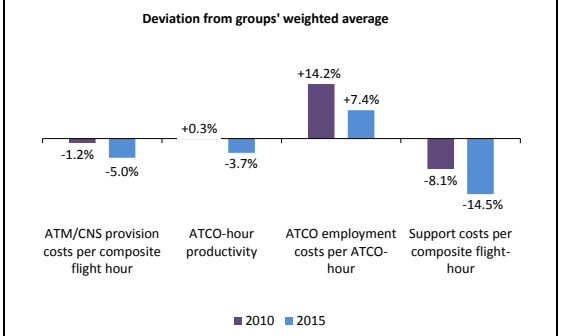
Changes in financial cost-effectiveness (2014-2015)



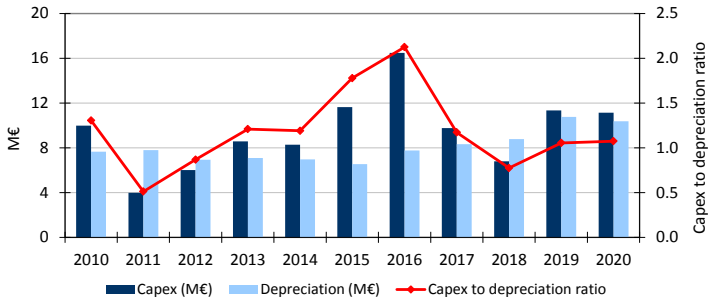
NAV Portugal Continental (Portugal) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2001*	C: 2001*	C: 2001*	C: 1999*
						2010				
						2011				
€5.1M	€2.9M	€1.1M	€1.7M	€3.7M	€3.1M	2012				
						2013				
						2014				
€21.3M	€4.2M	€8.5M	€14.4M	€4.5M	€2.8M	2015				
						2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	ATM systems program (mainly including the evolution of the LISATM system into LISATM-FDPS)	ATM	26.4	2012	2019
2	Surveillance program (mainly including equipment for Lisbon FIR, Mode S radar sensors, replacement of Lisbon radar)	SUR	16.1	2012	2019
3	Navaids program (mainly including new ILS systems at Porto and Lisbon and the installation of navaids in the Porto TMA)	NAV	9.6	2012	2019
4	Building program (mainly including facilities maintenance in Lisbon)	Buildings	8.2	2012	2019
5	Communication program (mainly including new VCS system and purchase of tape recorders and communications systems in the Lisbon FIR)	COM	7.1	2012	2019

NAVIAIR (Denmark) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: 1 EUR = 7.458 DKK

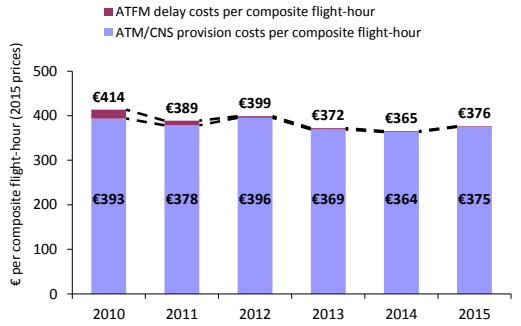
NAVIAIR represents 1.4% of European system gate-to-gate ATM/CNS provision costs

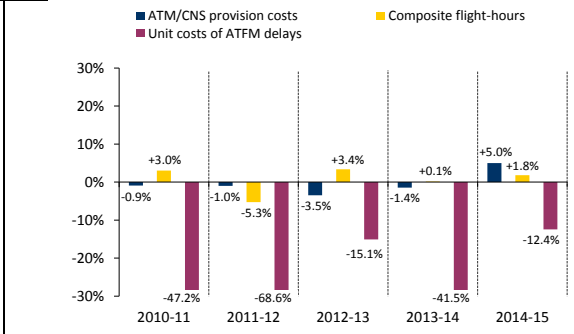
Operational conditions

Aggregated complexity score: Min — Max

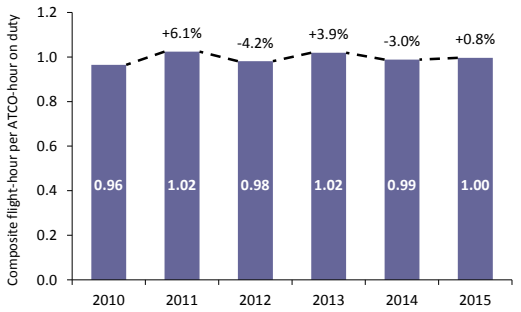
Seasonal traffic variability: Min — Max

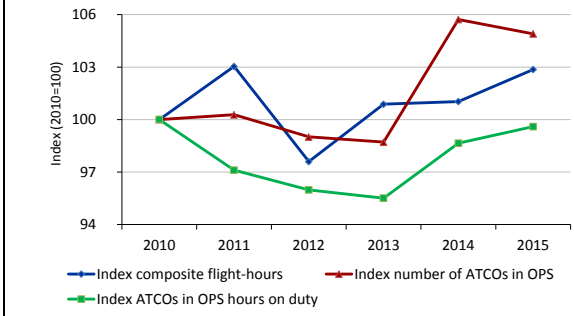
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



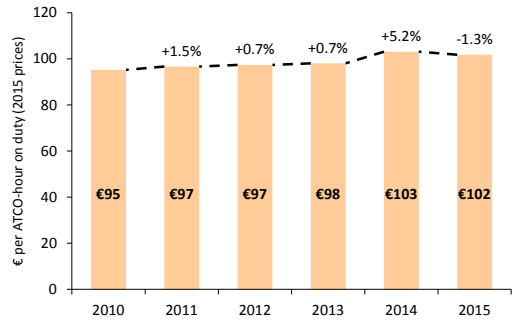


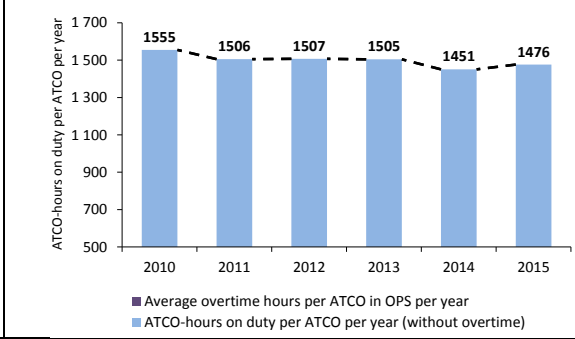
Trend in gate-to-gate ATCO-hour productivity



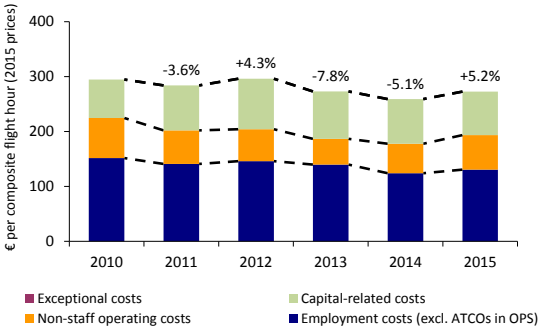


Trend in gate-to-gate employment costs per ATCO-hour

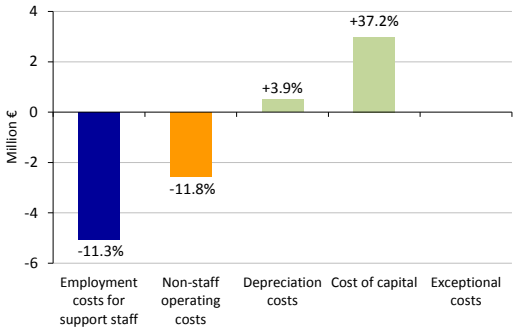




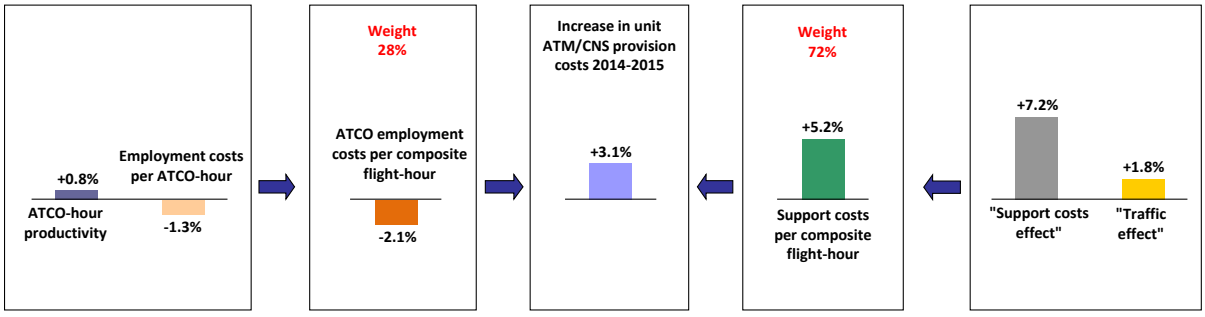
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

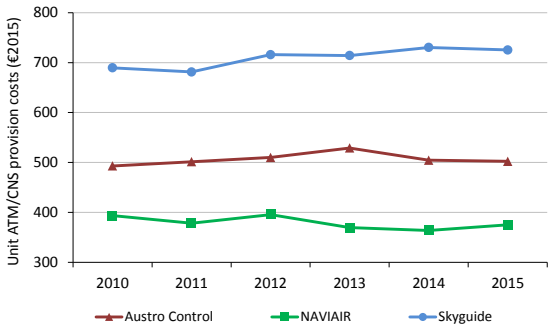


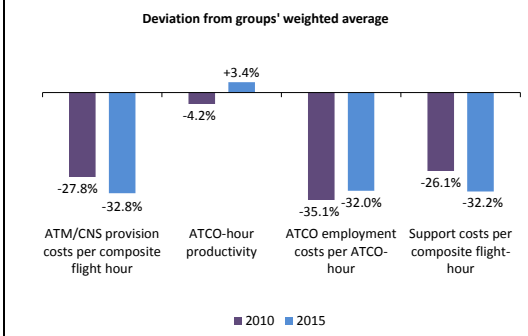
Changes in financial cost-effectiveness (2014-2015)



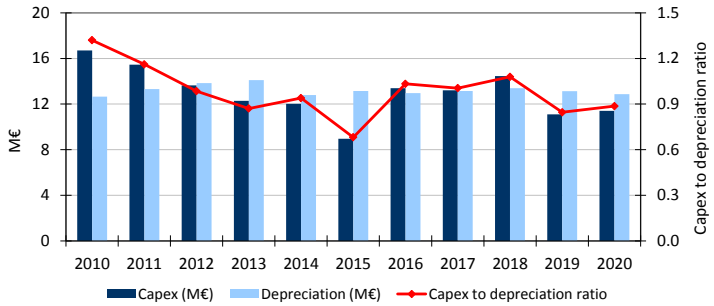
NAVIAIR (Denmark) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS C: 2012*	RDPS C: 2006*	HMI C: 2012*	VCS C: 2007*
						2010				
						2011				
						2012				
						2013				
						2014				
€19.5M	€9.1M	€0.7M	€5.0M	€7.3M	€2.6M	2015				
						2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Investments mainly relating to COOPANS and the upgrade of the FDP, RDP and HMI systems	ATM	19.4	2016	2020
2a	Investments mainly relating to the implementation of Voice over Internet Protocol (VoIP) programme and related projects	COM	14.8	2016	2020
2b		NAV			
2c		SUR			
3	Investments mainly related to buildings	Buildings	9.9	2016	2020
4	Other	Other			

Oro Navigacija (Lithuania) – Cost-effectiveness KPIs (€2015)

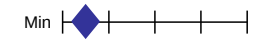
Contextual economic information

Exchange rate: Lithuania is within the EURO Zone

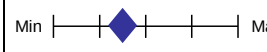
Oro Navigacija represents 0.3% of European system gate-to-gate ATM/CNS provision costs

Operational conditions

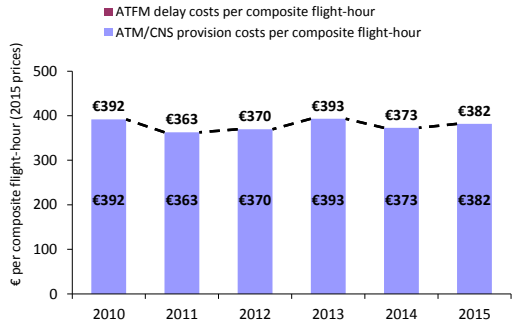
Aggregated complexity score:

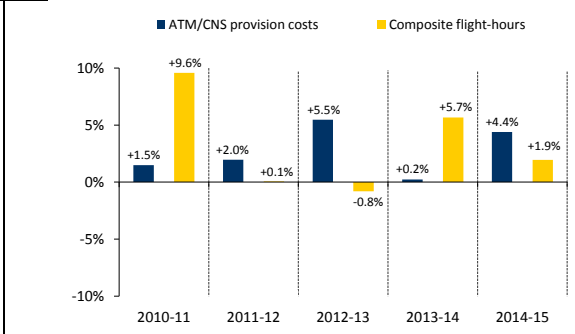


Seasonal traffic variability:

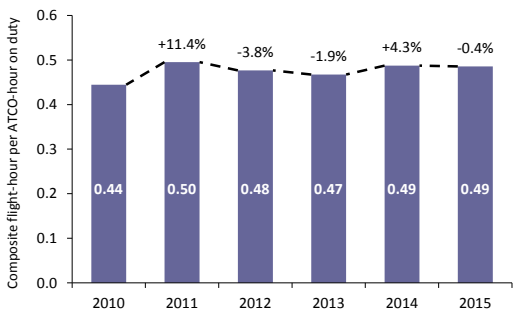


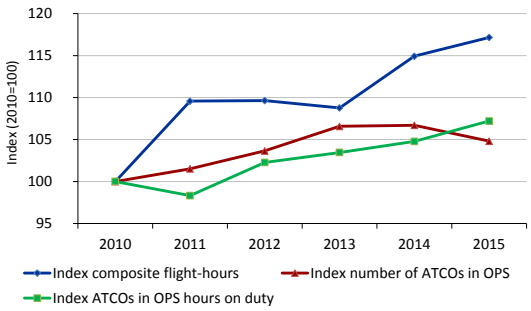
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



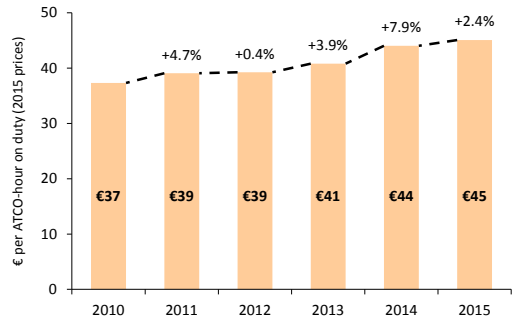


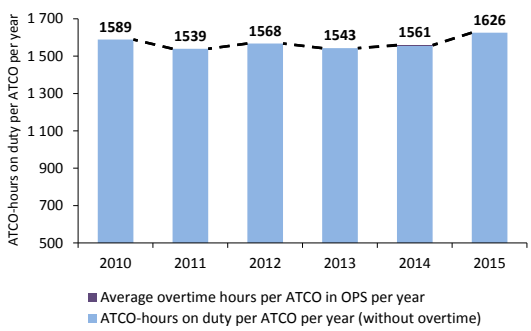
Trend in gate-to-gate ATCO-hour productivity



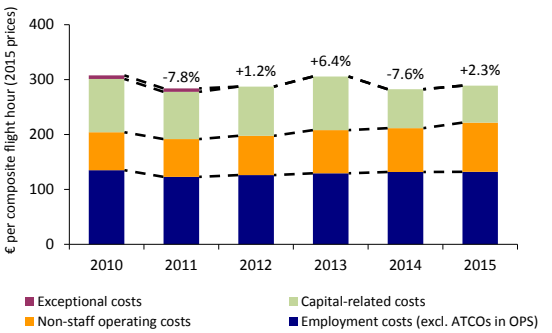


Trend in gate-to-gate employment costs per ATCO-hour

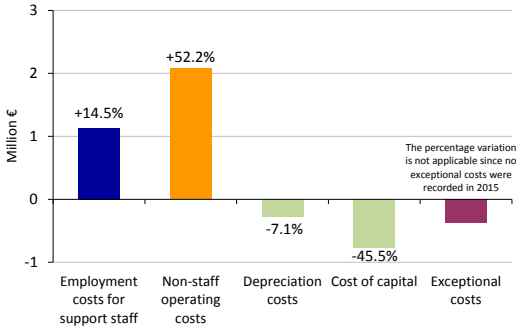




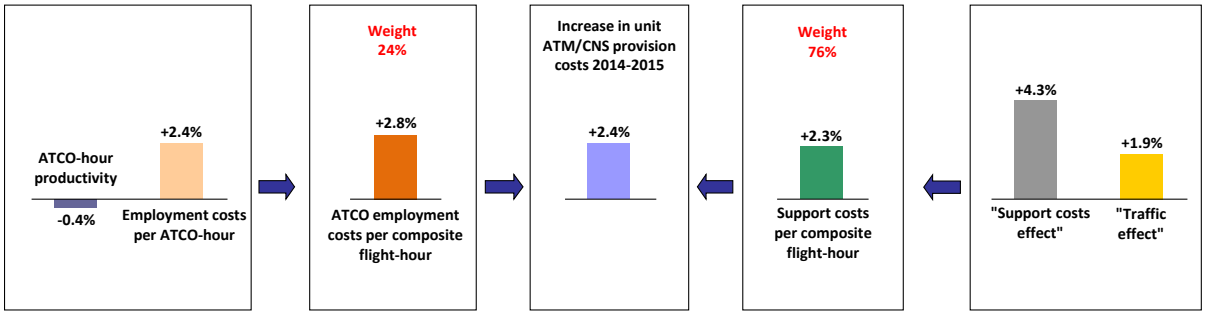
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

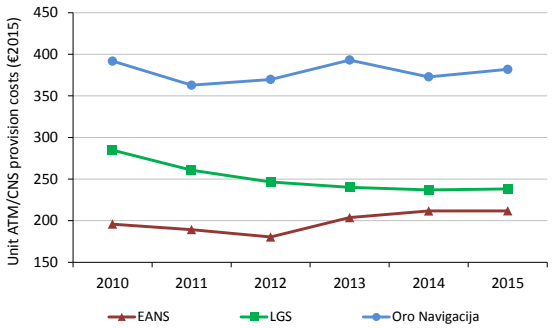


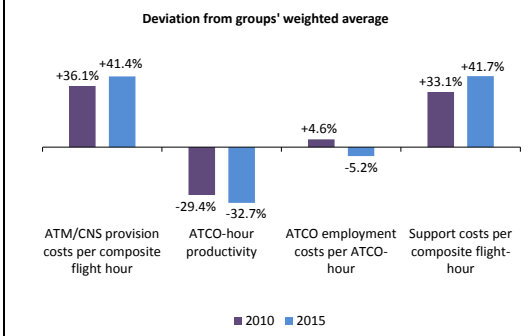
Changes in financial cost-effectiveness (2014-2015)



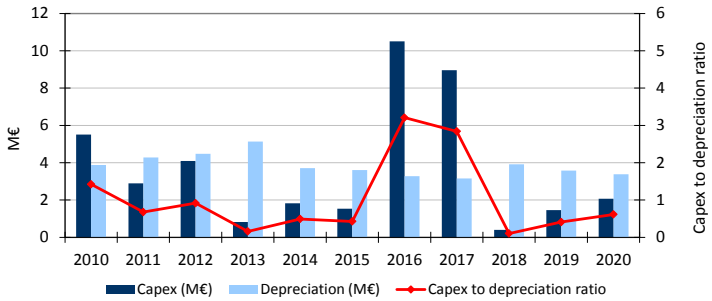
Oro Navigacija (Lithuania) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS C: 2005*	RDPS C: 2005*	HMI C: 2005*	VCS C: 2005*
€5.1M (2008-2014)	€3.0M (2009-2013)					2010				
						2011				
		€1.7M				2012				
						2013				
	€2.0M			€10.7M		2014				
€6.8M		€0.9M	€1.1M		€1.9M	2015				
						2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	ACC and Administration building	Buildings	10.7	2014	2018
2	Installation of the new ATC system in new ACC	ATM	6.2	2015	2018
3	ATCC equipment modernisation (Vilnius)	ATM	3.7	2008	2014
4	Improvement of the transmission network	COM	3.0	2009	2013
5	Modernization of A-SMGCS in Vilnius	SUR	1.1	2015	2019

PANSA (Poland) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: 1 EURO = 4.181 PLN

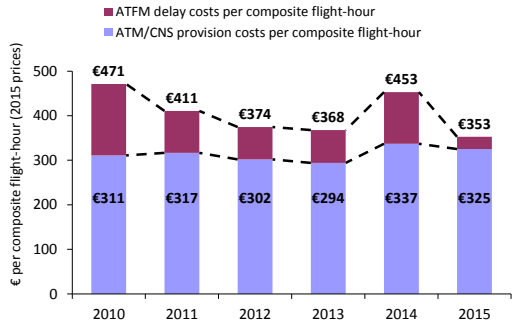
PANSA represents 2.0% of European system gate-to-gate ATM/CNS provision costs

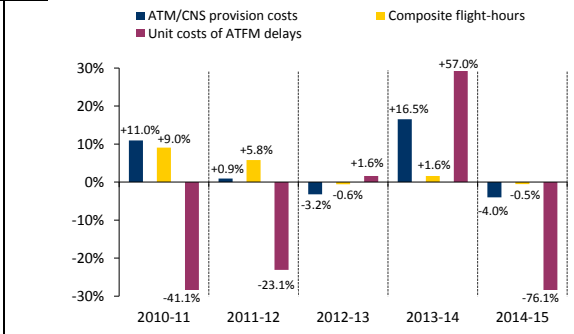
Operational conditions

Aggregated complexity score: Min — Max

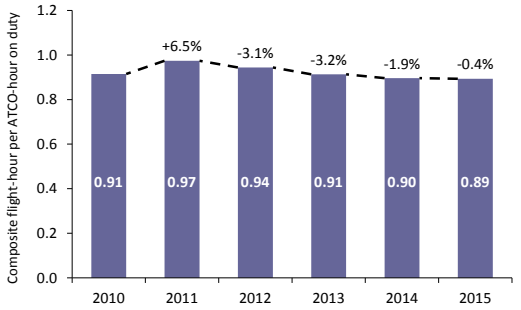
Seasonal traffic variability: Min — Max

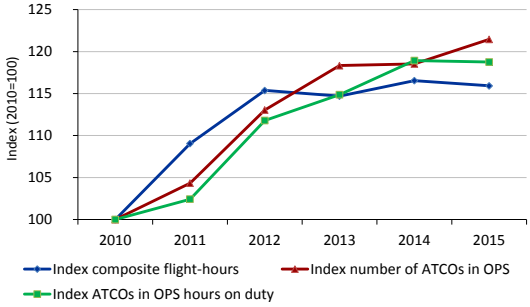
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



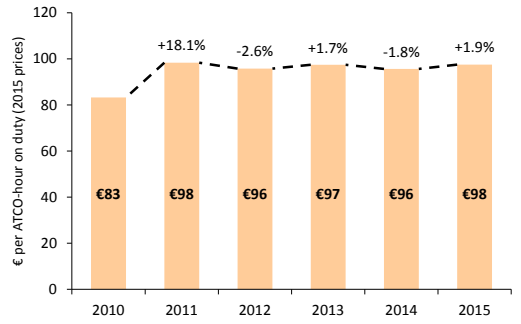


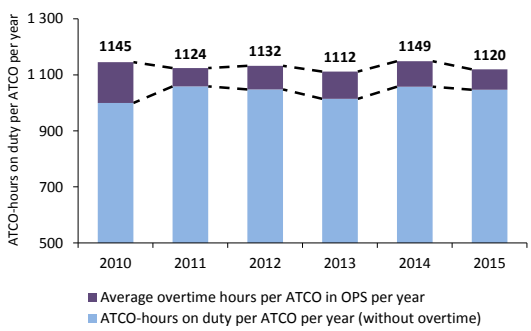
Trend in gate-to-gate ATCO-hour productivity



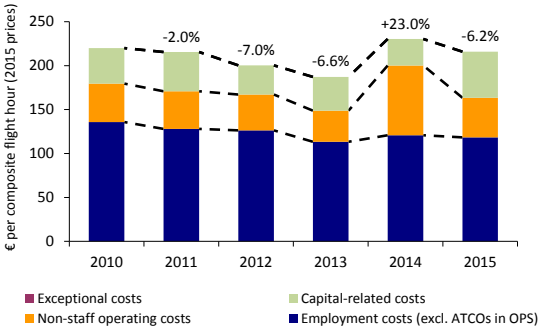


Trend in gate-to-gate employment costs per ATCO-hour

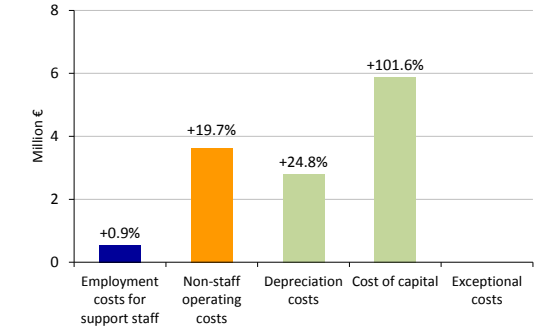




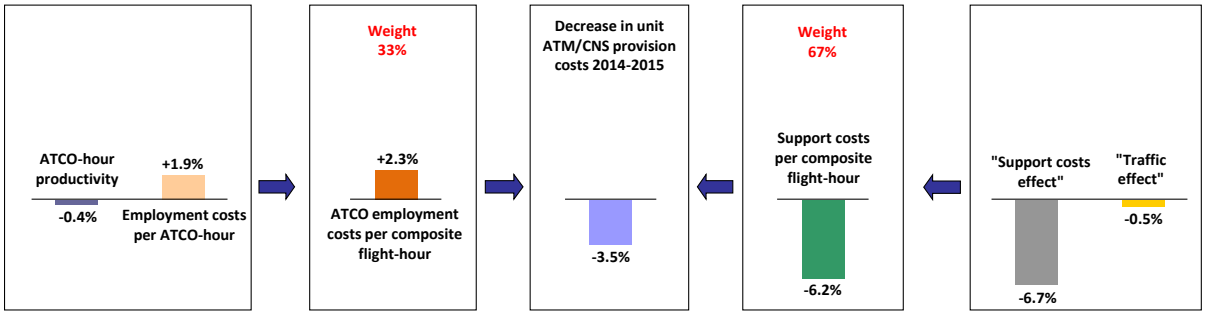
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

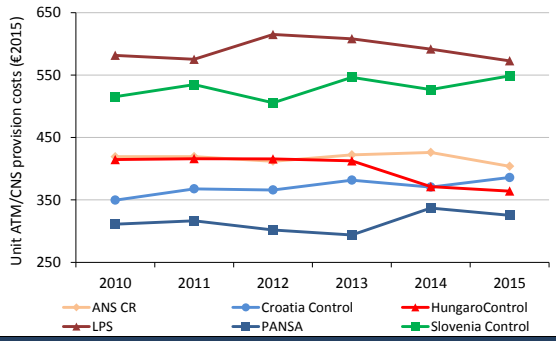


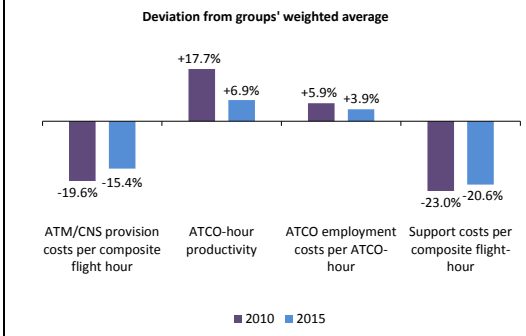
Changes in financial cost-effectiveness (2014-2015)



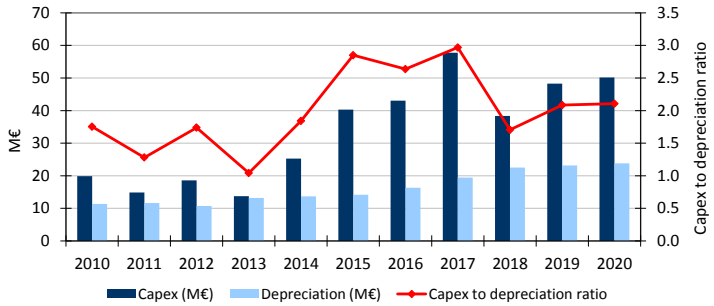
PANSA (Poland) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2013*	C: 2013*	C: 2013*	C: 2013*
					€4.6M	2010				
						2011				
€37.5M (2008-2014)	€1.4M	€11.1M				2012				
			€12.8M			2013				
						2014				
						2015				
€122.5M	€16.9M					2016				
		€11.6M	€45.9M	€47.7M	€32.2M	2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	ATC training and contingency infrastructure	ATM	87.0	2015	2020
2	Towers (Katowice, Kraków, Poznań) & other	Buildings	47.7	2016	2020
3	Radio location system	SUR	34.9	2015	2020
4	Implementation of PEGASUS ATM system	ATM	26.6	2008	2014
5	Pegasus ATM system and supporting systems	ATM	26.1	2015	2018

ROMATSA (Romania) – Cost-effectiveness KPIs (€2015)

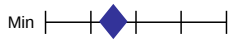
Contextual economic information

Exchange rate: 1 EUR = 4.442 RON

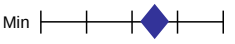
ROMATSA represents 2.0% of European system gate-to-gate ATM/CNS provision costs

Operational conditions

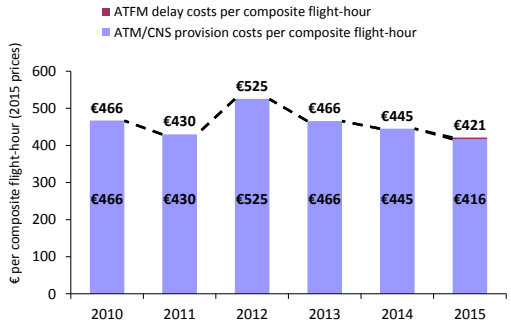
Aggregated complexity score:

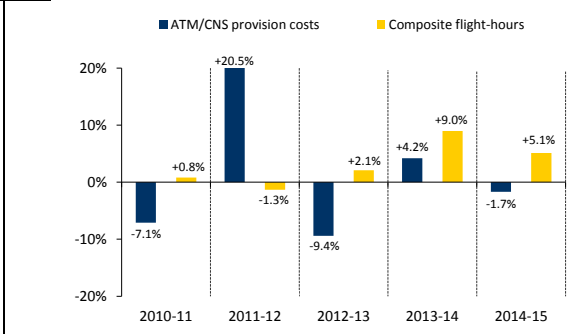


Seasonal traffic variability:

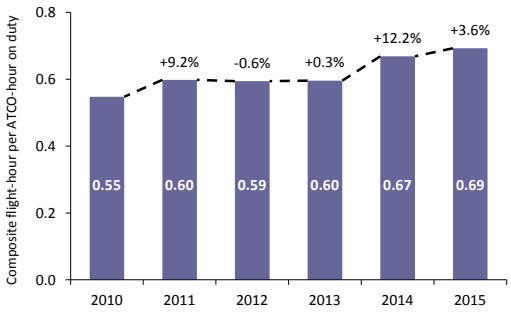


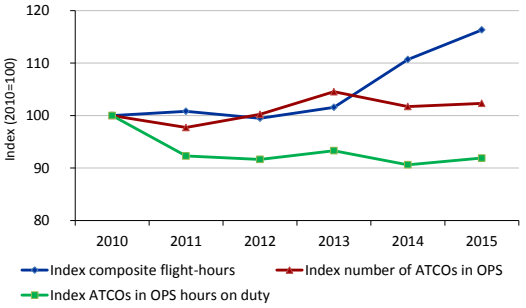
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



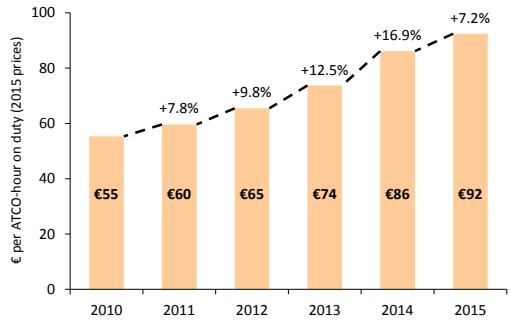


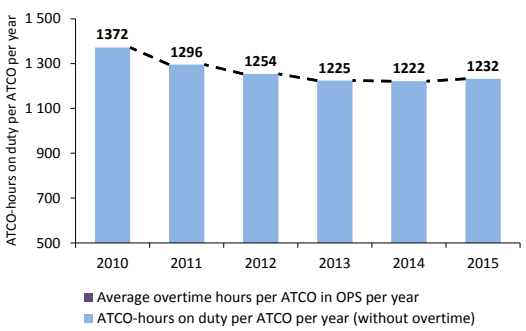
Trend in gate-to-gate ATCO-hour productivity



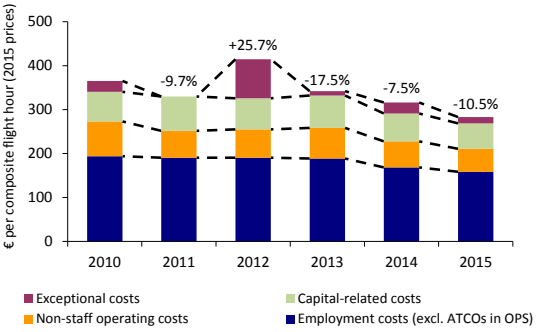


Trend in gate-to-gate employment costs per ATCO-hour

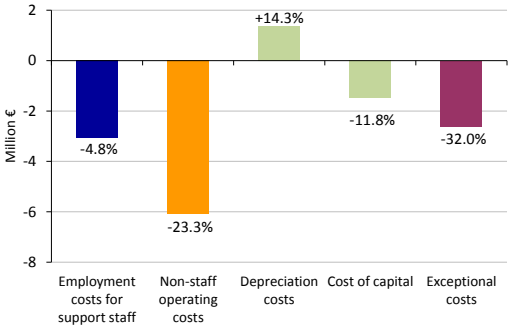




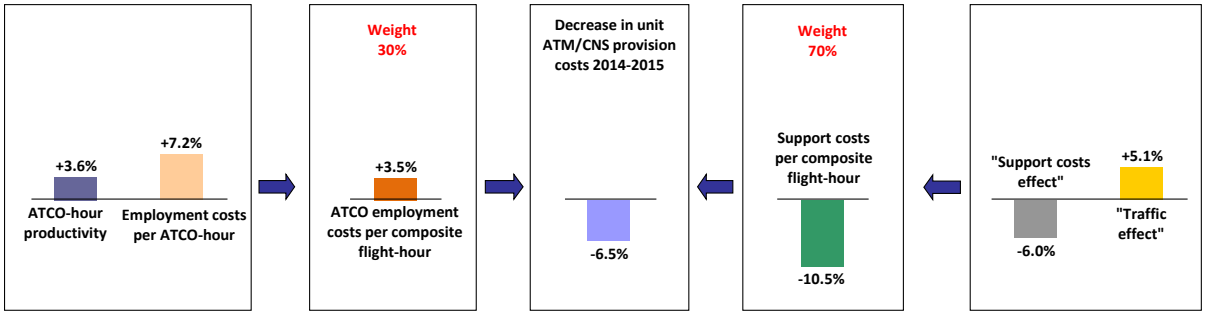
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

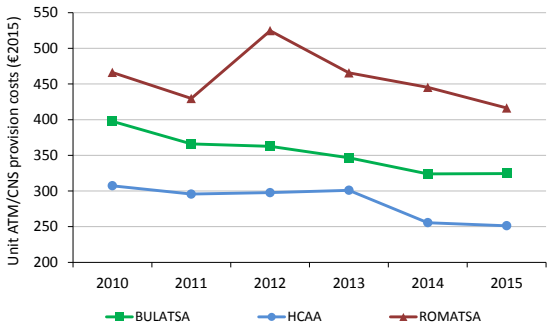


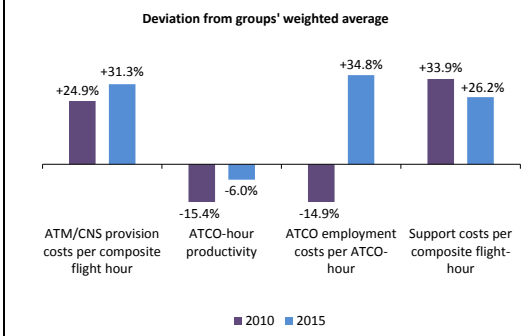
Changes in financial cost-effectiveness (2014-2015)



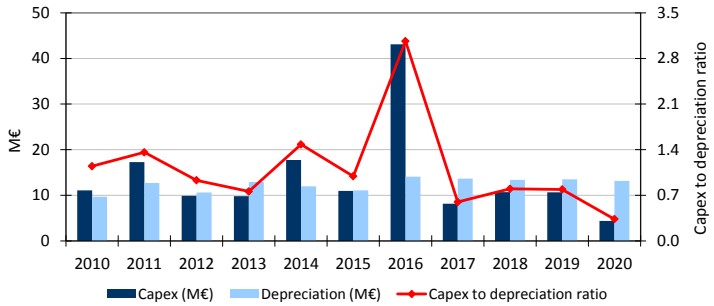
ROMATSA (Romania) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2003*	C: 2003*	C: 2003*	C: 2003*
						2010				
		€1.1M (2009-2013)		€0.4M		2011				
						2012				
			€23.7M (2009-2017)			2013				
€61.3M (2008-2021)	€13.7M				€3.8M	2014				
		€5.4M		€12.5M		2015				
						2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	ATM System ROMATSA 2015+ Phase I	ATM	34.1	2013	2017
2	ATM System ROMATSA 2015+ Phase II	ATM	15.0	2017	2019
3	ATM System ROMATSA 2015+ Phase III	ATM	10.0	2019	2021
4	New Cluj Tower	Buildings	8.0	2014	2017
5	MSSR Mode S radar installation	SUR	7.1	2014	2016

Sakaeronavigatsia (Georgia) – Cost-effectiveness KPIs (€2015)

Contextual economic information

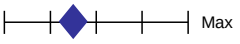
Exchange rate: 1 EUR = 2.240 GEL

Sakaeronavigatsia represents 0.3% of European system gate-to-gate ATM/CNS provision costs

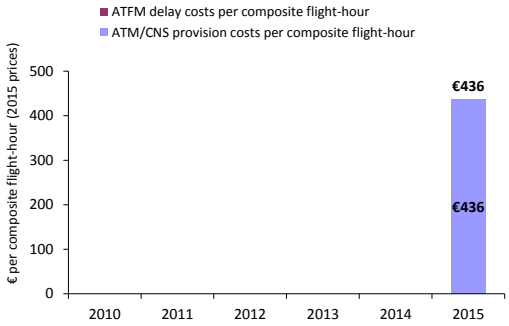
Operational conditions

Aggregated complexity score:

Seasonal traffic variability:

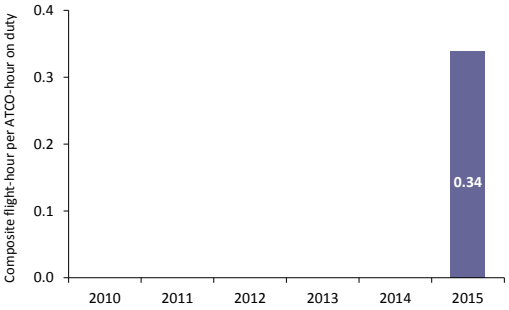


Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



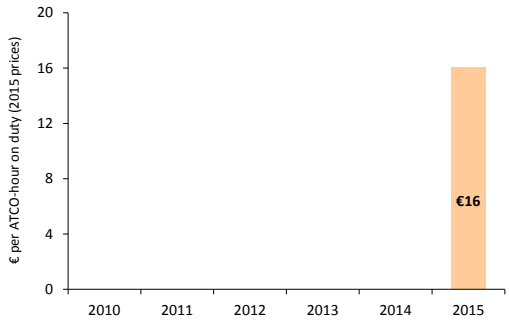
Note that Sakaeronavigatsia is included in ACE 2015 for the first time and no historical data is available prior to 2015.

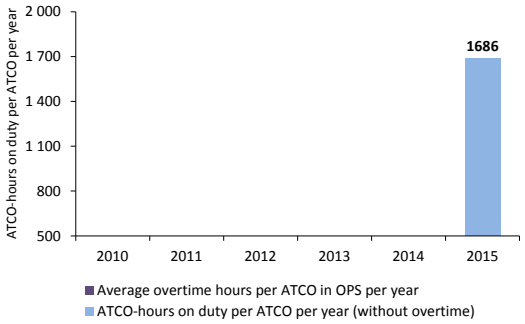
Trend in gate-to-gate ATCO-hour productivity



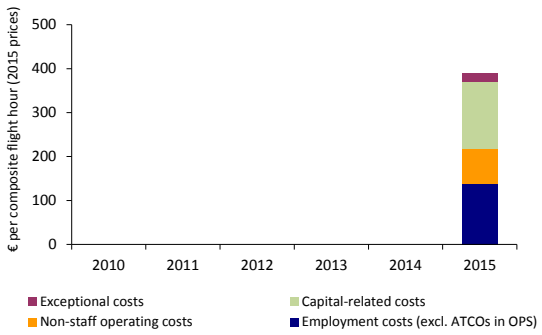
Note that Sakaeronavigatsia is included in ACE 2015 for the first time and no historical data is available prior to 2015.

Trend in gate-to-gate employment costs per ATCO-hour





Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

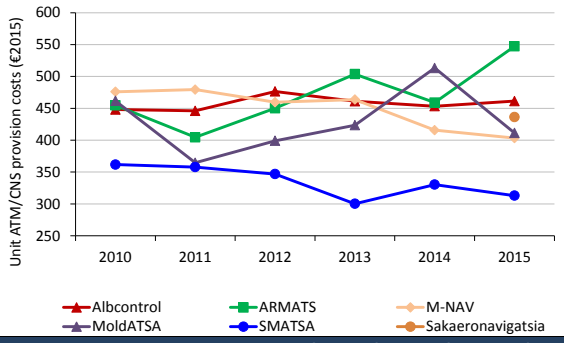
Note that Sakaeronavigatsia is included in ACE 2015 for the first time and no historical data is available prior to 2015.

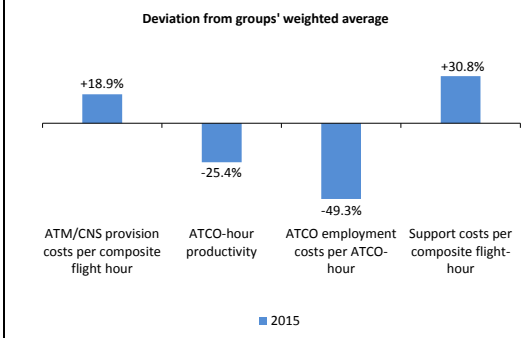
Changes in financial cost-effectiveness (2014-2015)

Note that Sakaeronavigatsia is included in ACE 2015 for the first time and no historical data is available prior to 2015.

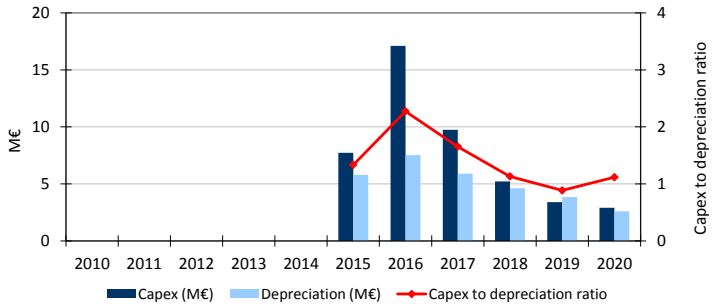
Sakaeronavigatsia (Georgia) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS C: 2009*	RDPS C:2009*	HMI C: 2009*	VCS C: 2009*
						2010				
						2011				
						2012				
						2013				
€8.5M	€0.7M			€2.4M	€3.4M**	2014				
		€2.3M (2015-2021)				2015				
						2016				
			€2.8M			2017				
						2018				
						2019				
						2020				

** Includes costs for 2 MET radars

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	New ATC system in Tbilisi Airport and backup at Kutaisi Airport	ATM	6.0	2015	2018
2	ADS-B/MLAT/WAM	SUR	2.8	2017	2018
3	Tbilisi ATC building construction	Buildings	2.4	2014	2017
4	Tower Simulator	ATM	1.9	2016	2018
5	Meteorological radar	OTHER	1.5	2015	2016

Skyguide (Switzerland) – Cost-effectiveness KPIs (€2015)

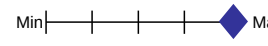
Contextual economic information

Exchange rate: 1 EUR = 1.068 CHF

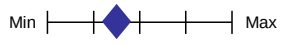
Skyguide represents 4.1% of European system gate-to-gate ATM/CNS provision costs

Operational conditions

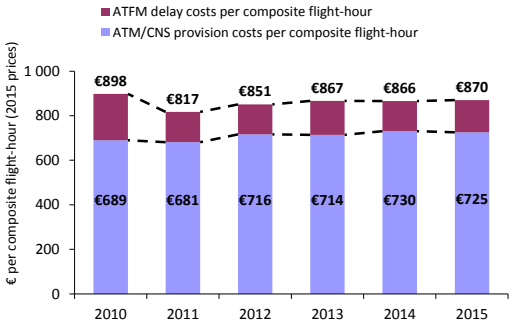
Aggregated complexity score:

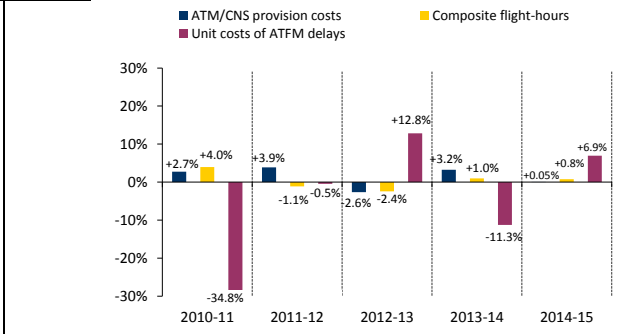


Seasonal traffic variability:

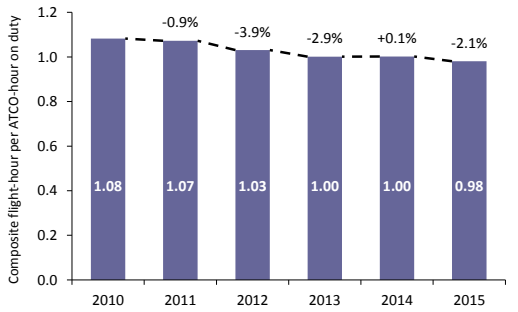


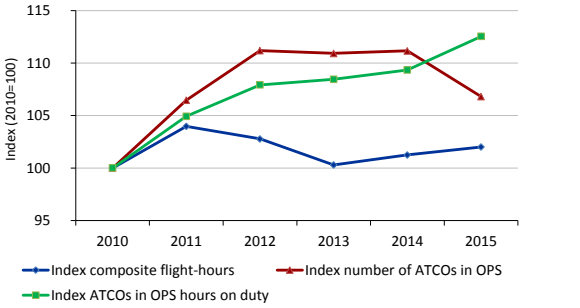
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



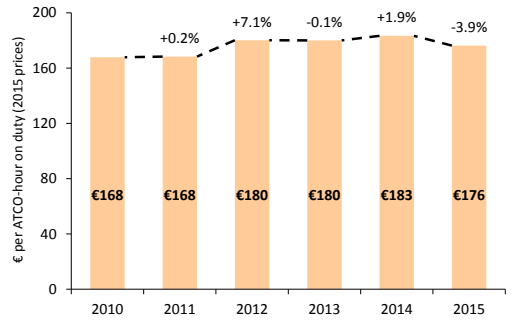


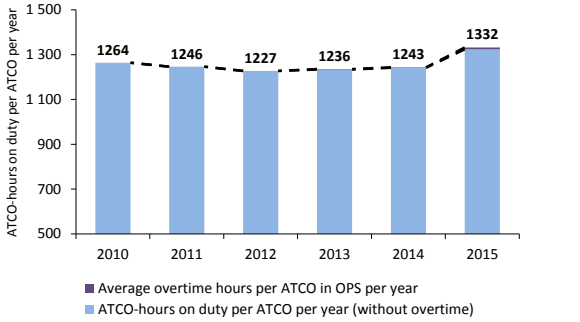
Trend in gate-to-gate ATCO-hour productivity



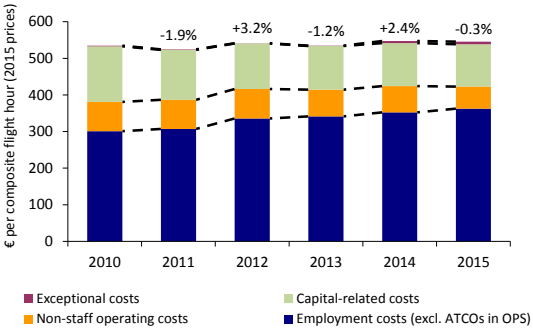


Trend in gate-to-gate employment costs per ATCO-hour

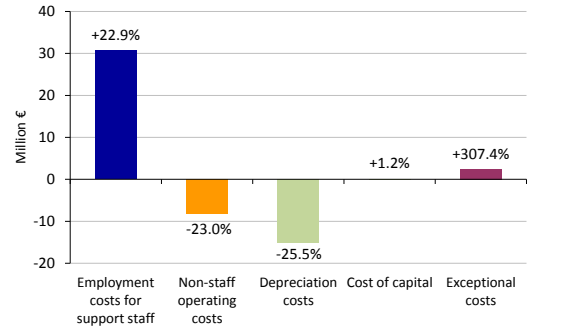




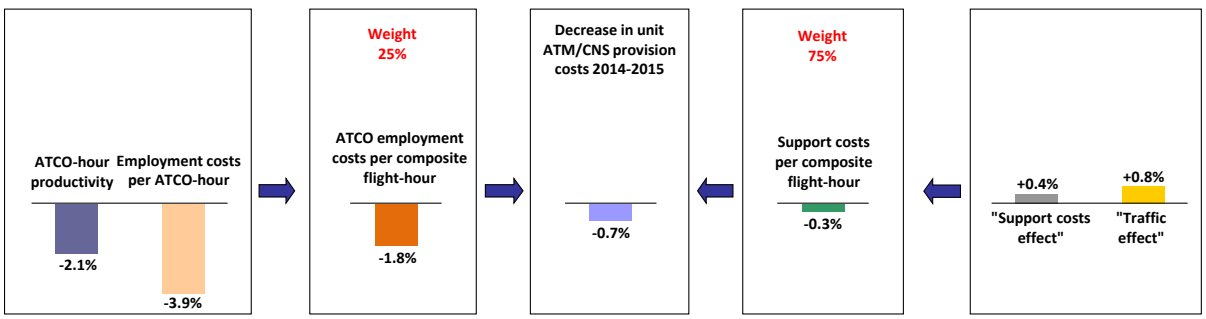
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

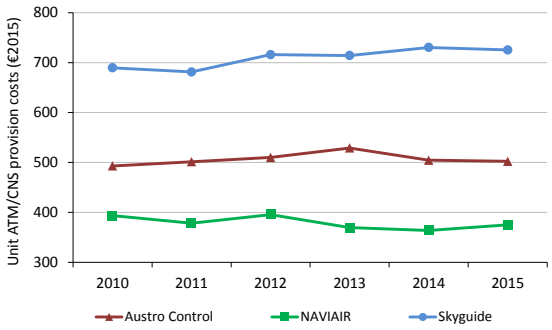


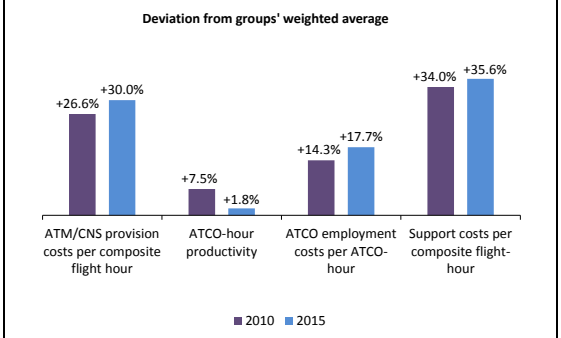
Changes in financial cost-effectiveness (2014-2015)



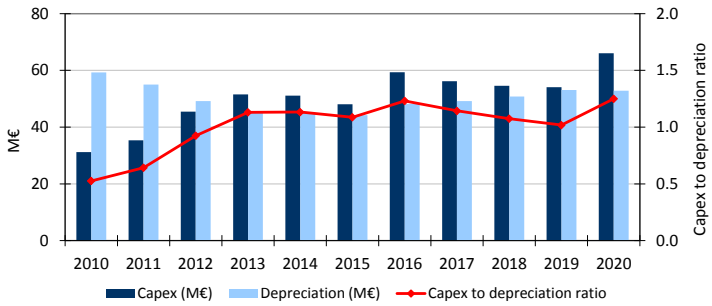
Skyguide (Switzerland) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS C: 1999 (Geneva) 2007 (Zurich)*	RDPS C: 2004 (All ACCs)*	HMI C: 2003/2006 (All ACCs)*	VCS C: 2004/2005 (All ACCs)*
€136.5M (2005-2021)			€12.6M			2010				
	€29.1M (2011-2021)					2011				
		€3.1M		€4.2M		2012				
						2013				
						2014				
						2015	Geneva		Geneva	All ACCs
						2016	Zurich	All ACCs	Zurich	
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Virtual Center 1	ATM	51.8	2011	2020
2	NETWORK Evolutions	ATM	34.1	2005	2020
3	Smart Radio	COM	23.8	2012	2021
4	TACO (Tower – Approach – Communication) system integration into the new FDP in Zurich	ATM	21.3	2008	2015
5	TD HW replacement ATM	ATM	12.6	2010	2021

Slovenia Control (Slovenia) – Cost-effectiveness KPIs (€2015)

Contextual economic information

Exchange rate: Slovenia is within the EURO Zone

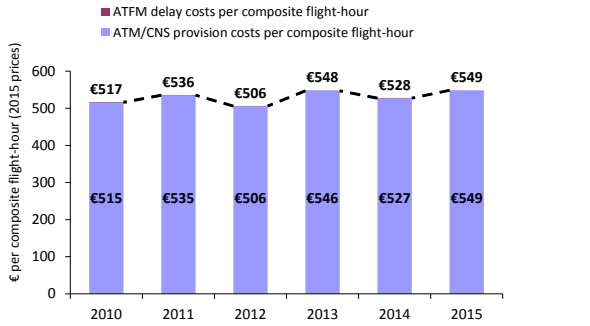
Slovenia Control represents 0.4% of European system gate-to-gate ATM/CNS provision costs

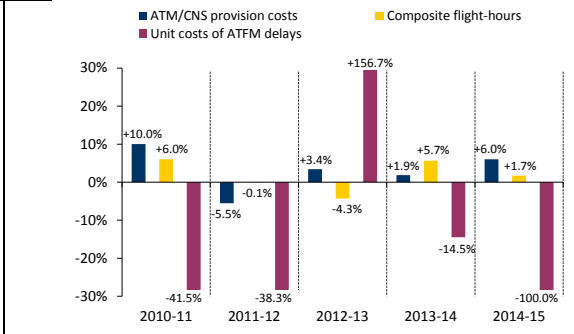
Operational conditions

Aggregated complexity score: Min — Max

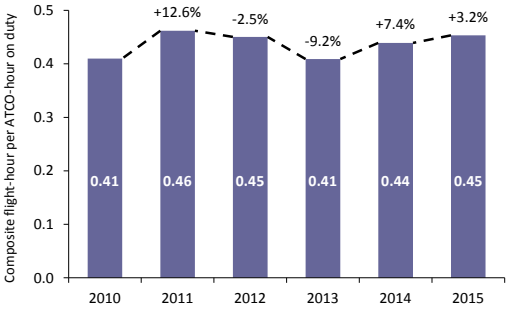
Seasonal traffic variability: Min — Max

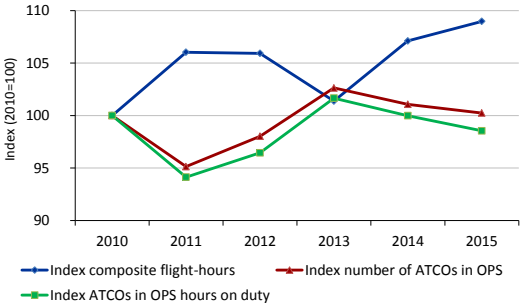
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



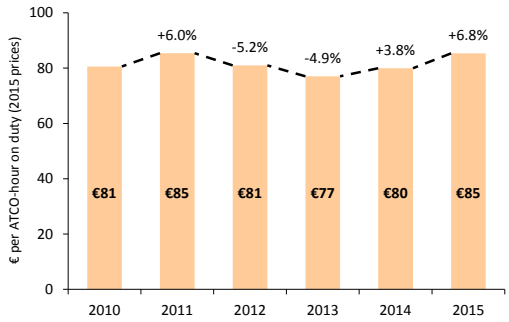


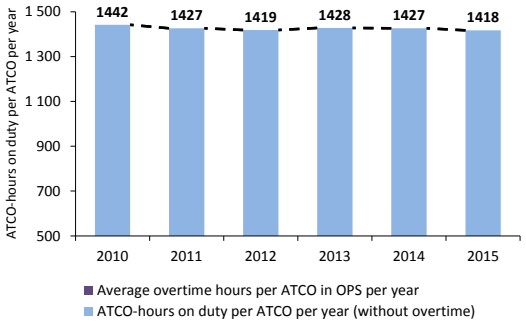
Trend in gate-to-gate ATCO-hour productivity



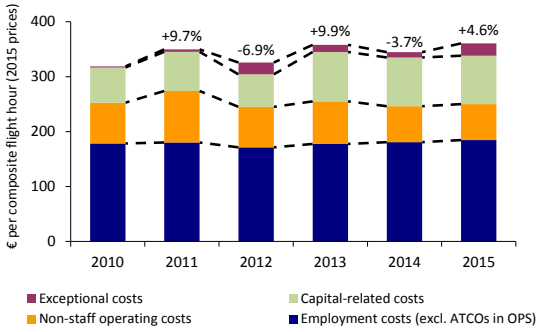


Trend in gate-to-gate employment costs per ATCO-hour

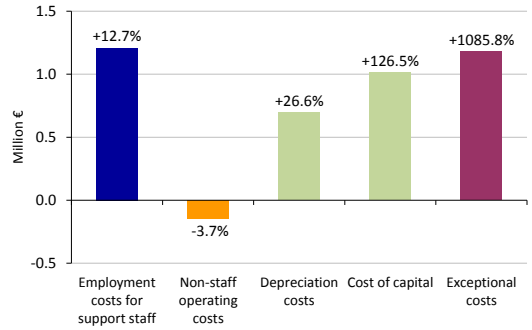




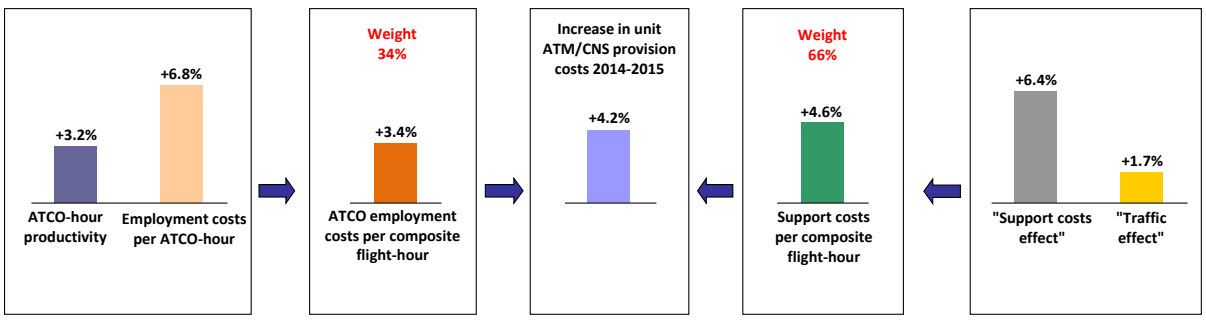
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

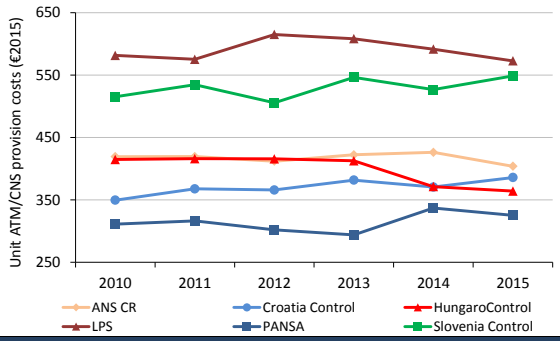


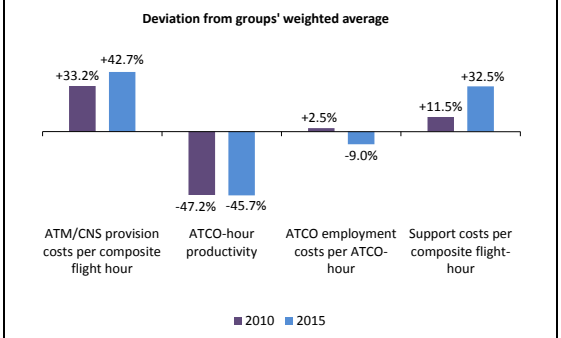
Changes in financial cost-effectiveness (2014-2015)



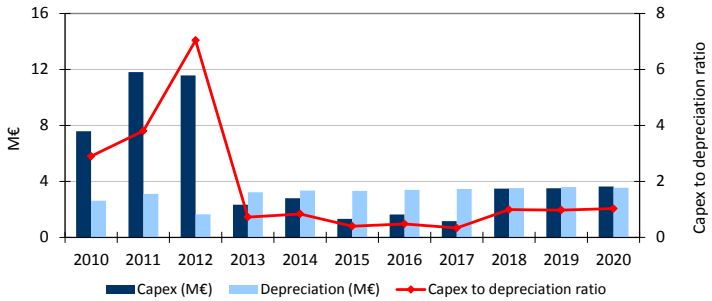
Slovenia Control (Slovenia) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS	RDPS	HMI	VCS
							C: 2007*	C: 2000*	C: 2000*	C: 2013*
€6.9M (2006-2013)	€1.2M	€1.8M (2009-2012)		€22.7M (2006-2013)		2010				
						2011				
						2012				
						2013				
			€1.0M			2014				
€8.1M					€2.9M	2015				
						2016				
	€2.9M					2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	New ATCC building in Ljubljana (including general equipment)	Buildings	22.7	2006	2013
2	New ATCC technical systems	ATM	6.9	2006	2013
3	ATM System upgrade	ATM	4.6	2018	2020
4	Datalink/CPDLC	COM	2.5	2017	2018
5	FDPS Upgrade	ATM	2.2	2015	2017

SMATSA (Serbia and Montenegro) – Cost-effectiveness KPIs (€2015)

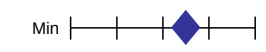
Contextual economic information

Exchange rate: 1 EUR = 120.620 RSD

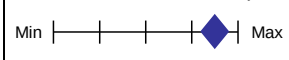
SMATSA represents 1.0% of European system gate-to-gate ATM/CNS provision costs

Operational conditions

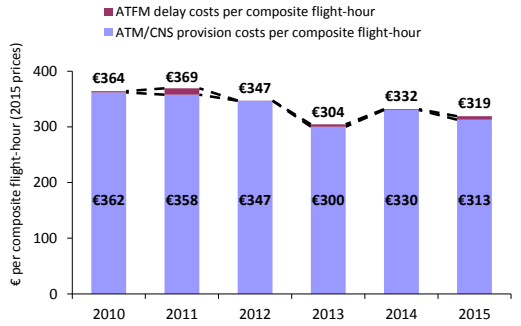
Aggregated complexity score:

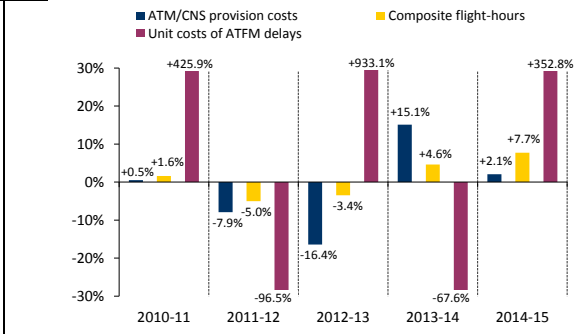


Seasonal traffic variability:

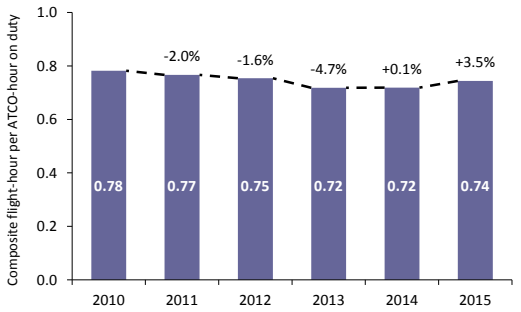


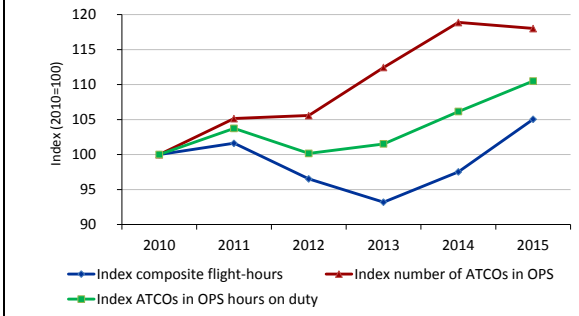
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



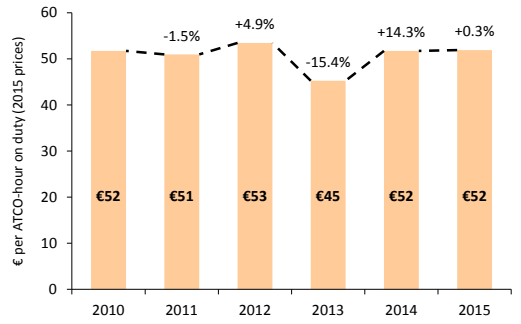


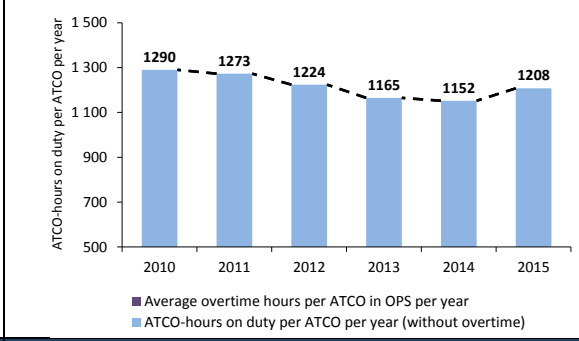
Trend in gate-to-gate ATCO-hour productivity



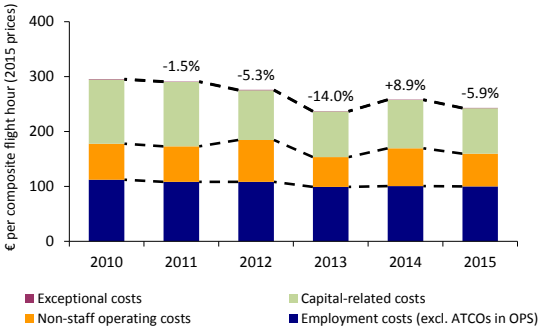


Trend in gate-to-gate employment costs per ATCO-hour

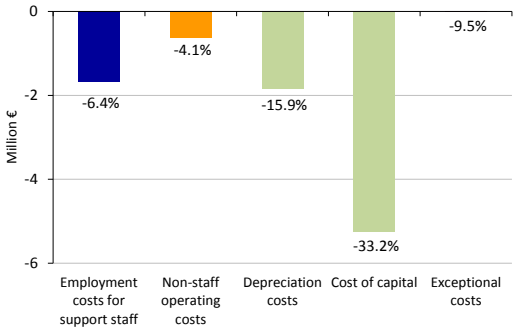




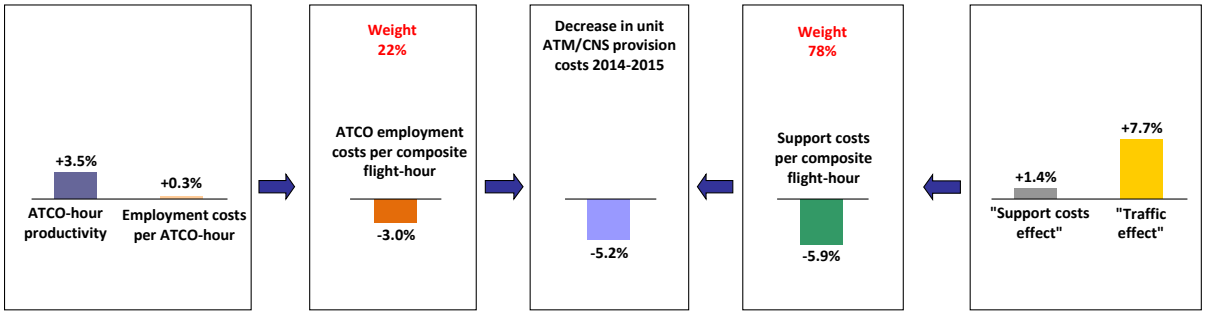
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

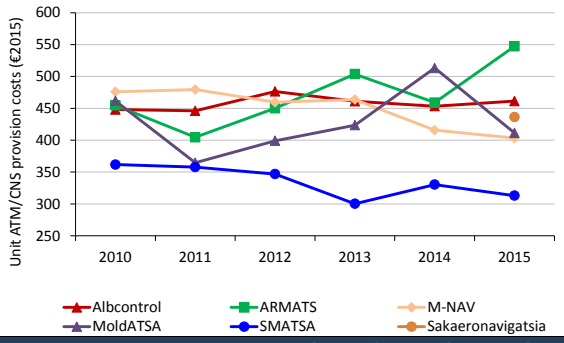


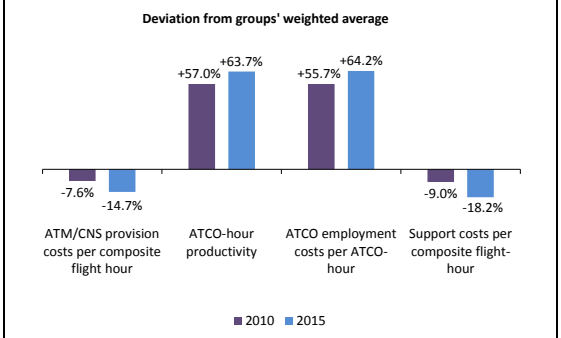
Changes in financial cost-effectiveness (2014-2015)



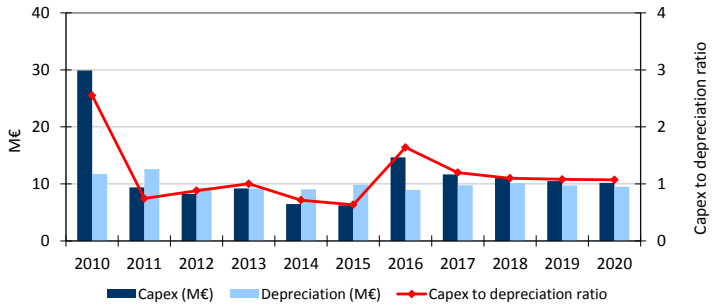
SMATSA (Serbia and Montenegro) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS C: 2011*	RDPS C: 2011*	HMI C: 2011*	VCS C: 2011*
€66.2M (2008-2017)				€22.5M (2009-2017)		2010				
			€2.2M			2011				
	€7.2M					2012				
		€2.7M				2013				
						2014				
						2015				
						2016				
						2017				
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	New ATM System for Belgrade ACC and SMATSA communications network	ATM	28.9	2009	2011
2	New ATCC in Belgrade	Buildings	16.5	2009	2010
3	Aircraft equipped with Automatic Flight Inspection System	ATM	9.4	2008	2010
4	Top Sky ATC system upgrade	ATM	7.9	2016	2017
5	Procurement of a second aircraft for flight calibration of equipment	ATM	7.6	2013	2013

UkSATSE (Ukraine) – Cost-effectiveness KPIs (€2015)

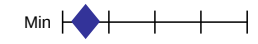
Contextual economic information

Exchange rate: 1 EUR = 24.123 UAH

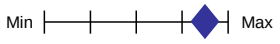
UkSATSE represents 1.1% of European system gate-to-gate ATM/CNS provision costs

Operational conditions

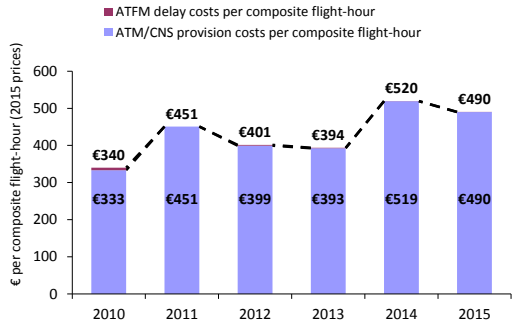
Aggregated complexity score:

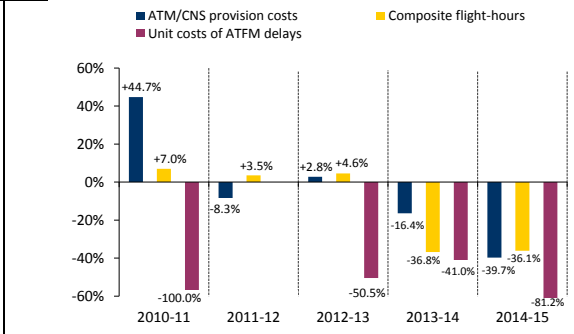


Seasonal traffic variability:

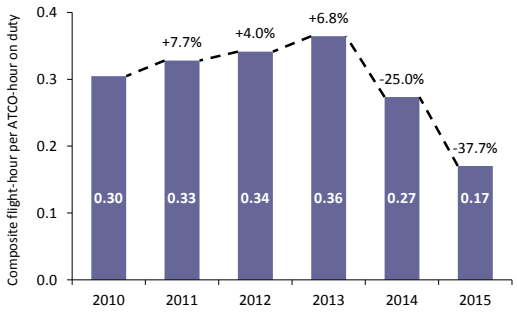


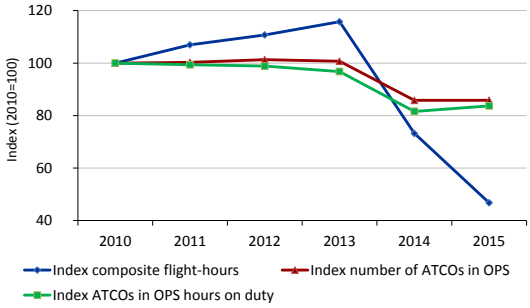
Trend in gate-to-gate economic cost-effectiveness (all financial data in €2015 prices)



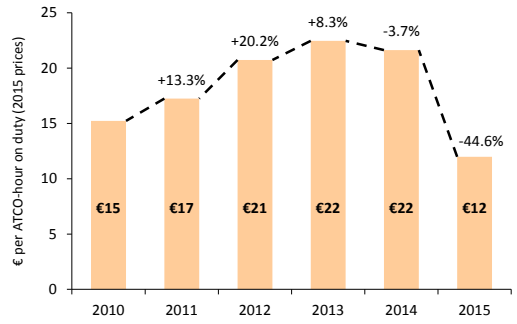


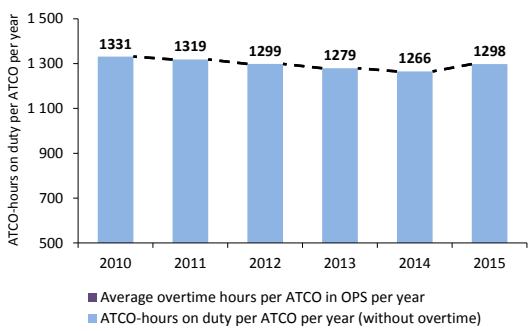
Trend in gate-to-gate ATCO-hour productivity



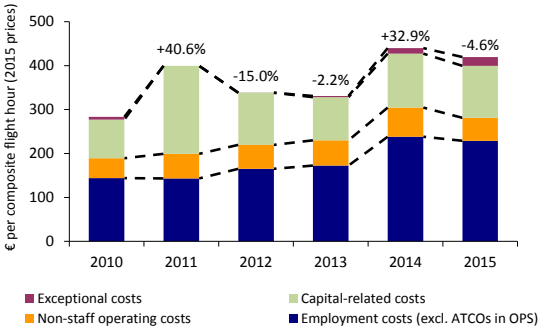


Trend in gate-to-gate employment costs per ATCO-hour

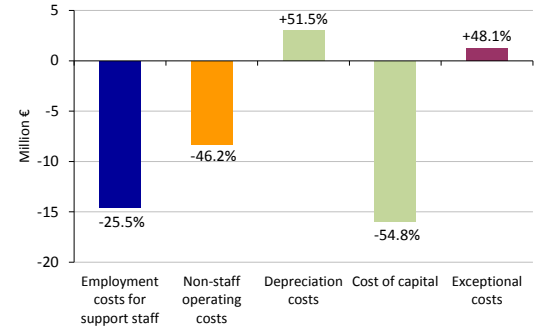




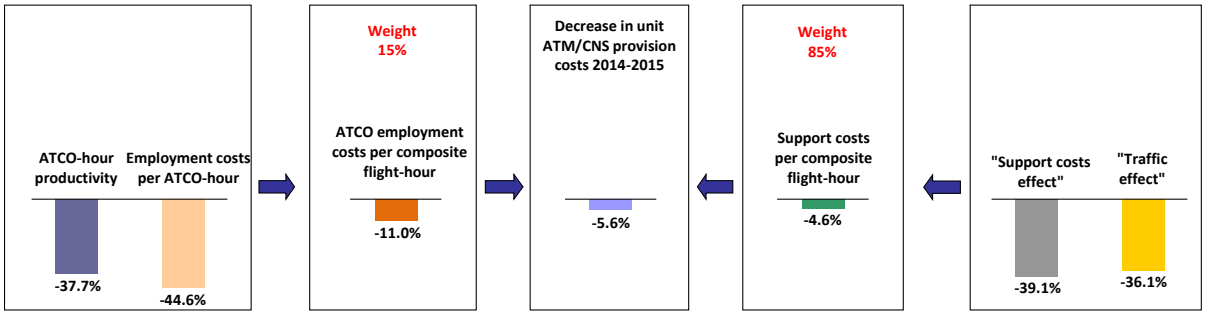
Trend in support costs per composite flight-hour



Changes in components of support costs (2010-2015)

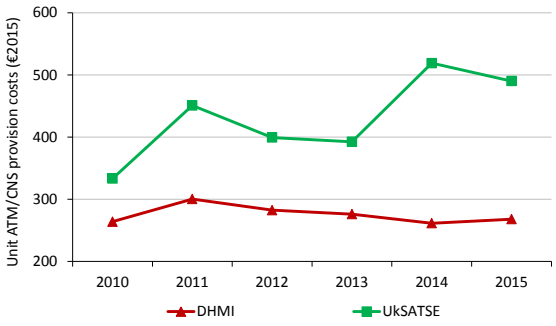


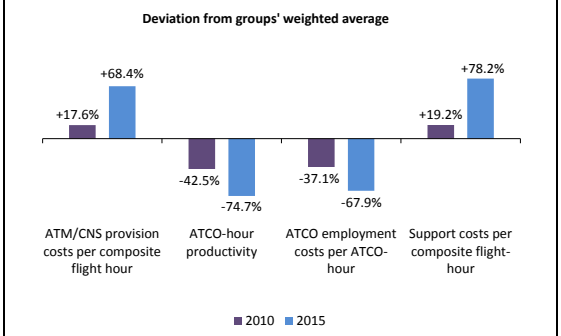
Changes in financial cost-effectiveness (2014-2015)



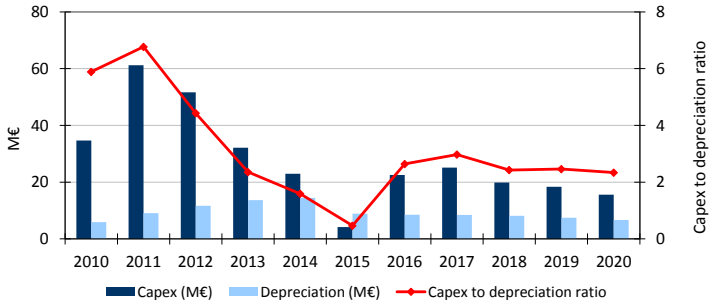
UkSATSE (Ukraine) – (€2015)

Changes in unit gate-to-gate ATM/CNS provision costs within comparator group





Planned capital expenditures and depreciation costs



Information on major capex projects and ATM systems upgrades/replacements

ATM	COM	NAV	SUR	Buildings	Other	Years	FDPS C:1997 (L'viv) 2007 (Kyiv, Odessa, Dnip.)*	RDPS C:1997 (L'viv) 2007 (Kyiv, Odessa, Dnip.)*	HMI C:1997 (L'viv) 2007 (Kyiv, Odessa, Dnip.)*	VCS C:2003 (L'viv) 2006 (Odessa, Dnip.) 2011 (Kyiv)*
€5.4M (2008-2018)						2010				
						2011				K
						2012	K	K	K	
			€16.4M		€3.8M	2013	O, D	O, D	O, D	
	€8.8M					2014	K	K	K	
		€1.7M				2015				K
						2016	L	L	L	L
						2017				O, D
						2018				
						2019				
						2020				

* C = Commissioning Upgrade Replacement

Focus on the top five capex projects

Project number	Name of the project	Domain	Capex spent between start and end dates (€M)	Start date	End date
1	Upgrade of surveillance systems in Bar, Dubno, Bahmach, Znamenka, Chuguyiv	SUR	10.4	2013	2017
2	Implementation of 3 new Monopulse Secondary Surveillance Radars with Mode S (EHS)	SUR	6.0	2016	2018
3	Implementation of new receiving-transmitting radio center with VoIP function on 13 remote sites. Implementation of VoIP function on 4 carent radio centers	COM	5.9	2016	2019
4	Automated system of aviation (air) search, ancillary emergency-rescue equipment	OTHER	3.8	2013	2015
5	Implementation of new ATCO simulator for Kyiv ATM Center	ATM	3.8	2016	2018

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ANNEX 1 – STATUS OF ANSPs 2015 ANNUAL REPORTS

	Availability of a public Annual Report (AR)	Availability of Management Report	Availability of Annual Accounts	Independent audited accounts	Separate disclosure of en-route and terminal ANS costs	Information provided in English	PRU comments
Albcontrol	✔	✔	✔	✔	No	✔	
ANS CR	✔	✔	✔	✔	No	✔	
ARMATS	No	No	No	No	No	No	PRU received an extract of the Financial Statements comprising an Income and a Balance Sheet statement.
Austro Control	✔	✔	✔	✔	No	✔	
Avinor	✔	✔	✔	✔	No	✔	
Belgocontrol	✔	✔	✔	✔	No	✔	Audit performed by the "board of auditors". No cash flow statement.
BULATSA	✔	✔	✔	✔	No	✔	
Croatia Control	✔	✔	✔	✔	No	✔	
DCAC Cyprus	No	No	No	No	No	No	DCAC annually discloses a report which includes some financial information from Route Charges Document but not Financial Statements.
DFS	✔	✔	✔	✔	No	✔	Separate accounts are used for internal reporting purposes and charges calculation.
DHMİ	✔	✔	✔	✔	No	✔	Includes airport activities.
DSNA	No	No	No	No	No	No	At the time of writing this report, DSNA had not yet released its 2015 Annual Report comprising Financial Statements.
EANS	✔	✔	✔	✔	✔	✔	Separate disclosure of aggregated revenues and costs for en-route and terminal ANS.
ENAIRE	✔	✔	✔	✔	No	✔	A document with an extract of the Financial Statements is available in English. Detailed annual accounts are available in Spanish.
ENAV	✔	✔	✔	✔	No	✔	
Finavia	✔	✔	✔	✔	No	✔	Detailed accounts are available for Finavia Group and Corporation, which include airport activities.
HCAA	No	No	No	No	No	No	PRU received HANSP activity report which included an extract of the en-route reporting tables but not Financial Statements.
HungaroControl	✔	✔	✔	✔	No	✔	
IAA	✔	✔	✔	✔	No	✔	
LFV	✔	✔	✔	✔	No	✔	
LGS	✔	✔	✔	✔	No	✔	
LPS	✔	✔	✔	✔	No	✔	
LVNL	✔	✔	✔	✔	✔	No	Separate Income Statement for en-route and terminal ANS.
MATS	✔	✔	✔	✔	✔	✔	
M-NAV	No	No	No	No	No	No	
MoldATSA	No	No	No	No	No	No	PRU received an extract of the Financial Statements.
MUAC	✔	✔	✔	✔	n/appl	✔	
NATS	✔	✔	✔	✔	✔	✔	Several Annual Reports for individual group companies.
NAV Portugal	✔	✔	✔	✔	✔	No	Separate disclosure of aggregated revenues and costs for en-route and terminal ANS.
NAVIAIR	✔	✔	✔	✔	✔	✔	
Oro Navigacija	✔	✔	✔	✔	✔	✔	Total revenues and costs provided for both en-route and terminal ANS.
PANSA	✔	✔	✔	✔	✔	✔	
ROMATSA	✔	✔	✔	✔	No	✔	
Sakaeronavigatsia	No	No	✔	✔	No	✔	PRU received a document comprising detailed Financial Statements together with the independent Auditors' Report.
Skyguide	✔	✔	✔	✔	✔	✔	Separate accounts for en-route, terminal and military OAT services.
Slovenia Control	✔	✔	✔	✔	No	✔	
SMATSA	✔	✔	✔	✔	No	✔	
UkSATSE	✔	✔	✔	✔	No	✔	Annual Report does not include Financial Statements. UkSATSE provided a separate document with Financial Statements.

Annex 1 - Table 0.1: Status on ANSP's 2015 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[28] and, for terminal ANS, the number of IFR airport movements controlled. 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[29].

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 Pan-European system. This average weighting factor is based on the total monetary value of the outputs over the period 2002-2015 and amounts to 0.27.

The composite gate-to-gate flight-hours are consequently defined as:

Composite gate-to-gate flight-hours = En-route flight-hours + (0.27 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[30].

The quality of service provided by ANSPs has an impact on the efficiency of aircraft operations, which carry with them additional costs that need to be taken into consideration for a full economic assessment of ANSP performance. In this ACE Benchmarking Report, an indicator of "economic" cost-effectiveness is computed at ANSP and Pan-European system levels by adding the ATM/CNS provision costs and the costs of ATFM ground delay, all expressed per composite flight-hour. This computation is shown in the Table below (see column 10).

[28] Controlled flight-hours are calculated by the Network Manager (NM) 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 NM (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 NM environment.

[29] See also working paper on "*Cost-effectiveness and Productivity Key Performance Indicators*", available on the PRC web site at www.eurocontrol.int/prc.

[30] Further details on the theoretical background to producing composite indicators can be found in a working paper on "Total Factor Productivity of European ANSPs: basic concepts and application" (Sept. 2005).

ANSPs	(1) Gate-to-gate ATM/CNS provision costs (in €'000)	(2) En-route ATFM delays ('000 minutes)	(3) Airport ATFM delays ('000 minutes)	(4)=(2)+(3) Total ATFM delays ('000 minutes)	(5) % share in European system ATFM delays	(6)=(4)x€100 Costs of ATFM delays (in €'000)	(7) Composite flight-hours (in '000)	(8)=(1)/(7) Financial gate-to-gate cost-effectiveness	(9)=(6)/(7) Costs of delay per composite flight-hour	(10)=(8)+(9) Economic costs per composite flight-hour
Albcontrol	22 488	0	0	0	0.0%	0	49	461	0	461
ANS CR	111 291	4	3	7	0.1%	701	276	404	3	406
ARMATS	8 873	0	0	0	0.0%	0	16	547	0	547
Austro Control	185 762	71	130	201	1.4%	20 128	370	502	54	557
Avinor (Continental)	190 529	31	87	118	0.8%	11 798	548	347	22	369
Belgocontrol	142 114	81	153	234	1.7%	23 384	215	662	109	771
BULATSA	87 713	4	0	4	0.0%	445	270	325	2	326
Croatia Control	89 648	286	0	287	2.1%	28 664	232	386	123	509
DCAC Cyprus	40 989	787	3	790	5.7%	78 957	169	243	468	711
DFS	1 043 916	580	325	905	6.5%	90 534	1 898	550	48	598
DHMI	430 367	117	2 494	2 611	18.7%	261 113	1 606	268	163	431
DSNA	1 244 896	2 514	328	2 842	20.4%	284 152	2 679	465	106	571
EANS	16 477	2	0	2	0.0%	231	78	212	3	215
ENAIRE	755 500	579	368	947	6.8%	94 690	1 641	460	58	518
ENAV	686 571	15	260	274	2.0%	27 439	1 330	516	21	537
Finavia	64 286	6	47	52	0.4%	5 246	166	387	32	418
HCAA	152 884	680	392	1 072	7.7%	107 154	609	251	176	427
HungaroControl	93 523	19	0	19	0.1%	1 939	257	364	8	372
IAA	109 654	0	16	16	0.1%	1 639	352	312	5	316
LFV	183 408	12	13	24	0.2%	2 448	547	335	4	340
LGS	22 678	0	0	0	0.0%	18	95	238	0	238
LPS	58 023	35	0	35	0.2%	3 455	101	573	34	607
LVNL	174 740	53	736	789	5.7%	78 903	294	595	269	864
MATS	16 721	0	1	1	0.0%	63	88	190	1	191
M-NAV	11 938	2	0	2	0.0%	199	30	403	7	410
MoldATSA	6 837	0	0	0	0.0%	0	17	411	0	411
MUAC	135 433	585	n/appl	585	4.2%	58 512	601	225	97	323
NATS (Continental)	905 080	190	756	946	6.8%	94 614	1 815	499	52	551
NAV Portugal (Continental)	116 661	243	107	349	2.5%	34 944	417	280	84	363
NAVIAIR	114 013	1	4	4	0.0%	444	304	375	1	376
Oro Navigacija	25 781	0	0	0	0.0%	0	68	382	0	382
PANSA	159 610	128	8	136	1.0%	13 556	491	325	28	353
ROMATSA	160 075	19	0	19	0.1%	1 882	384	416	5	421
Sakaeronavigatsia	25 400	0	0	0	0.0%	0	58	436	0	436
Skyguide	329 727	108	550	658	4.7%	65 844	455	725	145	870
Slovenia Control	31 920	0	0	0	0.0%	0	58	549	0	549
SMATSA	77 309	15	0	15	0.1%	1 525	247	313	6	319
UkSATSE	91 205	0	0	0	0.0%	23	186	490	0	490
Total European System	8 124 038	7 166	6 780	13 946	100%	1 394 641	19 016	427	73	501

Annex 2 - Table 0.1: Economic cost-effectiveness indicator, 2015

The cost of ATFM delay in this report is based on the **European airline delay cost reference values,** published by the University of Westminster. Based on the initial work published in 2004[31], the report has been updated in 2010 to improve the methodology and to take changes in the economic and regulatory environment into account. In each new ACE report, the PRU expresses the cost of one minute of ATFM delay in the price base of the year under review, using the average European Union inflation rate published by EUROSTAT (e.g. in the ACE 2013 report, the €81 per minute corresponding to the 2010 value amounted to €87 when expressed in 2013 prices).

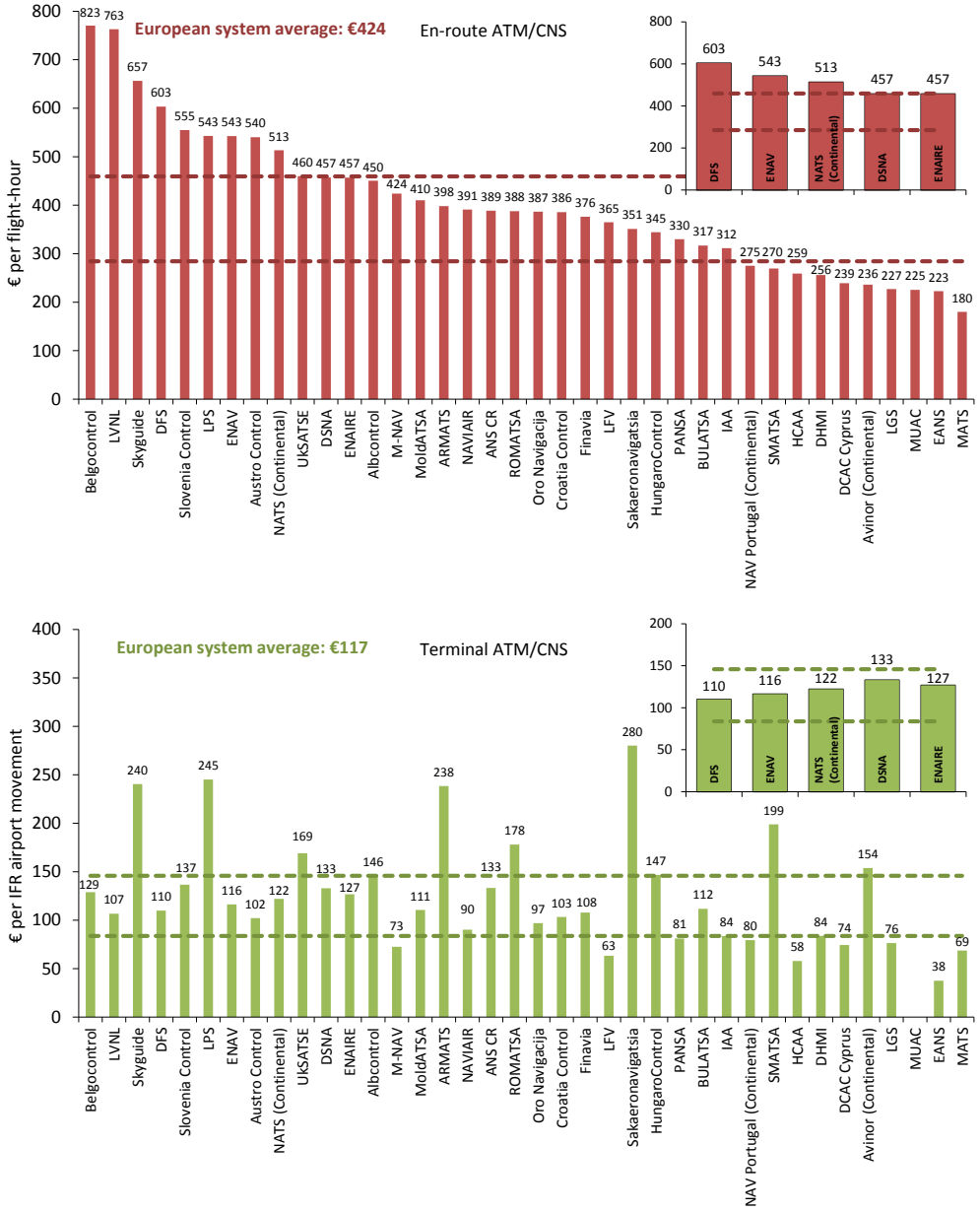
In December 2015, a further updated has been published to update the 2010 delay costs with 2014 values[32]. Based on this latest update, the estimated average European ATFM delay cost have been adjusted from €81 per minute (2010 value) to €100 per minute (2015 value). The increase in estimated ATFM delay costs is mainly driven by an increase in passenger delay costs (rebooking, compensation and care, etc.) which is the single largest group of costs, followed by reactionary, crew and maintenance costs. ATFM delays are only marginally affected by changes in jet fuel price as they primarily occur at the gate.

More detailed information can be found in the updated University of Westminster report, available for download on the PRC web-page (www.eurocontrol.int/prc).

It should be noted that the ATFM delays included in the ACE data analysis reflect all delay causes (e.g. capacity, weather, etc.). Detailed information on causes of ATFM delays at ACC level is provided in the PRC Performance Review Reports.

[31] Evaluating the true cost to airlines of one minute of airborne or ground delay (May 2004).
[32] European airline delay cost reference values (December 2015), available at: http://www.eurocontrol.int/publications/european-airline-delay-cost-reference-values.

For the sake of completeness, the gate-to-gate financial cost-effectiveness indicator shown in the Table above (see column 8) is broken down into en-route and terminal components. To facilitate the comparison and interpretation of the results, ANSPs are ranked according to the en-route cost-effectiveness indicator. The output units in the Figure below are en-route flight-hours and IFR airport movements, respectively.



Annex 2 - Figure 0.1: Breakdown of financial cost-effectiveness into en-route and terminal, 2015

The Figure above shows that 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 SMATSA has relatively high unit costs in terminal service provision but relatively low unit costs in en-route.

It is difficult to determine whether these differences 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.

For this reason, the focus of the cost-effectiveness benchmarking analysis in this report is “gate-to-gate”.

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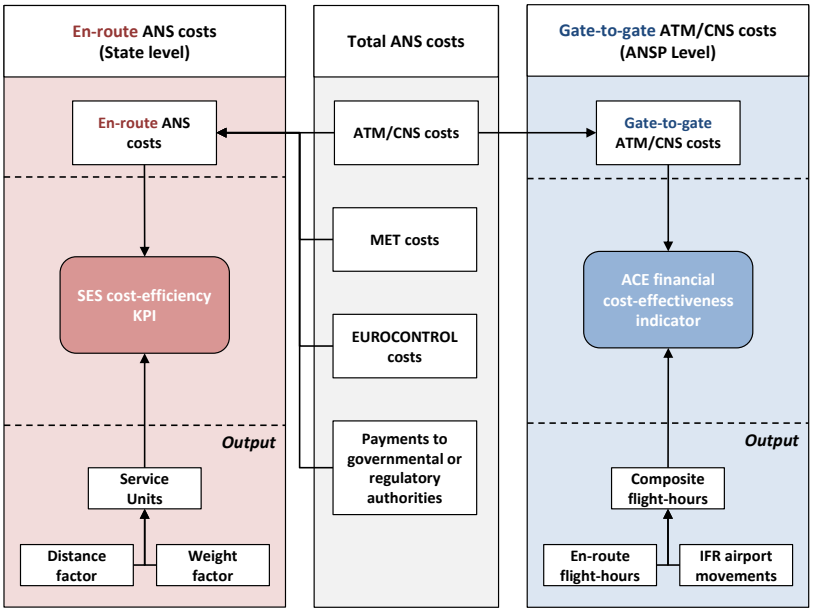
ANNEX 3 – ACE COST-EFFECTIVENESS INDICATOR AND SES COST-EFFICIENCY KPI

The objective of this Annex is to explain the main differences between the ACE financial cost-effectiveness indicator and the Single European Sky (SES) en-route cost-efficiency KPI (as defined in Regulation (EU) N°390/2013).

First of all, it should be noted that these two indicators have been specified in response to different needs:

- The purpose of the ACE analysis is to benchmark the cost-effectiveness performance of ANSPs in providing gate-to-gate ATM/CNS services (where en-route and terminal ATM/CNS are considered together). The ACE financial cost-effectiveness indicator is computed as the ratio of ATM/CNS provision costs to composite flight-hours and it can be broken down into three components (ATCO-hour productivity, ATCO employment costs per ATCO-hour and unit support costs). These components allow interpreting the differences in cost-effectiveness performance observed across Pan-European ANSPs. The ACE benchmarking analysis also informs ATM stakeholders on the level and trends of the Pan-European system cost-effectiveness performance.
- The en-route cost-efficiency KPI (the Determined Unit Cost or DUC), which is defined in the Performance Scheme regulation, is used as part of the SES cost-efficiency performance target-setting and monitoring processes. This KPI is computed as the ratio of en-route ANS costs (in real terms) to service units at charging zone level, and reflects the costs of several entities, not only the ANSP. The en-route ANS costs (in nominal terms) and service units also form the basis to calculate the unit rate that is billed to airspace users within a charging zone.

The methodology used to compute the two indicators is illustrated in the Figure below.



Annex 3 - Figure 0.1: ACE cost-effectiveness indicator and SES cost-efficiency KPI

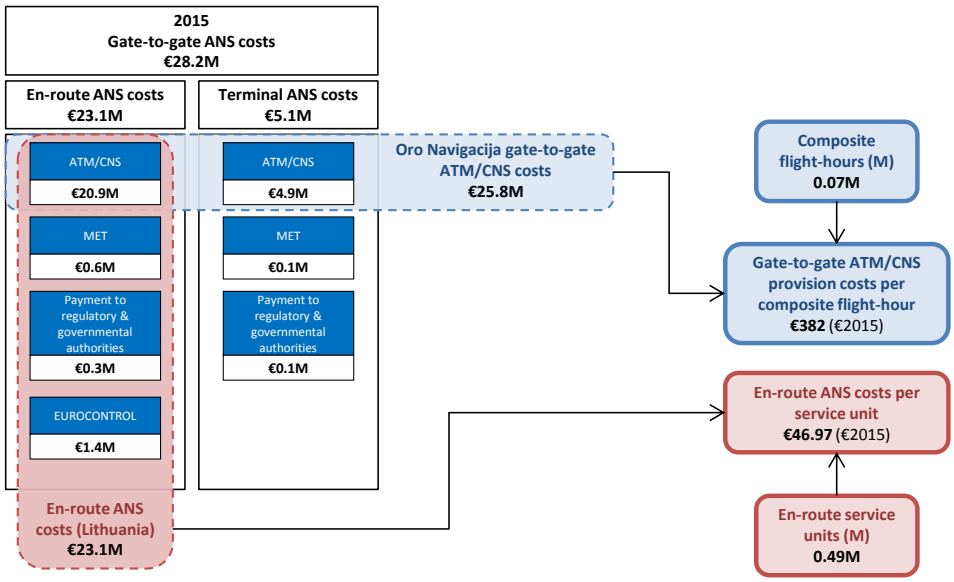
As shown in the Figure above, the main differences between the ACE financial cost-effectiveness indicator and the SES en-route cost-efficiency KPI are the following:

- **Operational scope**: En-route and terminal costs are considered together when benchmarking the economic performance of ANSPs in the ACE analysis. As explained in Annex 2 above, 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. On the other hand, the SES cost-efficiency KPI is computed for en-route and terminal ANS separately, for the purposes of the target-setting and/or monitoring processes.

- **Service scope**: Total ANS costs (including costs relating to the ANSPs, METSPs, EUROCONTROL, and NSAs) are used to compute the SES cost-efficiency KPI, while only the ANSPs ATM/CNS provision costs are included in the ACE benchmarking analysis.
- **Measure of the output**: The output metric used to compute the SES en-route cost-efficiency KPI is the number of en-route service units[33]. This metric is a function of the aircraft weight and of the distance flown within a given charging zone. This is the metric which has been historically used to compute the en-route unit rate charged to airspace users. On the other hand, the ACE financial cost-effectiveness indicator is computed using composite flight-hours[34], which combine both flight-hours and IFR airport movements as detailed in Annex 2 above. It should be noted that the geographical area controlled by ANSPs operational units can substantially differ from the charging zones in case of delegation of ANS. The composite flight-hours therefore better reflect the operational activity performed by ANSPs, while service units are more appropriate when charging zones are considered.

The Figure below provides a concrete example of reconciliation between the ACE financial cost-effectiveness indicator and the en-route costs per service unit[35]. It uses as an example the ACE 2015 data provided by Oro Navigacija and the 2015 actual en-route costs and service units provided by Lithuania for the purposes of the Enlarged Committee for Route Charges in November 2016. In both cases, financial information is expressed in €2015.



Annex 3 - Figure 0.2: Example of reconciliation between ANSP unit gate-to-gate ATM/CNS provision costs and a charging zone unit en-route ANS costs (2015)

[33] $Service\ unit = distance\ flown \times \sqrt{\frac{MTOW}{50}}$.

[34] Further details on the calculation of the metric can be found in Annex 2 of this report.

[35] It should be noted that the costs reported in the UK Performance Plans and charged to en-route airspace users are based on regulatory accounting rules. This is different from the methodology used by NATS to report historic and actual ATM/CNS provision costs which are based on IFRS accounting.

ANNEX 4 – PERFORMANCE RATIOS

This Annex 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 Chapter 2. 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 Pan-European system as a whole[36]. Performance 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 Pan-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*
Albcontrol	AL	0.93	0.54	4.08	0.42	2.21	0.73
ANS CR	CZ	1.06	1.16	1.27	0.72	1.47	0.94
ARMATS	AM	0.78	0.17	9.48	0.48	1.63	0.63
Austro Control	AT	0.85	1.11	0.72	1.07	0.80	0.88
Avinor (Continental)	NO	1.23	1.12	1.19	0.92	1.34	1.18
Belgocontrol	BE	0.65	0.84	0.81	0.95	0.68	0.63
BULATSA	BG	1.32	0.99	1.56	0.86	1.54	1.23
Croatia Control	HR	1.11	0.88	1.22	1.04	1.07	1.13
DCAC Cyprus	CY	1.76	1.05	2.22	0.76	2.33	1.58
DFS	DE	0.78	1.35	0.49	1.17	0.66	0.84
DHMI	TR	1.59	1.23	2.03	0.64	2.51	1.36
DSNA	FR	0.92	0.92	1.12	0.89	1.03	0.87
EANS	EE	2.02	1.09	1.87	0.98	2.05	2.00
ENAIRE	ES	0.93	0.95	0.67	1.45	0.64	1.17
ENAV	IT	0.83	0.86	0.98	0.98	0.84	0.82
Finavia	FI	1.11	0.75	1.27	1.16	0.95	1.20
HCAA	GR	1.70	0.89	2.18	0.88	1.94	1.61
HungaroControl	HU	1.17	1.12	1.18	0.89	1.32	1.11
IAA	IE	1.37	1.34	1.08	0.94	1.46	1.33
LFV	SE	1.27	0.83	1.06	1.45	0.88	1.61
LGS	LV	1.79	1.06	2.72	0.62	2.88	1.53
LPS	SK	0.75	0.92	1.09	0.74	1.00	0.67
LVNL	NL	0.72	0.95	0.97	0.79	0.91	0.65
MATS	MT	2.25	1.01	2.93	0.76	2.94	2.03
M-NAV	MK	1.06	0.44	2.59	0.94	1.13	1.03
MoldATSA	MD	1.04	0.18	10.63	0.53	1.96	0.85
MUAC		1.90	2.37	0.53	1.50	1.26	2.47
NATS (Continental)	UK	0.86	1.32	0.69	0.93	0.92	0.83
NAV Portugal (Continental)	PT	1.53	1.24	0.91	1.36	1.13	1.83
NAVIAIR	DK	1.14	1.20	1.10	0.86	1.32	1.07
Oro Navigacija	LT	1.12	0.59	2.48	0.77	1.45	1.01
PANSA	PL	1.31	1.08	1.15	1.06	1.24	1.35
ROMATSA	RO	1.03	0.84	1.21	1.01	1.01	1.03
Sakaeronavigatsia	GE	0.98	0.41	6.97	0.34	2.85	0.75
Skyguide	CH	0.59	1.18	0.63	0.78	0.75	0.54
Slovenia Control	SI	0.78	0.55	1.31	1.09	0.72	0.81
SMATSA	RS/ME	1.37	0.90	2.15	0.71	1.93	1.20
UkSATSE	UA	0.87	0.21	9.33	0.45	1.92	0.70
Total European System		1.00	1.00	1.00	1.00	1.00	1.00

Annex 4 – Table 0.1: The components of gate-to-gate cost-effectiveness, 2015

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).

[36] 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 the Table above), 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). The following example for ENAIRE illustrates the interpretation of the performance ratios:

0.93	ENAIRE's gate-to-gate **ATM/CNS costs per composite flight-hour** are **+8% higher** (1/0.93 - 1) than the European average.
= 0.95	**ATCO-hour productivity** is **-5% lower** than the European average.
x 0.67	The **ATCO employment costs per ATCO-hour** of ENAIRE are **+49% higher** (1/0.67 - 1) than the European average.
x 1.45	**Support cost ratio** is **-31% lower** (1/1.45 - 1) than the European 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):

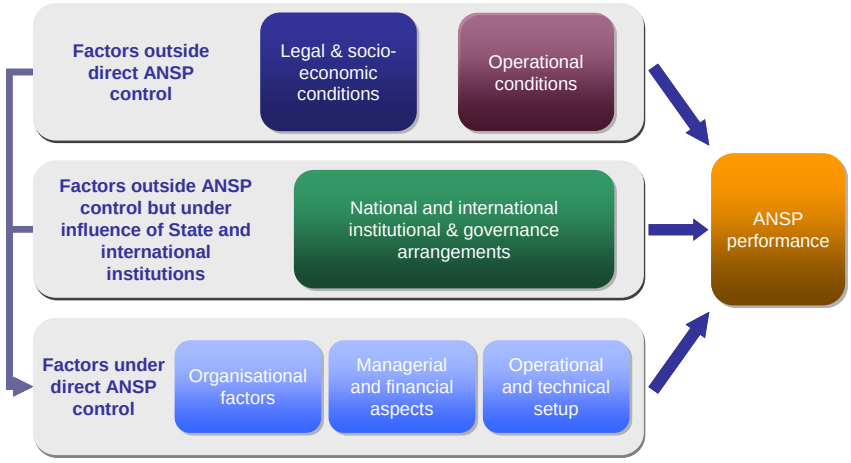
0.64	ENAIRE's ATCOs in OPS employment costs per composite flight-hour are +57% higher (1/0.64 - 1) than the European average, while
1.17	The **support costs per composite flight-hour** are **-15% lower** (1/1.17 - 1) than the European average.

ANNEX 5 – FACTORS AFFECTING PERFORMANCE

The ACE benchmarking analysis has the objective of comparing ATM cost-effectiveness performance across a wide range of ANSPs. The major focus of this report is to examine and analyse the quantitative facts about the observed cost-effectiveness performance of the ANSPs. 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 on how performance can be improved, without some complementary consideration of how differences in performance arose.

The framework illustrated in the Figure below, which was first introduced in the ACE 2007 Benchmarking Report, shows **exogenous** and **endogenous** factors which influence ANSP performance.

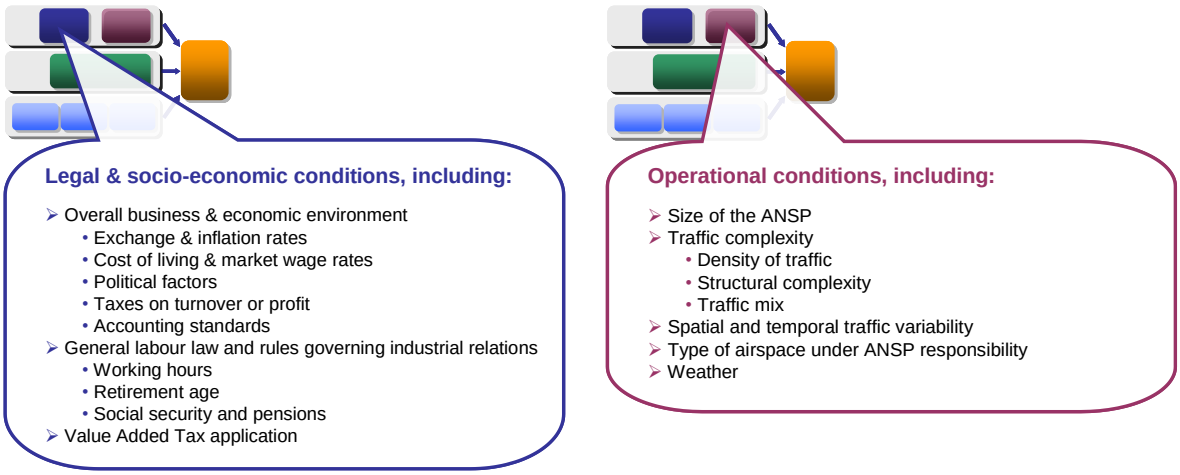


Annex 5 - Figure 0.1: Factors affecting cost-effectiveness performance

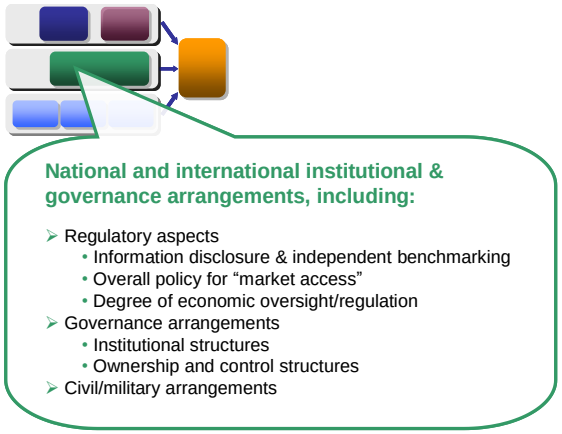
Exogenous factors are those outside the control of an ANSP whereas endogenous factors are those entirely under the ANSP's control.

Exogenous factors have been classified into two main areas according to which decision-makers have an influence over them. In particular, exogenous factors comprise:

- legal and socio-economic conditions (for example taxation policy), and operational conditions (for example traffic patterns the ANSP has to deal with) that are affected by decision makers and conditions outside aviation policy-making.

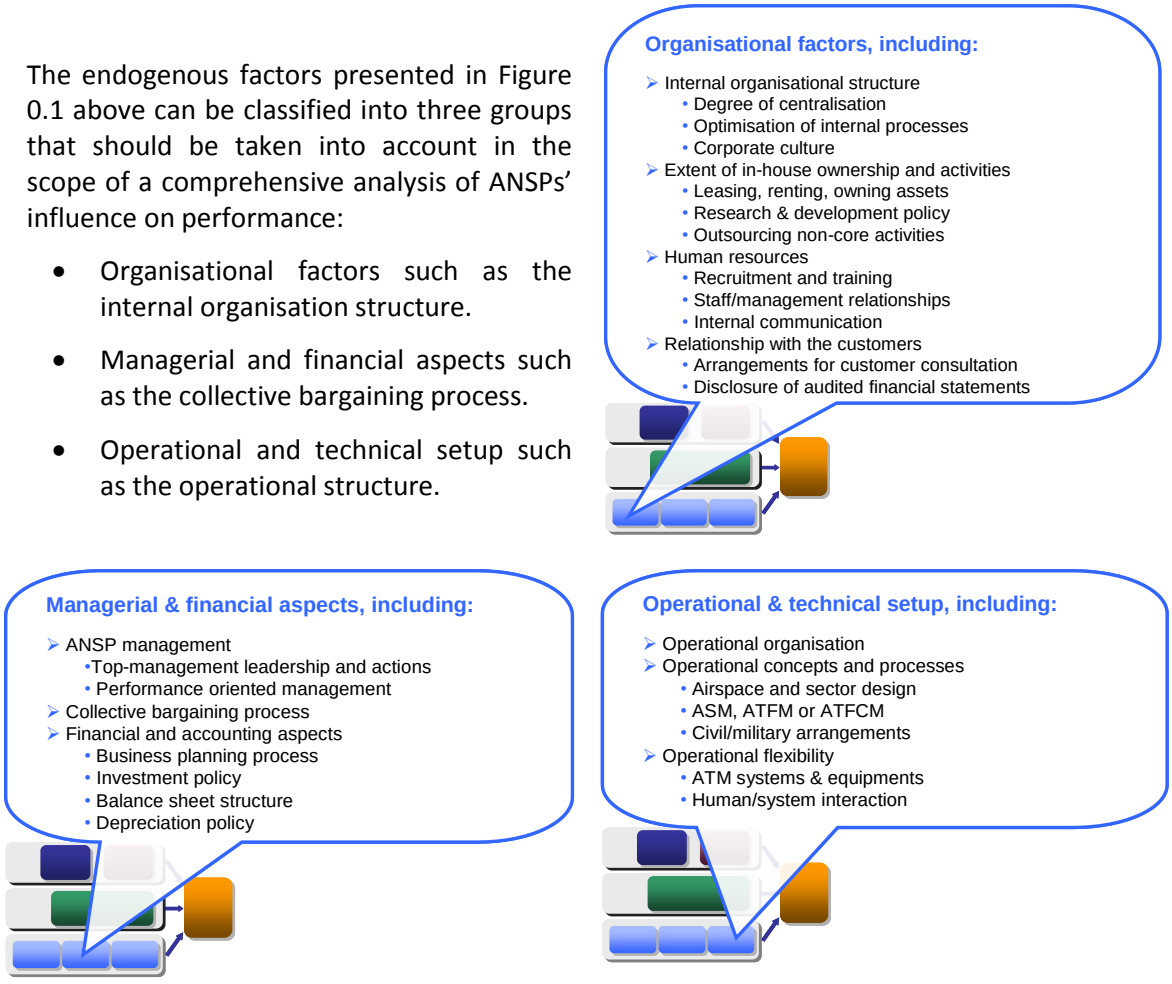


- institutional and governance arrangements such as international requirements imposed by the Single European Sky, that are influenced by aviation sector policy decisions.



The endogenous factors presented in Figure 0.1 above can be classified into three groups that should be taken into account in the scope of a comprehensive analysis of ANSPs' influence on performance:

- Organisational factors such as the internal organisation structure.
- Managerial and financial aspects such as the collective bargaining process.
- Operational and technical setup such as the operational structure.



A more comprehensive description and analysis of the performance framework illustrated in this Annex is available in Chapter 3 of the ACE 2009 Benchmarking Report[37].

[37] Document available on the PRC website (http://www.eurocontrol.int/publications/atm-cost-effectiveness-ace-2009).

ANNEX 6 – TRAFFIC COMPLEXITY AND TRAFFIC VARIABILITY INDICATORS

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
Skyguide	11.38	0.26	0.61	0.23	1.10	12.54
NATS (Continental)	10.33	0.37	0.45	0.32	1.14	11.74
Belgocontrol	8.04	0.38	0.56	0.45	1.39	11.16
DFS	9.99	0.27	0.58	0.25	1.10	10.96
MUAC	10.62	0.26	0.56	0.18	1.00	10.63
LVNL	10.27	0.19	0.43	0.41	1.03	10.60
ANS CR	10.32	0.13	0.53	0.16	0.81	8.37
Austro Control	8.37	0.17	0.56	0.19	0.92	7.72
DSNA	10.58	0.14	0.43	0.12	0.70	7.35
Slovenia Control	9.68	0.08	0.57	0.10	0.75	7.25
DHMI	11.76	0.13	0.28	0.18	0.59	6.99
LPS	9.13	0.08	0.44	0.16	0.68	6.18
ENAV	5.75	0.25	0.61	0.16	1.02	5.87
SMATSA	9.24	0.04	0.52	0.06	0.62	5.77
HungaroControl	8.95	0.05	0.46	0.13	0.64	5.72
Croatia Control	8.34	0.05	0.54	0.08	0.67	5.60
BULATSA	9.78	0.06	0.33	0.11	0.50	4.86
Sakaeronavigatsia	7.38	0.04	0.32	0.28	0.64	4.76
ENAIRE	6.89	0.15	0.38	0.13	0.65	4.49
ROMATSA	7.93	0.04	0.37	0.14	0.55	4.36
PANSA	4.25	0.14	0.57	0.21	0.92	3.92
DCAC Cyprus	5.57	0.16	0.39	0.12	0.67	3.71
NAVIAIR	3.58	0.18	0.57	0.23	0.99	3.54
Albcontrol	6.63	0.05	0.37	0.06	0.49	3.22
M-NAV	5.55	0.08	0.44	0.04	0.55	3.07
LFV	2.93	0.21	0.51	0.25	0.98	2.86
NAV Portugal (Continental)	4.39	0.15	0.40	0.08	0.63	2.75
EANS	3.62	0.15	0.32	0.27	0.75	2.71
HCAA	4.42	0.11	0.40	0.10	0.61	2.68
LGS	3.27	0.09	0.49	0.20	0.77	2.54
IAA	4.12	0.08	0.27	0.19	0.54	2.22
Oro Navigacija	2.89	0.08	0.48	0.20	0.76	2.19
Avinor (Continental)	2.14	0.26	0.45	0.26	0.97	2.08
Finavia	1.69	0.28	0.35	0.37	1.00	1.69
MATS	2.63	0.04	0.29	0.16	0.49	1.30
UkSATSE	2.14	0.08	0.29	0.10	0.48	1.02
ARMATS	1.16	0.11	0.30	0.24	0.66	0.76
MoldATSA	1.00	0.05	0.38	0.10	0.54	0.54
Average	8.24	0.18	0.45	0.18	0.82	6.73

Annex 6 - Table 0.1: Traffic complexity indicators at ANSP level, 2015

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
NATS (Continental)	London TC	26.5	0.4	0.5	0.3	1.3	34.7	147
DFS	Langen	10.0	0.4	0.6	0.4	1.4	13.6	171
Skyguide	Geneva	12.0	0.2	0.6	0.2	1.0	11.7	314
Skyguide	Zurich	9.9	0.3	0.6	0.3	1.2	11.4	288
DFS	Karlsruhe UAC	11.9	0.2	0.6	0.2	1.0	11.4	353
Belgocontrol	Brussels	8.0	0.4	0.6	0.4	1.4	11.2	179
MUAC	Maastricht	10.6	0.3	0.6	0.2	1.0	10.6	344
LVNL	Amsterdam	10.3	0.2	0.4	0.4	1.0	10.6	167
DFS	Munchen	7.3	0.4	0.5	0.4	1.4	9.9	218
DSNA	Reims	12.1	0.2	0.5	0.1	0.8	9.7	339
DSNA	Paris	10.2	0.3	0.4	0.3	0.9	9.4	226
ENAV	Padova	8.6	0.2	0.7	0.1	1.0	8.9	325
NATS (Continental)	London AC	9.0	0.3	0.4	0.3	0.9	8.5	310
ANS CR	Praha	10.5	0.1	0.5	0.2	0.8	8.4	334
ENAV	Milano	6.9	0.3	0.6	0.2	1.1	7.7	284
Austro Control	Wien	8.7	0.1	0.6	0.2	0.9	7.6	334
IAA	Dublin	7.3	0.3	0.4	0.4	1.0	7.6	158
Slovenia Control	Ljubljana	9.7	0.1	0.6	0.1	0.7	7.3	330
DSNA	Bordeaux	12.1	0.1	0.4	0.1	0.6	6.8	340
DSNA	Brest	11.0	0.1	0.5	0.1	0.6	6.8	352
ENAIRE	Palma	6.9	0.3	0.4	0.3	0.9	6.5	165
LPS	Bratislava	9.2	0.1	0.4	0.2	0.7	6.2	337
HungaroControl	Budapest	9.2	0.0	0.5	0.1	0.6	5.9	345
DSNA	Marseille	8.6	0.1	0.4	0.1	0.7	5.9	325
SMATSA	Beograd	9.4	0.0	0.5	0.1	0.6	5.9	351
Croatia Control	Zagreb	8.7	0.1	0.5	0.1	0.7	5.8	354
DHMI	Ankara	10.7	0.1	0.3	0.2	0.5	5.5	350
DFS	Bremen	4.2	0.3	0.6	0.4	1.3	5.4	182
NATS (Continental)	Prestwick	4.4	0.3	0.5	0.4	1.2	5.3	260
ENAIRE	Barcelona	7.1	0.2	0.4	0.1	0.7	5.0	311
BULATSA	Sofia	9.9	0.1	0.3	0.1	0.5	4.9	352
Sakaeronavigatsia	Tbilisi	7.4	0.0	0.3	0.3	0.6	4.8	342
ROMATSA	Bucuresti	8.0	0.0	0.4	0.1	0.5	4.4	347
DHMI	Istanbul	7.6	0.2	0.3	0.1	0.6	4.3	297
ENAV	Roma	4.5	0.3	0.5	0.2	1.0	4.3	299
ENAIRE	Madrid	8.1	0.1	0.4	0.1	0.5	4.2	342
PANSA	Warszawa	4.4	0.1	0.6	0.2	0.9	3.8	342
DCAC Cyprus	Nicosia	5.6	0.2	0.4	0.1	0.7	3.7	316
Albcontrol	Tirana	6.8	0.0	0.4	0.1	0.5	3.3	350
NAVIAIR	Kobenhavn	3.4	0.2	0.6	0.2	1.0	3.3	320
M-NAV	Skopje	5.7	0.1	0.4	0.0	0.5	3.1	342
ENAIRE	Sevilla	4.8	0.2	0.3	0.1	0.6	2.9	312
LFV	Malmo	3.2	0.2	0.5	0.2	0.9	2.9	326
NAV Portugal (Continental)	Lisboa	4.5	0.1	0.4	0.1	0.6	2.8	327
EANS	Tallinn	3.6	0.1	0.3	0.3	0.7	2.7	317
HCAA	Athinai+Macedonia	4.5	0.1	0.4	0.1	0.6	2.6	331
LGS	Riga	3.3	0.1	0.5	0.2	0.8	2.5	321
ENAV	Brindisi	2.9	0.2	0.6	0.1	0.8	2.3	332
Oro Navigacija	Vilnius	2.9	0.1	0.5	0.2	0.8	2.2	313
LFV	Stockholm	1.9	0.3	0.4	0.4	1.1	2.1	243
Avinor (Continental)	Oslo	2.2	0.3	0.4	0.2	0.9	2.0	280
ENAIRE	Canarias	2.8	0.2	0.3	0.1	0.6	1.8	286
IAA	Shannon	3.8	0.0	0.2	0.1	0.4	1.7	349
MATS	Malta	2.3	0.0	0.3	0.2	0.6	1.3	326
UkSATSE	L'viv	1.6	0.0	0.6	0.1	0.7	1.2	346
Avinor (Continental)	Bodo	1.4	0.2	0.4	0.2	0.9	1.2	262
Finavia	Tampere	1.2	0.3	0.3	0.3	0.9	1.1	266
Avinor (Continental)	Stavanger	1.4	0.2	0.4	0.2	0.8	1.1	296
UkSATSE	Kyiv	2.0	0.1	0.2	0.1	0.4	0.9	331
ARMATS	Yerevan	1.2	0.1	0.3	0.3	0.7	0.8	327
UkSATSE	Odesa	3.1	0.0	0.2	0.0	0.3	0.8	346
MoldATSA	Chisinau	1.0	0.1	0.4	0.1	0.5	0.5	295
UkSATSE	Dnipropetrovs'k	0.3	0.2	0.2	0.4	0.8	0.2	261
European system average		8.2	0.2	0.5	0.2	0.8	6.6	315

Annex 6 - Table 0.2: Traffic complexity indicators at ACC level, 2015

ANSPs	Traffic variability indicators		
	Variability based on three-months periods (2015)	Peak month / Average month (2015)	Peak week / Average week (2015)
Albcontrol	1.43	1.53	1.55
ANS CR	1.21	1.23	1.24
ARMATS	1.14	1.21	1.29
Austro Control	1.24	1.26	1.27
Avinor (Continental)	1.06	1.12	1.14
Belgocontrol	1.12	1.16	1.18
BULATSA	1.33	1.38	1.41
Croatia Control	1.40	1.49	1.50
DCAC Cyprus	1.21	1.26	1.32
DFS	1.13	1.15	1.15
DHMI	1.23	1.27	1.28
DSNA	1.19	1.22	1.23
EANS	1.13	1.14	1.16
ENAIRE	1.22	1.26	1.27
ENAV	1.26	1.29	1.32
Finavia	1.04	1.11	1.13
HCAA	1.49	1.58	1.60
HungaroControl	1.33	1.36	1.40
IAA	1.14	1.16	1.20
LFV	1.06	1.14	1.16
LGS	1.14	1.16	1.18
LPS	1.31	1.35	1.39
LVNL	1.09	1.11	1.13
MATS	1.17	1.19	1.28
M-NAV	1.61	1.73	1.76
MoldATSA	1.33	1.37	1.39
MUAC	1.11	1.12	1.13
NATS (Continental)	1.14	1.15	1.16
NAV Portugal (Continental)	1.12	1.16	1.16
NAVIAIR	1.08	1.11	1.14
Oro Navigacija	1.15	1.18	1.20
PANSA	1.18	1.22	1.23
ROMATSA	1.26	1.29	1.34
Sakaeronavigatsia	1.11	1.15	1.18
Skyguide	1.16	1.19	1.19
Slovenia Control	1.37	1.43	1.45
SMATSA	1.42	1.49	1.53
UkSATSE	1.33	1.37	1.39

Annex 6 - Table 0.3: Traffic variability indicators at ANSP level, 2015

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ANNEX 7 – EXCHANGE RATES, INFLATION RATES AND PURCHASING POWER PARITIES (PPPS) 2015 DATA

ANSPs	Countries	2015 Exchange rate (1€ =)	2015 Inflation rate (%)	2015 PPPs	Comments
Albcontrol	Albania	139.5	1.9	58.04	
ANS CR	Czech Republic	27.3	0.3	17.15	
ARMATS	Armenia	528.5	3.7	259.54	PPPs from IMF database
Austro Control	Austria	1	0.8	1.07	
Avinor (Continental)	Norway	8.9	2.0	12.97	
Belgocontrol	Belgium	1	0.6	1.07	
BULATSA	Bulgaria	2.0	-1.1	0.91	
Croatia Control	Croatia	7.6	-0.3	4.73	
DCAC Cyprus	Cyprus	1	-1.5	0.88	
DFS	Germany	1	0.1	1.04	
DHMI	Turkey	3.0	7.7	1.66	
DSNA	France	1	0.1	1.07	
EANS	Estonia	1	0.1	0.71	
ENAIRE	Spain	1	-0.6	0.89	
ENAV	Italy	1	0.1	0.97	
Finavia	Finland	1	-0.2	1.21	
HCAA	Greece	1	-1.1	0.83	
HungaroControl	Hungary	309.5	0.1	175.03	
IAA	Ireland	1	0.0	1.08	
LFV	Sweden	9.4	0.7	11.95	
LGS	Latvia	1.0	0.2	0.66	
LPS	Slovak Republic	1	-0.3	0.65	
LVNL	Netherlands	1	0.2	1.08	
MATS	Malta	1	1.2	0.80	
M-NAV	F.Y.R. Macedonia	61.2	-0.2	25.67	
MoldATSA	Moldova	20.7	9.6	8.94	PPPs from IMF database
MUAC		1	0.2	1.08	Netherlands' PPPs and inflation rate used for MUAC
NATS (Continental)	United Kingdom	0.7	0.0	0.92	
NAV Portugal (Continental)	Portugal	1	0.5	0.78	
NAVIAIR	Denmark	7.5	0.2	9.75	
Oro Navigacija	Lithuania	1.0	-0.7	0.60	
PANSA	Poland	4.2	-0.7	2.36	
ROMATSA	Romania	4.4	-0.4	2.18	
Sakaeronavigatsia	Georgia	2.2	4.0	1.16	PPPs from IMF database
Skyguide	Switzerland	1.1	-0.8	1.67	
Slovenia Control	Slovenia	1	-0.8	0.78	
SMATSA	Serbia and Montenegro	120.6	1.4	54.14	Data for Serbia only since ACE data is provided in Serbian Dinar
UkSATSE	Ukraine	24.1	48.7	7.65	PPPs from IMF database

Annex 7 - Table 0.1: 2015 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 2015 prices using national inflation rates. Finally, for comparison purposes in 2015, all national currencies are converted to Euros using the 2015 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 2015 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 2015 data.

The exchange rates used in this Report to convert the 2015 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 EUROSTAT[38] or from the International Monetary Fund[39] when the information was not available in EUROSTAT website. For the projections (2016-2020), 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 2 of this report was extracted from EUROSTAT.

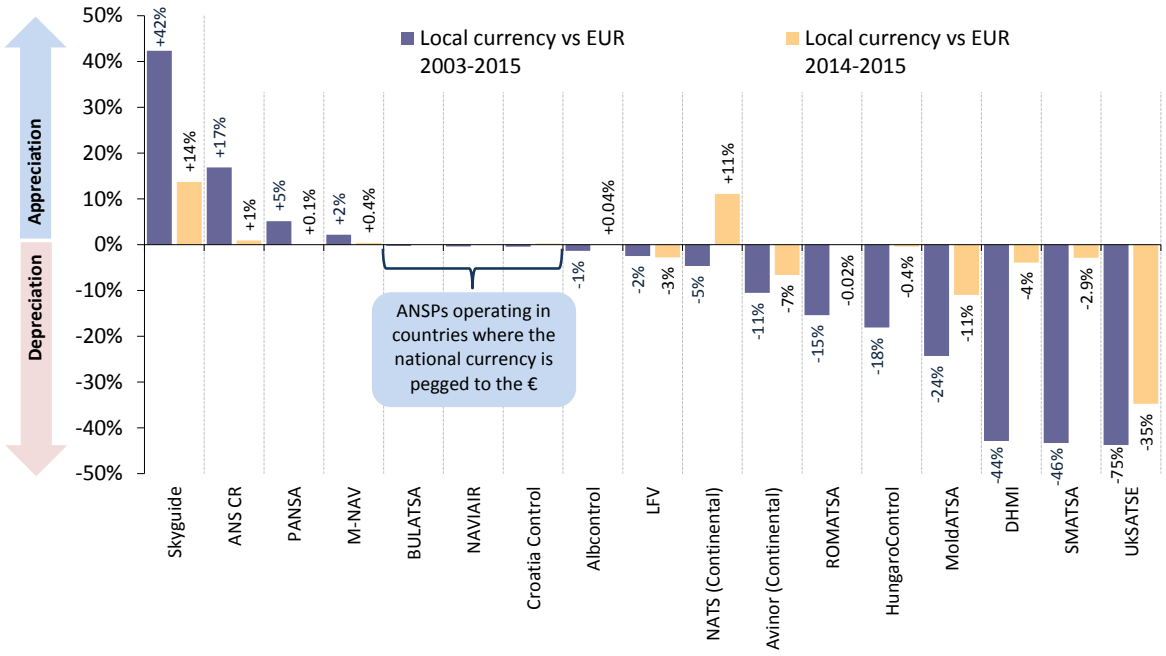
For four countries (Armenia, Georgia, Moldova and Ukraine), PPP data was not available in the EUROSTAT database. In these cases, the IMF database was used. Since in the IMF database, the PPPs are expressed in local currency per **international Dollar** rather than **PPS**, an adjustment has been made so that the figures used for Armenia, Georgia, 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 7.14 between the PPPs for Ukraine (5.839 UAH per international Dollar in 2015) and the PPPs for France (0.818 Euro per international Dollar). This factor is applied to the PPPs for France as disclosed in the EUROSTAT database (i.e. 1.07) to express the PPPs for Ukraine in PPS (7.65 = 1.07 × 7.14). A similar methodology is used to express Armenia, Georgia and Moldova PPPs in PPS.

[38] Latest EUROSTAT database available at:
http://ec.europa.eu/eurostat/web/main/home
[39] IMF April 2017 database available at:
http://www.imf.org/external/pubs/ft/weo/2017/01/weodata/index.aspx

It is important to note that, for ANSPs operating outside of the Euro zone, substantial changes of the national currency against the Euro may significantly affect the level of 2015 unit ATM/CNS provision costs when expressed in Euro (see Figure 2.12 on p.22). However, it should be noted that the changes in unit costs analysed in this Report (see for example Figure 2.15 on p.25) are not affected by changes in national currency against the Euro.

The Figure below shows the changes in exchange rates for ANSPs operating in countries which are not part of the Euro zone. The blue bar shows the long-term changes in exchange rate over the 2003-2015 period, while the orange bar displays the short-term changes (2014-2015).



Annex 7 - Table 0.2: Cumulative variations in exchange rates against the Euro (2003-2015 and 2014-2015)

Significant changes are observed over the 2003-2015 period for several ANSPs part of the ACE analysis. For example, the Swiss Franc significantly appreciated (42%) while the Ukrainian Hrvynia substantially depreciated (75%). Other substantial variations in exchange rates compared to the Euro include the depreciation of the Serbian Dinar (46%) and the Turkish Lira (44%) while the Czech Koruna appreciated by 17%.

Similarly, changes in exchange rates are also observed over the period 2014-2015 including significant appreciation of the Swiss Franc (14%) and British Pound (11%) while a notable depreciation vis-à-vis the Euro was observed for the Ukrainian Hrvyna (35%) and the Moldovan Leu (11%).

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ANNEX 8 – KEY DATA

ANSPs	En-route ANS revenues (in €'000)										Terminal ANS revenues (in €'000)										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**	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**	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**
Albcontrol	21 851	0	0	0	0	0	0	0	0	21 851	1 290	0	0	0	0	0	0	26	0	1 316	23 141	0	0	0	0	0	0	26	0	23 167
ANS CR	109 082	0	0	0	455	0	0	0	0	109 537	18 590	0	0	0	95	0	0	0	0	18 685	127 672	0	0	0	550	0	0	0	0	128 223
ARMATS	4 311	0	0	0	2	0	0	0	0	4 312	4 173	0	0	0	0	0	0	0	0	4 173	8 483	0	0	0	2	0	0	0	0	8 485
Austro Control	201 029	0	0	0	952	1 399	663	0	0	204 043	39 804	0	0	0	0	0	617	0	0	40 421	240 833	0	0	0	952	1 399	1 280	0	0	244 464
Avinor (Continental)	109 855	0	0	0	0	0	0	0	0	109 855	0	93 382	0	0	0	0	0	0	0	93 382	109 855	93 382	0	0	0	0	0	0	0	203 237
Belgocontrol	164 793	0	0	0	0	0	92	3 443	812	169 140	28 316	0	0	0	0	25 397	38	5 285	1 739	60 775	193 108	0	0	0	0	25 397	130	8 728	2 552	229 915
BULATSA	98 914	0	0	0	0	0	0	0	0	98 914	8 975	0	0	0	0	0	192	441	0	9 609	107 890	0	0	0	0	0	192	441	0	108 523
Croatia Control	76 310	0	7 058	0	396	0	0	0	0	83 764	9 770	0	0	0	182	0	0	0	0	9 952	86 080	0	7 058	0	579	0	0	0	0	93 716
DCAC Cyprus	56 388	0	0	0	0	0	0	0	0	56 388	0	0	0	0	0	7 318	0	0	0	7 318	56 388	0	0	0	0	7 318	0	0	0	63 705
DFS	962 281	0	0	0	0	0	38 148	0	0	1 000 429	233 839	0	0	0	0	0	9 270	0	0	243 109	1 196 120	0	0	0	0	0	47 418	0	0	1 243 538
DHMI	420 103	0	0	0	2 481	0	0	0	0	422 584	118 336	0	0	0	0	0	0	0	0	118 336	538 439	0	0	0	2 481	0	0	0	0	540 919
DSNA	1 307 795	0	0	0	18 270	0	0	8 761	0	1 334 826	235 021	0	0	0	43 853	0	0	2 412	0	281 285	1 542 816	0	0	0	62 122	0	0	11 173	0	1 616 112
EANS	25 368	0	0	0	0	0	0	0	0	25 368	1 402	0	0	0	0	0	0	0	0	1 402	26 769	0	0	0	0	0	0	0	0	26 769
ENAIRE	682 355	0	0	0	9 483	0	853	49 540	42	742 273	19 127	145 480	0	0	0	0	211	19 212	279	184 310	701 482	145 480	0	0	9 483	0	1 065	68 752	321	926 583
ENAV	566 072	0	0	0	11 327	16 956	0	6 713	0	601 068	165 761	0	0	0	1 500	7 884	0	13 334	0	188 478	731 833	0	0	0	12 828	24 840	0	20 046	0	789 547
Finavia	41 742	0	0	315	0	453	0	0	0	42 510	17 270	0	0	199	0	188	0	200	0	17 857	59 012	0	0	514	0	641	0	200	0	60 367
HCAA	181 088	0	0	0	0	0	0	0	0	181 088	19 910	0	0	0	0	0	0	0	0	19 910	200 998	0	0	0	0	0	0	0	0	200 998
HungaroControl	102 460	0	0	0	1 016	0	951	1 273	0	105 700	17 518	0	0	0	39	0	163	228	0	17 948	119 977	0	0	0	1 055	0	1 114	1 502	0	123 648
IAA	116 406	0	0	0	1 732	0	15	0	0	118 153	21 421	0	0	0	0	0	132	0	0	21 553	137 827	0	0	0	1 732	0	147	0	0	139 706
LFV	167 068	0	1 267	0	791	0	943	0	0	170 069	11 652	10 738	0	0	0	0	60	0	0	22 450	178 720	10 738	1 267	0	791	0	1 004	0	0	192 519
LGS	21 884	0	0	0	0	0	0	195	0	22 079	2 843	0	0	0	0	0	1	110	0	2 954	24 727	0	0	0	0	0	1	305	0	25 033
LPS	58 469	0	0	705	911	0	31	1 290	0	61 406	3 810	0	0	0	171	0	3	87	0	4 071	62 279	0	0	705	1 082	0	34	1 377	0	65 477
LVNL	136 475	0	0	0	0	514	0	2 163	0	139 152	58 602	0	0	0	0	6 086	0	1 533	0	66 221	195 077	0	0	0	0	6 600	0	3 696	0	205 373
MATS	17 526	0	0	0	0	0	0	0	0	17 526	4 413	1 115	0	0	0	1 863	0	1 348	0	8 740	21 939	1 115	0	0	0	1 863	0	1 348	0	26 266
M-NAV	12 407	0	0	0	0	0	29	0	0	12 436	1 579	0	0	0	0	0	0	0	0	1 579	13 986	0	0	0	0	0	29	0	0	14 015
MoldATSA	3 278	0	0	0	0	0	0	0	0	3 278	3 461	0	0	0	0	0	0	0	0	3 461	6 739	0	0	0	0	0	0	0	0	6 739
MUAC											n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl										
NATS (Continental)	790 616	0	0	0	0	0	3 548	2 586	769	797 519	16 559	225 141	0	0	0	0	1 080	22	0	242 801	807 175	225 141	0	0	0	0	4 628	2 608	769	1 040 320
NAV Portugal (Continental)	117 045	0	0	0	0	0	0	1 958	0	119 003	21 436	0	0	0	0	0	0	828	0	22 264	138 482	0	0	0	0	0	0	2 786	0	141 267
NAVIAIR	81 472	0	0	0	1 627	0	250	1 573	0	84 922	25 301	3 194	0	0	62	0	97	266	0	28 920	106 773	3 194	0	0	1 689	0	347	1 838	0	113 842
Oro navigacija	22 818	0	0	189	203	0	54	150	0	23 414	4 961	0	0	46	328	0	13	34	0	5 382	27 779	0	0	235	531	0	67	184	0	28 796
PANSA	132 962	0	0	0	1 120	0	62	2 217	0	136 361	28 849	0	0	0	528	0	14	483	0	29 874	161 811	0	0	0	1 648	0	76	2 700	0	166 235
ROMATSA	168 128	0	0	0	1 776	0	7 652	1	0	177 557	18 284	0	0	0	0	0	831	21	0	19 135	186 411	0	0	0	1 776	0	8 483	21	0	196 693
Sakaeronavigatsia	19 626	0	0	0	273	0	3 788	0	0	23 687	7 225	0	0	0	82	0	1 371	450	0	9 128	26 851	0	0	0	355	0	5 159	450	0	32 815
Skyguide	161 674	0	42 486	0	5 357	41 663	378	4 721	0	256 279	93 491	0	0	0	318	20 801	179	5 875	0	120 664	255 165	0	42 486	0	5 675	62 464	557	10 595	0	376 943
Slovenia Control	31 729	0	0	0	163	0	0	172	889	32 953	3 013	101	0	364	78	0	1	113	0	3 670	34 742	101	0	364	241	0	1	285	889	36 623
SMATSA	66 301	0	6 065	0	0	0	718	7	0	73 091	7 106	0	0	0	0	0	197	0	1 695	8 998	73 407	0	6 065	0	0	0	915	7	1 695	82 089
UkSATSE	58 273	0	0	0	0	0	0	0	0	58 273	25 833	0	0	0	0	0	0	0	0	25 833	84 106	0	0	0	0	0	0	0	0	84 106

Annex 8 - Table 0.1: Breakdown of total ANS revenues (en-route, terminal and gate-to-gate), 2015

ANSPs	Gate-to-gate ANS costs (in €'000)							
	ATM/CNS provision costs	MET costs	Payment for regulatory and supervision services	Payment to the State for provision of other services	EUROCONTROL costs	Payment for delegation	Irrecoverable value added tax (VAT)	**Total costs**
Albcontrol	22 488	554	1 053	0	878	0	0	24 973
ANS CR	111 291	2 748	1 581	0	6 472	0	0	122 092
ARMATS	8 873	0	0	0	240	0	0	9 113
Austro Control	185 762	18 978	748	0	11 429	0	0	216 917
Avinor (Continental)	190 529	2 314	1 558	0	7 805	0	0	202 206
Belgocontrol	142 114	10 724	2 121	0	9 667	36 805	0	201 431
BULATSA	87 713	6 644	15	0	3 215	0	10	97 597
Croatia Control	89 648	6 234	0	0	0	0	0	95 882
DCAC Cyprus	40 989	4 222	10 799	0	2 356	0	0	58 366
DFS	1 043 916	0	701	0	0	0	0	1 044 617
DHMI	430 367	26 399	2 773	0	21 108	0	0	480 647
DSNA	1 244 896	86 596	9 100	0	76 388	49 875	49 800	1 516 654
EANS	16 477	227	0	0	0	0	0	16 703
ENAIRE	755 500	26 609	7 746	0	44 646	0	0	834 501
ENAV	686 571	23 541	4 088	0	38 534	0	0	752 734
Finavia	64 286	844	406	0	0	393	0	65 929
HCAA	152 884	8 135	1 031	0	9 115	0	0	171 164
HungaroControl	93 523	3 039	1 876	0	4 961	0	0	103 398
IAA	109 654	8 115	1 860	2 905	6 583	0	0	129 117
LFV	183 408	2 480	618	0	0	0	0	186 506
LGS	22 678	989	1 169	0	989	0	0	25 825
LPS	58 023	3 149	1 400	0	2 911	0	0	65 483
LVNL	174 740	0	0	0	0	0	7 326	182 066
MATS	16 721	744	945	0	812	0	0	19 221
M-NAV	11 938	807	0	0	0	0	0	12 745
MoldATSA	6 837	997	0	0	452	0	0	8 285
MUAC	135 433	0	0	0	0	0	8	135 442
NATS (Continental)	905 080	643	10 712	0	0	853	37	917 325
NAV Portugal (Continental)	116 661	6 423	969	4 687	7 015	0	0	135 755
NAVIAIR	114 013	0	0	0	0	0	0	114 013
Oro navigacija	25 781	657	397	0	1 362	0	0	28 197
PANSA	159 610	8 876	2 406	0	8 725	891	0	180 508
ROMATSA	160 075	9 245	2 281	0	7 125	0	0	178 726
Sakaeronavigatsia	25 400	627	252	0	743	0	0	27 022
Skyguide	329 727	15 366	1 880	0	9 175	0	0	356 147
Slovenia Control	31 920	2 156	872	0	1 489	0	0	36 437
SMATSA	77 309	5 214	0	0	2 757	0	0	85 280
UkSATSE	91 205	1 165	854	0	2 303	0	0	95 527

Annex 8 - Table 0.2: Breakdown of total gate-to-gate ANSP costs, 2015

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
Albcontrol	6 257	7 670	4 446	1 064	0	19 437	1 833	893	264	61	0	3 050	8 090	8 563	4 710	1 124	0	22 488
ANS CR	57 517	13 050	14 052	7 811	0	92 429	13 296	2 671	2 895	0	0	18 862	70 812	15 721	16 946	7 811	0	111 291
ARMATS	2 289	794	567	858	0	4 508	2 071	1 167	483	643	0	4 365	4 360	1 961	1 051	1 502	0	8 873
Austro Control	111 794	17 378	18 072	4 724	0	151 967	24 822	3 750	4 622	601	0	33 795	136 616	21 127	22 694	5 325	0	185 762
Avinor (Continental)	58 632	17 467	5 385	5 497	0	86 981	82 708	17 067	2 359	1 414	0	103 548	141 339	34 534	7 744	6 911	0	190 529
Belgocontrol	68 321	11 682	9 679	3 433	4	93 118	37 822	5 636	4 554	984	0	48 996	106 143	17 318	14 233	4 416	4	142 114
BULATSA	53 480	9 454	6 955	9 249	0	79 138	5 936	1 074	802	764	0	8 575	59 416	10 528	7 756	10 013	0	87 713
Croatia Control	46 139	20 484	11 674	2 007	0	80 303	5 788	1 943	1 391	225	0	9 345	51 926	22 426	13 064	2 231	0	89 648
DCAC Cyprus	13 408	14 894	4 342	4 011	0	36 655	2 035	1 390	560	348	0	4 334	15 443	16 284	4 902	4 359	0	40 989
DFS	607 221	75 412	78 773	68 035	-1 986	827 455	158 587	23 033	16 552	17 587	701	216 461	765 809	98 445	95 325	85 622	-1 285	1 043 916
DHMI	143 198	108 668	42 243	30 507	0	324 617	38 106	37 038	14 760	15 846	0	105 750	181 303	145 706	57 004	46 354	0	430 367
DSNA	665 082	198 100	94 560	41 225	0	998 967	169 962	45 801	20 929	9 236	0	245 929	835 045	243 902	115 489	50 461	0	1 244 896
EANS	8 913	2 795	1 606	1 717	0	15 032	362	475	288	320	0	1 445	9 275	3 271	1 894	2 037	0	16 477
ENAIRE	394 353	60 135	87 357	40 800	6 408	589 054	127 407	11 166	18 621	7 728	1 525	166 446	521 760	71 301	105 977	48 528	7 933	755 500
ENAV	288 398	105 679	95 708	55 380	0	545 165	69 053	35 042	27 305	10 007	0	141 407	357 452	140 721	123 012	65 386	0	686 571
Finavia	20 200	12 873	3 954	2 072	0	39 099	14 855	7 192	2 382	758	0	25 187	35 055	20 065	6 336	2 830	0	64 286
HCAA	103 766	21 364	3 319	467	0	128 917	17 981	5 282	548	156	0	23 967	121 747	26 646	3 868	623	0	152 884
HungaroControl	43 776	23 627	8 351	4 051	232	80 037	9 079	2 893	1 141	373	0	13 486	52 855	26 521	9 492	4 423	232	93 523
IAA	54 210	20 077	8 693	6 643	0	89 623	9 038	4 253	3 820	2 921	0	20 032	63 248	24 330	12 513	9 563	0	109 654
LFV	103 039	26 376	20 376	3 793	0	153 585	27 056	2 766	0	0	0	29 822	130 096	29 142	20 376	3 793	0	183 408
LGS	10 364	2 589	3 528	1 019	0	17 500	2 799	457	1 591	331	0	5 178	13 163	3 046	5 119	1 350	0	22 678
LPS	31 787	9 114	6 970	2 771	0	50 642	5 201	1 038	736	406	0	7 381	36 988	10 152	7 706	3 177	0	58 023
LVNL	90 200	22 092	7 091	1 369	0	120 752	40 329	9 876	3 170	612	0	53 987	130 529	31 968	10 261	1 982	0	174 740
MATS	6 563	4 588	1 874	823	0	13 848	1 639	533	468	232	0	2 873	8 202	5 121	2 342	1 055	0	16 721
M-NAV	8 130	1 906	549	264	0	10 849	824	208	36	21	0	1 089	8 954	2 114	585	285	0	11 938
MoldATSA	1 950	674	787	926	0	4 337	885	773	330	512	0	2 500	2 835	1 447	1 117	1 438	0	6 837
MUAC	112 631	13 558	8 797	448	0	135 433	n/appl	n/appl	n/appl	n/appl	n/appl	n/appl	112 631	13 558	8 797	448	0	135 433
NATS (Continental)	360 147	116 426	136 755	77 254	566	691 148	149 770	47 512	6 309	2 207	8 134	213 931	509 917	163 938	143 063	79 461	8 700	905 080
NAV Portugal (Continental)	75 523	9 241	4 745	2 585	0	92 095	21 007	1 343	1 798	418	0	24 566	96 531	10 584	6 543	3 003	0	116 661
NAVIAIR	50 375	14 124	11 110	7 906	0	83 515	20 421	4 950	2 041	3 086	0	30 498	70 797	19 074	13 150	10 992	0	114 013
Oro navigacija	12 665	4 964	2 557	686	0	20 872	2 524	1 095	1 044	246	0	4 909	15 189	6 059	3 601	932	0	25 781
PANSA	93 778	17 269	11 968	9 957	0	132 971	17 872	4 862	2 177	1 727	0	26 639	111 650	22 132	14 145	11 684	0	159 610
ROMATSA	93 378	16 354	9 417	9 434	4 997	133 580	18 886	3 705	1 644	1 707	553	26 496	112 264	20 059	11 061	11 141	5 550	160 075
Sakaeronavigatsia	7 648	3 241	4 269	1 974	812	17 943	3 122	1 367	1 525	1 097	347	7 457	10 770	4 607	5 793	3 071	1 158	25 400
Skyguide	161 863	14 189	30 014	5 816	2 164	214 045	84 624	13 243	14 169	2 623	1 022	115 681	246 487	27 432	44 183	8 439	3 185	329 727
Slovenia Control	18 976	3 520	3 148	1 726	313	27 684	2 716	285	167	91	977	4 236	21 692	3 805	3 315	1 817	1 290	31 920
SMATSA	32 778	11 672	7 841	8 087	130	60 507	9 162	3 102	2 013	2 490	35	16 802	41 940	14 774	9 854	10 577	165	77 309
UkSATSE	42 934	7 574	6 932	10 287	2 981	70 708	12 772	2 129	1 981	2 870	745	20 497	55 706	9 703	8 913	13 157	3 727	91 205
Total	4 061 683	1 041 075	778 463	436 673	16 621	6 334 516	1 212 350	307 011	165 473	90 650	14 039	1 789 522	5 274 033	1 348 086	943 936	527 323	30 660	8 124 038

Annex 8 - Table 0.3: Breakdown of ATM/CNS provision costs[40] (en-route, terminal and gate-to-gate), 2015

[40] ENAIRE 2015 ATM/CNS provision costs comprise costs relating to ATM/CNS infrastructure shared with the military authority (€16.8M), which are charged to civil airspace users. It should be noted that these costs, which are borne by the Spanish Air Force (Ministry of Defence), as well as the corresponding revenues, are not passing through ENAIRE Accounts from 2014 onwards.

ANSPs	ANSP BALANCE SHEET in (€'000)								
	NBV fixed assets in operation	NBV fixed assets under construction	Long-term financial assets and receivables	Current assets	**Total assets**	Capital and reserves	Long-term liabilities	Current liabilities	**Total liabilities**
Albcontrol	33 050	5 754	43	18 055	56 902	42 773	12 290	1 839	56 902
ANS CR	102 676	22 281	10 302	87 920	223 180	203 805	4 337	15 039	223 180
ARMATS	9 327	1 819	60	2 157	13 363	11 364	985	1 013	13 363
Austro Control	226 267	6 288	61 625	157 757	451 937	80 038	315 958	55 941	451 937
Avinor (Continental)	69 556	37 478	15 821	93 069	215 924	86 640	63 664	65 620	215 924
Belgocontrol	101 528	4 114	87	126 841	232 571	161 554	16 014	55 003	232 571
BULATSA	82 434	19 050	3 470	113 408	218 362	155 474	21 338	41 549	218 362
Croatia Control	64 145	6 587	2 536	63 320	136 590	68 505	47 879	20 206	136 590
DCAC Cyprus	19 181	667	0	14 873	34 721	12 672	22 050	0	34 721
DFS	744 349	7 561	78 004	1 957 020	2 786 934	765 728	1 770 139	251 067	2 786 934
DHMI	758 922	76 855	42	240 475	1 076 293	935 616	33 367	107 310	1 076 293
DSNA	594 445	180 199	0	0	774 644	774 644	0	0	774 644
EANS	17 204	4 025	0	9 850	31 079	20 950	5 835	4 293	31 079
ENAIRE	484 612	125 203	65 482	485 917	1 161 215	831 545	194 222	135 448	1 161 215
ENAV	906 700	251 750	309 935	551 981	2 020 365	1 120 006	498 671	401 688	2 020 365
Finavia	43 741	9 745	0	50 870	104 356	65 953	38 403	0	104 356
HCAA	7 009	0	0	0	7 009	7 009	0	0	7 009
HungaroControl	55 527	12 911	1 289	92 712	162 439	127 377	10 456	24 606	162 439
IAA	61 807	17 440	14 573	202 013	295 833	130 618	140 652	24 563	295 833
LFV	90 778	25 439	113 514	518 288	748 019	85 497	610 051	52 470	748 019
LGS	13 186	6 597	3	10 759	30 545	28 086	222	2 237	30 545
LPS	49 166	5 103	20	40 941	95 230	68 789	13 136	13 305	95 230
LVNL	92 568	21 133	0	61 392	175 093	45 073	85 263	44 757	175 093
MATS	12 429	249	2 000	18 201	32 878	26 688	3 554	2 636	32 878
M-NAV	6 082	565	0	10 348	16 995	15 192	479	1 324	16 995
MoldATSA	6 317	678	18	6 698	13 711	10 480	971	2 259	13 711
MUAC	63 013	6 408	0	50 153	119 574	0	69 421	50 153	119 574
NATS (Continental)	850 012	499 910	435 246	694 699	2 479 867	1 031 585	1 122 212	326 070	2 479 867
NAV Portugal (Continental)	55 903	17 531	70 396	128 531	272 360	93 884	124 094	54 382	272 360
NAVIAIR	138 609	13 577	10 134	51 445	213 765	125 969	62 698	25 098	213 765
Oro navigacija	22 934	1 364	9 200	13 354	46 852	44 044	377	2 431	46 852
PANSA	168 274	19 259	16 815	112 386	316 734	167 722	109 049	39 963	316 734
ROMATSA	74 711	21 249	1 033	168 819	265 812	151 075	95 693	19 044	265 812
Sakaeronavigatsia	29 557	6 569	10 290	21 121	67 537	60 292	3 337	3 909	67 537
Skyguide	303 197	56 215	37 654	223 048	620 115	330 769	202 522	86 823	620 115
Slovenia Control	31 200	590	222	4 550	36 562	15 735	13 492	7 335	36 562
SMATSA	99 235	2 982	0	42 331	144 547	101 367	24 402	18 779	144 547
UkSATSE	108 310	23 224	1 047	71 796	204 376	198 877	999	4 500	204 376
Total	6 597 960	1 518 369	1 270 863	6 517 099	15 904 291	8 203 394	5 738 232	1 962 664	15 904 291

Annex 8 - Table 0.4: Balance Sheet data at ANSP level, 2015

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	Internal MET	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)
Albcontrol	70	6	0	0	8	0	86	0	73	22	16	51	332	47	77 879	23	30 682	2 976
ANS CR	190	21	12	11	98	65	129	25	234	31	0	71	887	92	137 834	98	149 372	25 278
ARMATS	83	0	0	0	26	14	137	0	47	24	0	64	395	24	32 688	59	80 830	1 339
Austro Control	294	15	18	21	42	73	101	99	70	33	89	0	855	122	165 676	172	236 500	62 525
Avinor (Continental)	382	107	10	27	124	0	162	57	42	27	0	20	957	139	215 311	243	373 604	55 133
Belgocontrol	225	25	4	2	0	49	139	26	131	26	75	51	753	86	115 500	139	193 600	42 805
BULATSA	257	51	0	2	41	25	332	25	153	44	58	86	1 072	129	165 475	128	165 292	23 752
Croatia Control	237	18	18	17	38	47	102	33	110	38	57	0	715	102	130 968	135	188 865	29 334
DCAC Cyprus	100	10	0	0	46	0	0	0	31	22	0	0	209	65	128 180	35	66 080	9 781
DFS	1 847	120	48	226	325	496	803	611	471	105	0	271	5 323	1 443	1 176 028	404	527 798	386 111
DHMI	1 219	58	64	44	28	354	1 484	22	1 338	448	0	1 088	6 147	549	794 952	670	777 200	86 525
DSNA	2 727	422	175	210	117	1 005	1 241	331	1 211	202	0	0	7 642	1 351	1 734 684	1 376	1 766 784	349 564
EANS	55	19	2	0	4	2	30	0	8	29	0	17	166	25	39 000	30	46 800	5 123
ENAIRE	1 737	273	0	0	155	50	514	320	518	15	0	102	3 684	1 120	1 366 550	617	717 814	346 764
ENAV	1 452	202	30	64	43	21	121	122	580	123	229	139	3 125	858	1 052 506	594	804 740	212 846
Finavia	186	27	0	0	7	0	49	9	23	38	3	0	342	57	81 567	129	187 566	23 642
HCAA	486	58	0	13	0	48	484	44	110	10	0	405	1 658	208	354 016	278	473 156	42 394
HungaroControl	176	7	11	4	30	29	101	35	196	67	21	77	754	103	163 255	73	113 515	26 198
IAA	207	34	5	8	24	8	45	22	71	0	0	0	424	144	219 312	63	96 579	32 600
LFV	451	84	0	18	42	25	70	35	212	30	2	0	969	203	359 310	248	438 464	83 875
LGS	92	0	0	0	0	41	101	0	90	16	13	1	354	65	67 246	27	41 391	4 470
LPS	87	24	4	6	44	33	121	17	120	29	0	0	485	47	68 655	40	63 676	13 626
LVNL	199	23	33	21	68	180	108	82	165	17	0	84	980	61	102 699	138	272 037	43 369
MATS	53	0	0	0	0	0	43	0	33	18	0	0	147	33	66 099	20	39 680	4 037
M-NAV	59	25	0	0	9	7	45	0	54	29	16	27	271	36	50 940	23	31 050	3 538
MoldATSA	75	6	0	5	0	9	58	14	62	10	33	50	322	50	72 400	25	36 375	1 144
MUAC	265	24	5	2	41	51	125	0	57	0	0	0	570	265	305 613	0	0	64 404
NATS (Continental)	1 357	160	28	3	354	306	818	179	823	0	0	0	4 027	896	1 092 693	461	562 396	266 329
NAV Portugal (Continental)	224	32	0	3	26	55	88	55	160	43	7	6	699	88	159 280	136	248 608	49 965
NAVIAIR	207	67	0	1	88	29	95	30	87	11	0	0	616	96	140 157	111	164 979	31 065
Oro navigacija	86	10	0	2	0	25	67	9	68	27	0	0	294	33	54 106	52	84 914	6 269
PANSA	491	17	67	52	72	291	329	51	337	104	0	0	1 811	139	149 503	351	400 092	53 598
ROMATSA	450	105	14	9	76	0	357	0	388	10	122	0	1 531	211	257 054	240	297 699	51 276
Sakaeronavigatsia	102	0	13	1	22	10	358	15	147	38	54	0	760	42	70 812	60	101 160	2 758
Skyguide	348	81	9	21	93	203	171	91	211	67	0	27	1 321	207	279 054	140	184 332	81 678
Slovenia Control	91	14	8	0	11	6	36	0	36	24	0	0	226	55	77 063	36	51 228	10 953
SMATSA	275	61	0	7	30	29	97	112	110	63	89	0	873	156	188 448	119	143 752	17 246
UkSATSE	842	281	0	1	64	98	1 583	37	619	96	37	989	4 647	532	682 024	310	411 060	13 102
Total	17 682	2 488	577	801	2 196	3 684	10 730	2 506	9 196	1 938	920	3 625	56 343	9 879	12 394 537	7 802	10 569 667	2 567 391

Annex 8 - Table 0.5: Total staff and ATCOs in OPS data, 2015

ANSPs	Size of controlled airspace	Number of ACC operational units	Number of APP operational units	Number of TWR operational units	Number of AFIS	Total IFR flights controlled by the ANSP	Total IFR km controlled by the ANSP	Total flight-hours controlled by the ANSP	IFR Airport movements controlled by the ANSP	Composite flight-hours
Albcontrol	36 000	1	1	1	1	201 983	34 196 308	43 150	20 912	48 742
ANS CR	76 300	1	4	4	0	730 979	177 972 353	237 734	141 497	275 568
ARMATS	29 700	1	2	2	2	42 168	8 329 063	11 319	18 307	16 214
Austro Control	80 900	1	6	6	0	915 007	195 697 699	281 358	330 892	369 833
Avinor (Continental)	728 000	3	17	19	28	604 635	199 700 214	368 391	673 588	548 497
Belgocontrol	39 500	1	4	5	0	591 480	55 990 046	113 111	380 163	214 760
BULATSA	145 000	1	3	5	0	771 068	202 624 625	249 764	76 716	270 277
Croatia Control	129 000	1	7	10	0	530 607	162 043 731	208 112	90 508	232 312
DCAC Cyprus	174 000	1	2	2	0	319 091	119 449 959	153 140	58 225	168 708
DFS	390 000	4	16	16	0	2 818 110	887 364 963	1 371 301	1 971 046	1 898 328
DHMI	982 000	2	37	46	0	1 322 423	955 170 259	1 268 412	1 262 415	1 605 962
DSNA	1 010 000	5	12	75	54	2 887 215	1 563 087 670	2 184 317	1 849 423	2 678 824
EANS	77 400	1	2	2	0	193 325	50 212 172	67 511	38 465	77 796
ENAIRE	2 190 000	5	17	22	0	1 730 434	897 914 748	1 289 298	1 314 027	1 640 648
ENAV	732 000	4	25	16	11	1 565 568	700 916 741	1 004 733	1 216 554	1 330 020
Finavia	409 000	1	5	15	9	229 226	62 578 337	103 865	233 491	166 297
HCAA	537 000	1	16	18	15	712 434	373 205 250	497 788	414 099	608 512
HungaroControl	104 000	1	1	1	0	809 937	182 491 467	232 313	91 896	256 884
IAA	457 000	2	3	3	0	565 916	223 252 022	287 663	239 322	351 654
LFV	627 000	2	20	22	1	707 470	284 160 683	420 976	471 341	547 005
LGS	95 900	1	2	1	1	242 554	56 953 565	77 094	67 796	95 222
LPS	48 700	1	2	5	0	467 466	73 169 957	93 248	30 111	101 299
LVNL	53 100	1	3	4	0	585 439	73 229 289	158 229	506 076	293 545
MATS	231 000	1	2	1	1	102 774	53 129 257	76 832	41 893	88 034
M-NAV	24 700	1	2	2	1	152 130	20 176 616	25 595	15 003	29 607
MoldATSA	34 800	1	1	4	0	45 440	6 990 124	10 570	22 612	16 616
MUAC	260 000	1	0	0	0	1 702 263	492 388 621	600 970	n/appl	600 970
NATS (Continental)	880 000	3	16	16	0	2 268 666	820 635 949	1 346 567	1 753 259	1 815 361
NAV Portugal (Continental)	671 000	1	4	6	0	504 381	250 683 773	334 646	308 996	417 267
NAVIAIR	158 000	1	7	6	1	641 881	140 900 482	213 579	338 390	304 059
Oro navigacija	74 800	1	4	4	0	225 075	37 441 340	53 964	50 685	67 516
PANSA	334 000	1	4	14	0	688 316	294 765 190	403 032	328 185	490 783
ROMATSA	254 000	1	3	16	0	634 739	272 548 424	344 614	148 870	384 420
Sakaeronavigatsia	88 700	1	3	3	1	121 311	42 148 036	51 104	26 625	58 223
Skyguide	69 700	2	4	7	0	1 184 665	211 577 414	325 964	481 066	454 594
Slovenia Control	20 400	1	3	3	0	267 411	36 870 631	49 871	31 019	58 165
SMATSA	127 000	1	8	8	0	601 283	176 347 886	224 424	84 454	247 005
UkSATSE	776 000	4	8	17	3	213 133	112 836 706	153 706	121 191	186 111
Total		63	276	407	129		10 509 151 572	14 938 263	15 249 118	19 015 635

Annex 8 - Table 0.6: Operational data at ANSP level, 2015

ANSPs	ACC Code	Flight-hours controlled	ATCO-hours on duty	ATCO-hour productivity	Average transit time in minutes	IFR ACC Movements	Size of the controlled area	ATCOs in OPS	Size of OPS room area (m^2)	Number of sectors	Sum of sector-hours
Albcontrol	Tirana	42 022	77 879	0.54	12	201 838	36 000	47	265	4	26 280
ANS CR	Praha	210 115	137 834	1.52	17	721 111	76 300	92	950	9	30 417
ARMATS	Yerevan	8 481	32 688	0.26	13	39 066	29 700	24	168	1	8 760
Austro Control	Wien	205 255	165 676	1.24	16	763 733	79 500	122	900	13	38 500
Avinor (Continental)	Bodo	80 633	68 156	1.18	22	215 519	400 000	44	450	6	25 568
Avinor (Continental)	Oslo	82 222	102 234	0.80	15	339 935	111 000	66	605	6	34 320
Avinor (Continental)	Stavanger	86 570	44 921	1.93	22	241 350	216 000	29	250	3	21 800
Belgocontrol	Brussels	77 173	115 500	0.67	8	584 601	39 500	86	1 054	7	25 251
BULATSA	Sofia	236 336	165 475	1.43	19	746 783	147 000	129	1 183	12	33 407
Croatia Control	Zagreb	187 385	130 968	1.43	23	498 472	129 000	102	800	10	24 742
DCAC Cyprus	Nicosia	146 388	128 180	1.14	28	318 954	174 000	65	250	5	25 370
DFS	Karlsruhe UAC	578 408	329 625	1.75	20	1 722 241	261 000	414	1 850	39	139 097
DFS	Langen	351 661	397 179	0.89	17	1 220 323	108 000	473	1 689	35	138 930
DFS	Munchen	252 647	229 826	1.10	14	1 066 739	119 000	306	1 262	18	102 801
DFS	Bremen	188 585	219 398	0.86	18	627 925	174 000	250	1 050	17	88 846
DHMI	Ankara	803 248	456 120	1.76	51	939 574	779 000	315	295	11	83 220
DHMI	Istanbul	405 427	338 832	1.20	25	964 514	203 000	234	420	11	96 360
DSNA	Bordeaux	447 619	318 432	1.41	31	868 451	212 000	248	1 295	19	104 119
DSNA	Reims	255 621	294 036	0.87	18	859 832	117 000	229	1 040	17	74 891
DSNA	Paris	414 644	405 744	1.02	21	1 202 528	167 000	316	1 250	20	116 198
DSNA	Marseille	371 334	389 052	0.95	22	996 379	298 000	303	1 310	28	116 438
DSNA	Brest	466 865	327 420	1.43	30	919 775	400 000	255	850	18	80 749
EANS	Tallinn	61 047	39 000	1.57	19	188 491	77 400	25	269	3	11 315
ENAIRE	Canarias	155 443	172 699	0.90	33	279 913	1 370 000	144	750	10	46 548
ENAIRE	Barcelona	321 496	358 501	0.90	25	760 914	266 000	287	1 485	20	96 043
ENAIRE	Madrid	507 738	549 297	0.92	32	954 620	435 000	440	1 070	26	148 298
ENAIRE	Palma	68 643	132 189	0.52	16	262 986	51 400	112	783	8	38 404
ENAIRE	Sevilla	142 132	153 864	0.92	26	331 788	179 000	137	773	7	40 509
ENAV	Brindisi	86 953	107 858	0.81	21	254 421	136 000	90	550	4	14 616
ENAV	Milano	250 979	316 310	0.79	19	790 479	75 800	245	593	21	70 207
ENAV	Padova	178 907	242 318	0.74	17	643 905	84 000	200	375	13	45 098
ENAV	Roma	416 118	386 019	1.08	32	782 444	437 000	324	1 600	22	91 242
Finavia	Tampere	67 795	81 567	0.83	25	162 533	409 000	57	550	6	17 885
HCAA	Athinai+Macedonia	437 645	354 016	1.24	38	685 718	537 000	208	1 000	12	59 400
HungaroControl	Budapest	215 531	163 255	1.32	16	790 521	104 300	103	720	9	29 741
IAA	Dublin	36 754	54 828	0.67	10	211 120	23 200	36	441	4	22 353
IAA	Shannon	232 962	164 484	1.42	34	411 224	449 000	108	576	10	48 933
LFV	Malmo	219 284	207 090	1.06	26	511 531	226 000	117	841	14	45 000
LFV	Stockholm	127 979	152 220	0.84	20	393 072	479 000	86	828	11	46 720
LGS	Riga	77 016	67 246	1.15	19	242 485	95 900	65	169	4	19 000
LPS	Bratislava	87 961	68 655	1.28	12	453 552	48 700	47	813	5	14 292
LVNL	Amsterdam	77 638	102 699	0.76	9	547 254	53 100	61	1 800	5	31 442
MATS	Malta	65 585	66 099	0.99	39	101 885	231 000	33	121	2	17 520
M-NAV	Skopje	23 623	50 940	0.46	10	146 522	24 700	36	202	3	13 200
MoldATSA	Chisinau	8 198	72 400	0.11	11	43 355	34 800	50	144	2	17 520
MUAC	Maastricht	600 970	305 613	1.97	21	1 702 263	260 000	265	1 050	20	72 435
NATS (Continental)	Prestwick	344 528	283 992	1.21	23	890 997	629 000	233	1 020	23	124 008
NATS (Continental)	London AC	524 343	428 147	1.22	17	1 887 800	287 000	351	2 000	23	81 000
NATS (Continental)	London TC	288 854	380 555	0.76	13	1 323 250	40 600	312	766	22	110 000
NAV Portugal (Continental)	Lisboa	285 747	159 280	1.79	36	474 041	671 000	88	663	8	45 269
NAVIAIR	Kobenhavn	158 451	140 157	1.13	18	543 088	158 000	96	600	7	31 208
Oro Navigacija	Vilnius	46 275	54 106	0.86	13	217 825	74 800	33	336	3	19 710
PANSA	Warszawa	314 919	149 503	2.11	29	644 412	331 000	139	1 300	9	39 325
ROMATSA	Bucuresti	323 229	257 054	1.26	31	626 516	254 000	211	1 391	11	59 220
Sakaeronavigatsia	Tbilisi	48 846	70 812	0.69	24	119 756	88 700	42	250	2	17 520
Skyguide	Geneva	110 933	144 984	0.77	11	611 905	30 000	103	1 113	9	29 828
Skyguide	Zurich	132 980	134 070	0.99	11	731 334	39 800	105	960	9	36 971
Slovenia Control	Ljubljana	47 707	77 063	0.62	11	264 583	20 400	55	360	4	14 879
SMATSA	Beograd	207 933	188 448	1.10	21	591 586	127 000	156	744	9	39 900
UkSATSE	Kyiv	75 001	260 246	0.29	31	145 339	185 000	203	883	12	69 013
UkSATSE	Dnipropetrovs'k	4 922	171 788	0.03	20	14 479	287 000	134	415	7	51 251
UkSATSE	L'viv	36 951	116 662	0.32	25	87 370	134 000	91	202	5	26 670
UkSATSE	Odesa	35 195	133 328	0.26	24	88 737	170 000	104	235	6	43 850
Total		13 353 848	12 394 537	1.08	22	36 975 657	13 890 600	9 879		719	3 333 406

Annex 8 - Table 0.7: Operational data at ACC level, 2015

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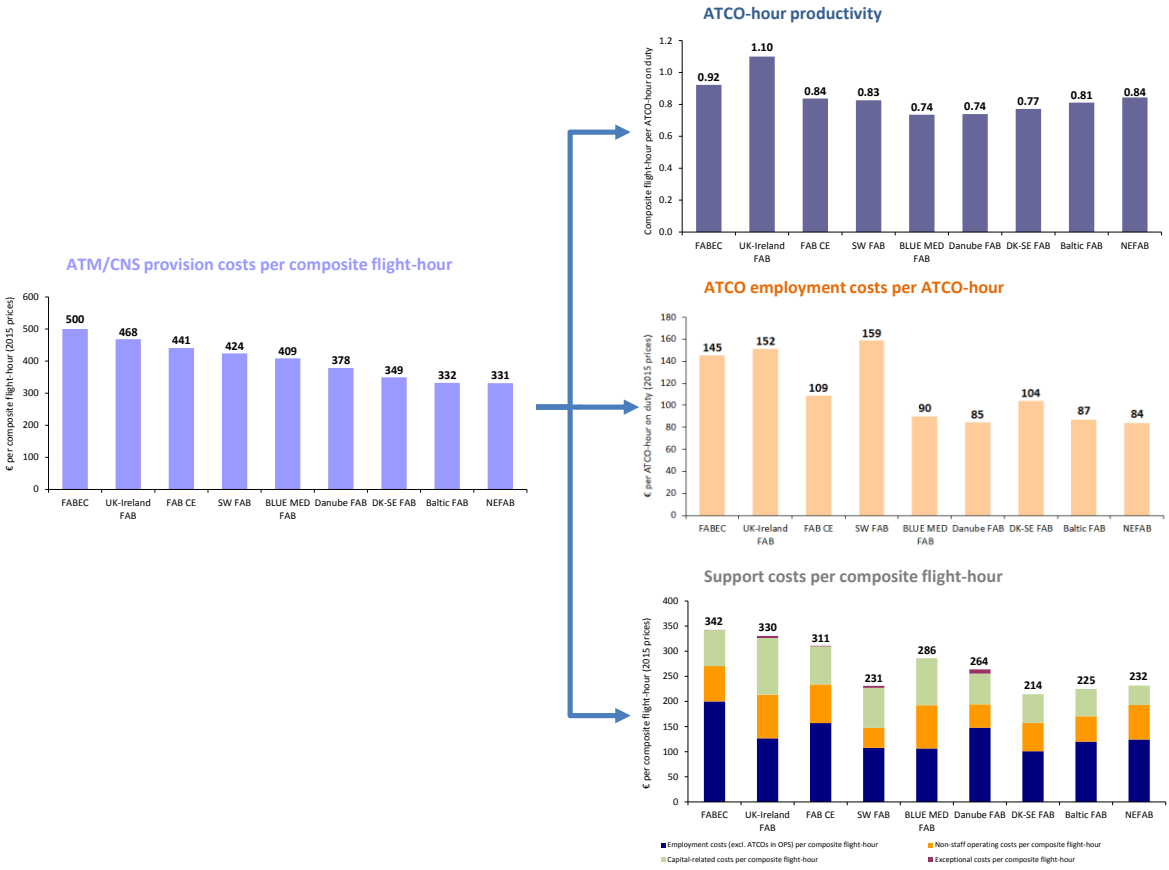
ANNEX 9 – PERFORMANCE INDICATORS AT FAB LEVEL

This Annex provides a breakdown of the **financial** cost-effectiveness indicator at FAB level by ATCO-hour productivity, ATCO employment costs per ATCO-hour and support costs per composite flight-hour.

The figures shown at FAB level have been computed taking into account the ANSPs participating to the ACE analysis in 2015 and which were formally part of a FAB initiative:

- FABEC: Belgocontrol, DFS, DSNA, LVNL, MUAC and Skyguide.
- FAB CE: ANS CR, Austro Control, Croatia Control, HungaroControl, LPS and Slovenia Control.
- SW FAB: ENAIRE and NAV Portugal.
- BLUE MED: DCAC Cyprus, ENAV, HCAA and MATS.
- UK-Ireland: IAA and NATS.
- Danube: BULATSA and ROMATSA.
- DK-SE: LFV and NAVIAIR.
- Baltic: Oro Navigacija and PANSA.
- NEFAB: Avinor, EANS, Finavia and LGS.

The Figure below represents a break-down of unit ATM/CNS provision costs into ATCO-hour productivity, ATCO employment costs per ATCO-hour and unit support costs at FAB level.



Annex 9 - Figure 0.1: Breakdown of cost-effectiveness indicator at FAB level, 2015

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ANNEX 10 – INDIVIDUAL ANSP FACT-SHEETS

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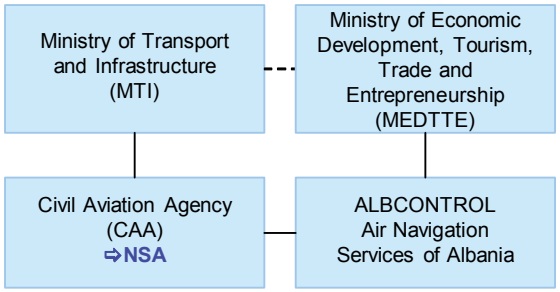
Albcontrol, Albania

National Air Traffic Agency

http://www.albcontrol.com.al/

Institutional arrangements and links (2017)



Status (2017)

- Since May 1999 NATA, now ALBCONTROL, is a joint-stock company
- 100% State owned

National Supervisory Authority (NSA):

Civil Aviation Agency (CAA)

Body responsible for:

Safety Regulation

MTI and Civil Aviation Agency (CAA)

Airspace Regulation

MTI and Civil Aviation Agency (CAA)

Economic Regulation

Ministry of Economic Development, Tourism, Trade and Entrepreneurship (MEDTTE)

Corporate governance structure (2017)

SUPERVISORY BOARD (6 members)
Chairman + 5 members

All 6 members are nominated by the MEDTTE.
2 members are proposed by the MEDTTE, 2 members by the MTI and 2 members by the Ministry of Finance.

MANAGEMENT BOARD (6 members)
Director General + 5 Head of Divisions

Director General is appointed by MEDTTE through the Supervisory Board of ALBCONTROL

Albcontrol (2017)

CHAIRMAN OF SUPERVISORY BOARD:

Genci Gjonçaj

DIRECTOR GENERAL OF ALBCONTROL:

Belinda Balluku

HEAD OF THE ATS DEPARTMENT:

Sokol Reveli

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☑ MET

Operational ATS units (2015)

1 ACC (Tirana)
1 APP (Tirana)
1 TWR (Tirana)
1 AFIS (Tirana)

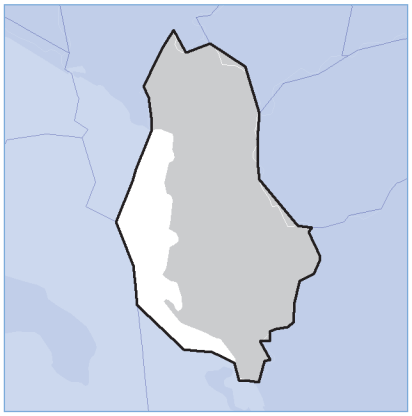
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	23
Gate-to-gate total costs (M€)	25
Gate-to-gate ATM/CNS provision costs (M€)	22
Gate-to-gate total ATM/CNS assets(M€)	38
Gate-to-gate ANS total capex (M€)	9
ATCOs in OPS	70
Gate-to-gate total staff (incl. MET staff*)	332
Total IFR flight-hours controlled by ANSP ('000)	43
IFR airport movements controlled by ANSP ('000)	21
En-route sectors	4
Minutes of ATFM delays ('000)	0

** if applicable*

Size (2015)

Size of controlled airspace: 36 000 km²

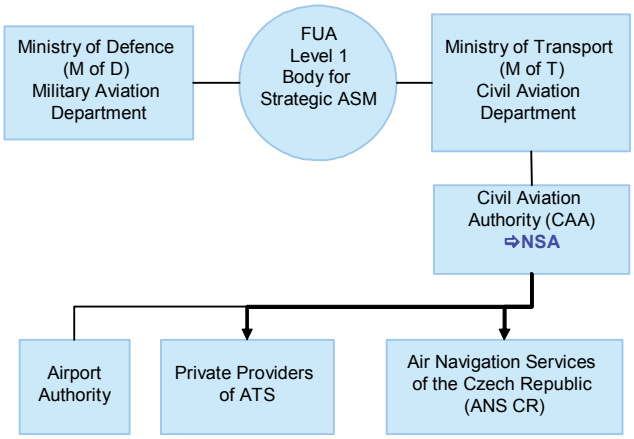


ANS CR, Czech Republic

Air Navigation Services of the Czech Republic

www.rlp.cz

Institutional arrangements and links (2017)



Status (2017)

- 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

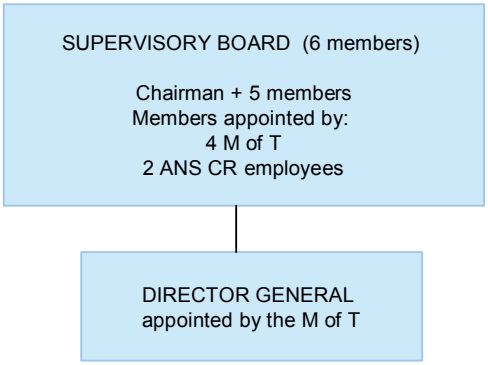
Airspace Regulation

Body for Strategic ASM

Economic Regulation

Ministry of Transport

Corporate governance structure (2017)



ANS CR (2017)

CHAIRWOMAN OF THE SUPERVISORY BOARD:

Magdalena Faltýsková

DIRECTOR GENERAL (CEO):

Jan Klas

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☐ MET

- OAT compatible only

Operational ATS units (2015)

1 ACC (Praha)
4 APPs (Praha, Karlovy Vary, Brno, Ostrava)
4 TWRs (Praha, Karlovy Vary, Brno, Ostrava)
1 AFIS (located in Praha ACC)

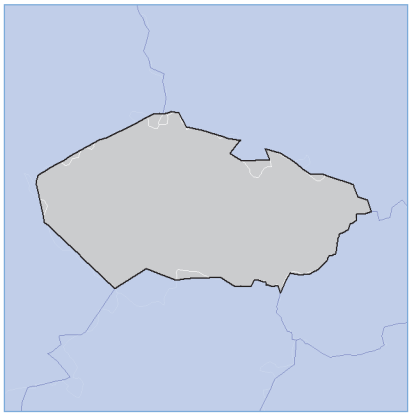
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	128
Gate-to-gate total costs (M€)	122
Gate-to-gate ATM/CNS provision costs (M€)	111
Gate-to-gate total ATM/CNS assets(M€)	120
Gate-to-gate ANS total capex (M€)	19
ATCOs in OPS	190
Gate-to-gate total staff (incl. MET staff*)	887
Total IFR flight-hours controlled by ANSP ('000)	238
IFR airport movements controlled by ANSP ('000)	141
En-route sectors	9
Minutes of ATFM delays ('000)	7

** if applicable*

Size (2015)

Size of controlled airspace: 76 300 km²

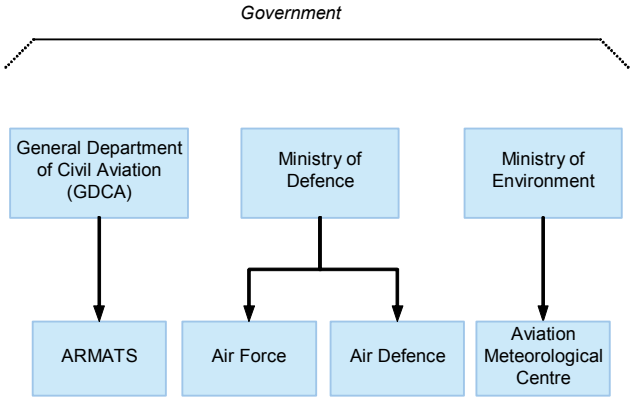


ARMATS, Armenia

Armenian Air Traffic Services

www.armats.com

Institutional arrangements and links (2017)



Status (2017)

- Joint-stock company as of 1997
- 100% State-owned

National Supervisory Authority (NSA):

General Department of Civil Aviation (GDCA)

Body responsible for:

Safety Regulation

General Department of Civil Aviation (GDCA)

Airspace Regulation

General Department of Civil Aviation (GDCA) and Ministry of Defence

Economic Regulation

Tax Authorities

Corporate governance structure (2017)

SUPERVISORY BOARD
Chairman is GDCA DG

EXECUTIVE BODY
Chairman + 5 members appointed by the stockholders
Chairman is ARMATS DG

ARMATS (2017)

CHAIRMAN OF THE SUPERVISORY BOARD:

Sergey Avetisyan

CHAIRMAN OF THE EXECUTIVE BODY:

Artur Gasparyan

DIRECTOR OF AIR TRAFFIC SERVICES:

Artur Papoyan

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

Operational ATS units (2015)

1 ACC (Yerevan)
2 APPs (Yerevan, Gyumri)
2 TWRs (Shirak, Zvartnots)

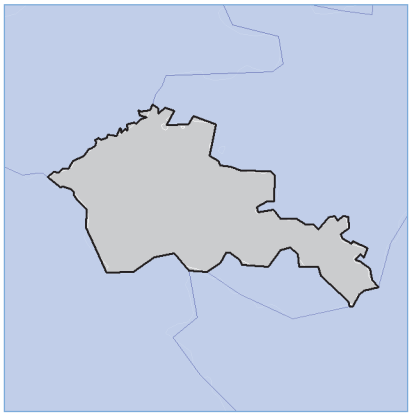
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	8
Gate-to-gate total costs (M€)	9
Gate-to-gate ATM/CNS provision costs (M€)	9
Gate-to-gate total ATM/CNS assets(M€)	11
Gate-to-gate ANS total capex (M€)	1
ATCOs in OPS	83
Gate-to-gate total staff (incl. MET staff*)	395
Total IFR flight-hours controlled by ANSP ('000)	11
IFR airport movements controlled by ANSP ('000)	18
En-route sectors	1
Minutes of ATFM delays ('000)	0

** if applicable*

Size (2015)

Size of controlled airspace: 29 700 km²

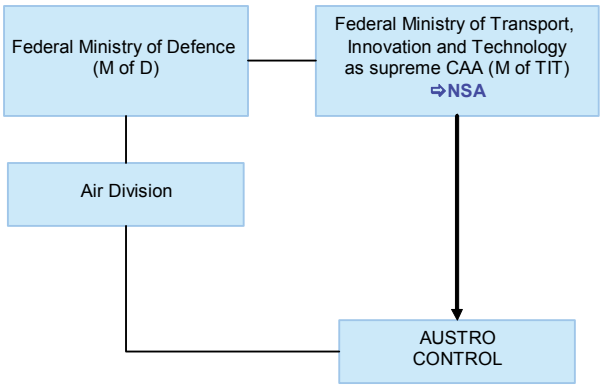


Austro Control, Austria

Österreichische Gesellschaft für Zivilluftfahrt mbH

www.austrocontrol.at

Institutional arrangements and links (2017)



Status (2017)

- 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 National Supervisory Authority

Corporate governance structure (2017)

GENERAL ASSEMBLY - M of TIT

SUPERVISORY BOARD (9 members)
Chairman + 8 members
6 members are appointed by M of TIT.
Members represent: 1 from M of Finance,1 from M of TIT, 1 from the field of aviation, 1 from the field of consulting, 1 from the field of transport, 3 from works council.

MANAGING BOARD
2 members
Members appointed by M of TIT.

Austro Control (2017)

CHAIRMAN OF THE SUPERVISORY BOARD:

Mag. Karin Zipperer

MANAGING BOARD:

Dr. Heinz Sommerbauer
Thomas Hoffmann, MSc

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

Operational ATS units (2015)

1 ACC (Wien)
6 APPs (Wien, Graz, Innsbruck, Klagenfurt, Linz, Salzburg)
6 TWRs

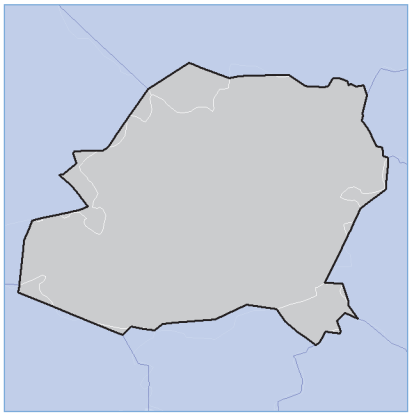
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	244
Gate-to-gate total costs (M€)	217
Gate-to-gate ATM/CNS provision costs (M€)	186
Gate-to-gate total ATM/CNS assets(M€)	168
Gate-to-gate ANS total capex (M€)	21
ATCOs in OPS	294
Gate-to-gate total staff (incl. MET staff*)	855
Total IFR flight-hours controlled by ANSP ('000)	281
IFR airport movements controlled by ANSP ('000)	331
En-route sectors	13
Minutes of ATFM delays ('000)	201

** if applicable*

Size (2015)

Size of controlled airspace: 80 900 km²

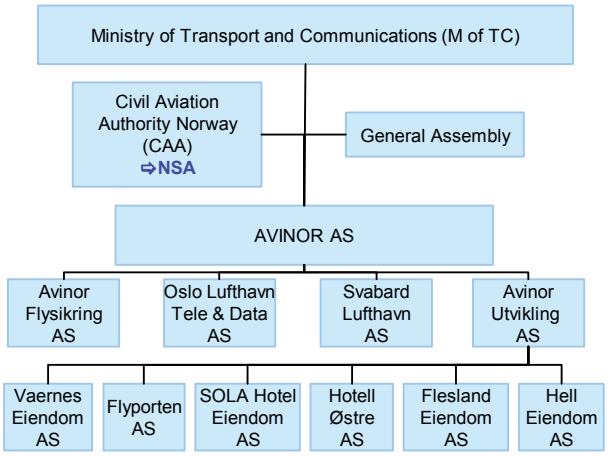


Avinor Flysikring, Norway

Avinor Flysikring AS

www.avinor.no

Institutional arrangements and links (2017)



Status (2017)

- 100% owned by Avinor AS (state-owned)
- Civil ANSP
- Independent of CAA

National Supervisory Authority (NSA):

Civil Aviation Authority Norway (CAA)

Body responsible for:

Safety Regulation

Civil Aviation Authority Norway

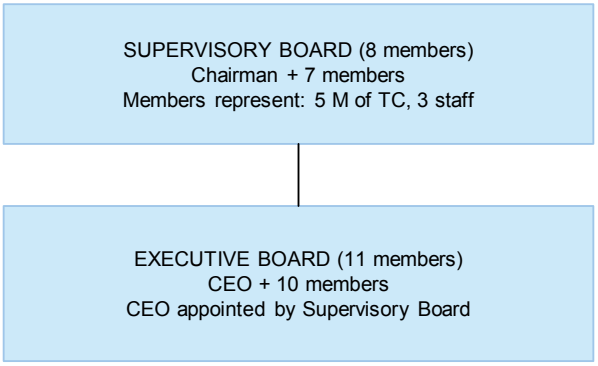
Airspace Regulation

Civil Aviation Authority Norway

Economic Regulation

Aeronautic charges are set annually by the Ministry of Transport and Communications

Corporate governance structure (2017)



Avinor Flysikring (2017)

CHAIRMAN OF THE SUPERVISORY BOARD:

Dag Falk-Petersen

CHIEF EXECUTIVE OFFICER:

Anders Kirsebom

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☑ Oceanic ANS
☑ OAT	☑ Lower Airspace	☐ MET

Operational ATS units (2015)

3 ACCs Oslo (ACC + APP), Stavanger (ACC), Bodo (ACC + APP + Oceanic)
17 APPs (2 APPs combined with ACCs + 14 TWRs/APPs + 1 stand alone APP)
19 TWRs

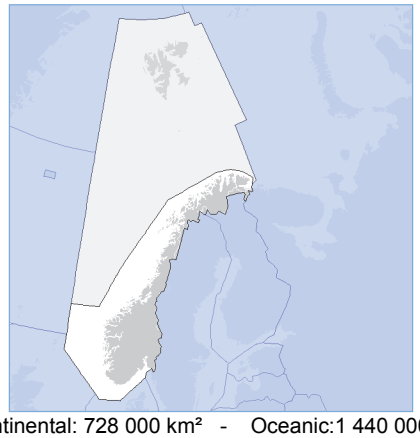
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	203
Gate-to-gate total costs (M€)	202
Gate-to-gate ATM/CNS provision costs (M€)	191
Gate-to-gate total ATM/CNS assets(M€)	95
Gate-to-gate ANS total capex (M€)	14
ATCOs in OPS	382
Gate-to-gate total staff (incl. MET staff*)	957
Total IFR flight-hours controlled by ANSP ('000)	368
IFR airport movements controlled by ANSP ('000)	674
En-route sectors	15
Minutes of ATFM delays ('000)	118

** if applicable*

Size (2015)

Size of controlled airspace: 2 168 000 km²



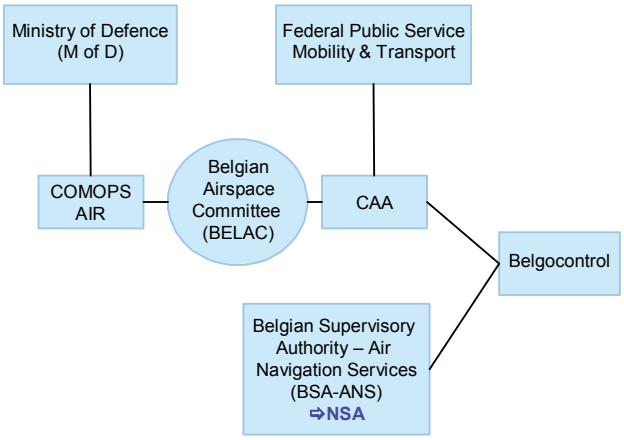
Continental: 728 000 km² - Oceanic:1 440 000 km²

Belgocontrol, Belgium

Belgocontrol

www.belgocontrol.be

Institutional arrangements and links (2017)



Status (2017)

- 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

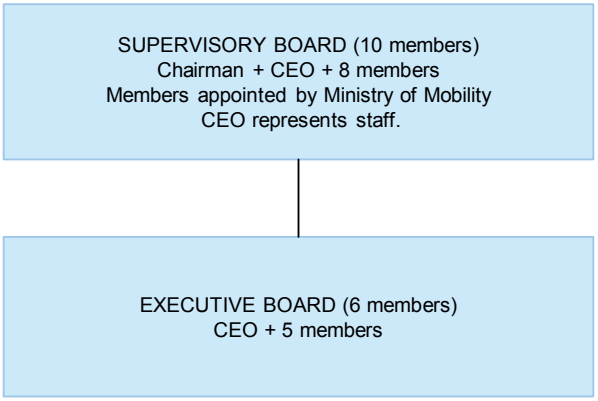
Airspace Regulation

Belgian Airspace Committee

Economic Regulation

Federal Public Service of Mobility and Transport

Corporate governance structure (2017)



Belgocontrol (2017)

CHAIRMAN OF THE SUPERVISORY BOARD:

Renaud Lorand

DIRECTOR GENERAL (CEO):

Johan Decuyper

Scope of services (2015)

☑ GAT	☐ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

- Belgocontrol controls lower airspace up to FL 245, including Luxembourg airspace above FL 145/165
- Upper airspace (> FL 245) is controlled by Maastricht UAC

Operational ATS units (2015)

1 ACC (Brussels)
4 APPs (Brussels, Liege, Charleroi, Oostende)
5 TWRs (Brussels, Antwerp, Liege, Charleroi, Oostende)

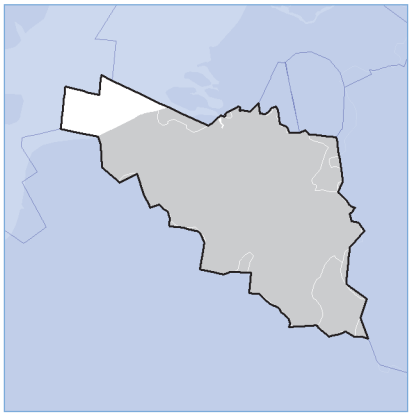
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	230
Gate-to-gate total costs (M€)	201
Gate-to-gate ATM/CNS provision costs (M€)	142
Gate-to-gate total ATM/CNS assets(M€)	99
Gate-to-gate ANS total capex (M€)	6
ATCOs in OPS	225
Gate-to-gate total staff (incl. MET staff*)	753
Total IFR flight-hours controlled by ANSP ('000)	113
IFR airport movements controlled by ANSP ('000)	380
En-route sectors	7
Minutes of ATFM delays ('000)	234

** if applicable*

Size (2015)

Size of controlled airspace: 39 500 km²

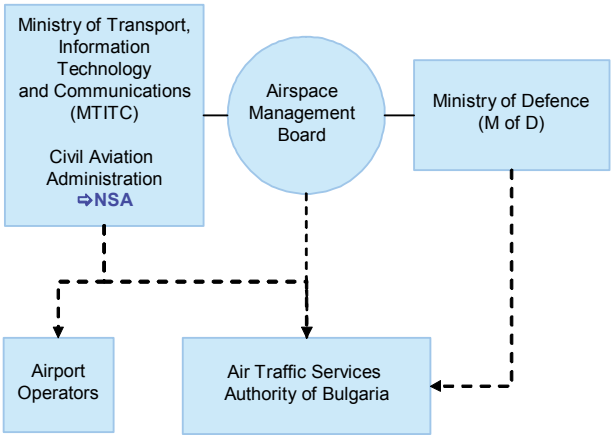


BULATSA, Bulgaria

Bulgarian Air Traffic Services Authority

www.atsa.bg

Institutional arrangements and links (2017)



Status (2017)

- 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, Information Technology and Communications (MTITC))

Airspace Regulation

Airspace Management Board

Economic Regulation

Ministry of Transport, Information Technology and Communications (MTITC)

Corporate governance structure (2017)

MANAGEMENT BOARD (3 members)
DG + 2 members

All members appointed by the MTITC.

BULATSA (2017)

CHAIRMAN OF THE MANAGEMENT BOARD:

Vaselina Karamileva

DIRECTOR GENERAL (CEO):

Georgi Peev

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

- Training of ATCOs

Operational ATS units (2015)

1 ACCs (Sofia)
3 APPs (Sofia, Varna, Burgas)
5 TWRs (Sofia, Varna, Burgas, Gorna Oriahovitza, Plovdiv)

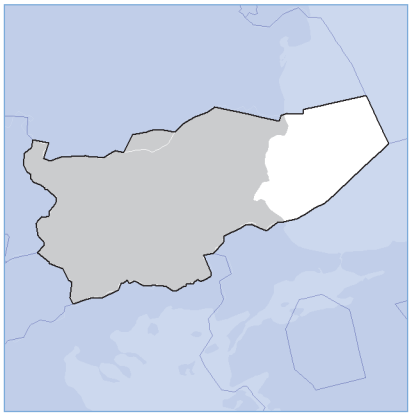
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	109
Gate-to-gate total costs (M€)	98
Gate-to-gate ATM/CNS provision costs (M€)	88
Gate-to-gate total ATM/CNS assets(M€)	99
Gate-to-gate ANS total capex (M€)	21
ATCOs in OPS	257
Gate-to-gate total staff (incl. MET staff*)	1 072
Total IFR flight-hours controlled by ANSP ('000)	250
IFR airport movements controlled by ANSP ('000)	77
En-route sectors	12
Minutes of ATFM delays ('000)	4

** if applicable*

Size (2015)

Size of controlled airspace: 145 000 km²

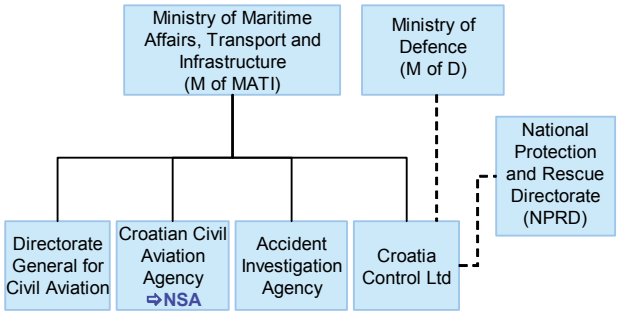


Croatia Control, Croatia

Croatia Control Ltd, Croatian Air Navigation Services

www.crocontrol.hr

Institutional arrangements and links (2017)



Status (2017)

- Limited liability company as of 1st 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

M of MATI

Economic Regulation

State Law and Croatia Control Ltd

Corporate governance structure (2017)

ASSEMBLY (3 members)
The President represents Ministry of MATI (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 MATI, 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 (2017)

CHAIRMAN OF THE SUPERVISORY BOARD:

Dinko Staničić

DIRECTOR GENERAL:

Dragan Bilać

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☑ MET

- ATS provision within western part of Sarajevo FIR (west of the line: GUBOK-DER-BOSNA-VRANA-VELIT) from FL 325 to FL 660 until 13-11-2014.
- After opening of Sarajevo ACC on 13-11-2014, ATS provision in a big part of lower airspace has been taken over by BHANSA.

Operational ATS units (2015)

1 ACC (Zagreb)
1 APP (Zagreb)
6 APPs/TWRs (Osijek, Rijeka, Pula, Zadar, Split, Dubrovnik)
4 TWRs (Lučko, Zagreb, Brač, Lošinj)

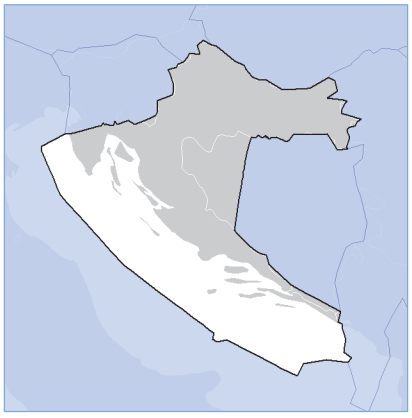
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	94
Gate-to-gate total costs (M€)	96
Gate-to-gate ATM/CNS provision costs (M€)	90
Gate-to-gate total ATM/CNS assets(M€)	68
Gate-to-gate ANS total capex (M€)	8
ATCOs in OPS	237
Gate-to-gate total staff (incl. MET staff*)	715
Total IFR flight-hours controlled by ANSP ('000)	208
IFR airport movements controlled by ANSP ('000)	91
En-route sectors	10
Minutes of ATFM delays ('000)	287

** if applicable*

Size (2015)

Size of controlled airspace: 129 000 km²

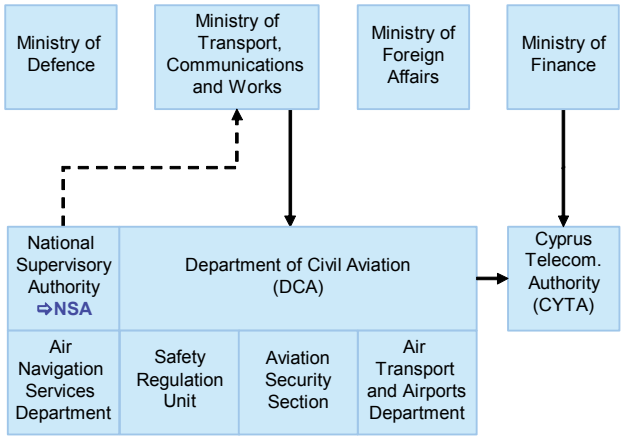


DCAC Cyprus, Cyprus

Department of Civil Aviation of Cyprus

www.mcw.gov.cy

Institutional arrangements and links (2017)



Status (2017)

- 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 (2017)

Minister of Transport, Communications and Works

Director DCAC, Head of ANS Section, Head of T&A Section, Head of Aviation Security Section and Head of Safety Regulation Unit are nominated by the Civil Service. The Head of the NSA is also nominated by the Civil Service.

DCAC Cyprus (2017)

HEAD OF ANS SECTION (COO):

Nicos Nicolaou (ACC, Airspace, ATFM)
Persephone Papadopoulou (APPs, TWRs, AIS, Training)

ACTING HEAD OF AVIATION SECURITY SECTION:

P. Hadjiyiasemis

ACTING HEAD OF TRANSPORT AND AIRPORTS SECTION:

P. Hadjiyiasemis

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

- DCAC Cyprus owns and operates 2 airports

Operational ATS units (2015)

1 ACC (Nicosia)
2 APPs (Larnaca, Paphos)
2 TWRs (Larnaca, Paphos)

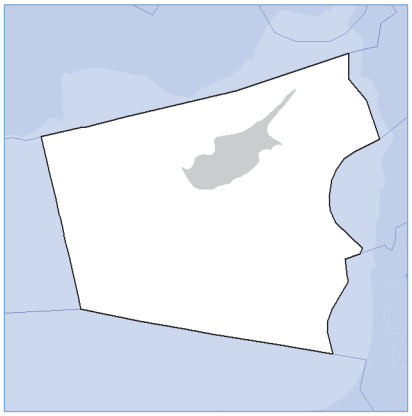
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	64
Gate-to-gate total costs (M€)	58
Gate-to-gate ATM/CNS provision costs (M€)	41
Gate-to-gate total ATM/CNS assets(M€)	20
Gate-to-gate ANS total capex (M€)	1
ATCOs in OPS	100
Gate-to-gate total staff (incl. MET staff*)	209
Total IFR flight-hours controlled by ANSP ('000)	153
IFR airport movements controlled by ANSP ('000)	58
En-route sectors	5
Minutes of ATFM delays ('000)	790

** if applicable*

Size (2015)

Size of controlled airspace: 174 000 km²

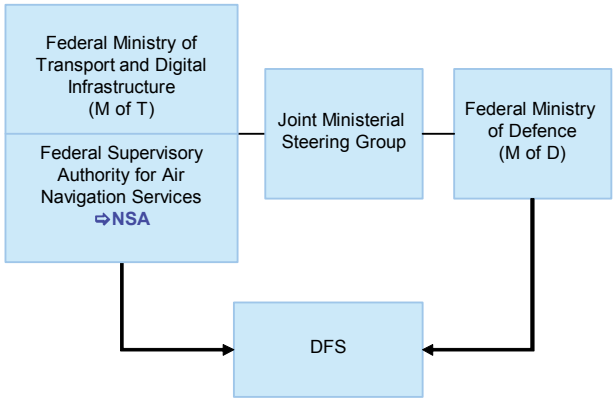


DFS, Germany

Deutsche Flugsicherung GmbH

www.dfs.de

Institutional arrangements and links (2017)



Status (2017)

- 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 Supervisory Authority for Air Navigation Services (NSA)

Airspace Regulation

Federal Supervisory Authority for Air Navigation Services (NSA)

Economic Regulation

Federal Supervisory Authority for Air Navigation Services (NSA)

Corporate governance structure (2017)

SHAREHOLDER Meeting with M of T

SUPERVISORY BOARD (12 Members)
Chairwoman + 11 Members
Chairwoman is recommended by the Government, elected by the Supervisory Board.
Members represent: 1 (Chairwoman) from M of T, 1 M of T, 2 M of D, 1 M of F, 1 business consultant, 6 staff reps.
Chairman has a double voting right.

EXECUTIVE BOARD (3 members)
CEO + 2 members
Executive Board is appointed by the Supervisory Board.

DFS (2017)

CHAIRWOMAN OF THE SUPERVISORY BOARD:

Mrs. Dr. Martina Hinricher

CHAIRMAN OF THE EXECUTIVE BOARD:

Prof. Klaus-Dieter Scheurle

Scope of services (2015)

☑ 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 Germany
- Other ANS
- Consulting, training, engineering & maintenance services

Operational ATS units (2015)

1 UAC (Karlsruhe)
3 ACCs/APPs (Bremen, Langen, München)
1 UAC (co-located with Maastricht UAC) for OAT in upper airspace in North-Western Germany
16 TWRs

Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	1 244
Gate-to-gate total costs (M€)	1 045
Gate-to-gate ATM/CNS provision costs (M€)	1 044
Gate-to-gate total ATM/CNS assets(M€)	655
Gate-to-gate ANS total capex (M€)	68
ATCOs in OPS	1 847
Gate-to-gate total staff (incl. MET staff*)	5 323
Total IFR flight-hours controlled by ANSP ('000)	1 371
IFR airport movements controlled by ANSP ('000)	1 971
En-route sectors	109
Minutes of ATFM delays ('000)	905

** if applicable*

Size (2015)

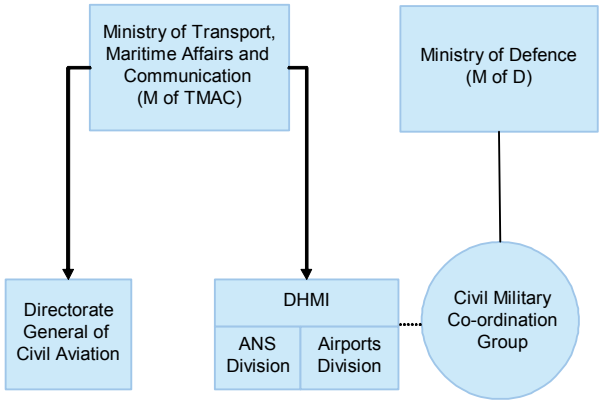
Size of controlled airspace: 390 000 km²

DHMI, Turkey

General Directorate of State Airports Authority

www.dhmi.gov.tr

Institutional arrangements and links (2017)



Status (2017)

- Autonomous State Enterprise
- 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

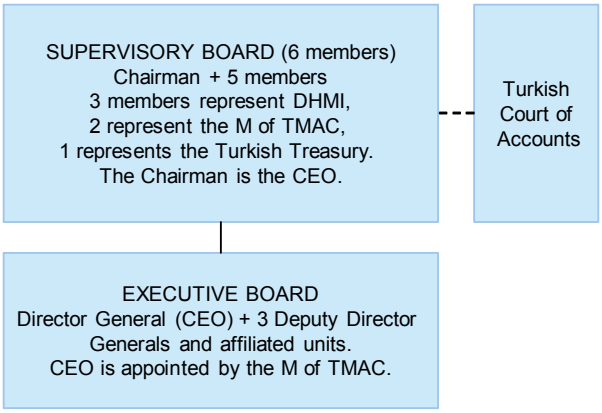
Airspace Regulation

General Directorate of DHMI

Economic Regulation

General Directorate of DHMI

Corporate governance structure (2017)



DHMI (2017)

CHAIRMAN OF THE SUPERVISORY BOARD:

Mrs. Funda Ocak

DIRECTOR GENERAL (CEO):

Mrs. Funda Ocak

DIRECTOR ANS DIVISION:

Mr. Mustafa Kiliç

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

- DHMI is responsible for the administration of 49 State Airports. ATS services are provided by DHMI in 52 Airports

Operational ATS units (2015)

1 ACC (Ankara) (en-route sectors from Istanbul and Izmir ACCs have been transferred to Ankara ACC as of 18 November 2015)
37 APPs
46 TWRs
1 FICs/ 2 RCCs
48 AIS/ARO
47 SAR sub-center units

Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	541
Gate-to-gate total costs (M€)	481
Gate-to-gate ATM/CNS provision costs (M€)	430
Gate-to-gate total ATM/CNS assets(M€)	836
Gate-to-gate ANS total capex (M€)	166
ATCOs in OPS	1 219
Gate-to-gate total staff (incl. MET staff*)	6 147
Total IFR flight-hours controlled by ANSP ('000)	1 268
IFR airport movements controlled by ANSP ('000)	1 262
En-route sectors	22
Minutes of ATFM delays ('000)	2 611

** if applicable*

Size (2015)

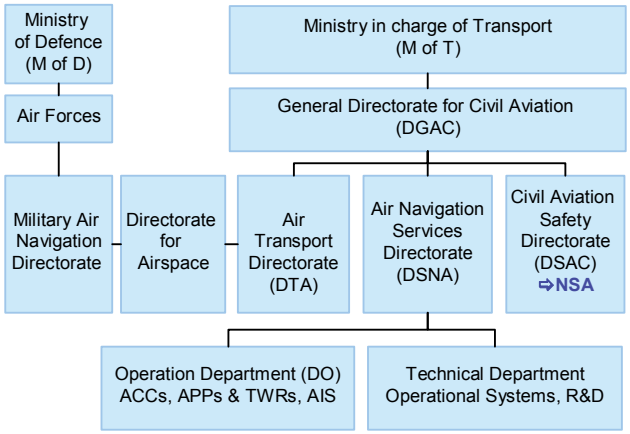
Size of controlled airspace: 982 000 km²

DSNA, France

Directorate of Air Navigation Services

www.aviation-civile.gouv.fr

Institutional arrangements and links (2017)



Status (2017)

- 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)

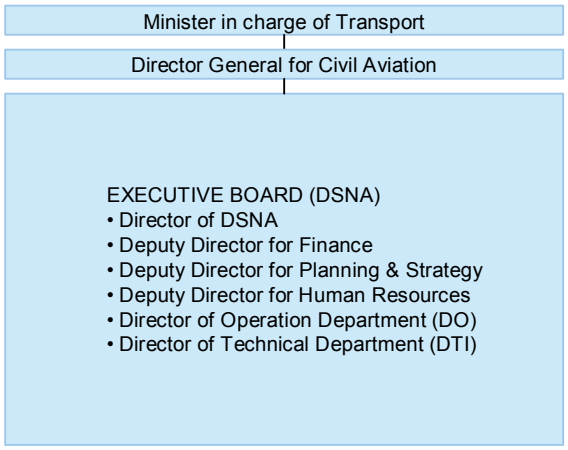
Airspace Regulation

Air Transport Directorate (DTA)
Direction de la circulation aérienne militaire (DIRCAM)

Economic Regulation

Air Transport Directorate (DTA)

Corporate governance structure (2017)



DSNA (2017)

DIRECTOR OF DSNA:

M. Georges

DIRECTOR OF OPERATION DEPARTEMENT (DO):

M. Bruneau

DIRECTOR OF TECHNICAL DEPARTEMENT (DTI):

P. Planchon

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

- Delegation of airspace to Skyguide and Jersey

Operational ATS units (2015)

5 ACCs
12 APPs/TWRs (i.e. Paris Orly, Paris CDG, Marseille, Lyon, Nice, Bordeaux, Toulouse, Clermont Ferrand, Montpellier, Strasbourg, Bâle-Mulhouse, Nantes)
63 TWRs

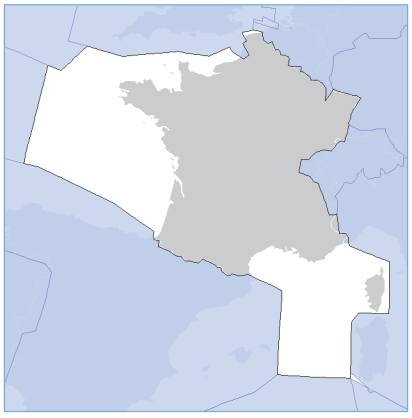
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	1 616
Gate-to-gate total costs (M€)	1 517
Gate-to-gate ATM/CNS provision costs (M€)	1 245
Gate-to-gate total ATM/CNS assets(M€)	775
Gate-to-gate ANS total capex (M€)	160
ATCOs in OPS	2 727
Gate-to-gate total staff (incl. MET staff*)	7 642
Total IFR flight-hours controlled by ANSP ('000)	2 184
IFR airport movements controlled by ANSP ('000)	1 849
En-route sectors	102
Minutes of ATFM delays ('000)	2 842

** if applicable*

Size (2015)

Size of controlled airspace: 1 010 000 km²

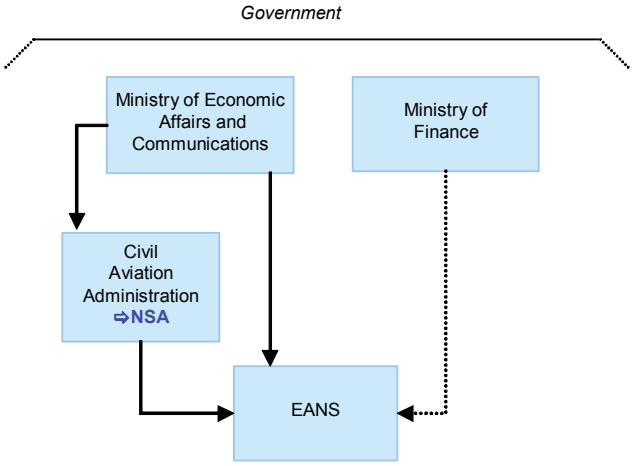


EANS, Estonia

Estonian Air Navigation Services

www.eans.ee

Institutional arrangements and links (2017)



Status (2017)

- 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 (2017)

SUPERVISORY BOARD (6 members)
Chairman + 5 members
Members: 3 appointed by M of EC of which 1 is elected Chairman by the members of the Supervisory Board;
3 appointed by M of F.

MANAGEMENT BOARD (3 members)
CEO + 2 members
CEO appointed by the Supervisory Board

EANS (2017)

CHAIRMAN OF THE SUPERVISORY BOARD:

Andres Uusma

CHAIRMAN OF THE MANAGEMENT BOARD & CEO:

Tanel Rautits

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

- Tech. serv. (NAV/COMM/SUR), Aeronautical info serv.
- Consultancy services
- Control Tallinn Aerodrome
- Estonia is member of EUROCONTROL since 1st of January 2015

Operational ATS units (2015)

1 ACC (Tallinn)
2 APPs/TWRs (Tallinn, Tartu)

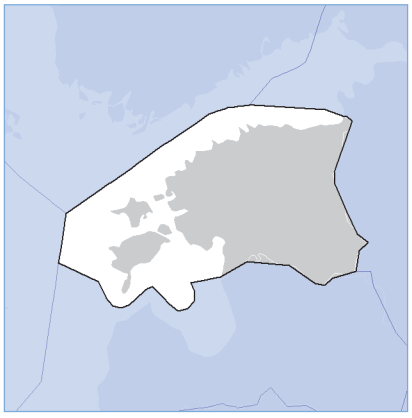
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	27
Gate-to-gate total costs (M€)	17
Gate-to-gate ATM/CNS provision costs (M€)	16
Gate-to-gate total ATM/CNS assets(M€)	21
Gate-to-gate ANS total capex (M€)	4
ATCOs in OPS	55
Gate-to-gate total staff (incl. MET staff*)	166
Total IFR flight-hours controlled by ANSP ('000)	68
IFR airport movements controlled by ANSP ('000)	38
En-route sectors	3
Minutes of ATFM delays ('000)	2

** if applicable*

Size (2015)

Size of controlled airspace: 77 400 km²

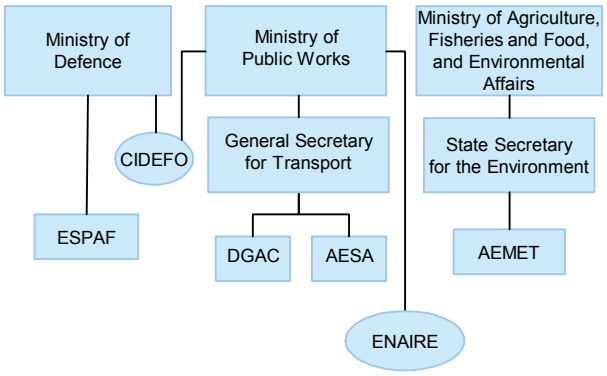


ENAIRE, Spain

ENAIRE

www.enaire.es

Institutional arrangements and links (2017)



Status (2017)

- Business Public Entity attached to Ministry of Public Works
- 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 ENAIRE)
- Spanish Air Force Staff (for MIL)
- Secretary of State for the Environment (for MET)

Body responsible for:

Safety Regulation

Spanish Civil Aviation Authority - Government
AESA - Government

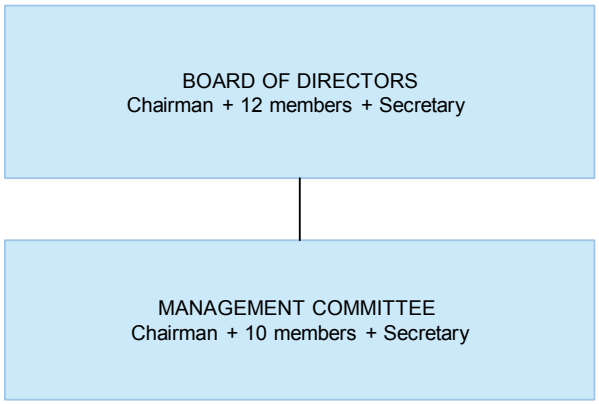
Airspace Regulation

Spanish Civil Aviation Authority - Government
AESA - Government

Economic Regulation

Government

Corporate governance structure (2017)



ENAIRE (2017)

CHAIRMAN OF THE BOARD OF DIRECTORS:

Julio Gómez-Pomar Rodríguez

DIRECTOR GENERAL OF ENAIRE:

Ángel Luis Arias Serrano

DIRECTOR OF AIR NAVIGATION:

Ignacio González Sánchez

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

Operational ATS units (2015)

5 ACCs (Madrid, Barcelona, Canary Islands, Palma, Sevilla)
17 APPs (3 stand-alone APPs + 14 APPs co-located with TWR units)
22 TWRs

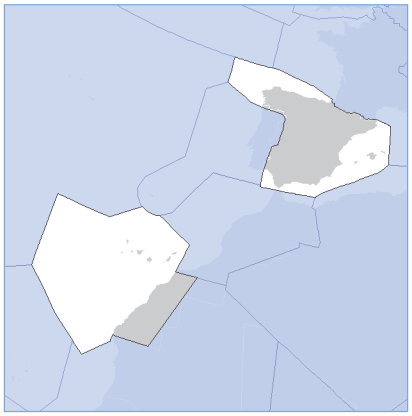
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	927
Gate-to-gate total costs (M€)	835
Gate-to-gate ATM/CNS provision costs (M€)	755
Gate-to-gate total ATM/CNS assets(M€)	608
Gate-to-gate ANS total capex (M€)	49
ATCOs in OPS	1 737
Gate-to-gate total staff (incl. MET staff*)	3 684
Total IFR flight-hours controlled by ANSP ('000)	1 289
IFR airport movements controlled by ANSP ('000)	1 314
En-route sectors	71
Minutes of ATFM delays ('000)	947

** if applicable*

Size (2015)

Size of controlled airspace: 2 190 000 km²

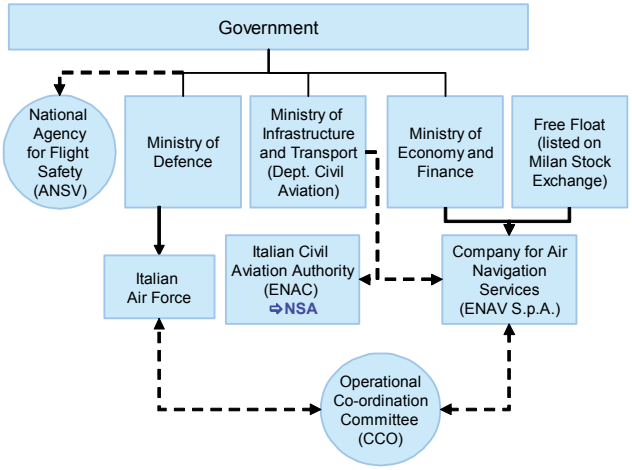


ENAV, Italy

Company for Air Navigation Services

www.enav.it

Institutional arrangements and links (2017)



Status (2017)

- Listed Company
- 53,4% State-owned by Ministry of Economy and Finance
- 46,6% Free Float (listed on Milan Stock Exchange)

National Supervisory Authority (NSA):

Italian Civil Aviation Authority (ENAC)

Body responsible for:

Safety Regulation

Italian Civil Aviation Authority (ENAC) and Ministry of Infrastructure and Transport

Airspace Regulation

Italian Civil Aviation Authority (ENAC)

Economic Regulation

Ministry of Infrastructure and Transport and ENAC review annually ANS charges in co-operation with Ministry of Economy and Finance and Ministry of Defence

Corporate governance structure (2017)

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

ENAV (2017)

CHAIRMAN:

Ferdinando Franco Falco Beccalli

CEO:

Roberta Neri

MEMBERS OF THE ADMINISTRATION BOARD:

Maria Teresa Di Matteo
Nicola Maione
Stefano Siragusa
Alessandro Tonetti
Mario Vinzia

DIRECTOR GENERAL:

Massimo Bellizzi

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

- AIS, ATM and CNS
- Training and licensing of ATCO's
- R&D consultancy services
- Cartography and Airspace design
- Aerodrome weather services, Flight Calibration services

Operational ATS units (2015)

4 ACCs (Milan, Padua, Rome, Brindisi)
20 APPs co-located within TWR units + 5 APPs co-located within ACC units
32 TWRs (including 16 low traffic airports not included in ACE data analysis)
2 AFIUs where TWR is provided at specific hours (low traffic airports not included in ACE data analysis)
9 AFIUs (low traffic airports not included in ACE data analysis)
*data above reflects the situation at the end of 2015

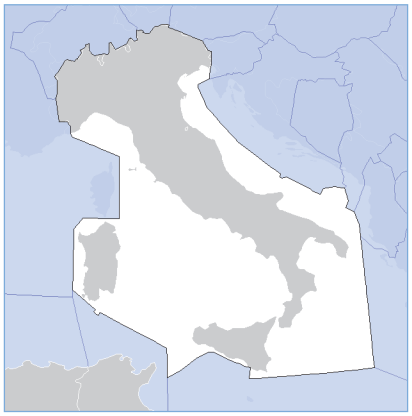
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	790
Gate-to-gate total costs (M€)	753
Gate-to-gate ATM/CNS provision costs (M€)	687
Gate-to-gate total ATM/CNS assets(M€)	954
Gate-to-gate ANS total capex (M€)	87
ATCOs in OPS	1 452
Gate-to-gate total staff (incl. MET staff*)	3 125
Total IFR flight-hours controlled by ANSP ('000)	1 005
IFR airport movements controlled by ANSP ('000)	1 217
En-route sectors	60
Minutes of ATFM delays ('000)	274

** if applicable*

Size (2015)

Size of controlled airspace: 732 000 km²

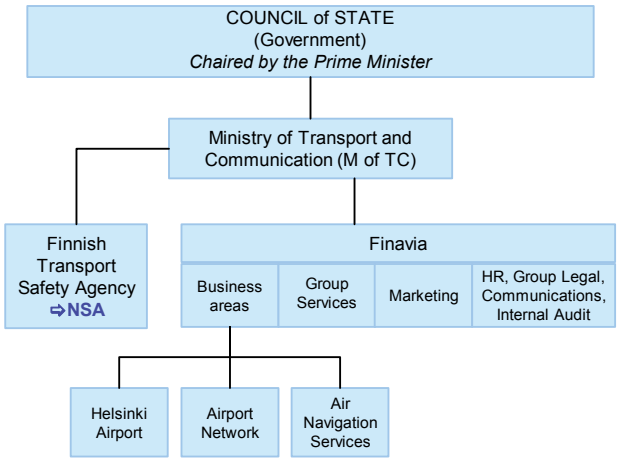


Finavia, Finland

Finavia

www.finavia.fi

Institutional arrangements and links (2017)



Status (2017)

- 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 (2017)

The BOARD (temporarily 7 members)
Chairman + 6 members (1 member represents staff)
All members are appointed
by the General Meeting of Shareholders.
Chief Executive Officer of Finavia is not a member of the Board.

President and CEO

Finavia (2017)

CHAIRMAN OF THE FINAVIA BOARD:

Harri Sailas

PRESIDENT AND CEO:

Kari Savolainen

SENIOR VICE PRESIDENT - AIR NAVIGATION SERVICES:

Raine Luojus

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☐ MET

- Finavia owns and operates 23 airports
- Delegation of ATS in certain areas to LFV and Avinor
- 186 ATCOs in OPS reported below do not include those providing services to military OAT flights

Operational ATS units (2015)

1 ACC (Tampere)
5 APPs/TWRs (Helsinki, Jyväskylä, Kuopio, Tampere-Pirkkala, Rovaniemi)
1 Mil-APPs/TWRs (Halli)
10 TWRs
1 General Aviation Airport (Malmi)

*data above reflects the situation at the end of 2015

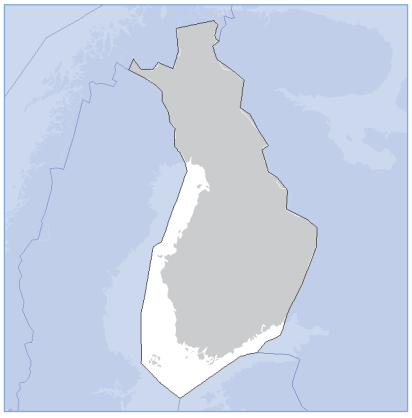
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	60
Gate-to-gate total costs (M€)	66
Gate-to-gate ATM/CNS provision costs (M€)	64
Gate-to-gate total ATM/CNS assets(M€)	45
Gate-to-gate ANS total capex (M€)	5
ATCOs in OPS	186
Gate-to-gate total staff (incl. MET staff*)	342
Total IFR flight-hours controlled by ANSP ('000)	104
IFR airport movements controlled by ANSP ('000)	233
En-route sectors	6
Minutes of ATFM delays ('000)	52

** if applicable*

Size (2015)

Size of controlled airspace: 409 000 km²

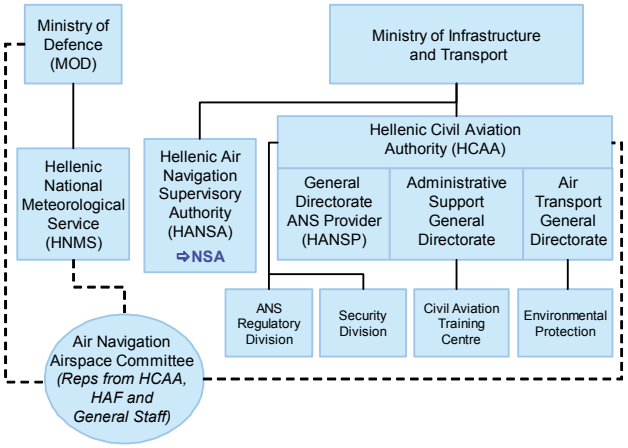


HCAA / HANSP, Greece

Hellenic Civil Aviation Authority

www.hcaa.gr

Institutional arrangements and links (2017)



Status (2017)

- State body
- 100% State-owned

National Supervisory Authority (NSA):

Hellenic Air Navigation Supervisory Authority (HANSA)

Body responsible for:

Safety Regulation

Hellenic Civil Aviation Authority

Airspace Regulation

Air Navigation Airspace Committee

Economic Regulation

- Ministry of Infrastructure and Transport
- HCAA for charges
- Ministry of Finance for HCAA Budget

Corporate governance structure (2017)

Minister of Infrastructure and Transport

HCAA Governor and two HCAA Deputy Governors

Three Directors General, one of which is responsible for HANSP

HCAA / HANSP (2017)

GOVERNOR:

K. Lintzerakos

DIRECTOR GENERAL OF HANSP:

G. Kontogiannis

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

Operational ATS units (2015)

1 ACC
16 APPs
18 TWRs
15 AFISs

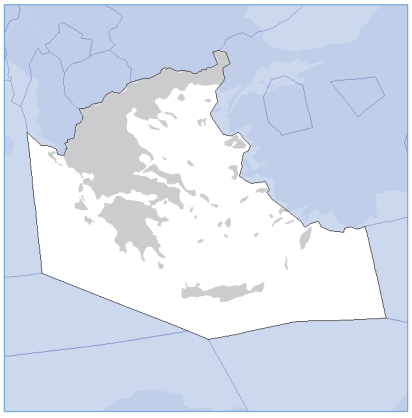
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	201
Gate-to-gate total costs (M€)	171
Gate-to-gate ATM/CNS provision costs (M€)	153
Gate-to-gate total ATM/CNS assets(M€)	7
Gate-to-gate ANS total capex (M€)	0
ATCOs in OPS	486
Gate-to-gate total staff (incl. MET staff*)	1 658
Total IFR flight-hours controlled by ANSP ('000)	498
IFR airport movements controlled by ANSP ('000)	414
En-route sectors	12
Minutes of ATFM delays ('000)	1 072

** if applicable*

Size (2015)

Size of controlled airspace: 537 000 km²



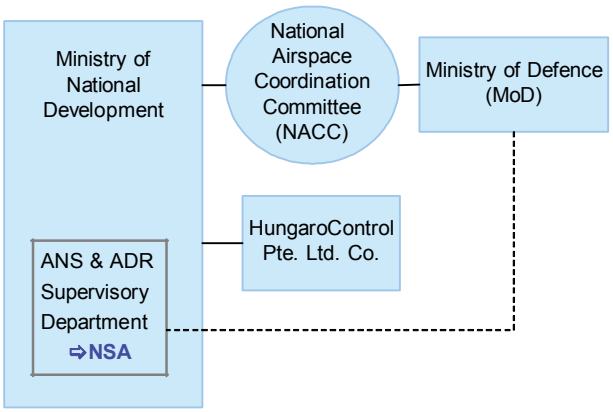
HungaroControl, Hungary

Hungarian Air Navigation Services

www.hungarocontrol.hu

HungaroControl
Hungarian Air Navigation Services Pte. Ltd. Co.

Institutional arrangements and links (2017)



Status (2017)

- HungaroControl was set up on January 1st 2002
- Registered as Private Limited Company as of 22 November 2006
- Operates as a Private Limited Company as of 1st January 2007
- 100% State-owned

National Supervisory Authority (NSA):

Aviation Authority

Body responsible for:

Safety Regulation

Ministry of National Development

Airspace Regulation

Govt., Ministry of National Development

Economic Regulation

Govt., Ministry of National Development

Corporate governance structure (2017)

SHAREHOLDER
The Minister responsible for transport exercises the rights of the shareholder on behalf of the State

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

BOARD OF DIRECTORS
5 members including CEO
All members appointed by the Minister responsible for transport

CHIEF EXECUTIVE OFFICER
The CEO is appointed by the Minister responsible for transport

HungaroControl (2017)

CHAIRMAN OF THE SUPERVISORY BOARD:

Dr. Alex Bozóky

CHAIRMAN OF THE BOARD OF DIRECTORS:

Attila Márton

CHIEF EXECUTIVE OFFICER (CEO):

Kornél Szepessy

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

- Entry Point Central Ltd. (49% HungaroControl owned company) provides training activities.
- HungaroControl provides ATM unit training.
- From 3rd of April 2014 HungaroControl provides air traffic services in the KFOR sector.

Operational ATS units (2015)

1 ACC (Budapest)
1 APP (Budapest)
1 TWR (Budapest)
8 AFISs

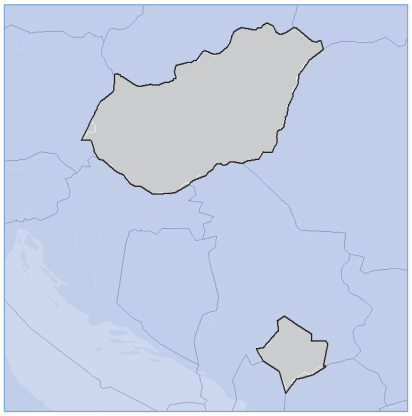
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	124
Gate-to-gate total costs (M€)	103
Gate-to-gate ATM/CNS provision costs (M€)	94
Gate-to-gate total ATM/CNS assets(M€)	68
Gate-to-gate ANS total capex (M€)	22
ATCOs in OPS	176
Gate-to-gate total staff (incl. MET staff*)	754
Total IFR flight-hours controlled by ANSP ('000)	232
IFR airport movements controlled by ANSP ('000)	92
En-route sectors	9
Minutes of ATFM delays ('000)	19

** if applicable*

Size (2015)

Size of controlled airspace: 104 000 km²



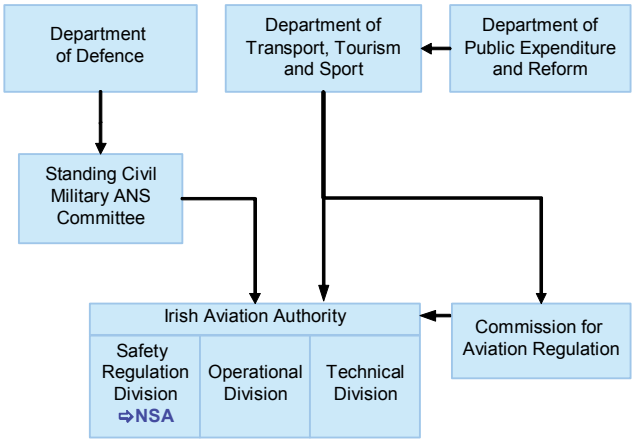
Hungary area: 92 600 km² - KFOR sector: 11 400 km²

IAA, Ireland

Irish Aviation Authority

www.iaa.ie

Institutional arrangements and links (2017)



Status (2017)

- Commercial company as of 1994 governed by Companies Acts, 1963 to 2009
- 100% State-owned (Department of Public Expenditure and Reform) - IAA receives no funding or loans from the exchequer

National Supervisory Authority (NSA):

Safety Regulation Division

Body responsible for:

Safety Regulation

IAA Safety Regulation Division

Airspace Regulation

IAA Safety Regulation Division

Economic Regulation

NSA responsible for Economic Regulation in the context of en-route charges

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 (2017)

BOARD OF THE AUTHORITY (9 members)
Chairman + CEO + 7 members

EXECUTIVE BOARD (Senior Management Board)
(8 members)
CEO + 7 senior executives

IAA (2017)

CHAIRMAN OF THE BOARD OF AUTHORITY:

Anne Nolan

CHIEF EXECUTIVE OFFICER:

Eamonn Brennan

DIRECTOR OF OPERATIONS DIVISION:

Peter Kearney

DIRECTOR OF TECHNICAL DIVISION:

Philip Hughes

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☑ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

Operational ATS units (2015)

2 ACCs (Dublin, Shannon)
3 APPs (Dublin, Shannon, Cork)
3 TWRs (Dublin, Shannon, Cork)

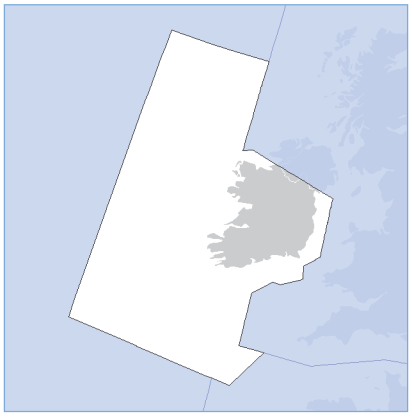
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	140
Gate-to-gate total costs (M€)	129
Gate-to-gate ATM/CNS provision costs (M€)	110
Gate-to-gate total ATM/CNS assets(M€)	75
Gate-to-gate ANS total capex (M€)	12
ATCOs in OPS	207
Gate-to-gate total staff (incl. MET staff*)	424
Total IFR flight-hours controlled by ANSP ('000)	288
IFR airport movements controlled by ANSP ('000)	239
En-route sectors	14
Minutes of ATFM delays ('000)	16

** if applicable*

Size (2015)

Size of controlled airspace: 457 000 km²

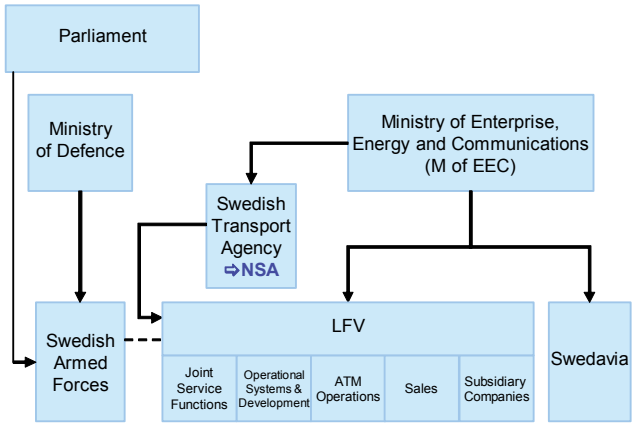


LFV, Sweden

LFV, Swedish Air Navigation Services

www.lfv.se

Institutional arrangements and links (2017)



Status (2017)

- 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 (2017)

BOARD OF DIRECTORS (10 members)
Chairman + DG + 8 members
8 members are appointed by the Government
(Chairman + DG + 6 members)
2 members appointed by Trade Unions

EXECUTIVE BOARD (9 members)
DG + 8 members
DG is appointed by the Government

LFV (2017)

CHAIRMAN OF THE BOARD OF DIRECTORS:

Jan Olson

DIRECTOR GENERAL:

Olle Sundin

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☑ MET

Operational ATS units (2015)

2 ACCs (Stockholm and Malmö)
1 RTC (Remote Tower Center in Sundsvall)
20 APPs (2 combined with ACCs, 1 separate unit, 1 in RTC and 16 combined with TWRs)
22 TWRs
1 AFIS

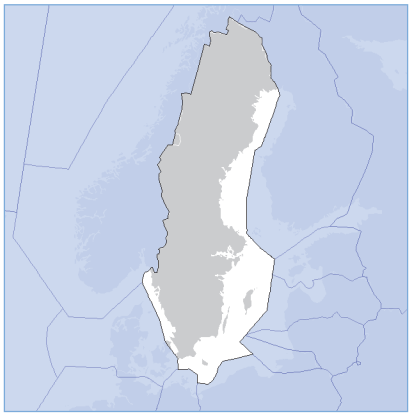
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	193
Gate-to-gate total costs (M€)	187
Gate-to-gate ATM/CNS provision costs (M€)	183
Gate-to-gate total ATM/CNS assets(M€)	116
Gate-to-gate ANS total capex (M€)	15
ATCOs in OPS	451
Gate-to-gate total staff (incl. MET staff*)	969
Total IFR flight-hours controlled by ANSP ('000)	421
IFR airport movements controlled by ANSP ('000)	471
En-route sectors	25
Minutes of ATFM delays ('000)	24

** if applicable*

Size (2015)

Size of controlled airspace: 627 000 km²

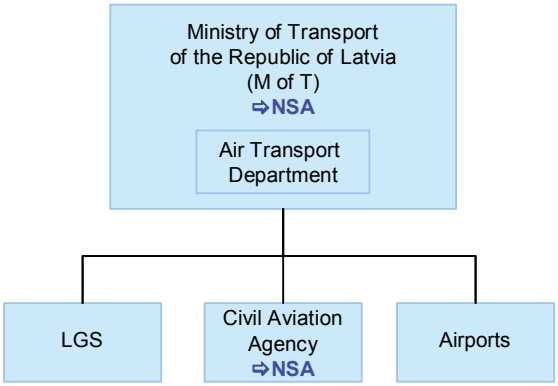


LGS, Latvia

SJSC Latvijas Gaisa Satiksme

www.lgs.lv

Institutional arrangements and links (2017)



Status (2017)

- Joint-stock company since 1997
- 100% State-owned (Ministry of Transport)

National Supervisory Authority (NSA):

- MoT (for policy and economic issues)
- Civil Aviation Agency (for safety, operational aspects, certification and licensing issues)

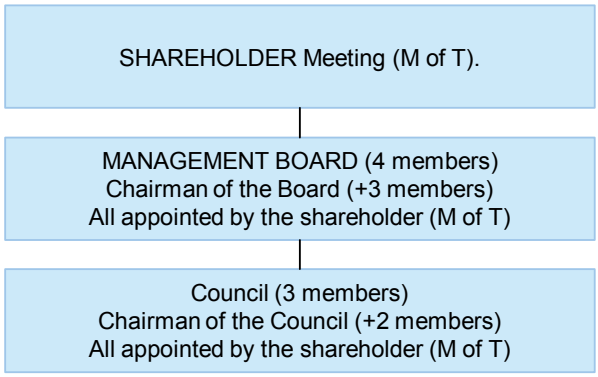
Body responsible for:

Safety Regulation
Civil Aviation Agency

Airspace Regulation
Civil Aviation Agency

Economic Regulation
Air Transport Department and Cabinet of Ministers (Government)

Corporate governance structure (2017)



LGS (2017)

SHAREHOLDER'S REPRESENTATIVE:
Dzineta Innusa (Ministry of Transport, Deputy State Secretary for Legal and Administrative Affairs)

CHAIRMAN OF THE BOARD:
Davids Taurins

CHAIRMAN OF THE COUNCIL:
Dins Merirands

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

- ATC services delegated to Latvia by Lithuania over a part of the Baltic Sea

Operational ATS units (2015)

1 ACC (Riga)
2 APPs (Riga, Liepaja)
1 TWRs (Riga)
1 AFIS/FIC* (Liepaja)

*FIC for western part of Riga FIR

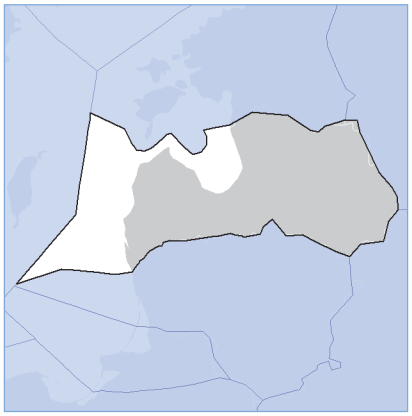
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	25
Gate-to-gate total costs (M€)	26
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€)	3
ATCOs in OPS	92
Gate-to-gate total staff (incl. MET staff*)	354
Total IFR flight-hours controlled by ANSP ('000)	77
IFR airport movements controlled by ANSP ('000)	68
En-route sectors	4
Minutes of ATFM delays ('000)	0

** if applicable*

Size (2015)

Size of controlled airspace: 95 900 km²

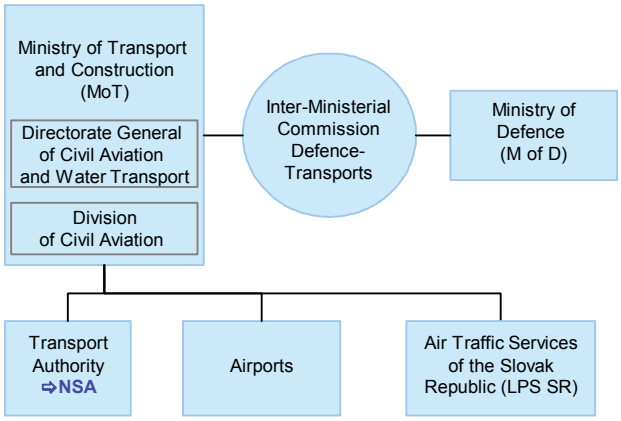


LPS, Slovak Republic

Letové Prevádzkové Služby Slovenskej Republiky

www.lps.sk

Institutional arrangements and links (2017)



Status (2017)

- State-owned enterprise as of January 2000
- 100% State-owned

National Supervisory Authority (NSA):

Transport Authority

Body responsible for:

Safety Regulation

Ministry of Transport and Construction

Airspace Regulation

Ministry of Transport and Construction

Economic Regulation

Ministry of Transport and Construction and other State bodies

Corporate governance structure (2017)

SUPERVISORY BOARD (9 members)
Chairman + 8 members
Members represent: 5 MoT,
3 staff reps., 1 trade union association rep.

EXECUTIVE BOARD (10 members)
CEO + 9 members
The CEO is appointed by the MoT.

LPS (2017)

CHAIRPERSON OF THE SUPERVISORY BOARD:

Tibor Šimoni

DIRECTOR GENERAL (CEO):

Pavol Gelinger

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

Operational ATS units (2015)

1 ACC (Bratislava)
2 APPs (Bratislava, Kosice)
5 TWRs (Bratislava, Kosice, Piestany, Poprad and Zilina)
1 Central ATS Reporting Office (Bratislava)

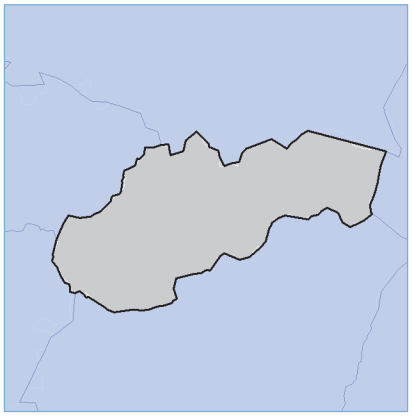
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	65
Gate-to-gate total costs (M€)	65
Gate-to-gate ATM/CNS provision costs (M€)	58
Gate-to-gate total ATM/CNS assets(M€)	54
Gate-to-gate ANS total capex (M€)	7
ATCOs in OPS	87
Gate-to-gate total staff (incl. MET staff*)	485
Total IFR flight-hours controlled by ANSP ('000)	93
IFR airport movements controlled by ANSP ('000)	30
En-route sectors	5
Minutes of ATFM delays ('000)	35

** if applicable*

Size (2015)

Size of controlled airspace: 48 700 km²

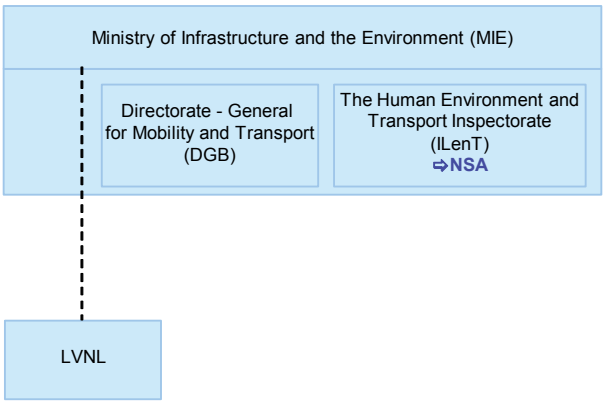


LVNL, Netherlands

Luchtverkeersleiding Nederland

www.lvnl.nl

Institutional arrangements and links (2017)



Status (2017)

- Corporate Entity as of 1993 (by Air Traffic Law)
- 100% State-owned

National Supervisory Authority (NSA):

The Human Environment and Transport Inspectorate (ILenT)

Body responsible for:

Safety Regulation

Directorate-General for Mobility and Transport (DGB)

Airspace Regulation

Directorate-General for Mobility and Transport (DGB)

Economic Regulation

Directorate-General for Mobility and Transport (DGB)

Corporate governance structure (2017)

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 of LVNL is appointed by the MIE, on the recommendation of the Supervisory Board.

LVNL (2017)

CHAIRMAN OF THE SUPERVISORY BOARD:

G.J.N.H. Cerfontaine

CHAIRMAN OF THE EXECUTIVE BOARD (CEO):

Mr. M.W.A. Dorst

Scope of services (2015)

☑ GAT	☐ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

- Controls lower airspace up to FL 245

Operational ATS units (2015)

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

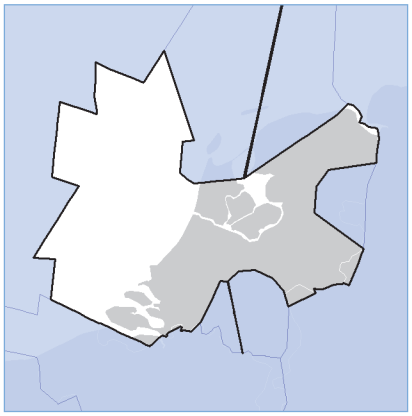
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	205
Gate-to-gate total costs (M€)	182
Gate-to-gate ATM/CNS provision costs (M€)	175
Gate-to-gate total ATM/CNS assets(M€)	112
Gate-to-gate ANS total capex (M€)	29
ATCOs in OPS	199
Gate-to-gate total staff (incl. MET staff*)	980
Total IFR flight-hours controlled by ANSP ('000)	158
IFR airport movements controlled by ANSP ('000)	506
En-route sectors	5
Minutes of ATFM delays ('000)	789

** if applicable*

Size (2015)

Size of controlled airspace: 53 100 km²

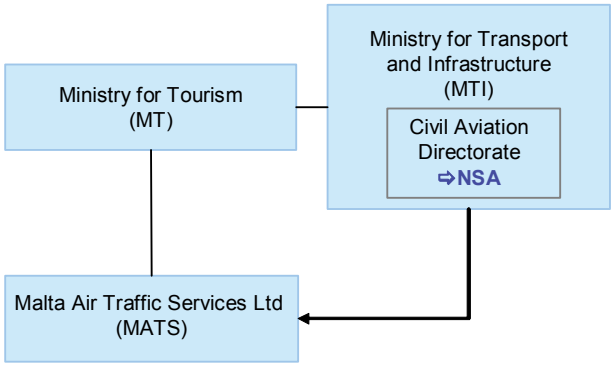


MATS, Malta

Malta Air Traffic Services Limited

www.maltats.com

Institutional arrangements and links (2017)



Status (2017)

- 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):

Civil Aviation Directorate Malta (CADM)

Body responsible for:

Safety Regulation

Civil Aviation Directorate

Airspace Regulation

Civil Aviation Directorate

Economic Regulation

Civil Aviation Directorate

Corporate governance structure (2017)

BOARD of DIRECTORS (5 members)
Chairman + 4 Directors
Members are appointed by the Government

The Board of Directors appoints the CEO

MATS (2017)

CHAIRMAN OF BOARD OF DIRECTORS:

Maj. Tony Abela

CEO:

Dr. Kenneth Chircop

HEAD OF ATS DIVISION:

Mr. Robert Sant

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

- MATS controls portions of airspace delegated to Malta ACC by Rome ACC

Operational ATS units (2015)

1 ACC/APP (Malta)
1 TWR/APP (Luqa)
1 AFIS

Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	26
Gate-to-gate total costs (M€)	19
Gate-to-gate ATM/CNS provision costs (M€)	17
Gate-to-gate total ATM/CNS assets(M€)	13
Gate-to-gate ANS total capex (M€)	2
ATCOs in OPS	53
Gate-to-gate total staff (incl. MET staff*)	147
Total IFR flight-hours controlled by ANSP ('000)	77
IFR airport movements controlled by ANSP ('000)	42
En-route sectors	2
Minutes of ATFM delays ('000)	1

** if applicable*

Size (2015)

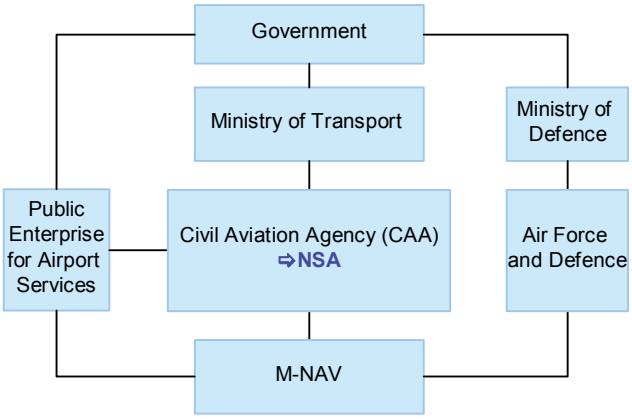
Size of controlled airspace: 231 000 km²

M-NAV, Former Yugoslav Republic of Macedonia

Air Navigation Services

www.mnavigation.mk

Institutional arrangements and links (2017)



Status (2017)

- Joint-stock company
- 100% State-owned

National Supervisory Authority (NSA):

Civil Aviation Agency (CAA)

Body responsible for:

Safety Regulation

Safety Dept. of Civil Aviation Agency

Airspace Regulation

Civil-military Aviation Committee

Economic Regulation

Government, Civil Aviation Agency

Corporate governance structure (2017)

SUPERVISORY BOARD
(3 members appointed by the Government)

MANAGEMENT BOARD
(3 executive directors appointed by the Government)

M-NAV (2017)

CHAIRMAN OF THE SUPERVISORY BOARD:

Ilir Mehmedi

DIRECTOR GENERAL OF CAA:

Goran Jandreoski

DIRECTOR OF ANS DEPARTEMENT:

Nikolet Tagarinski

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☑ MET

Operational ATS units (2015)

1 ACC (Skopje)
2 APPs (Skopje and Ohrid)
2 TWRs (Skopje and Ohrid)
1 AFIS (Skopje)

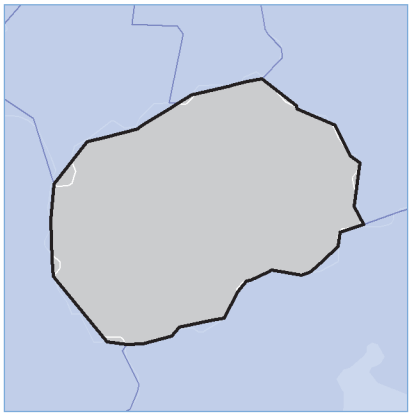
Key financial and operational figures (ACE 2015)

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€)	6
Gate-to-gate ANS total capex (M€)	0
ATCOs in OPS	59
Gate-to-gate total staff (incl. MET staff*)	271
Total IFR flight-hours controlled by ANSP ('000)	26
IFR airport movements controlled by ANSP ('000)	15
En-route sectors	3
Minutes of ATFM delays ('000)	2

** if applicable*

Size (2015)

Size of controlled airspace: 24 700 km²

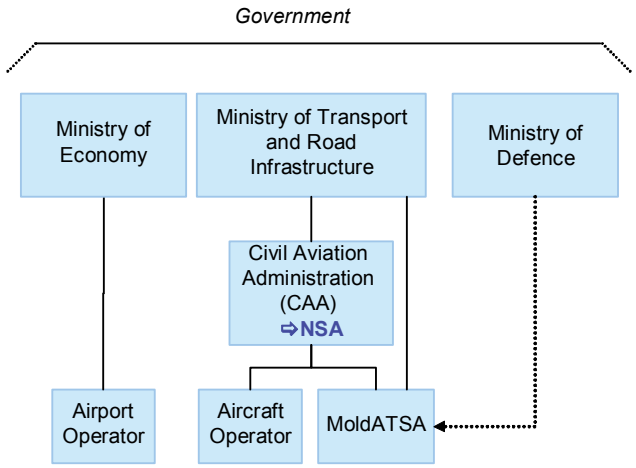


MoldATSA, Moldova

Moldavian Air Traffic Services Authority

www.moldatsa.md

Institutional arrangements and links (2017)



Status (2017)

- 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 (2017)

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 (2), MoldATSA management (1), Ministry of Finance (2), Ministry of Economy (2)

Management Board:
Director General MoldATSA

MoldATSA (2017)

CHAIRMAN OF THE SUPERVISORY BOARD:

Mr. Vitalie Rapcea

DIRECTOR GENERAL (CEO):

Mr. Vadim Gugea

HEAD OF ATM DIVISION:

Mr. Sergei Fedoseev

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☑ MET

Operational ATS units (2015)

1 ACC (Chisinau)
1 APP (Chisinau)
4 TWRs (Chisinau, Balti, Cahul, Marculesti)

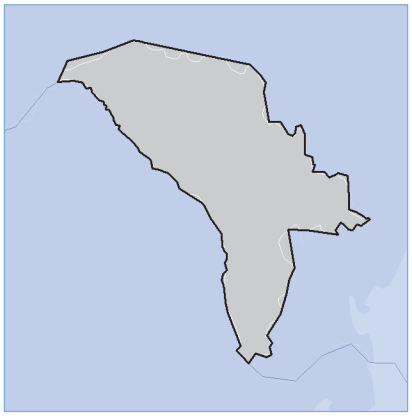
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	7
Gate-to-gate total costs (M€)	8
Gate-to-gate ATM/CNS provision costs (M€)	7
Gate-to-gate total ATM/CNS assets(M€)	6
Gate-to-gate ANS total capex (M€)	1
ATCOs in OPS	75
Gate-to-gate total staff (incl. MET staff*)	322
Total IFR flight-hours controlled by ANSP ('000)	11
IFR airport movements controlled by ANSP ('000)	23
En-route sectors	2
Minutes of ATFM delays ('000)	0

** if applicable*

Size (2015)

Size of controlled airspace: 34 800 km²



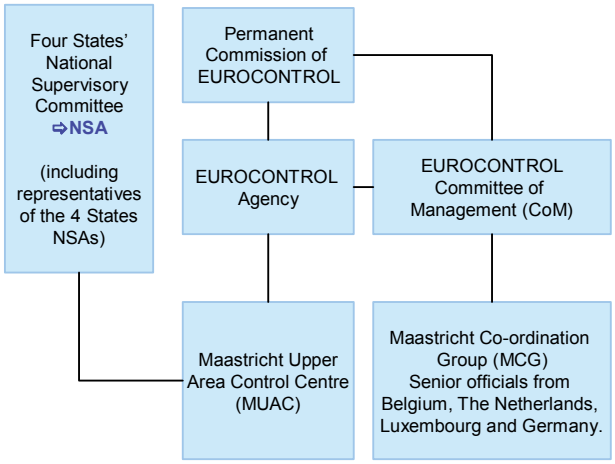
MUAC, Maastricht

Maastricht Upper Area Control Centre

www.eurocontrol.int

EUROCONTROL

Institutional arrangements and links (2017)



Status (2017)

- 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

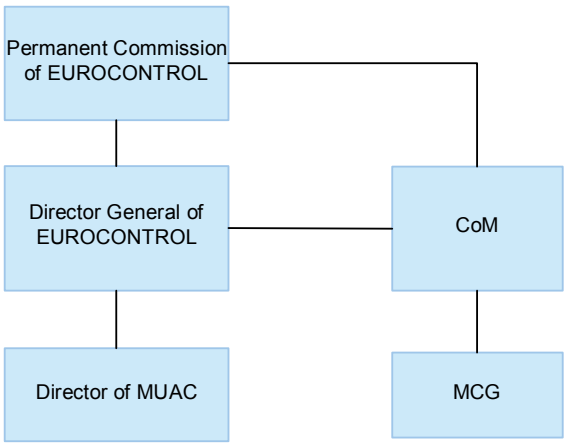
Airspace Regulation

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 (2017)



MUAC (2017)

DIRECTOR GENERAL OF EUROCONTROL:

Frank Brenner

DIRECTOR OF MUAC:

Jac Jansen

Scope of services (2015)

☑ 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 (2015)

1 ACC (Maastricht)

Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	
Gate-to-gate total costs (M€)	135
Gate-to-gate ATM/CNS provision costs (M€)	135
Gate-to-gate total ATM/CNS assets(M€)	63
Gate-to-gate ANS total capex (M€)	5
ATCOs in OPS	265
Gate-to-gate total staff (incl. MET staff*)	570
Total IFR flight-hours controlled by ANSP ('000)	601
IFR airport movements controlled by ANSP ('000)	n/appl
En-route sectors	20
Minutes of ATFM delays ('000)	585

** if applicable*

Size (2015)

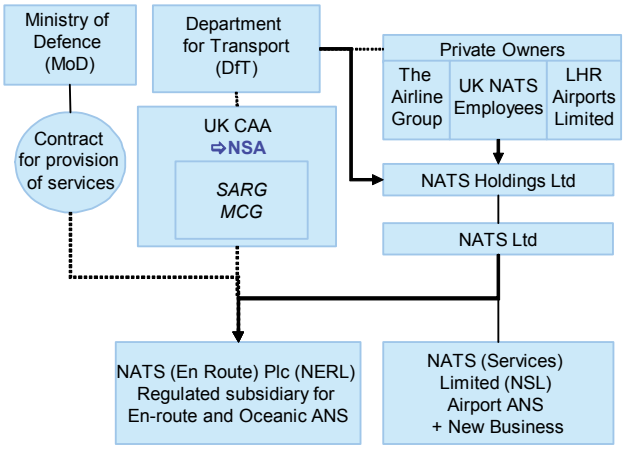
Size of controlled airspace: 260 000 km²

NATS, United Kingdom

NATS Ltd

www.nats.aero

Institutional arrangements and links (2017)



Status (2017)

- Public Private Partnership as of 2001
  - 49% State-owned (Govt retains a Golden Share)
  - 51% private-owned (42% by the Airline Group, 4% by LHR Airports Limited and 5% by UK NATS employees)
- The Airline Group comprises 6 airlines (BA, Virgin Atlantic, Lufthansa, EasyJet, Thomas Cook, Thomson Airways) and 2 pension funds (Pension Protection Fund and USS Sherwood Limited, which owns 49.9% of the Airline Group).

National Supervisory Authority (NSA):

UK CAA

Body responsible for:

Safety Regulation

UK CAA, Safety and Airspace Regulation Group (SARG)

Airspace Regulation

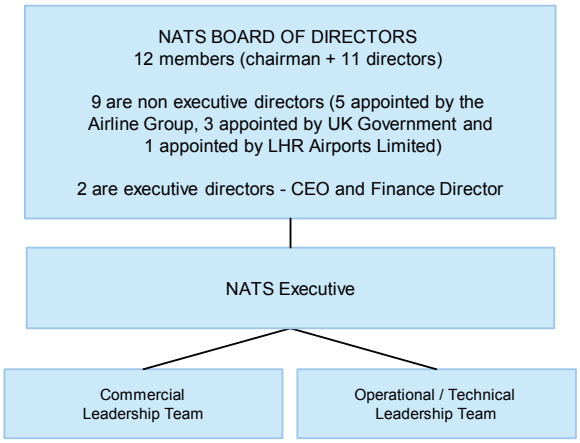
UK CAA, Safety and Airspace Regulation Group (SARG)

Economic Regulation

UK CAA, Markets and Consumers Group (MCG).

Charges control in RP2 linked to CPI (formerly RPI in CP3/RP1)

Corporate governance structure (2017)



NATS (2017)

CHAIRMAN OF THE NATS BOARD:

Paul Golby

CEO of NATS:

Martin Rolfe

OPERATIONS DIRECTOR:

Juliet Kennedy

COMMERCIAL DIRECTOR:

Guy Adams

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☑ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

Operational ATS units (2015)

1 OAC (Shanwick)
3 ACCs (Swanwick AC, London TC, Prestwick AC)
16 APPs
16 TWRs (including Gibraltar TWR)
2 AFISs

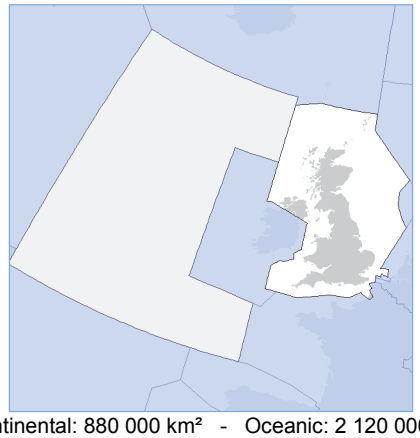
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	1 040
Gate-to-gate total costs (M€)	917
Gate-to-gate ATM/CNS provision costs (M€)	905
Gate-to-gate total ATM/CNS assets(M€)	1 163
Gate-to-gate ANS total capex (M€)	171
ATCOs in OPS	1 357
Gate-to-gate total staff (incl. MET staff*)	4 027
Total IFR flight-hours controlled by ANSP ('000)	1 347
IFR airport movements controlled by ANSP ('000)	1 753
En-route sectors	68
Minutes of ATFM delays ('000)	946

** if applicable*

Size (2015)

Size of controlled airspace: 3 000 000 km²



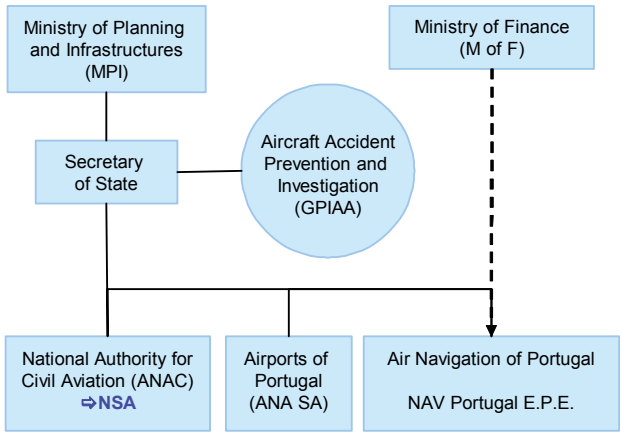
Continental: 880 000 km² - Oceanic: 2 120 000 km²

NAV Portugal, Portugal

Navegação Aérea de Portugal - NAV Portugal, E.P.E.

www.nav.pt

Institutional arrangements and links (2017)



Status (2017)

- Public Entity Corporation as of December 1998
- 100% State-owned

National Supervisory Authority (NSA):

National Authority for Civil Aviation (ANAC)

Body responsible for:

Safety Regulation

National Authority for Civil Aviation (ANAC)

Airspace Regulation

ANAC+FA (Portuguese Air Force) + NAV Portugal in close permanent co-ordination

Economic Regulation

National Authority for Civil Aviation (ANAC)

Corporate governance structure (2017)

BOARD OF ADMINISTRATION (3 members)
Chairman + 2 member

All members are appointed by the MPI for a 3 years term. Each member has executive functions within NAV Portugal. Each member is responsible to supervise several Directorates and Advisory Bodies to the Board.

There are 7 Directorates and 3 Advisory Bodies.

NAV Portugal has also a Board of Auditors composed of 3 members who are appointed by MPI for a 3 year term.

NAV Portugal (2017)

CHAIRMAN OF THE BOARD OF ADMINISTRATION:

Albano Manuel Carvalho Coutinho

CEO:

Albano Manuel Carvalho Coutinho

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☑ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

Operational ATS units (2015)

2 ACCs (Lisboa, Santa Maria)
8 APPs (Lisboa, Porto, Faro, Madeira, Santa Maria, Ponta Delgada, Horta, Flores)
10 TWRs (Lisboa, Cascais, Porto, Faro, Funchal, Porto Santo, Ponta Delgada, Santa Maria, Horta, Flores)

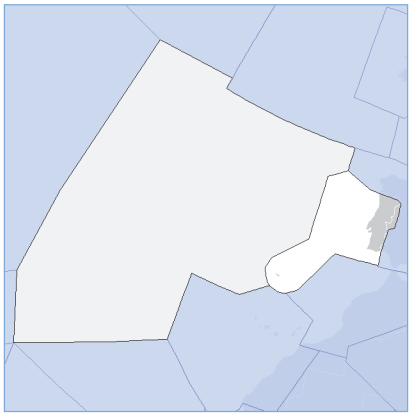
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	141
Gate-to-gate total costs (M€)	136
Gate-to-gate ATM/CNS provision costs (M€)	117
Gate-to-gate total ATM/CNS assets(M€)	43
Gate-to-gate ANS total capex (M€)	12
ATCOs in OPS	224
Gate-to-gate total staff (incl. MET staff*)	699
Total IFR flight-hours controlled by ANSP ('000)	335
IFR airport movements controlled by ANSP ('000)	309
En-route sectors	8
Minutes of ATFM delays ('000)	349

** if applicable*

Size (2015)

Size of controlled airspace: 5 851 000 km²



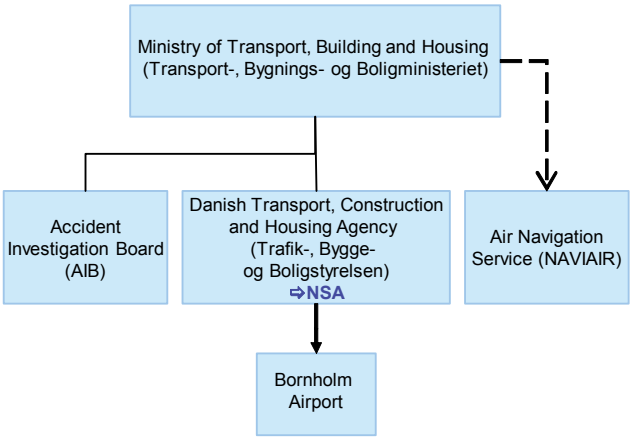
Continental: 671 000 km² - Oceanic: 5 180 000 km²

NAVIAIR, Denmark

Air Navigation Services

www.naviair.dk

Institutional arrangements and links (2017)



Status (2017)

- Company owned by the state
- 100% State-owned

National Supervisory Authority (NSA):

Danish Transport, Construction and Housing Agency (Trafik-, Bygge- og Boligstyrelsen)

Body responsible for:

Safety Regulation

Danish Transport, Construction and Housing Agency (Trafik-, Bygge- og Boligstyrelsen)

Airspace Regulation

Danish Transport, Construction and Housing Agency (Trafik-, Bygge- og Boligstyrelsen)

Economic Regulation

Danish Transport, Construction and Housing Agency (Trafik-, Bygge- og Boligstyrelsen)

Corporate governance structure (2017)

BOARD OF DIRECTORS
1 Chairman + 8 Members
(three members elected by the employees)

EXECUTIVE BOARD (2 members)
CEO + CFO
The CEO and CFO are appointed by the Board of Directors.

NAVIAIR (2017)

CHAIRMAN OF BOARD OF DIRECTORS

Anne Birgitte Lundholt

CHIEF EXECUTIVE OFFICER (CEO):

Morten Dambæk

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☐ MET

Note: ANS Greenland upper airspace is delegated to Isavia and NAV Canada

Operational ATS units (2015)

(Excluding Greenland)
1 ACC (Copenhagen)
6 APPs/TWRs (Kastrup, Roskilde, Rønne, Billund, Aarhus, Aalborg)
1 APP co-located with ACC
1 AFIS (Vagar)

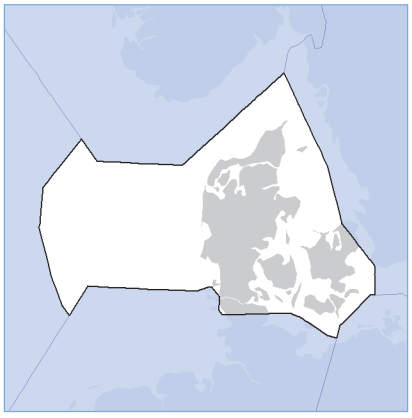
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	114
Gate-to-gate total costs (M€)	114
Gate-to-gate ATM/CNS provision costs (M€)	114
Gate-to-gate total ATM/CNS assets(M€)	144
Gate-to-gate ANS total capex (M€)	9
ATCOs in OPS	207
Gate-to-gate total staff (incl. MET staff*)	616
Total IFR flight-hours controlled by ANSP ('000)	214
IFR airport movements controlled by ANSP ('000)	338
En-route sectors	7
Minutes of ATFM delays ('000)	4

** if applicable*

Size (2015)

Size of controlled airspace: 158 000 km²

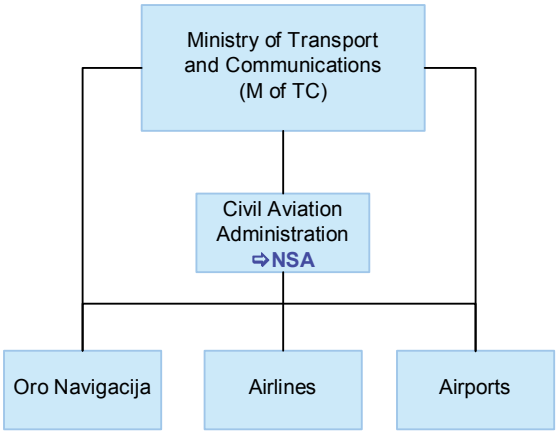


Oro Navigacija, Lithuania

State Enterprise Oro Navigacija

www.ans.lt

Institutional arrangements and links (2017)



Status (2017)

- 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 (2017)

MANAGEMENT BOARD (5 members)
Chairman (vacant as of 24 January 2017)
2 members represent M of TC
2 independent members

No Supervisory Board

DG is appointed by the Minister.

Oro Navigacija (2017)

CHAIRMAN OF THE MANAGEMENT BOARD:

Arijandas Šliupas (until 23 January 2017)

DIRECTOR GENERAL (CEO):

Algimantas Raščius (until 3 February 2017)
Mindaugas Gustys (acting director as of 4 February 2017)

DIRECTOR ATM:

Sergej Smirnov

Scope of services (2015)

☑ 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 (2015)

1 ACC (Vilnius)
4 APPs
4 TWRs

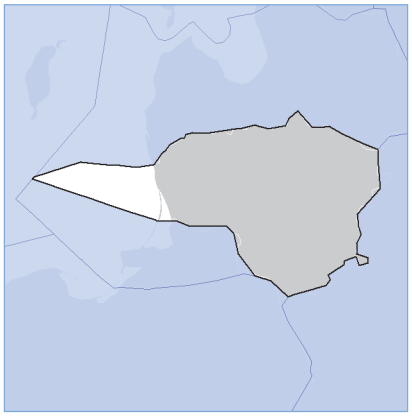
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	29
Gate-to-gate total costs (M€)	28
Gate-to-gate ATM/CNS provision costs (M€)	26
Gate-to-gate total ATM/CNS assets(M€)	24
Gate-to-gate ANS total capex (M€)	2
ATCOs in OPS	86
Gate-to-gate total staff (incl. MET staff*)	294
Total IFR flight-hours controlled by ANSP ('000)	54
IFR airport movements controlled by ANSP ('000)	51
En-route sectors	3
Minutes of ATFM delays ('000)	0

** if applicable*

Size (2015)

Size of controlled airspace: 74 800 km²

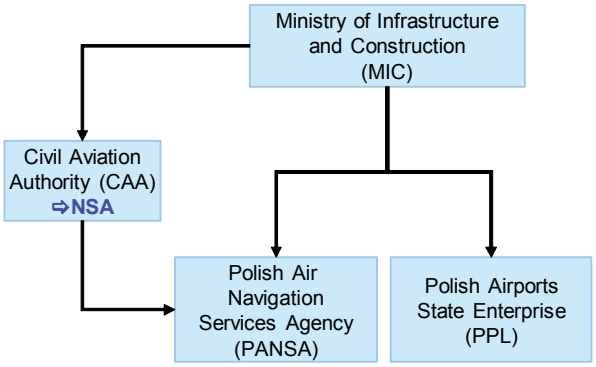


PANSA, Poland

Polish Air Navigation Services Agency (PANSA)

www.pansa.pl

Institutional arrangements and links (2017)



Status (2017)

- 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 Authority (CAA)

Body responsible for:

Safety Regulation

Civil Aviation Authority (CAA)

Airspace Regulation

Civil Aviation Authority (CAA)

Economic Regulation

Civil Aviation Authority (CAA)

Corporate governance structure (2017)

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 MIC

PANSA (2017)

PRESIDENT OF PANSA

Janusz Niedziela

ACTING DEPUTY PRESIDENT OF THE AIR NAVIGATION

Robert Bogacki

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☐ MET

- APP Kraków provides ATC services for Kraków and Katowice
- Katowice TWR provides aerodrome control
- APP Poznań provides ATC services for Poznań and Wrocław
- Wrocław TWR provides aerodrome control

Operational ATS units (2015)

1 ACC with 9 sectors
4 APPs (Warszawa, Gdańsk, Kraków, Poznań) providing radar control
7 TWRs (Warszawa Chopin and Modlin, Gdańsk, Kraków, Poznań, Katowice, Wrocław) providing aerodrome control
7 TWRs (Lublin, Szczecin, Rzeszów, Łódź, Zielona Góra, Bydgoszcz, Radom) providing aerodrome control and non-radar approach control
4 FIS units (Warszawa, Kraków, Gdańsk, Poznań)

Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	166
Gate-to-gate total costs (M€)	181
Gate-to-gate ATM/CNS provision costs (M€)	160
Gate-to-gate total ATM/CNS assets(M€)	185
Gate-to-gate ANS total capex (M€)	40
ATCOs in OPS	491
Gate-to-gate total staff (incl. MET staff*)	1 811
Total IFR flight-hours controlled by ANSP ('000)	403
IFR airport movements controlled by ANSP ('000)	328
En-route sectors	9
Minutes of ATFM delays ('000)	136

** if applicable*

Size (2015)

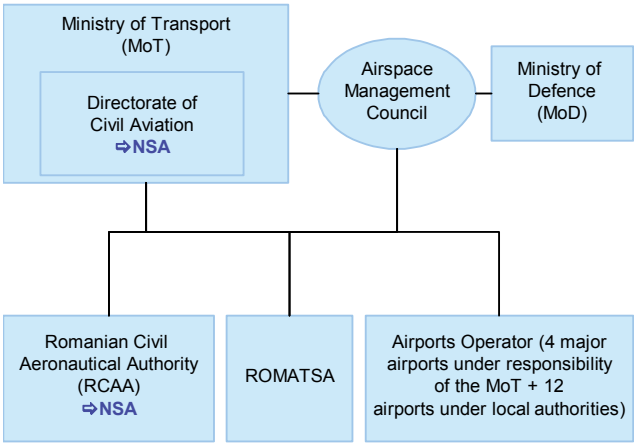
Size of controlled airspace: 334 000 km²

ROMATSA R.A., Romania

Romanian Air Traffic Services Administration

www.romatsa.ro

Institutional arrangements and links (2017)



Status (2017)

- 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 of Civil Aviation
- Romanian Civil Aeronautical Authority (RCAA)

Body responsible for:

Safety Regulation

Ministry of Transport (MoT)
Enforcement and safety oversight is delegated and discharged through the RCAA

Airspace Regulation

Both Ministry of Transport (MoT) and Ministry of Defence (MoD), and discharged through the RCAA and Air Force Staff

Economic Regulation

Ministry of Transport (MoT)

Corporate governance structure (2017)

ADMINISTRATION BOARD (5 voting members)
Chairman + 4 members
Members represent: MoT (1 member),
Financial Supervisory Authority (1 member),
S.C. AVIATIA UTILITARA BUCURESTI S.A (1 member)
and Bucharest Airports (1 member) + additional non-voting participants representing staff

STEERING COMMITTEE

DG + other directors

ROMATSA R.A. (2017)

CHAIRMAN OF THE ADMINISTRATION BOARD:

Carmen Radu

DIRECTOR GENERAL (CEO):

Gabriel Dumitrescu

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

Operational ATS units (2015)

1 ACC (Bucharest)
3 APPs
16 TWRs

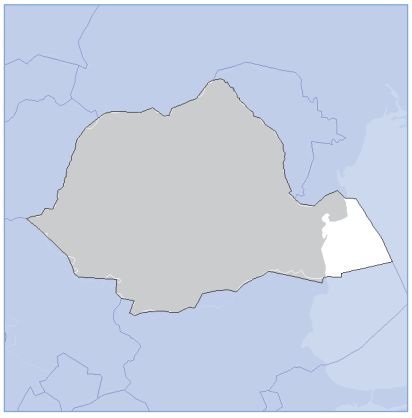
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	197
Gate-to-gate total costs (M€)	179
Gate-to-gate ATM/CNS provision costs (M€)	160
Gate-to-gate total ATM/CNS assets(M€)	91
Gate-to-gate ANS total capex (M€)	11
ATCOs in OPS	450
Gate-to-gate total staff (incl. MET staff*)	1 531
Total IFR flight-hours controlled by ANSP ('000)	345
IFR airport movements controlled by ANSP ('000)	149
En-route sectors	11
Minutes of ATFM delays ('000)	19

** if applicable*

Size (2015)

Size of controlled airspace: 254 000 km²

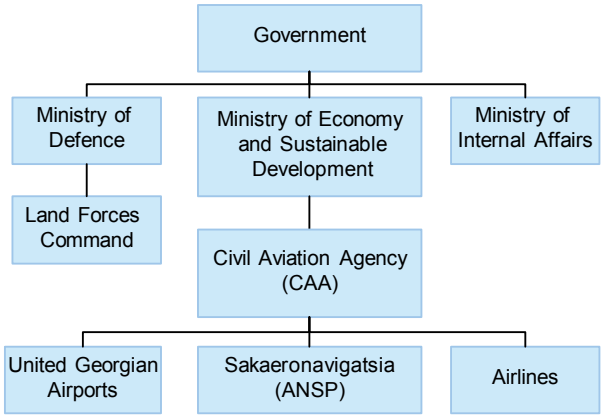


Sakaeronavigatsia, Georgia

SAKAERONAVIGATSIA Ltd

www.airnav.ge

Institutional arrangements and links (2017)



Status (2017)

- Limited liability company as of 1999
- 100% State owned

National Supervisory Authority (NSA):

Georgian Civil Aviation Agency (GCAA)

Body responsible for:

Safety Regulation

GCAA

Airspace Regulation

President of Georgia

Economic Regulation

Ministry of Economy and Sustainable Development of Georgia

Corporate governance structure (2017)

Chairman of Supervisory Council elected by council members and is the Deputy Minister of Economy and Sustainable Development of Georgia

DIRECTOR GENERAL appointed by the Supervisory Council in coordination with National Agency for State Property Management

Director of GCAA appointed by Ministry of Economy and Sustainable Development

Sakaeronavigatsia (2017)

CHAIRMAN OF THE SUPERVISORY BOARD:

Davit Khutsishvili

DIRECTOR GENERAL AND CEO:

Gocha Mezvrishvili

HEAD OF THE ATS DEPARTMENT:

David Kadzanaia

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

Operational ATS units (2015)

1 ACC (Tbilisi)
3 TWRs (Tbilisi, Batumi, Kutaisi)
3 APPs co-located with ACCs (Tbilisi)
1 AFIS (Mestia)

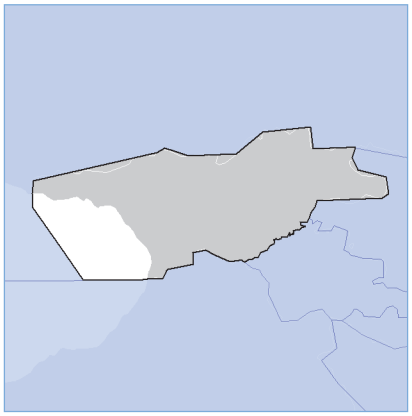
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	33
Gate-to-gate total costs (M€)	27
Gate-to-gate ATM/CNS provision costs (M€)	25
Gate-to-gate total ATM/CNS assets(M€)	36
Gate-to-gate ANS total capex (M€)	8
ATCOs in OPS	102
Gate-to-gate total staff (incl. MET staff*)	760
Total IFR flight-hours controlled by ANSP ('000)	51
IFR airport movements controlled by ANSP ('000)	27
En-route sectors	2
Minutes of ATFM delays ('000)	0

** if applicable*

Size (2015)

Size of controlled airspace: 88 700 km²

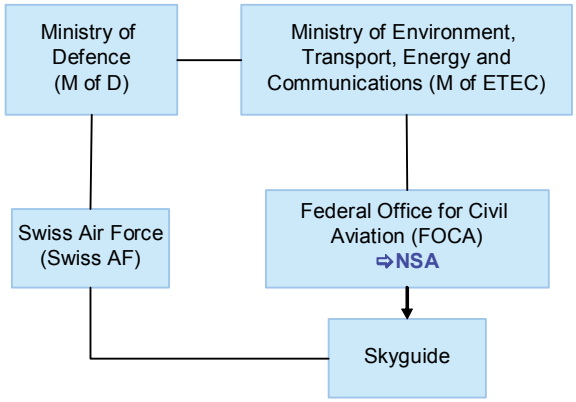


Skyguide, Switzerland

Skyguide

www.skyguide.ch

Institutional arrangements and links (2017)



Status (2017)

- 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 (2017)

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 (7 members)
CEO + 6 members
The CEO is appointed by the Supervisory Board.

Skyguide (2017)

CHAIRMAN OF THE SUPERVISORY BOARD:

Walter T. Vogel

DIRECTOR GENERAL (CEO):

Daniel Weder

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☐ MET

- ATC services delegated to Geneva ACC by France

Operational ATS units (2015)

2 ACCs (Geneva, Zurich)
4 APPs (Geneva, Zurich, Lugano, Bern)
7 TWRs (Geneva, Zurich, Lugano, Bern, Buochs, Altenrhein, Grenchen)

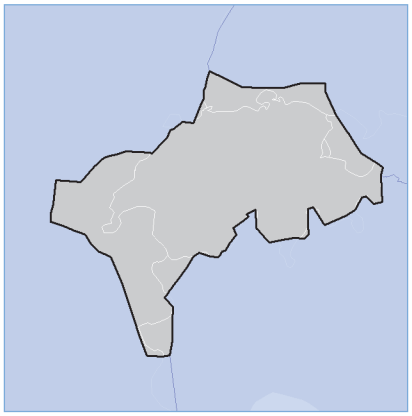
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	377
Gate-to-gate total costs (M€)	356
Gate-to-gate ATM/CNS provision costs (M€)	330
Gate-to-gate total ATM/CNS assets(M€)	338
Gate-to-gate ANS total capex (M€)	48
ATCOs in OPS	348
Gate-to-gate total staff (incl. MET staff*)	1 321
Total IFR flight-hours controlled by ANSP ('000)	326
IFR airport movements controlled by ANSP ('000)	481
En-route sectors	18
Minutes of ATFM delays ('000)	658

** if applicable*

Size (2015)

Size of controlled airspace: 69 700 km²

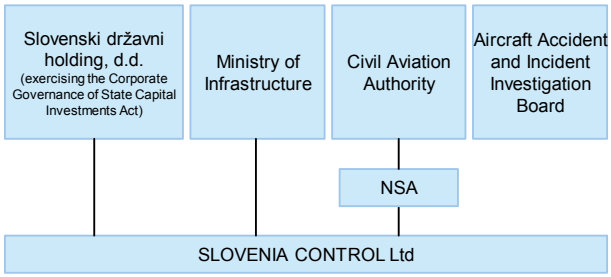


Slovenia Control, Slovenia

SLOVENIA CONTROL Ltd

www.sloveniacontrol.si

Institutional arrangements and links (2017)



Status (2017)

- Since 2004 the SLOVENIA CONTROL, Slovenian Air Navigation Services, Ltd, as a 100% state-owned enterprise is independent of national supervisory authorities.

National Supervisory Authority (NSA):

Civil Aviation Authority

Body responsible for:

Safety Regulation

Ministry of Infrastructure and Spatial Planning

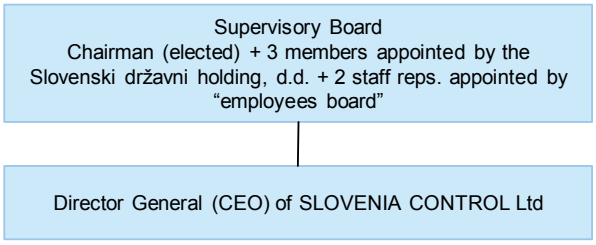
Airspace Regulation

Ministry of Infrastructure and Spatial Planning

Economic Regulation

Slovenski državni holding, d.d. (SDH), exercising the Corporate Governance of State Capital Investments Act

Corporate governance structure (2017)



Slovenia Control (2017)

CHAIRMAN OF THE SUPERVISORY BOARD:

Dušan Hočevar

DIRECTOR GENERAL (CEO):

Franc Željko Županič, Ph.D.

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☐ MET

Operational ATS units (2015)

1 ACC (Ljubljana)
3 APPs (Ljubljana, Maribor, Portorož)
3 TWRs (Ljubljana, Maribor, Portorož)

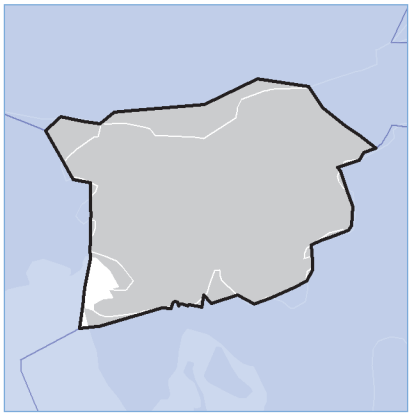
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	37
Gate-to-gate total costs (M€)	36
Gate-to-gate ATM/CNS provision costs (M€)	32
Gate-to-gate total ATM/CNS assets(M€)	32
Gate-to-gate ANS total capex (M€)	1
ATCOs in OPS	91
Gate-to-gate total staff (incl. MET staff*)	226
Total IFR flight-hours controlled by ANSP ('000)	50
IFR airport movements controlled by ANSP ('000)	31
En-route sectors	4
Minutes of ATFM delays ('000)	0

** if applicable*

Size (2015)

Size of controlled airspace: 20 400 km²

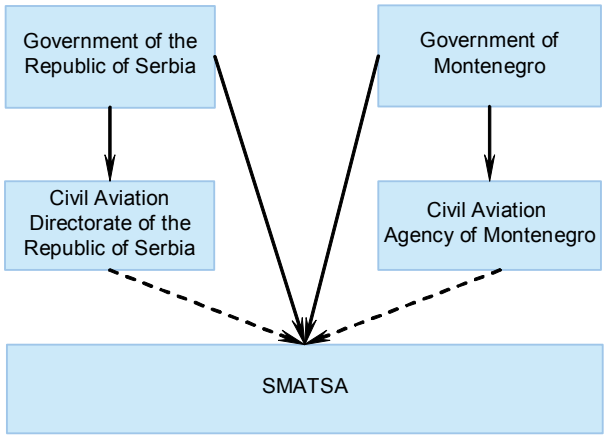


SMATSA, Serbia and Montenegro

Serbia and Montenegro Air Traffic Services SMATSA llc

http://www.smatsa.rs

Institutional arrangements and links (2017)



Status (2017)

- 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 (2017)

ASSEMBLY

6 members representing founders (Government of the Republic of Serbia and Government of Montenegro) selected from the Ministries in charge of transport, finance, and defence)

SUPERVISORY BOARD

5 members appointed by the Assembly for a period of 4 years, upon proposals of the Government of the Republic of Serbia (4) and Government of Montenegro (1)
CEO is appointed by the Supervisory Board.

SMATSA (2017)

PRESIDENT OF THE ASSEMBLY:

Nebojša Krstajić

PRESIDENT OF THE SUPERVISORY BOARD:

Bratislav Grubačić

CEO:

Radojica Rovčanin

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☑ OAT	☑ Lower Airspace	☑ MET

- ANS Services (ATM, CNS, MET, AIS)
- SMATSA provides Air Traffic Services in the 55% of the upper airspace of Bosnia and Herzegovina
- ANS personnel and pilot training, Flight Inspection Services, PANS-OPS and cartography

Operational ATS units (2015)

1 ACC (Belgrade)
1 APP collocated with ACC Belgrade
7 APPs/TWRs (Batajnica, Kraljevo, Nis, Vrsac, Podgorica, Tivat, Uzice)
1 TWR (Belgrade)

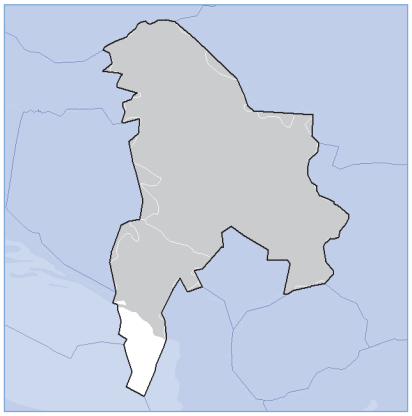
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	82
Gate-to-gate total costs (M€)	85
Gate-to-gate ATM/CNS provision costs (M€)	77
Gate-to-gate total ATM/CNS assets(M€)	83
Gate-to-gate ANS total capex (M€)	6
ATCOs in OPS	275
Gate-to-gate total staff (incl. MET staff*)	873
Total IFR flight-hours controlled by ANSP ('000)	224
IFR airport movements controlled by ANSP ('000)	84
En-route sectors	9
Minutes of ATFM delays ('000)	15

** if applicable*

Size (2015)

Size of controlled airspace: 127 000 km²



UkSATSE, Ukraine

Ukrainian State Air Traffic Service Enterprise

www.uksatse.ua

Institutional arrangements and links (2017)

Ministry of Infrastructure of Ukraine
(State Aviation Administration)

Ukrainian State Air Traffic Service Enterprise (UkSATSE)

- Regional branches
- AIS
- Ukraerocenter (Ukrainian Airspace Management and Planning Center)
- Training & Certification Center of UkSATSE
- UkSATSE Flight Calibration Service
- Medical Certification Center

Status (2017)

- Self-financing enterprise
- 100% State-owned

National Supervisory Authority (NSA):

State Aviation Administration (SAAU) acts as NSA

Body responsible for:

Safety Regulation
State Aviation Administration

Airspace Regulation
State Aviation Administration

Economic Regulation
Ministry of Infrastructure of Ukraine

Corporate governance structure (2017)

Director of UkSATSE (CEO) has been appointed by the Ministry of Infrastructure of Ukraine

Reciprocal obligations between Ministry of Infrastructure of Ukraine and Director of UkSATSE are regulated by the contract

UkSATSE (2017)

DIRECTOR OF UkSATSE (CEO):
Dmytro Babeichuk

Scope of services (2015)

☑ GAT	☑ Upper Airspace	☐ Oceanic ANS
☐ OAT	☑ Lower Airspace	☑ MET

Operational ATS units (2015)

4 ACCs/APPs (Dnipropetrovs'k, Kyiv, L'viv, Odesa)
4 APPs (Ivano-Frankivs'k, Kharkiv, Uzghorod, Zaporizhzhia)
17 TWRs
3 AFISs

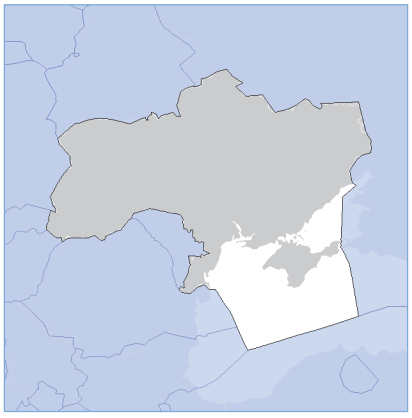
Key financial and operational figures (ACE 2015)

Gate-to-gate total revenues (M€)	84
Gate-to-gate total costs (M€)	96
Gate-to-gate ATM/CNS provision costs (M€)	91
Gate-to-gate total ATM/CNS assets(M€)	128
Gate-to-gate ANS total capex (M€)	4
ATCOs in OPS	842
Gate-to-gate total staff (incl. MET staff*)	4 647
Total IFR flight-hours controlled by ANSP ('000)	154
IFR airport movements controlled by ANSP ('000)	121
En-route sectors	30
Minutes of ATFM delays ('000)	0

** if applicable*

Size (2015)

Size of controlled airspace: 776 000 km²



GLOSSARY

ACC	Area Control Centre
ACE	Air Traffic Management Cost-Effectiveness
ADS-B	Automatic Dependent Surveillance-Broadcast
AFIS	Airport/Aerodrome Flight Information Service
AIS	Aeronautical Information Services
Albcontrol	National Air Traffic Agency, Albania
ANS	Air Navigation Services
ANS CR	Air Navigation Services of the Czech Republic
ANSP	Air Navigation Service Provider
APP	Approach Control Unit
ARMATS	Armenian Air Traffic Services
A-SMGCS	Advanced Surface Movement Guidance and Control System
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
Austro Control	Austro Control Österreichische Gesellschaft für Zivilluftfahrt mbH, Austria
Avinor	Avinor Flysikring AS, Norway
B	Billion
Belgocontrol	Belgocontrol, Belgium
BULATSA	Bulgarian Air Traffic Services Authority
CAPEX	Capital Expenditure
CNS	Communications, Navigation and Surveillance
COOPANS	Industrial partnership between 5 ANSPs (Austro Control, Croatia Control, IAA, LFV and NAVIAIR)
CPDLC	Controller Pilot Data Link Communications
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
ENAIRE	Air Navigation Service Provider of Spain
ENAV	Ente Nazionale di Assistenza al Volo S.p.A., Italy
ERC	EUROCONTROL Research Centre
ETS	Early Termination of Service
EU	European Union
FAB	Functional Airspace Block
FDP	Flight Data Processing system
Finavia	Finavia, Finland
FIR	Flight Information Region
FIS	Flight Information Service
FL	Flight Level

FTE	Full-Time Equivalent
FUA	Flexible Use of Airspace
GBAS	Ground Based Augmentation System
GDP	Gross Domestic Product
HCAA	Hellenic Civil Aviation Authority, Greece
HMI	Human-Machine Interface
HQ	Headquarters
HungaroControl	Hungarian Air Navigation Services, Hungary
IAA	Irish Aviation Authority, Ireland
IFR	Instrument Flight Rules
IFRS	International Financial Reporting Standards
ILS	Instrument Landing System
iTEC	"interoperability Through European Collaboration", an industrial alliance between 7 ANSPs (Avinor, DFS, ENAIRE, LVNL, NATS, Oro Navigacija and PANSA) and one ATM system supplier (INDRA)
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
MLAT	Multilateration
M-NAV	Air Navigation Services Provider of the former Yugoslav Republic of Macedonia
MoldATSA	Moldavian Air Traffic Services Authority
MSSR	Monopulse Secondary Surveillance Radar
MUAC	Maastricht Upper Area Control Centre
NATS	National Air Traffic Services, United Kingdom
NAV Portugal	Navegação Aérea de Portugal – NAV Portugal, EPE
NAVIAIR	Air Navigation Services – Flyvesikringstjenesten, Denmark
NBV	Net Book Value
NDB	Non-Directional Beacon
NM	EUROCONTROL Network Manager
NSA	National Supervisory Authority
OAT	Operational air traffic
ODS	Operational Display System
OPS	Operations
Oro Navigacija	State Enterprise Oro Navigacija, Lithuania
PANSA	Polish Air Navigation Services Agency
PPPs	Purchasing power parities
PRB	Performance Review Body
PRC	Performance Review Commission
PRR	Performance Review Report
PRU	Performance Review Unit
PSR	Primary Surveillance Radar
RDP	Radar Data Processing system
ROMATSA	Romanian Air Traffic Services Administration
RP1	Reference Period 1 (2012 – 2014)
RP2	Reference Period 2 (2015 – 2019)

RPI	Retail Price Index
Sakaeronavigatsia	SAKAERONAVIGATSIA Ltd., Georgia
SAR	Search and Rescue
SEID	Specification for Economic Information Disclosure
SES	Single European Sky
SESAR IP1	Single European Sky ATM Research Implementation Package 1
Skyguide	Skyguide, Switzerland
Slovenia Control	SLOVENIA CONTROL Ltd, 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
VCSS	Voice Communication Switching System
VFR	Visual Flight Rules
VoIP	Voice over Internet Protocol
VOR	Very high frequency Omni-directional Range
WAM	Wide Area Multilateration

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