

# GLOBAL AIR NAVIGATION SERVICES PERFORMANCE REPORT

2015 – 2019 ANSP  
Performance Results

# ACKNOWLEDGEMENTS

This publication is a product of the CANSO Global Benchmarking Workgroup, produced with the assistance of Egis. The workgroup is grateful for the continued analytical support provided by Egis.



We also thank EUROCONTROL and the Performance Review Unit (PRU) for their collaboration in providing the data from the ANSP Cost Effectiveness (ACE) Report. This has enabled our CANSO Air Navigation Services Performance Report to continue to reflect a broader scope of air navigation service providers.



The workgroup would also like to thank its Chair, Diána Galgóczi of HungaroControl, for her leadership and commitment over the last year.

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# FOREWORD

The past 20 months have been one of the most difficult periods for aviation by any measure or benchmark. The collapse of traffic volumes due to state-imposed travel restrictions aimed at controlling the spread of the pandemic and new virus variants has continued to have devastating effects. The impact has extended far beyond the period which anybody first believed possible at the beginning of the crisis in early 2020. While the roll-out of vaccination programmes progress at differing rates internationally, it is increasingly apparent that things may not return to 'normal' for some time – and that 'normal' may not look like how it used to.



As our eyes begin to shift away from short-term crisis management towards longer term planning and recovery, there are still two key questions to address: what will 'normal' look like and what can we do to increase our resilience to similar crises in the future?

The truth is there is still a lot of uncertainty surrounding these questions. One thing most of the industry can agree on, however, is that it is vital to unpick the lessons learnt from the past two years and agree on how we baseline our performance going forward. To provide evidence to inform this and build a global picture of how ANSPs were performing before, during and (eventually) after the pandemic, we will need data – and this is where the work of the CANSO Global Benchmarking Workgroup (GBWG) can help.

This year, CANSO celebrates the eleventh edition of the *CANSO Global Air Navigation Services Performance Report*. The document is a key output of the work of the GBWG and acts as a tool for ANSPs to compare, contrast and identify good practices in air navigation services (ANS) performance, particularly in the areas of cost efficiency and ATCO productivity. The report has a loyal and significant list of contributors from all across the globe, including 52 ANSPs for this edition. It is an excellent example of the fruits of long-term international collaboration – an ethos that lies at the very heart of CANSO's strategy and ambition.

This year also marks the second edition of the report where data has been incorporated from that published by EUROCONTROL's Performance Review Unit (PRU). Inclusion of a wider set of ANSP results enhances the value of the report by presenting an even more global and comprehensive view of ANS performance, which is perhaps more important now than ever before.

Although the impacts of the pandemic will not be reflected in the data published in this report, it does present the performance of 2019. This is commonly used as a 'baseline year' for assessing the impact of the pandemic on performance. The findings of this report suggest that perhaps 2019 was more unusual than first thought, perhaps calling into question whether this is the best baseline for comparison of future performance.

I would like to thank the CANSO GBWG and all the participating CANSO members. I also thank EUROCONTROL for their collaboration; this has made such a difference in increasing the scope, scale and utility of the report. Finally, I would like to thank Egis for their efforts over the past nine years in data collection and analysis, and their continued dedication in supporting CANSO and the GBWG with this work.

A stylized, handwritten signature in black ink, consisting of a large, flowing 'S' followed by a series of loops and a final horizontal stroke.

**Simon Hocquard**  
Director General CANSO

# EXECUTIVE SUMMARY

## EVER IMPROVING

The CANSO *Global Air Navigation Services (ANS) Performance Report* is produced annually by CANSO's Global Benchmarking Workgroup (GBWG) with the support of Egis.

This year is the second year that through agreement with EUROCONTROL's Performance Review Unit (PRU), data regarding European ANSPs taken from the *ATM Cost-Effectiveness (ACE) Benchmarking Report* has been included. The report now provides data for 52 ANSPs, who together are responsible for the management of over 65% of global air traffic.

In line with CANSO's ambitions for the *Global ANS Performance Report* to reflect a broader picture of performance, data been provided this year by the CANSO Human Resources Workgroup on key human resources metrics and trends. Collaboration between CANSO workgroups aims to enable interdependencies between data to be analysed and ultimately drive better insights into the reasons behind performance trends.

## OVERVIEW OF PERFORMANCE TRENDS

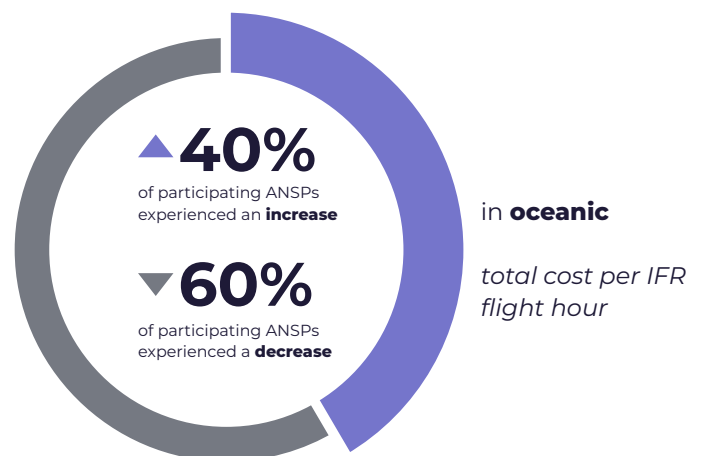
This report contains performance indicators for identified ANSPs for the year 2019, along with trend data between 2015 and 2019. The data presented in this report for the European ANSPs is sourced from the PRU of EUROCONTROL and is consistent with the figures published in the *ATM Cost-effectiveness (ACE) Benchmarking Report*. ACE Report data collected by the PRU since 2002 is available on the [ACE dashboard](#).

In an industry that is still experiencing the impacts of the COVID-19 pandemic, 2019 is regularly referred to as a reference year for normal traffic levels. However, from our analyses it can be seen that a number of key patterns were reversed in 2019. This is primarily due to a slowing of traffic growth across our participating ANSPs; the mean traffic growth in 2019 was 1.6%, whereas in 2018 it was 4.6%. The key findings of the report detailed below show that ANSPs' cost bases cannot be easily scaled to respond to the slowing traffic growth.

### Key findings of the report <sup>1</sup>

#### Cost Efficiency

#### Increases in costs outweighed increases in traffic in 2019, in contrast to 2018



Average global percentage change – Total cost per IFR flight hour (2018-2019):

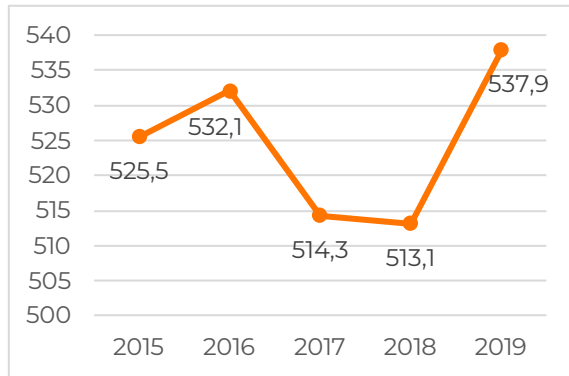
**CONTINENTAL: +4.8%**

**OCEANIC: +0.8%**

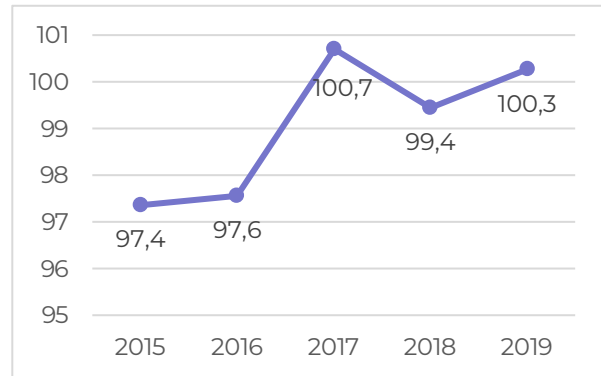
<sup>1</sup> For identified results supporting these key findings, see 2019 performance data section from page 32 onwards. Please note, Airservices Australia and SANS submit data that is used to calculate the global trends within this document's Executive Summary section but their data is not presented in the graphs included in the rest of this document. For this reason, there are also small differences between the averages presented in both sections.

Average KPI values – Total cost per IFR flight hour (USD) (2015-2019):

**CONTINENTAL:**

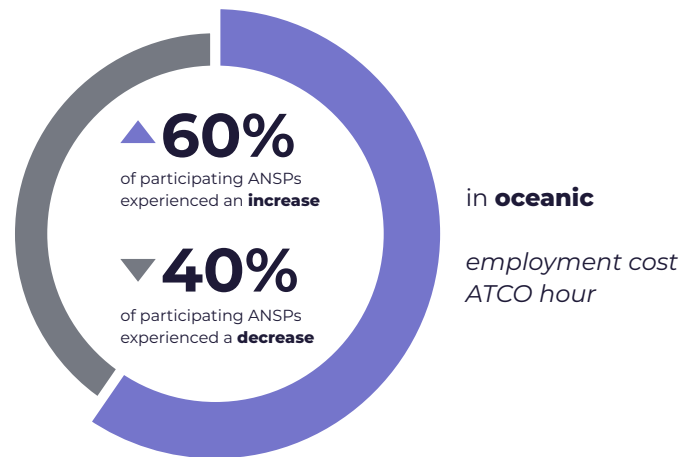
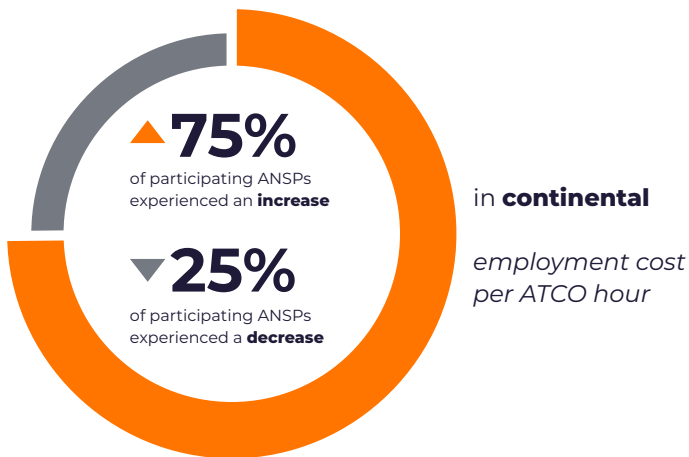


**OCEANIC:**



ATCO in OPS costs

**Increases in ATCO employment costs per ATCO hour were consistent with those recorded in the last two years**



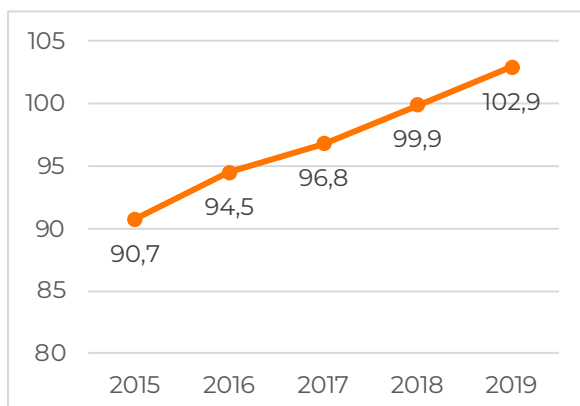
Average global percentage change – Employment cost per ATCO hour (2018-2019):

**CONTINENTAL: +3.0%**

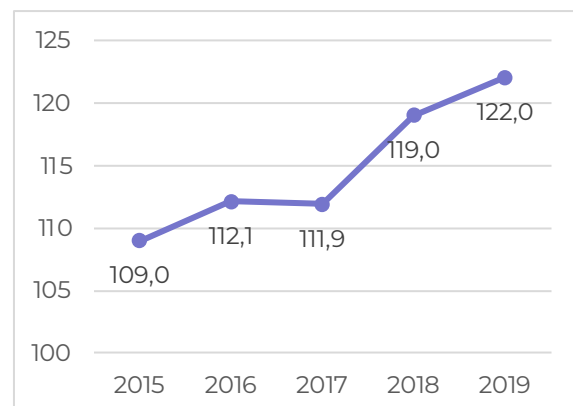
**OCEANIC: +2.5%**

Average KPI values – Employment cost per ATCO hour (USD) (2015-2019):

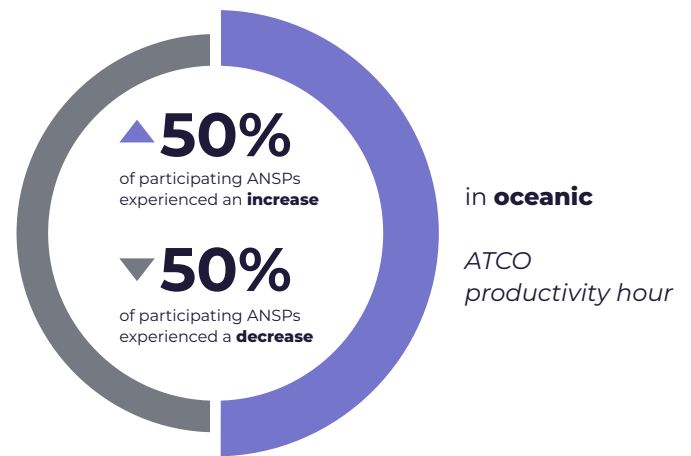
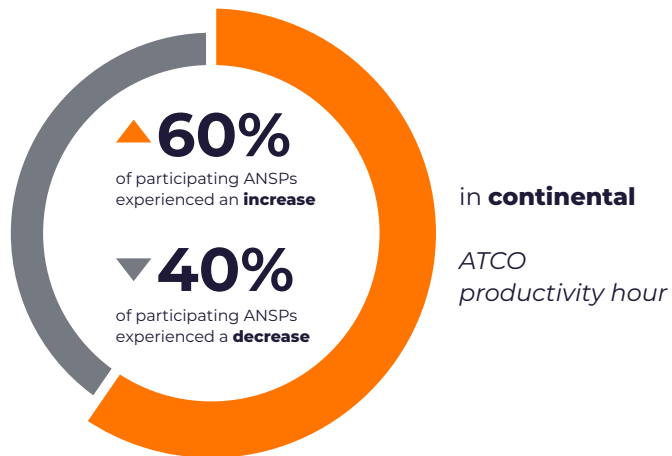
**CONTINENTAL:**



**OCEANIC:**



## The rate of ATCO productivity increase slowed



**27%** of ATCO productivity 2018-2019 increases were **>4%**, compared to **61%** between 2017-2018

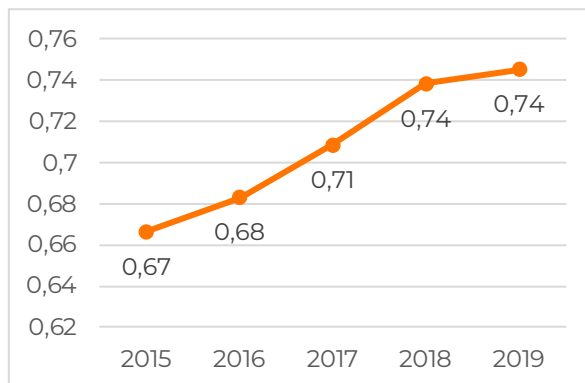
Average global percentage change – ATCO productivity (2018-2019):

**CONTINENTAL: +0.9%**

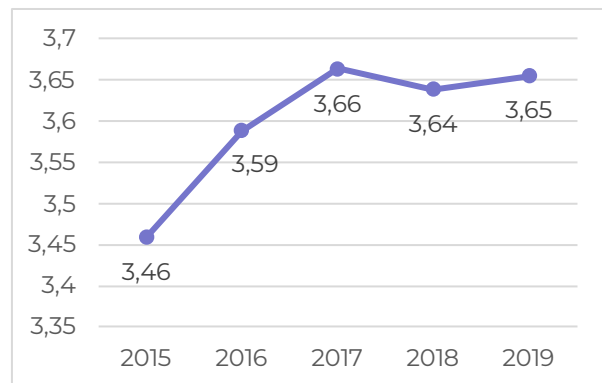
**OCEANIC: +0.5%**

Average KPI values – ATCO productivity (2015-2019):

### CONTINENTAL:



### OCEANIC:





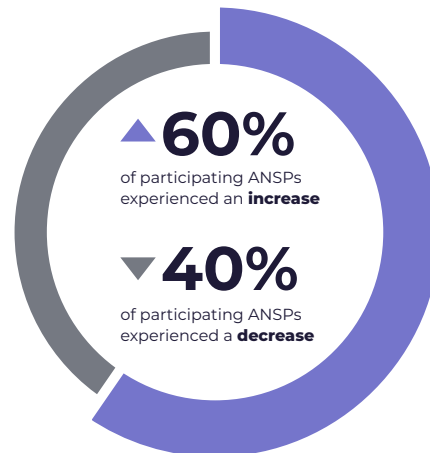
## Other costs

In contrast to the previous two years, costs excluding ATCO in OPS employment costs per IFR flight hour increased for the majority of ANSPs



in **continental**

other costs per  
IFR flight hour



in **oceanic**

other costs per  
IFR flight hour

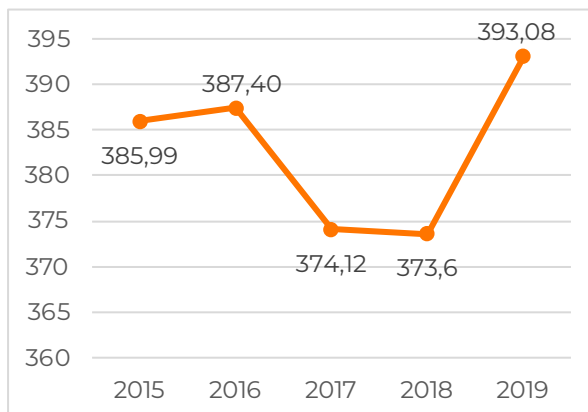
Average global percentage change – Other costs per IFR flight hour (2018-2019):

**CONTINENTAL: +5.2%**

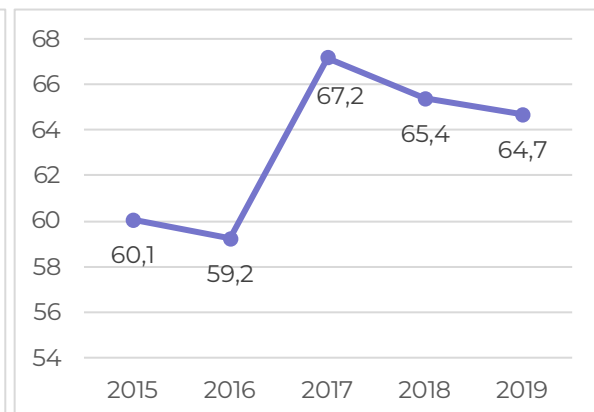
**OCEANIC: -1.1%**

Average KPI values – Other costs per IFR flight hour (USD) (2015-2019):

**CONTINENTAL:**



**OCEANIC:**



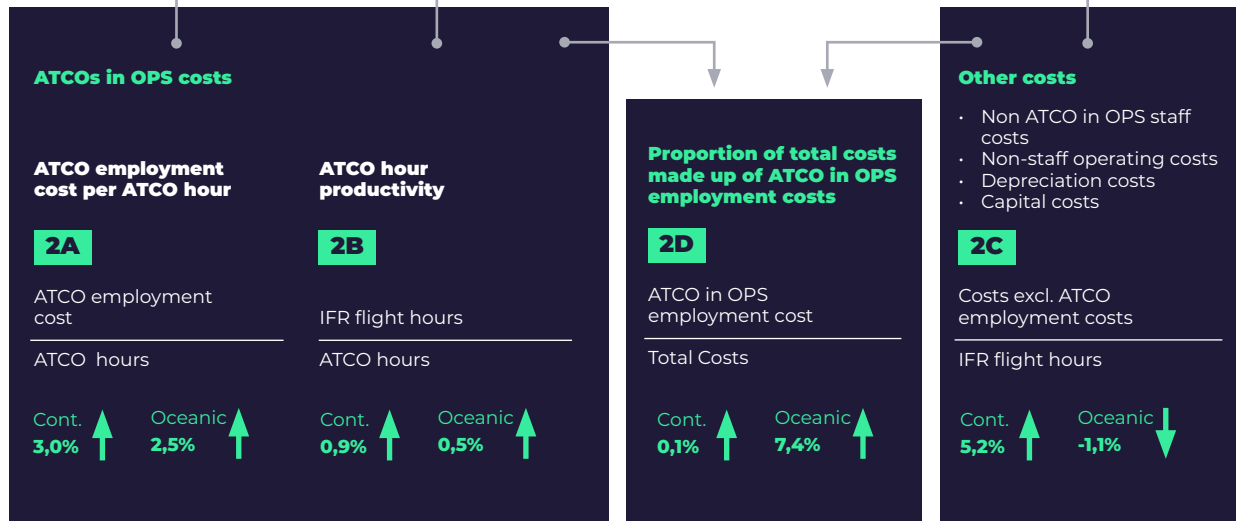
## CANSO KPI framework trends

The average percentage change for the remaining CANSO Key Performance Indicators (KPIs), when comparing 2018 and 2019 ANSP data, are detailed in the summary figure below:

### Level 1



### Level 2



### Level 3



Figure 1: Average percentage change for all CANSO GBWG KPIs between 2018 and 2019

# INTRODUCTION

## COMPARING ANSP PERFORMANCE

Air navigation service providers (ANSPs) are responsible for managing global air traffic safely, efficiently and cost-effectively. This includes managing and enhancing airspace capacity through improvements to infrastructure and technology, and improving efficiency through a skilled and productive workforce and an innovative approach to airspace management.

The performance of the air navigation system impacts stakeholders throughout the aviation ecosystem. From boosting connectivity and minimising delays, to upholding the highest standard of safety in aviation, efficient, effective air navigation services are a critical component of a high-performance aviation industry. To that end, CANSO has devised benchmarking exercises that aggregate and review global performance accordingly.

Comparing and benchmarking key financial and productivity indicators enables ANSPs to make informed decisions when pursuing increased cost-effectiveness and productivity, without impacting safety – the industry's top priority. It helps ANSPs to work together to address both their own performance and that of the ATM industry worldwide. The *CANSO Global ANS Performance Report* highlights global performance trends and identifies performance gaps, acting as a basis for collective improvement.

## IMPACT OF COVID-19 ON PERFORMANCE

This report focuses on 2015-2019 performance data, however, the reporting periods of participating ANSPs are not aligned in all instances. For a small number whose reporting periods run into the first part of 2020, data has been impacted by the drop in traffic caused by the COVID-19 pandemic. This must be taken into context when interpreting the trends of those affected ANSPs included in the 2019 Performance Data section and in comparing the performance of ANSPs whose reporting periods matches the calendar year with those whose may include months with COVID-19 traffic impacts. For the full analysis, please see Annex 1.

## MEASURING COST EFFICIENCY AND PRODUCTIVITY

Cost efficiency and productivity are two key performance indicators of air navigation services that enable this monitoring of performance. They demonstrate how ANSPs are delivering value and serve as indicators of operational efficiency. The *CANSO ANS Performance Framework* identifies the factors that determine cost-efficiency and productivity, including employment costs, hours worked and other costs, and is used to create a clear, common model for understanding global ANS performance. Understanding performance is critical as a means to inform and navigate the marked changes to the industry caused about the COVID-19 pandemic.

## GLOBAL AIR NAVIGATION SERVICES PERFORMANCE REPORT

This year's *Global Air Navigation Services Performance Report* contains performance indicators for identified ANSPs for the year 2019, along with trend data between 2015 and 2019.

ANSPs submitting to CANSO have also provided contextual comments, including any exceptional events during the year or items that may impact the comparability of their data. Additional comments on important events are included within the contextual data, providing insight into the results of the participating ANSPs.

The detailed results for each ANSP can be found in the *CANSO Global Benchmarking Workgroup Performance Dashboard*, which is available to participating GBWG members.



## INCORPORATION OF PRU DATA

A key objective for CANSO and the members of CANSO's Global Benchmarking Workgroup (GBWG) is to continue to increase the global coverage of the data included in the annual *Performance Report*. To support this, for the second year, CANSO, with the agreement of EUROCONTROL, has incorporated public data collected by EUROCONTROL's Performance Review Unit (PRU) to complete the representation of European ANSPs in the dataset.

It should be noted that while the raw data extracted from the ACE Report is directly comparable, the final KPIs expressed in the CANSO report are not directly comparable to those reported in the ACE report.

Primarily, this is because the KPIs use different inputs. In particular, the CANSO report uses IFR flight hours and extracts "*total flight hours controlled by the ANSP*" as a comparable data point from the ACE dataset, while the ACE Report uses "*composite flight hours*". These comparable data points were validated as part of a comparison exercise undertaken by Egis, which was presented to the GBWG at GBWG/32 in Tokyo.

Differences in indicators between the two reports, go beyond the use of a different flight hour measurement. Two key examples are highlighted below:

- CANSO's *Performance Report* converts all cost data into USD instead of EURO
- CANSO's *Performance Report* primarily uses Organisation for Economic Co-operation and Development (OECD) as a source for exchange rate, inflation rate and PPP information, whereas EUROCONTROL's ACE Report uses a combination of EUROSTAT and IMF data.

European GBWG members have been allowed to request, with justification, to use the GBWG submission instead. For further details please see *Global Air Navigation Services Performance Report 2015-2019: Participation*.

# 2019 INDUSTRY TRENDS

## Movement and passenger number growth resilient



Global passenger  
**growth of  
3.6%**  
in all regions. Down  
from 6.4% in 2018.



Air cargo volumes  
**declined by  
3.2%**  
in 2019. Compared to  
a 3.4% growth in 2018

**+1.7%** in Aircraft Movements in 2019 (+3.1% in 2018)



Passenger numbers in  
**emerging markets grew  
+3.9%**

Passenger numbers in  
**advanced economies grew  
+3.1%**



Traffic at the world's 20  
busiest airports **grew by  
1.7%**  
in 2019, down from 4.7%  
in 2018.

## Demand continued to rise faster than supply

RPK rising more  
than ASK



**RPK / ASK = 0.7%**

increase in load  
factor



Passenger numbers rose to almost **4.5 billion**

Increase in passenger numbers driven predominantly by

## Asia Pacific region

Despite the moderation in  
growth, **almost 30 million  
journeys added in China** alone

China's domestic market  
showed the fastest **growth in  
passenger numbers by 5.8%**

Load factors  
reached a record  
**82.6%.**



## Financial Performance



2019 provided lower profits for airlines worldwide, collective net profit value of

**\$26 billion**,

compared to \$30 billion in 2018.

Operating margins fell from **5.7% in 2018** to

**5.1% in 2019**



Average jet fuel prices were just below

**\$80/bbl.**

in 2019 (2018 average \$86).

**The industry positively contributes to the wider economy**



Tourists travelling internationally by air are estimated to have spent

**about \$900 billion**,

an increase of over 7% in 2018

In 2019 the industry supported over

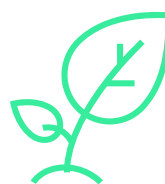
**87.7 million jobs**

## Reduced Environmental Impact

In 2019, the industry marked the milestone of

**>250,000 flights**

completed using **Sustainable Aviation Fuel**



**Average annual fuel efficiency improvement** between 2009 and 2019 has been

**over 2%**

# ANSP CASE STUDIES

The following case studies have been kindly provided by HungaroControl and NAV Portugal. The case studies provide a deep dive into the reasons for improved ATCO productivity between 2015-2019.

## HUNGAROCONTROL

### Background of the Hungarian traffic situation:

Traffic increased significantly due to traffic bypassing Ukraine (after Malaysia Airlines Flight MH17 was shot down over Ukraine in July 2014, and Ukraine closed airspace to all Russian planes and the area was generally considered unsafe by the airlines. Subsequently, a significant amount of bypass traffic appeared in the neighbouring Hungarian airspace).

However, in the performance plan, planned traffic and capacity could not take this into account as it was prepared earlier.

Due to this extra traffic, a continuous increase in productivity can be observed, as a result of the utilisation, optimisation of existing capacities.

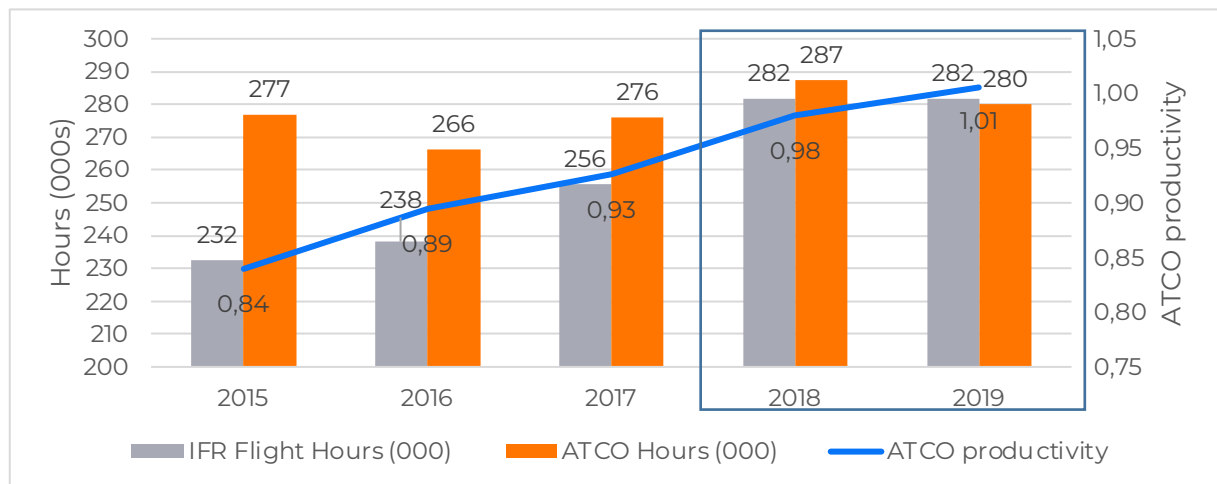


Figure 2 - HungaroControl's historical ATCO productivity against IFR flight hours and ATCO hours

## Same trend, different reasons in 2019

In HungaroControl's case, the improvement in ATCO productivity was the consequence of decreasing ATCO hours (while the number of IFR flight hours remained flat) from 2018 to 2019 (highlighted in the charts).

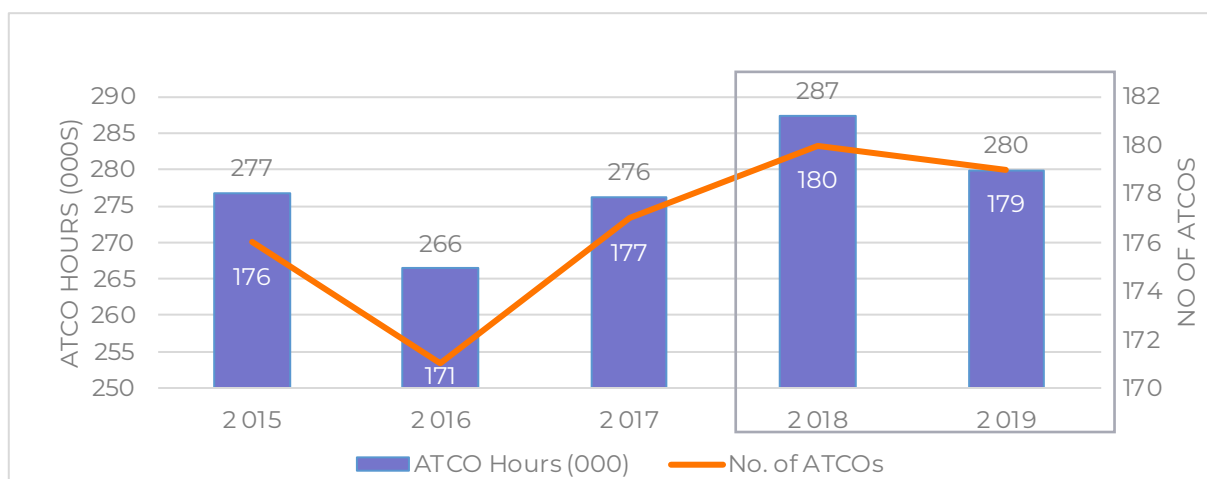


Figure 3 - HungaroControl's historical ATCO hours and Number of ATCOs in Operations

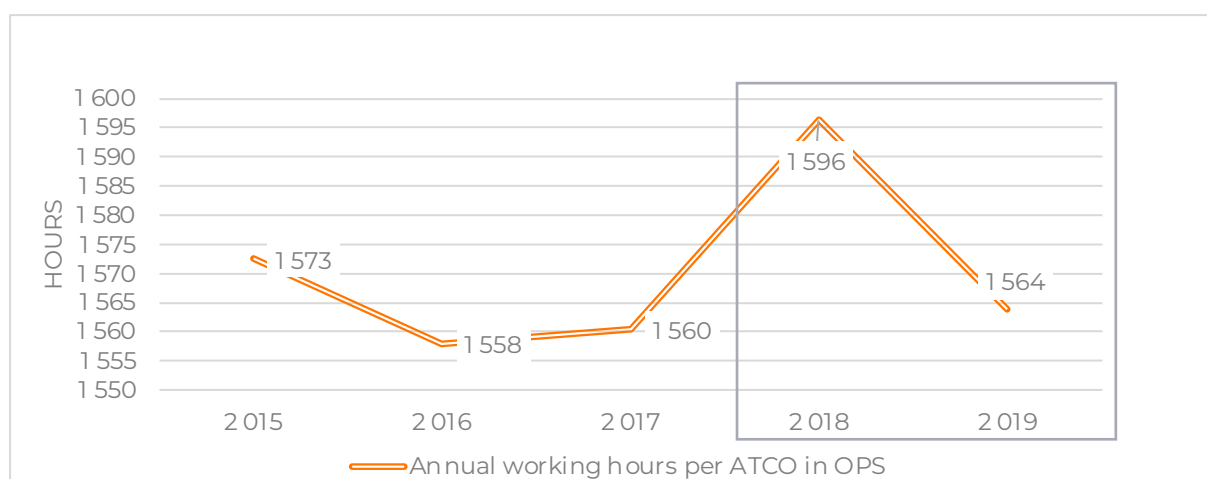


Figure 4 - HungaroControl's historical annual working hours per ATCO in OPS

ATCO hours decreased by 3% in 2019 (compared to 2018), and so did the per-ATCO KPI. The reason for this was the introduction of measures related to fatigue risk management (FRM). Consequently, overtime was limited due to the early introduction of this new legislation.

Unfortunately, the improvement of ATCO productivity had a price: the adverse impact to service quality, namely the significant increase in delay minutes. HungaroControl's case is therefore a good reminder that changes in the KPIs should be looked at together with the relevant background information, and interdependencies in different key performance areas should be thoroughly analysed.



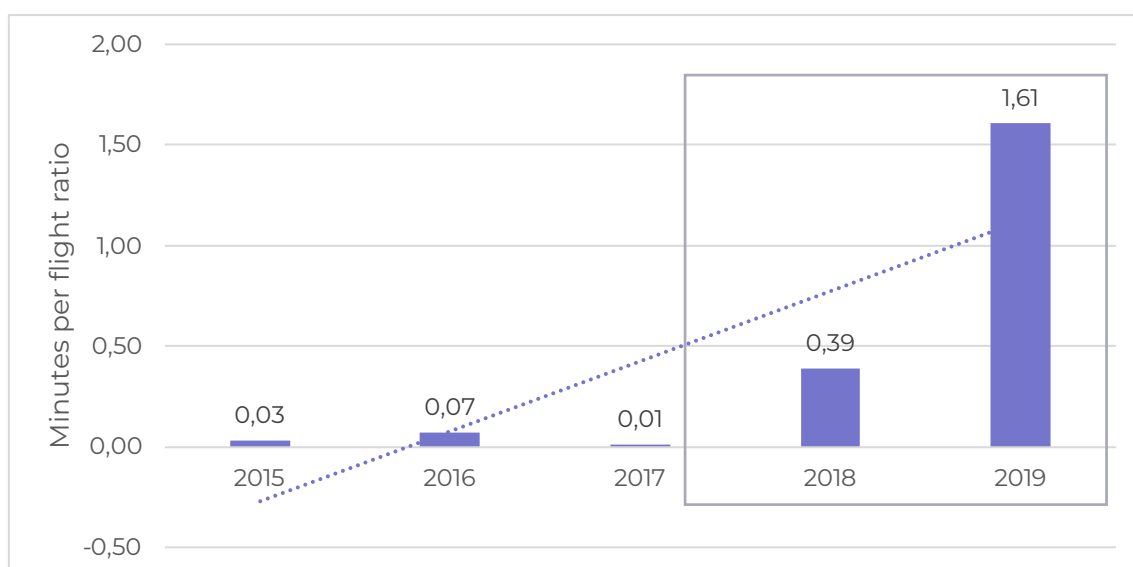


Figure 5 - Hungary's actual ATFM delay (minutes per flight)

**Delay= en-route ATFM delay [min.] / number of IFR flight**

**Note:** 'ATFM delay' does not take into account the planned capacity thus it is possible that an ANSP has a relative high capacity (handled flights/hour) but due to the higher demand the given ANSP will generate delay.

Until 2017, existing capacity and improved airspace optimisation allowed HungaroControl to take advantage of the increase in traffic without major delays.<sup>2</sup> In 2018, the delay indicator had already started to rise significantly, but the organisation continued to respond with extra shifts (leading to additional overtime). At the end of 2019 the capacity clearly reached its limits and it was not possible to further increase the workload without jeopardising safety standards. Consequently, a new FRM agreement was reached with the ATCOs, which resulted in safe, sustainable service provision, but also a significant increase in delays.

The capacity plan for a reference period is fixed. It can take time to build additional capacity, or to respond to significant changes in demand.

<sup>2</sup> In Europe, when traffic demand is anticipated to exceed the available capacity in en route centres or at airports, Air Traffic Control (ATC) units may request the local Flow Management Position (FMP) to instigate an Air Traffic Flow Management (ATFM) measure, or regulation. Aircraft expected to arrive during a period of congestion are given Air Traffic Flow Management delay at their departure airport, under the authority of the Network Manager, in order to regulate the flow of traffic into the constrained downstream en route sector or airport, thus ensuring safety. The resulting ATFM delays are calculated as the difference between the estimated take-off time calculated from the filed flight plan including updates and the calculated take-off time allocated by the central unit of ATFM. The reason for the regulation is indicated by the responsible Flow Management Position (FMP). The delay is attributed to the most constraining ATC unit.

Significant seasonality in traffic volumes requires adjustments in capacity. Figure 6 which shows overflight movements in 2018 and 2019 demonstrates how much difference there is between winter and summer for HungaroControl.

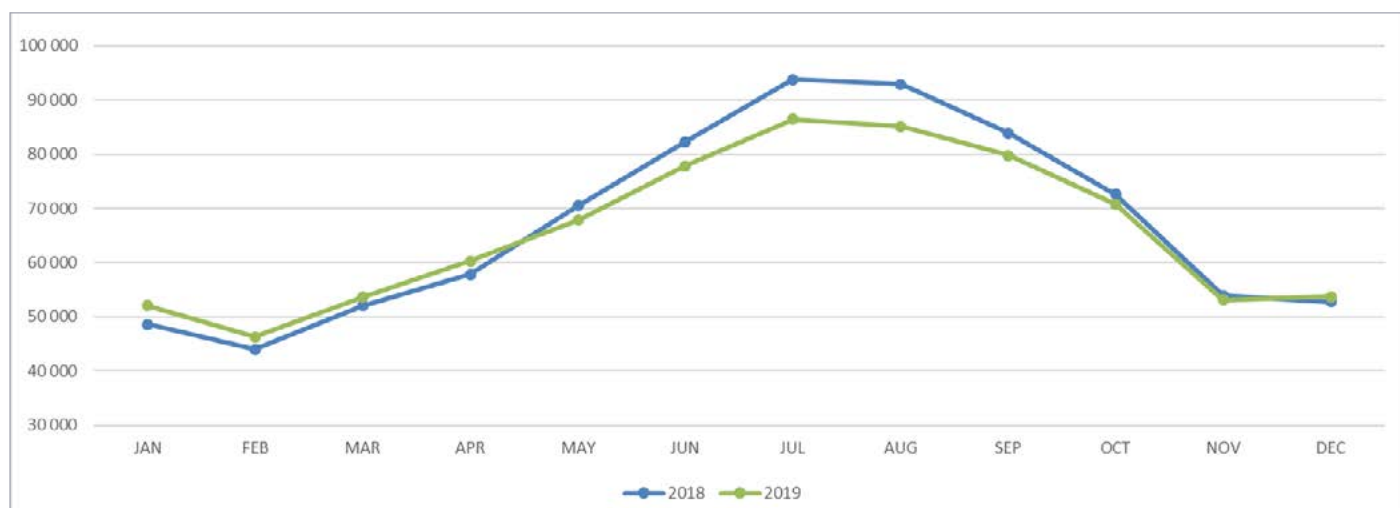


Figure 6 - Number of overflight movements in 2018 and 2019

Significant seasonality in traffic volumes requires adjustments in capacity. Figure 6 which shows overflight movements in 2018 and 2019 demonstrates how much difference there is between winter and summer for HungaroControl.

The number of movements in July is double normal February volumes. It is also evident from the comparison that in the summer months of 2019 the number of overflights was restricted due to FRM measures. In the off-peak seasons, on the contrary, when capacity was not limited, 2019 figures are above those of 2018.

## NAV PORTUGAL

In recent years productivity at NAV Portugal has increased progressively (see Figure 7), mainly as a result of very careful management of ATCOs resources. This efficient management, combined with a high degree of flexibility in the use of ATCOS, allowed NAV Portugal to allocate the necessary resources according to traffic demand. For this result to be possible, traffic forecasts are analysed on a daily basis

until d-1 (day before) of the operation, thus allowing for very precise planning according to the sector configurations necessary to accommodate the traffic. It is above all in this dynamic and flexible management that much of this result lies.

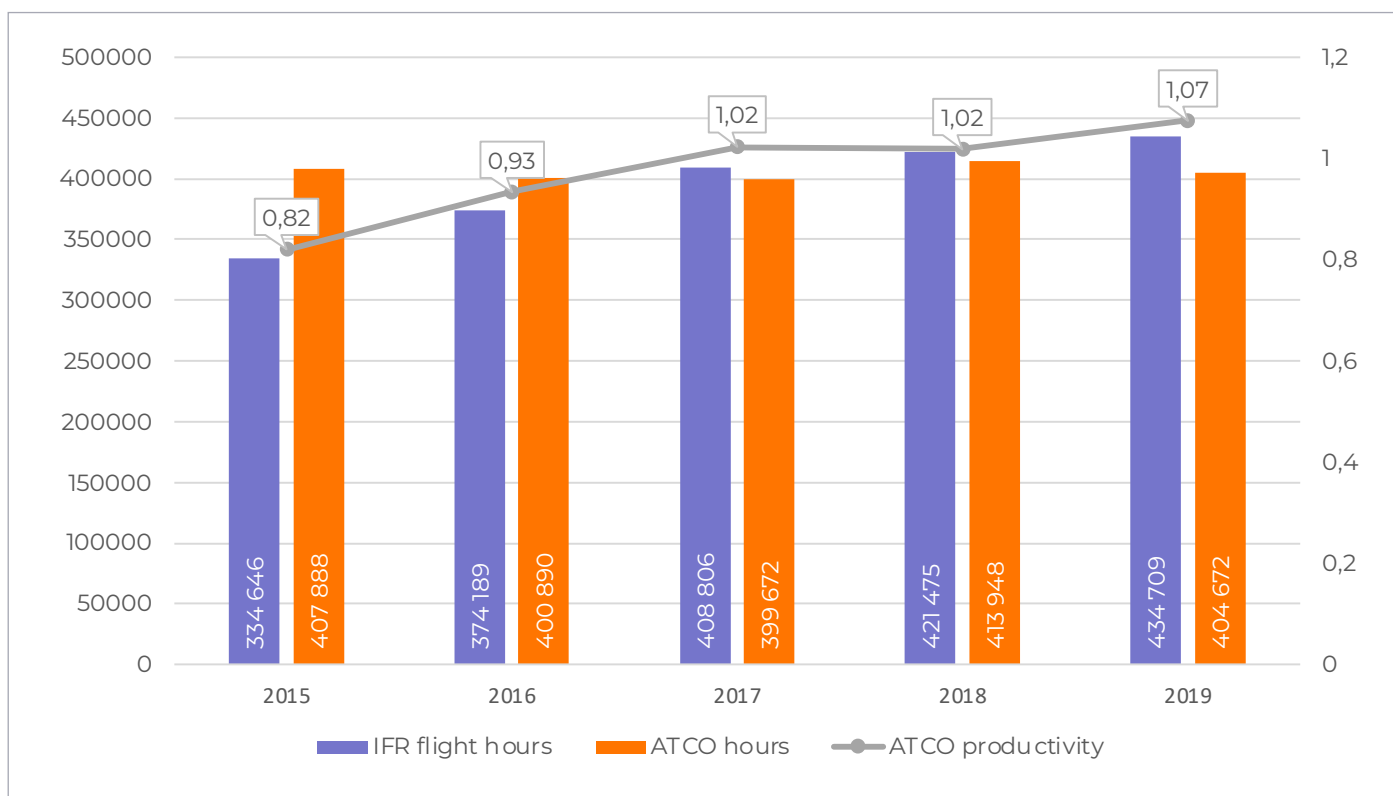


Figure 7 - ATCOs in OPS hour productivity at NAV Portugal (Continental) over the years 2015-2019

# RELATED CANSO BENCHMARKING ACTIVITIES

CANSO conducts a variety of benchmarking exercises to examine developments in the industry. Combined these allow for a greater understanding of the current initiatives and trends occurring across the aviation industry, contextualising the ANS performance analysis within this report. The following input has kindly been provided by the CANSO Human Resources Work Group (HRWG).

## CANSO HUMAN RESOURCES WORK GROUP

The CANSO Human Resources Workgroup (HPWG) examines human resources metrics, many of which are recognised as influencing the cost-efficiency and productivity KPIs explored in the *Performance Report*. Every few years the group undertakes an in-depth analysis of the terms and conditions of employment, employment costs, retention issues, training times, as well as factors such as progress on achieving gender balance in our industry. By sharing data, the entire ATM community can better understand and manage its performance and identify the actions that can be taken to influence it.

21 ANSPs participated in the 2020 survey, with the smallest organisation employing less than 100 employees and the largest employing over 5,000.

Some of the key results from the 2020 survey are as follows:

- Among the participating ANSPs, ATCOs made up on average 37% of total staff.
- ATCOs are tending to be older. The plurality of ATCOs employed by participating ANSPs now fall in the 41-50 age bracket (36%). The percentage of ATCOs under 30 years old has consistently fallen since the metric began being tracked in 2011 and now stands at 11%. The majority of ANSPs reported their ATCOs having an average length of service of over 21 years.

- Significant increases in average annual ATCO salaries were reported since the 2017 survey. This year the report began exploring differences between enroute and tower/terminal salaries.
- The average work week of an ATCO is just under 37 hours with an average of 23 hours spent in position.
- Overtime amounts were uneven with the majority of ANSPs reporting minimal use of overtime and others reporting significant usage of overtime.
- The average failure rate for ATCO students rose slightly from 17 to 18.8%
- Retention rates remain high, with the majority of ATCOs working until retirement. Turnover largely relates to ATCOs moving into management positions or relocating to another country.
- Women made up on average 25% of ATCOs (up over 4% since 2015) and just over 30% of total employees among responding ANSPs.

# LIST OF KEY PERFORMANCE INDICATORS

INDICATOR	KPI	NUMERATOR	DENOMINATOR	FIGURE REFERENCES	
COST EFFICIENCY AND PRODUCTIVITY PERFORMANCE INDICATORS				CONTINENTAL	OCEANIC
				2019 / TREND	2019
1	Cost per IFR flight hour	Total Cost	IFR flight hours	Figure 8	Figure 19
2A	ATCOs in OPS Employment cost per ATCO in OPS hour	Employment costs for ATCOs in OPS	ATCOs in OPS hours	Figure 9, 10	Figure 20, 21
2B	ATCOs in OPS hour productivity	IFR flight hours	ATCOs in OPS hours	Figure 11	Figure 22
2C	Cost excluding ATCOs in OPS employment costs per IFR flight hour	Costs excluding employment costs for ATCOs in OPS	IFR flight hours	Figure 12	Figure 23
2D	Employment cost of ATCOs in OPS as a percentage of total costs	Employment cost for ATCOs in OPS	Total Costs	Figure 13	Figure 24
3A	Annual employment cost per ATCO in OPS	Employment cost for ATCOs in OPS	ATCOs in OPS	Figure 14,15	
3B	Annual Working hours per ATCO in OPS	ATCOs in OPS hours	ATCOs in OPS	Figure 16	
3C	Annual IFR hours per ATCO in OPS	IFR flight hours	ATCOs in OPS	Figure 17	
3D	Ratio of frontline service staff to ATCO in OPS	No. of Frontline Service Support Staff	ATCOs in OPS	Figure 18	
JOINT CONTINENTAL AND OCEANIC COST EFFICIENCY PERFORMANCE INDICATORS				CONTINENTAL AND OCEANIC	
				2018/TREND	
CO1	Cost per IFR flight hour	Total Cost	IFR flight hours	Figure 25	
CO2D	Employment cost of ATCOs in OPS as a percentage of total costs	Employment cost for ATCOs in OPS	Total Cost	Figure 26	

Note that KPI CO1 is the combined continental and oceanic metric for KPI 1. Likewise, KPI CO2D is the combined continental and oceanic metric for KPI 2D.

# METHODOLOGY

## MEASURING PERFORMANCE

Cost efficiency and productivity are two key indicators of measuring the performance of air navigation service provision. They demonstrate how ANSPs are delivering value and serve as indicators of operational efficiency. These KPIs are all part of the *CANSO ANS Performance Framework* (page 78).

### Cost efficiency

Cost efficiency provides an indication of the balance between operational effectiveness (i.e. ATCO productivity) and the cost of providing the service.

The simplest indicator of cost efficiency is the cost of providing **ANS services per IFR flight hour**. A lower cost per flight hour, however, is not necessarily indicative of greater overall performance.

Economic differences outside of the control of ANSPs can drive differences in costs. This includes labour contracts, salary scales and working conditions (such as hours), as well as government regulations on pension management and mandatory financial controls. Furthermore, ANSPs do not control the volume of traffic, which is a function of economic activity and other air passenger demands. Where a minimum level of service is required, there is a limit to how activities can be scaled down in response to lower demand.

Cost indicators do not reflect external factors, other performance areas or the quality of service. Moreover, there are costs associated with providing a safer and more punctual, predictable, and efficient service.

Costs are broken down into ATCOs in OPS employment and other costs. Other costs include operating costs (excluding ATCO in OPS employment costs), depreciation/amortisation and costs of capital related to providing ATC/ATFM services. They do not include MET costs.

### Productivity

The key indicator of ANS productivity is **IFR flight hours per ATCO in OPS hour**, often described as 'ATCO in OPS productivity'. Although generally reflective of ANSPs' performance, factors beyond the control of the ANSP can cause low levels of productivity – for example a geopolitical event that alters traffic demand.

ATCO in OPS productivity is driven by traffic levels and an ANSP's ability to utilise its ATCOs in operations (OPS) resources. Although they cannot affect traffic demand, ANSPs may improve productivity by utilising flexible rostering and adapting airspace configuration to open and close sectors according to evolving traffic patterns.

Furthermore, advances in technology are now focusing more than ever on reducing the workload of ATCOs in OPS to enable them to safely manage higher levels of traffic in a given volume of airspace. Training associated with the introduction of technology, however, can lead to short-term reductions in productivity.

Airspace complexity also affects ATCO in OPS productivity. Lower airspace will typically have lower levels of ATCO in OPS productivity than upper airspace where aircraft are flying at more consistent altitudes and on non-crossing routes. Therefore, an ANSP operating a high proportion of sectors in lower airspace, or with numerous busy airports with complex approach sectors, is likely to have lower ATCO in OPS productivity than an ANSP with more overflights at higher altitude.

## DATA PROCESSING

**Data collection:** ANSPs who are members of the CANSO GBWG provided data for this analysis. ANSPs either submit the minimum dataset required for participation in the report (the basic data), or additional data to inform the analysis of trial KPIs (the advanced data). ANSPs can also revise data submitted in previous years. The data submission workbook includes validation calculations that ANSPs are encouraged to consult in the data collection phase.

The entire dataset is available to all participating ANSPs to enable closer analysis and evaluation of performance trends. The advanced KPI dataset is only available to ANSPs submitting advanced data.

2019 performance data for European ANSPs has been kindly provided by EUROCONTROL, alongside data for the years 2015 – 2018 to facilitate historical trends analysis, which will be completed with the extended set of ANSPs to ensure validity of any trend analysis. European ANSP members of the CANSO GBWG, who also submit data to EUROCONTROL will have their ACE data used in this analysis, unless otherwise agreed.

As noted in the Executive Summary, it should be noted that Indicator 2B 'ATCO productivity' is not directly comparable to the ATCO productivity KPI used in the ACE report. This is because the CANSO ANS Performance Framework uses IFR flight hours to calculate this KPI, rather than composite flight hours as used in the ACE report ATCO productivity KPI.

Finally, as part of the data sharing agreement with EUROCONTROL, CANSO data is only available to the core EUROCONTROL analysts and is not shared with the wider ACE report ANSP community.

**Data Dashboard:** As part of the CANSO 2015-2019 data collection cycle, a PowerBI dashboard was produced in November 2020, which allowed CANSO members a first look at trends in their data. This dashboard, and accompanying underlying data document provided members the opportunity to thoroughly review and validate their data submission, and notify Egis of any amendments if necessary.

**Data processing:** Data has been processed by Egis subject to a data processing agreement with CANSO and in accordance with European data privacy laws. It was subject to a one-step quality check for significant changes, potential errors or omissions and is subject to continued revision by participating ANSPs.

**Separation of continental and oceanic data:** Information is provided both for continental and oceanic air navigation services, where applicable. Each of these environments has different challenges associated with providing ANS. For example, it is more straightforward to provide ground infrastructure for communications and surveillance services in continental airspace than it is over oceans.

**Exchange rate conversion:** ANSPs submit data in their chosen currency. For KPI comparison, data is presented in USD. 2019 KPI data is converted using exchange rates provided by each ANSP or using data available from the Organisation for Economic Co-operation and Development (OECD) website. Exchange rates for some countries are unavailable using OECD; International Monetary Fund (IMF) exchange rates have been used in such situations.

For ANSPs that operate in a currency other than the USD, the assumption of lower cost may be caused in part by the strengthening USD. Between 2015 and 2016, the USD appreciated against most other world currencies, meaning each USD buys more foreign currency. Despite a dip in 2017, the USD once again strengthened in 2018. This change in the relative value of the dollar effectively lowers the price that ANSPs incur in USD.

**Growth rates:** Data is presented from 2019 and then for the one-year and four-year trends. The trend over four years is calculated as the compound annual growth rate (4 yr CAGR). This shows the overall trend between 2015 and 2019, but masks the fluctuations that may have taken place over the intervening years. In addition, if 2015 was an outlier, this trend may not be representative of the trend over this timeframe. Individual ANSP results for 4 yr CAGR should therefore be interpreted alongside contextual information.

The trend analysis is presented above the 2019 KPI data and is based on the data submitted in the ANSP's chosen currency.

**Inflation:** The growth rates are not adjusted for inflation, and local inflation rates should therefore be considered when interpreting AGR trends.

**PPP correction:** Salaries and the cost of living vary extensively around the world. One way to correct for this is by using purchasing power parity (PPP). Employment costs for ATCOs in OPS are corrected using IMF data. There are, of course, limitations to this approach, as the cost of living can vary widely within a country and may be higher or lower in the region where ANS offices are located.

**Q1 and Q3:** The first quartile (Q1) is defined as the middle number between the smallest number and the median of the data set. The third quartile (Q3) is the middle value between the median and the highest value of the data set. The average is the mean result.



## REPORTING PERIODS

While the GBWG encourages ANSPs with reporting periods that do not run between January and December to submit their most recent dataset, it is noted this is not possible for some providers due to data validation and availability. Readers are therefore encouraged to check reporting periods when comparing individual ANSPs. These are outlined within Table 2. Figure 29, in Annex 1, also provides a summary of these reporting periods, and indicates which ANSPs may have submitted data that has been affected by the COVID-19 pandemic.



# 2019 PARTICIPATION

## CANSO GBWG SUBMISSIONS

CANSO data submissions were received from 28 ANSPs, which included two new participants<sup>3</sup>. ANSPs who submitted to PRU, CANSO or both are indicated in the table below. Note that PRU data was used as default in this report for those submitting both CANSO and PRU.

Table 1 - CANSO GBWG Public Report participation

THE 2019 DATA SUBMISSION COVERS 4:						
Total IFR flight hours: 61 million						
Total costs: USD 25.9 billion			Total ATCOs in operations: 39,829			
REGION	COUNTRY/ TERRITORY	MEMBER	LABEL FOR GRAPHICS	SUBMITTED		
				CANSO	PRU	BOTH
Africa	South Africa	Air Traffic & Navigation Services	ATNS	X		
	Kenya	Kenya Civil Aviation Authority	KCAA	X		
Americas	Argentina	Empresa Argentina de Navegación Aérea	EANA	X		
	USA	Federal Aviation Administration – Air Traffic Organization	FAA-ATO	X		
	Canada	NAV CANADA	NAV CANADA	X		
Asia Pacific	Thailand	Aeronautical Radio of Thailand	AEROTHAI	X		
	India	Airports Authority of India	AAI	X		
	Australia	Airservices Australia <sup>5</sup>	Airservices	X		
	New Zealand	Airways New Zealand	Airways NZ	X		
	Singapore	Civil Aviation Authority of Singapore	CAAS	X		
	Japan	Japan Air Navigation Service	JANS	X		

<sup>3</sup> Comparative to 2018, two new CANSO submissions from ENAIRE and Slovenia Control were received for the final report.

<sup>4</sup> As some ANSPs did not submit data for every field, this is not the total for all participating ANSPs; rather it is the total of all data submitted.

<sup>5</sup> Airservices Australia and SANS submit data that is used to calculate the global trends within this document's Executive Summary section but their data is not presented in the graphs included in the rest of this document.

REGION	COUNTRY/ TERRITORY	MEMBER	LABEL FOR GRAPHICS	SUBMITTED		
				CANSO	PRU	BOTH
Europe	Albania	Air Navigation Services of Albania	Albcontrol		X	
	Luxembourg	Administration de la navigation aérienne	ANA	X		
	Czech Republic	Air Navigation Services of the Czech Republic	ANS CR			X
	Finland	Air Navigation Services Finland	ANS Finland			X
	Armenia	Armenia Air Traffic Services	ARMATS		X	
	Austria	Austro Control	Austro Control		X	
	Norway	Avinor Air Navigation Services	Avinor (Continental)		X	
	Bulgaria	Bulgarian Air Traffic Services Authority	BULATSA		X	
	Croatia	Croatia Control Ltd	Croatia Control		X	
	Cyprus	Department of Civil Aviation of Cyprus	DCAC Cyprus		X	
	Germany	DFS Aviation Services GmbH	DFS		X	
	Turkey	General Directorate of State Airports Authority	DHMI			X
	France	Direction des Services de la navigation aérienne	DSNA		X	
	Estonia	Estonian Air Navigation Services	EANS			X
	Spain	ENAIRE	ENAIRE			X
	Italy	ENAV S.p.A <sup>6</sup>	ENAV		X	
	Greece	Hellenic Civil Aviation Authority	HCAA		X	
	Hungary	HungaroControl Pte. Ltd. Co.	HungaroControl			X
	Ireland	Irish Aviation Authority	IAA		X	
	Iceland	Isavia Ltd	Isavia	X		
	Sweden	Luftfartsverket	LFV		X	
	Latvia	Latvijas gaisa satiksme	LGS			X

<sup>6</sup> ENAV has provided its view that KPIs that compare data referred to different dimensions (for example Costs, ATCOs in OPS hours, Number of ATCOs in OPS referred to Gate to Gate and Flight hours referred only to En-route) are not representative of real phenomena. Moreover, ENAV's costs are oriented towards the achievement of the cost-efficiency target defined in accordance with the EU Regulation (DUC).

REGION	COUNTRY/ TERRITORY	MEMBER	LABEL FOR GRAPHICS	SUBMITTED		
				CANSO	PRU	BOTH
Europe	Slovakia	Letové prevádzkové služby	LPS		X	
	Netherlands	Luchtverkeersleiding Nederland	LVNL		X	
	Malta	Malta Air Traffic Services	MATS		X	
	Macedonia	Macedonian Air Navigation Service Provider, GOJSC	M-NAV		X	
	Moldova	Moldovian Air Traffic Services Authority	MOLDATSA		X	
	-	Maastricht Upper Areal Control Centre	MUAC		X	
	United Kingdom	NATS Holdings	NATS (Continental)		X	
	Portugal	Navegação Aérea de Portugal - NAV Portugal, E.P.E.	NAV Portugal (Continental)			X
	Denmark	Navigation Via Air	NAVIAIR		X	
	Lithuania	SE Oro Navigacija	Oro Navigacija			X
	Poland	Polish Air Navigation Services Agency	PANSA			X
	Romania	Romanian Air Traffic Services Administration	ROMATSA		X	
	Georgia	Sakaeronavigatsia Ltd.	Sakaeronavigatsia		X	
	Belgium	skeyes	skeyes		X	
	Switzerland	skyguide	skyguide		X	
	Slovenia	Kontrola zračnega prometa Slovenije	Slovenia Control			X
	Serbia and Montenegro	Serbia and Montenegro Air Traffic Services SMATSA Ilc	SMATSA			X
	Ukraine	Ukrainian State Air Traffic Service Enterprise	UkSATSE		X	
Middle East	Saudi Arabia	Saudi Air Navigation Services8	SANS	X		

Table 2 - ANSP reporting periods.

REGION	LABEL FOR GRAPHICS	REPORTING PERIOD
Africa	ATNS	Apr 2019 – Mar 2020
	KCAA	Jul 2019 – Jun 2020
Americas	EANA	Jan 2019 – Dec 2019
	FAA-ATO	Oct 2018 – Sep 2019
	NAV CANADA	Sep 2018 – Aug 2019
Asia Pacific	AEROTHAI	Oct 2018 - Sep 2019
	AAI	Apr 2019 – Mar 2020
	Airservices	Jul 2018 – Jun 2019
	Airways NZ	Jul 2019 – Jun 2020
	CAAS	Apr 2019 – Mar 2020
	JANS	Apr 2019 – Mar 2020
Europe	Albcontrol	Jan 2019 – Dec 2019
	ANA	Jan 2019 – Dec 2019
	ANS CR	Jan 2019 – Dec 2019
	ANS Finland	Jan 2019 – Dec 2019
	ARMATS	Jan 2019 – Dec 2019
	Austro Control	Jan 2019 – Dec 2019
	Avinor (Continental)	Jan 2019 – Dec 2019
	BULATSA	Jan 2019 – Dec 2019
	Croatia Control	Jan 2019 – Dec 2019
	DCAC Cyprus	Jan 2019 – Dec 2019
	DFS	Jan 2019 – Dec 2019
	DHMI	Jan 2019 – Dec 2019
	DSNA	Jan 2019 – Dec 2019
	EANS	Jan 2019 – Dec 2019
	ENAIRE	Jan 2019 – Dec 2019
	ENAV	Jan 2019 – Dec 2019
	HCAA	Jan 2019 – Dec 2019
	HungaroControl	Jan 2019 – Dec 2019
	IAA	Jan 2019 – Dec 2019
	Isavia	Jan 2019 – Dec 2019

REGION	LABEL FOR GRAPHICS	REPORTING PERIOD
	LFV	Jan 2019 – Dec 2019
	LGS	Jan 2019 – Dec 2019
	LPS	Jan 2019 – Dec 2019
	LVNL	Jan 2019 – Dec 2019
	MATS	Jan 2019 – Dec 2019
	M-NAV	Jan 2019 – Dec 2019
	MOLDATSA	Jan 2019 – Dec 2019
	MUAC	Jan 2019 – Dec 2019
	NATS (Continental)	Jan 2019 – Dec 2019
	NAV Portugal (Continental)	Jan 2019 – Dec 2019
	NAVIAIR	Jan 2019 – Dec 2019
	Oro Navigacija	Jan 2019 – Dec 2019
	PANSA	Jan 2019 – Dec 2019
	ROMATSA	Jan 2019 – Dec 2019
	Sakaeronavigatsia	Jan 2019 – Dec 2019
	skeyes	Jan 2019 – Dec 2019
	skyguide	Jan 2019 – Dec 2019
	Slovenia Control	Jan 2019 – Dec 2019
	SMATSA	Jan 2019 – Dec 2019
	UKSATSE	Jan 2019 – Dec 2019
Middle East	SANS	Jan 2019 – Dec 2019

Please note the reporting periods are also displayed in diagrammatical format in Annex 1, Figure 29.

Table 3 – Participating ANSPs' IFR flight hours

ANSP	TOTAL IFR FLIGHT HOURS 2019 (CONTINENTAL)	GROWTH IFR FLIGHT HOURS (CONTINENTAL)	TOTAL IFR FLIGHT HOURS 2019 (OCEANIC)	GROWTH IFR FLIGHT HOURS (OCEANIC)
FAA-ATO	25,417,993	2%	2,224,413	4%
AAI	3,691,293	-1%		
NAV CANADA	3,168,030	0%	653,566	4%
DSNA	2,483,703	1%		
JANS	2,447,285	2%		
ENAIRE	1,636,713	4%		
NATS (Continental)	1,550,815	1%		
DFS	1,546,512	1%		
DHMI	1,483,924	1%		
ENAV	1,204,689	6%		
AEROTHAI	865,276	0%		
MUAC	667,596	0%		
HCAA	618,921	6%		
PANSA	512,417	5%		
CAAS	461,291	-3%		
LFV	453,741	-2%		
NAV Portugal (Continental)	434,709	3%		
EANA	433,116	1%		
ROMATSA	396,664	1%		
Avinor (Continental)	363,915	0%		
skyguide	362,254	1%		
Austro Control	342,224	5%		
IAA	319,777	1%		
BULATSA	294,771	1%		
SMATSA	288,319	5%		
HungaroControl	281,554	0%		
ANS CR	278,720	-1%		
ATNS	271,571	-6%	5,583	-52%
Croatia Control	264,056	9%		

ANSP	TOTAL IFR FLIGHT HOURS 2019 (CONTINENTAL)	GROWTH IFR FLIGHT HOURS (CONTINENTAL)	TOTAL IFR FLIGHT HOURS 2019 (OCEANIC)	GROWTH IFR FLIGHT HOURS (OCEANIC)
NAVIAIR	229,977	3%		
Airways NZ	211,262	-20%	101,099	-20%
UKSATSE	198,147	8%		
DCAC Cyprus	196,404	5%		
LVNL	174,562	2%		
ANS Finland	127,118	2%		
skeyes	115,863	-2%		
KCAA	111,579	25%		
LPS	111,298	-1%		
LGS	91,367	3%		
MATS	89,547	5%		
EANS	76,461	-1%		
Oro Navigacija	70,684	6%		
Slovenia Control	63,469	7%		
Sakaeronavigatsia	50,017	-9%		
Albcontrol	47,384	8%		
M-NAV	37,681	16%		
ANA	28,738	0%		
Isavia	27,884	-16%	277,750	-5%
ARMATS	17,600	-4%		

# 2019 PERFORMANCE DATA

The following section presents 2019 performance data and 2015-2019 trend data for both continental and oceanic activities in line with the *CANSO ANS Performance Framework* levels 1-3 (see page 62).

## CONTINENTAL COST EFFICIENCY AND PRODUCTIVITY: 2019

### 2019 Continental – Cost efficiency

**Indicator 1: Cost per IFR hour (USD)** (Formula: Total costs / IFR flight hours)

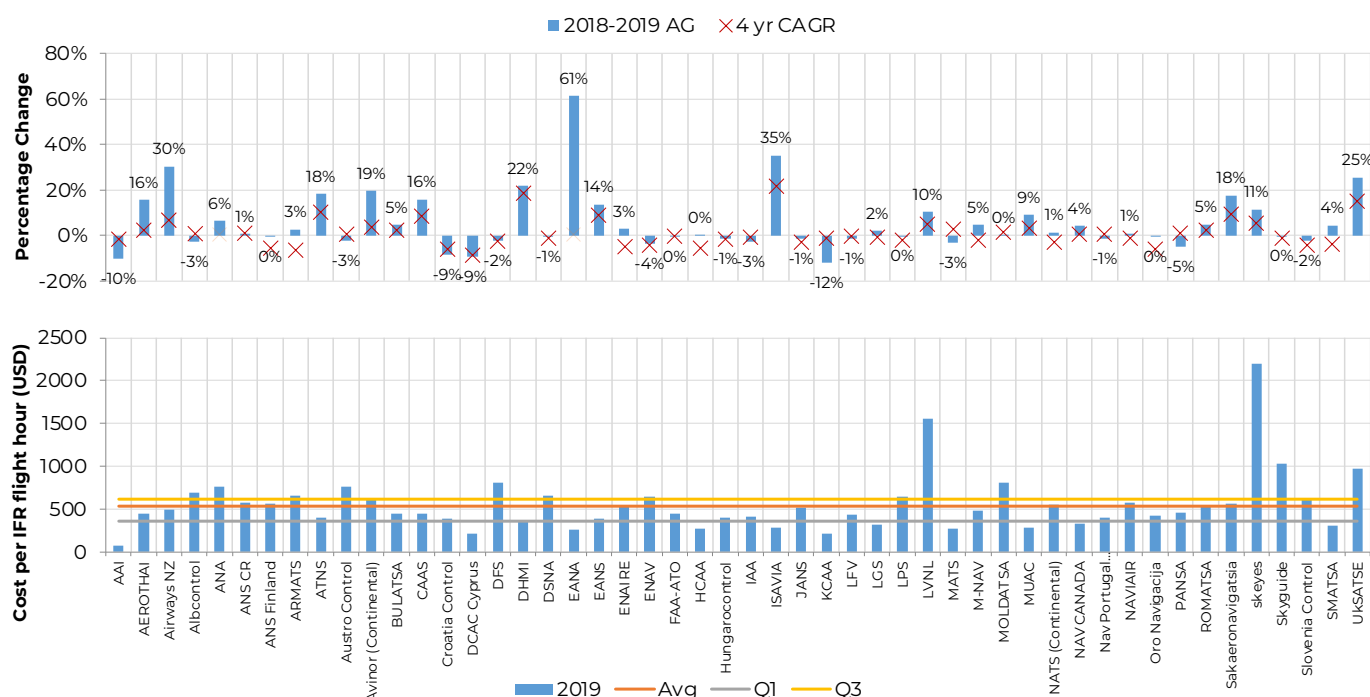


Figure 8 - Cost per IFR flight hour (USD)

The 2019 average cost per IFR flight hour is USD 548. All ANSPs submitting continental data for 2019 did so for 2018; the 2018 average was USD 522. Revenue expenditure and financial market conditions caused total costs to rise for some ANSPs, while changes in traffic impacted IFR flight hours.

It should be noted that differences between the operational characteristics of ANSPs' airspaces may significantly influence their 'Cost per IFR flight hour'. For example, skeyes and LVNL have delegated control of their upper airspace to MUAC. skeyes and LVNL therefore

have a higher 'Cost per IFR flight hour', than if they would also control the upper airspace, because the traffic is generally more complex in lower airspace. MUAC, meanwhile, make use of infrastructure provided by skeyes and LVNL which reduces its 'Cost per IFR flight hour'. Furthermore, since the upper airspace does not include VFR flights, MUAC's ATCO in OPS productivity is fully reflected in this KPI, while the values for skeyes and LVNL does include VFR workload, which reduces the ATCO in OPS productivity.

Specific ANSP comments are outlined below.



### **AEROTHAI (Thailand)**

AEROTHAI experienced an increase in total cost outweighing the increase in traffic due to employment cost adjustment of pension contribution (please refer to Thailand LABOUR PROTECTION ACT (NO.7) B.E. 2562 (2019)).

### **Airways NZ (New Zealand)**

Total cost efficiency has been impacted due to reduced flights related to the COVID-19 pandemic since Airways NZ's financial year ending 30 June 2020. There has also been an increase in staff costs due to recruitment activity, as well as wage increases resulting from the labour agreement.

### **ANA (Luxembourg)**

Increase in staff costs due to recruitment activity as well as wage increases resulting from the labour agreement – but largely impacted by reduced IFR hours due to COVID-19

### **ATNS (South Africa)**

IFR flight hours has declined by 5.6% as a result of South African Airways cancelling many regional and international sectors. Total cost has increased by 11.7% between 2018 and 2019, the bulk of which was employment cost, which rose by 9.5% between 2018 and 2019.

### **EANA (Argentina)**

Argentina faced economic crisis and devaluation of the national currency in 2019. Therefore, the annual growth rates for KPIs containing EANA's cost data will be significantly higher in this report where inflation rates have not been applied.

### **ISAVIA (Iceland)**

ISAVIA had increased total costs due to transferal of new ATM system and reduction in approach IFR hours due to collapse of WOW air (second largest airline in Iceland).

### **KCAA (Kenya)**

In 2019, KCAA introduced a new automated methodology to more accurately calculate IFR flight hours, which has resulted in a 25% increase in IFR flight hours between 2018 and 2019.

## 2019 Continental - Cost efficiency

**Indicator 2A: ATCOs in OPS employment cost per ATCO in OPS hour (USD)** (Formula: ATCOs in OPS employment costs / ATCOs in OPS hours)

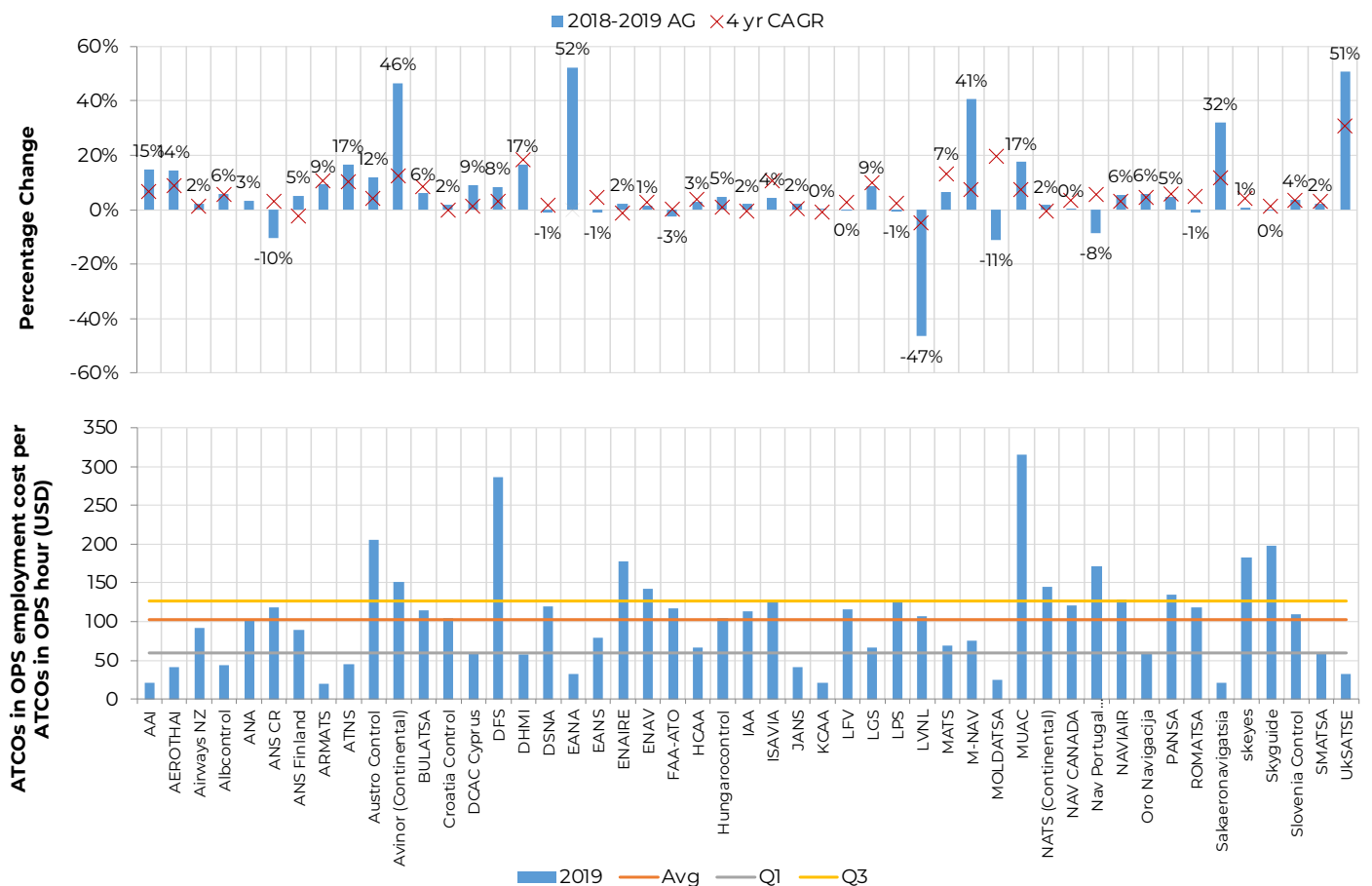


Figure 9 - ATCOs in OPS employment cost per ATCOs in OPS hour (USD)

The 2019 average ATCOs in OPS employment cost per ATCOs in OPS hour is USD 104. All ANSPs submitting continental data for 2019 did so for 2018; the 2018 average was USD 100. Specific ANSP comments are outlined below.

### AEROTHAI (Thailand)

AEROTHAI experienced an increase in ATCO in OPS employment cost due to employment cost adjustment of pension contribution (please refer to Thailand LABOUR PROTECTION ACT (NO.7) B.E. 2562 (2019)).

### Airways NZ (New Zealand)

Overall staff costs increased (with the exception of COVID-19 period) due to Airways NZ recruiting heavily in preparation for their new ATM platform and the associated training. Staff costs further increased in preparation for a pending retirement bubble due to the age profile of the Airways NZ workforce.

### Avinor (Norway)

The following justification is taken from the [ACE Report 2019](#).

Avinor faced significantly increased ATM/CNS provision costs in 2019, primarily due to the large increase in employed contributions to staff pensions which results in the increase in ATCO employment costs. The occupational pension scheme in the Norwegian Public Service Pension Fund closed on 1 January 2019 and a contribution based retirement scheme was introduced on the same date.

### EANA (Argentina)

Argentina faced economic crisis and devaluation of the national currency in 2019. Therefore the annual growth rates for KPIs containing EANA's cost data will be significantly higher in this report where inflation rates have not been applied.

## **LVNL (Netherlands)**

*The following justification is taken from the [ACE Report 2019](#).*

The large decrease in ATCO in OPS employment cost per ATCO in OPS hour is mainly due to “..the introduction of a more accurate methodology to isolate ATCOs in OPS employment costs. In previous years these costs were combined with the employment costs of ATCOs working on other duties and of ATC assistants”. As a result 2019 shows a decrease in Costs excluding ATCOs in OPS employment costs per IFR hour.

## **M-NAV (North Macedonia)**

*The following justification is taken from the [ACE Report 2019](#).*

In 2019, the unit employment costs for M-NAV employees were affected by a) increases in employer contributions to social security and pensions, and b) payment of bonuses linked to increased traffic.

## **UksATSE (Ukraine)**

*The following justification is taken from the [ACE Report 2019](#).*

The 2019 increase in staff costs mainly reflects a catch-up effect since unit employment costs had been significantly reduced in 2014, 2015 and 2016 after the traffic downturn caused by the establishment of restricted/prohibited areas in UksATSE airspace due to military conflicts in the Eastern region of Ukraine (Crimea).

## Indicator 2A: ATCOs in OPS employment cost per ATCO in OPS hour (USD) – PPP adjusted

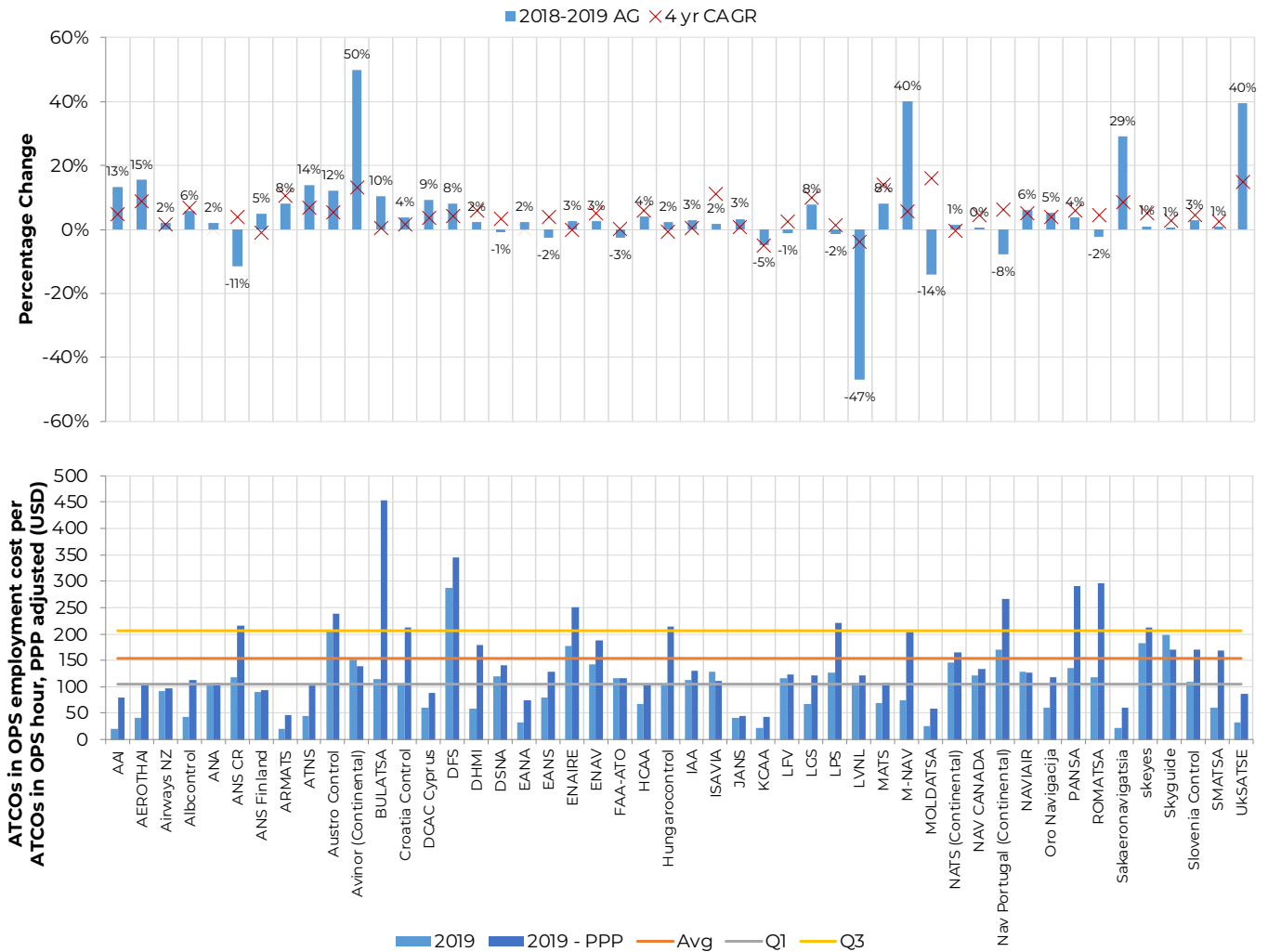


Figure 10 - ATCOs in OPS employment cost per ATCOs in OPS hour, PPP adjusted (USD)

The 2019 average ATCOs in OPS employment cost per ATCOs in OPS hour, after PPP adjustment is USD 154. All ANSPs submitting continental data for 2019 did so for 2018; the 2018 average was USD 150.

## 2019 Continental – Productivity

**Indicator 2B: ATCOs in OPS hour productivity** (Formula: IFR flight hours / ATCOs in OPS hours)

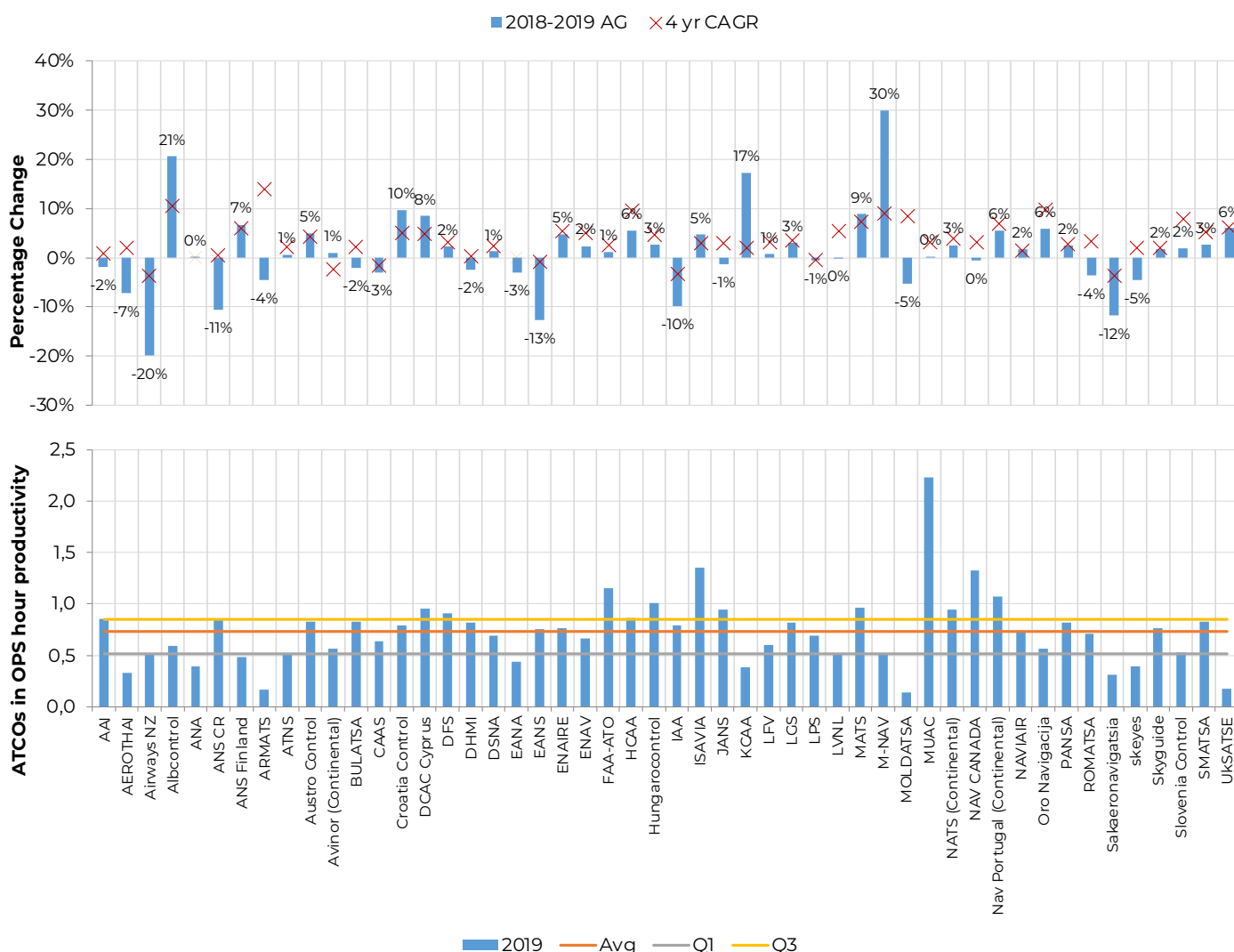


Figure 11 - ATCOs in OPS hour productivity

The 2019 average ATCOs in OPS hour productivity is 0.73. All ANSPs submitting continental data for 2019 did so for 2018; the 2018 average was 0.72.

Specific ANSP comments are outlined below.

### Albcontrol (Albania)

The following justification is taken from the [ACE Report 2019](#).

Albcontrol saw the 3rd highest increase in flight hours out of the ACE report ANSPs (+8.5%).

### Airways NZ (New Zealand)

Airways NZ's reporting year runs to June 2020, therefore the significant drop in IFR flight hours caused by the COVID-19 pandemic is leading to a decrease in ATCO in OPS hour productivity.

### ATNS (South Africa)

IFR flight hours has declined by 5.6% due to the South African national carrier cancelling many of its regional and international sectors.

### M-NAV (North Macedonia)

The following justification is taken from the [ACE Report 2019](#).

M-NAV saw the highest increase in flight hours out of the ACE report ANSPs (+15.5%).

### KCAA (Kenya)

In 2019, KCAA introduced a new automated methodology to more accurately calculate IFR flight hours, which has resulted in a 25% increase in IFR flight hours between 2018 and 2019.

## 2019 Continental - Cost efficiency

**Indicator 2C: Costs excluding ATCOs in OPS employment costs per IFR hour (USD)** (Formula: Costs excluding ATCOs in OPS employment costs / IFR flight hours)

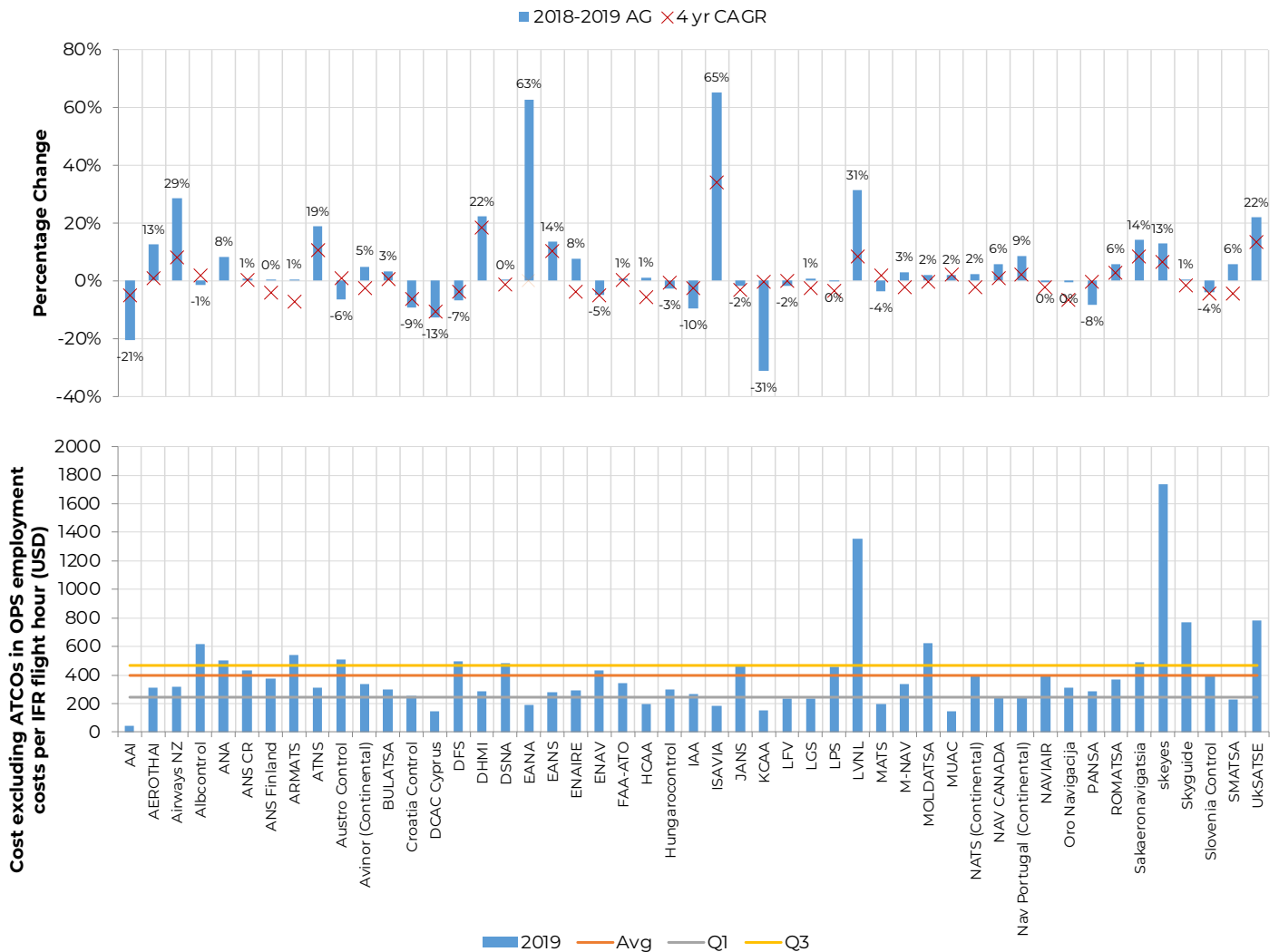


Figure 12 - Cost excluding ATCOs in OPS employment costs per IFR flight hour (USD)

The 2019 average cost excluding ATCOs in operations employment cost per IFR flight hour is USD 400. All ANSPs submitting continental data for 2019 did so for 2018; the 2018 average was USD 380.

For the same reasons stated in the description of Indicator 1 'Cost per IFR flight hour', it should be noted that differences between the operational characteristics of ANSPs' airspaces may significantly influence their 'Costs excluding ATCOs in OPS employment costs per IFR hour'.

Specific ANSP comments are outlined below.

### AEROTHAI (Thailand)

AEROTHAI experienced an increased employment cost due to an adjustment of pension contribution (please refer to Thailand LABOUR PROTECTION ACT (NO.7) B.E. 2562 (2019)).

### Airways NZ

Reduction in IFR hours due to COVID-19, as well as increased capital expenditure prior to the pandemic – new ATM platform creation, Electronic Flight strips for towers and digital tower technology development.

## **ANA**

The volume of IFR flight hours handled by ANA were stable in 2019 while other costs increased compared to the previous year. Higher other costs were mainly due to depreciation cost and new maintenance contracts.

## **ATNS**

The volume of IFR flight hours handled by ATNS declined by 5.6% as a result of SAA cancellation of many regional and international sectors.

## **EANA (Argentina)**

Argentina faced economic crisis and devaluation of the national currency in 2019. Therefore the annual growth rates for KPIs containing EANA's cost data will be significantly higher in this report where inflation rates have not been applied.

## **ISAVIA**

ISAVIA experienced increased total costs due to the transferal of ownership of a costly air traffic control system used by ISAVIA's approach services over to their newly established company Isavia ANS. Another key issue affecting ISAVIA's figures was the collapse of the second largest airliner in Iceland, WOW Air. This collapse is the reason for the considerable decrease in IFR Flight Hours in the oceanic section.

## **KCAA (Kenya)**

In 2019, KCAA introduced a new automated methodology to more accurately calculate IFR flight hours, which has resulted in a 25% increase in IFR flight hours between 2018 and 2019.

## **LVNL (Netherlands)**

*The following justification is taken from the [ACE Report 2019](#).*

In 2019, there was a large decrease in ATCO in OPS employment cost per ATCO in OPS hour due to “..the introduction of a more accurate methodology to isolate ATCOs in OPS employment costs. In previous years these costs were combined with the employment costs of ATCOs working on other duties and of ATC assistants”. As a result 2019 shows a decrease in Costs excluding ATCOs in OPS employment costs per IFR hour.

## 2019 Continental - Cost efficiency

**Indicator 2D: Proportion of total costs made up of ATCO in OPS employment costs (USD)** (Formula: ATCO in OPS employment costs/Total Costs)

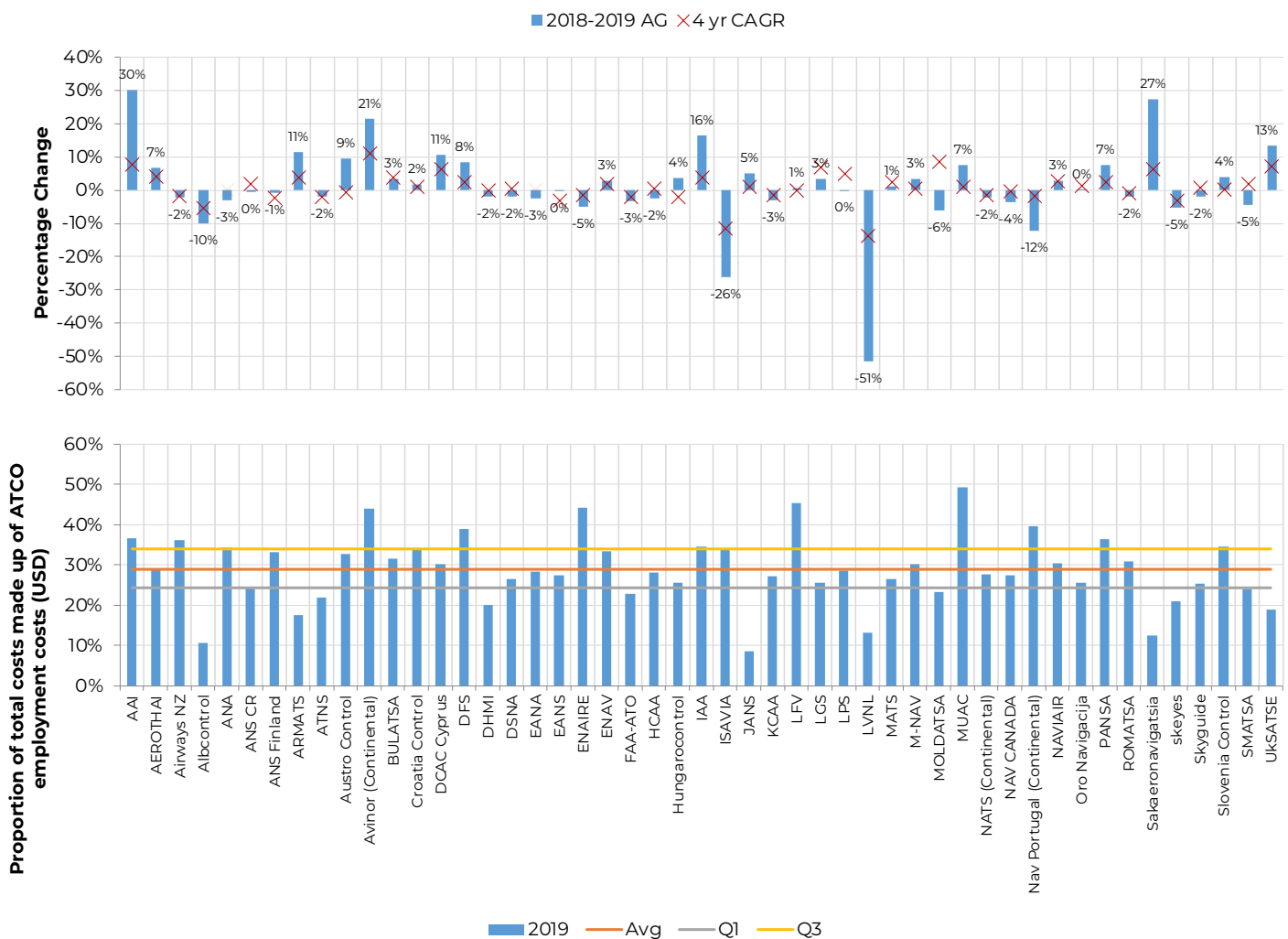


Figure 13 - Proportion of total costs made up of ATCO in OPS employment costs (USD)

In 2019, on average 29% of total ANS costs were spent on employing ATCO in OPS. All ANSPs submitting continental data for 2019 did so for 2018; the 2018 average was 29%.

Specific comments from ANSPs are below.

### AEROTHAI (Thailand)

AEROTHAI experienced an increase in total cost outweighing the increase in traffic due to employment cost adjustment of pension contribution (please refer to Thailand LABOUR PROTECTION ACT (NO.7) B.E. 2562 (2019)). This adjustment in employment cost can be seen in the increase in the proportion of ATCO in ops employment cost with respect to Total Cost (KPI 2D).

### ISAVIA (Iceland)

The proportion of ISAVIA's ATCO employment costs reduced considerably due to increased total costs as a result of a new ATM system.

### LVNL (Netherlands)

The following justification is taken from the [ACE Report 2019](#).

In 2019, there was a large decrease in ATCO in OPS employment cost per ATCO in OPS hour due to "the introduction of a more accurate methodology to isolate ATCOs in OPS employment costs. In previous years these costs were combined with the employment costs of ATCOs working on other duties and of ATC assistants".



## 2019 Continental - Cost efficiency

**Indicator 3A: Annual employment cost per ATCO in OPS (USD)** (Formula: ATCOs in OPS employment costs / No. ATCOs in OPS)

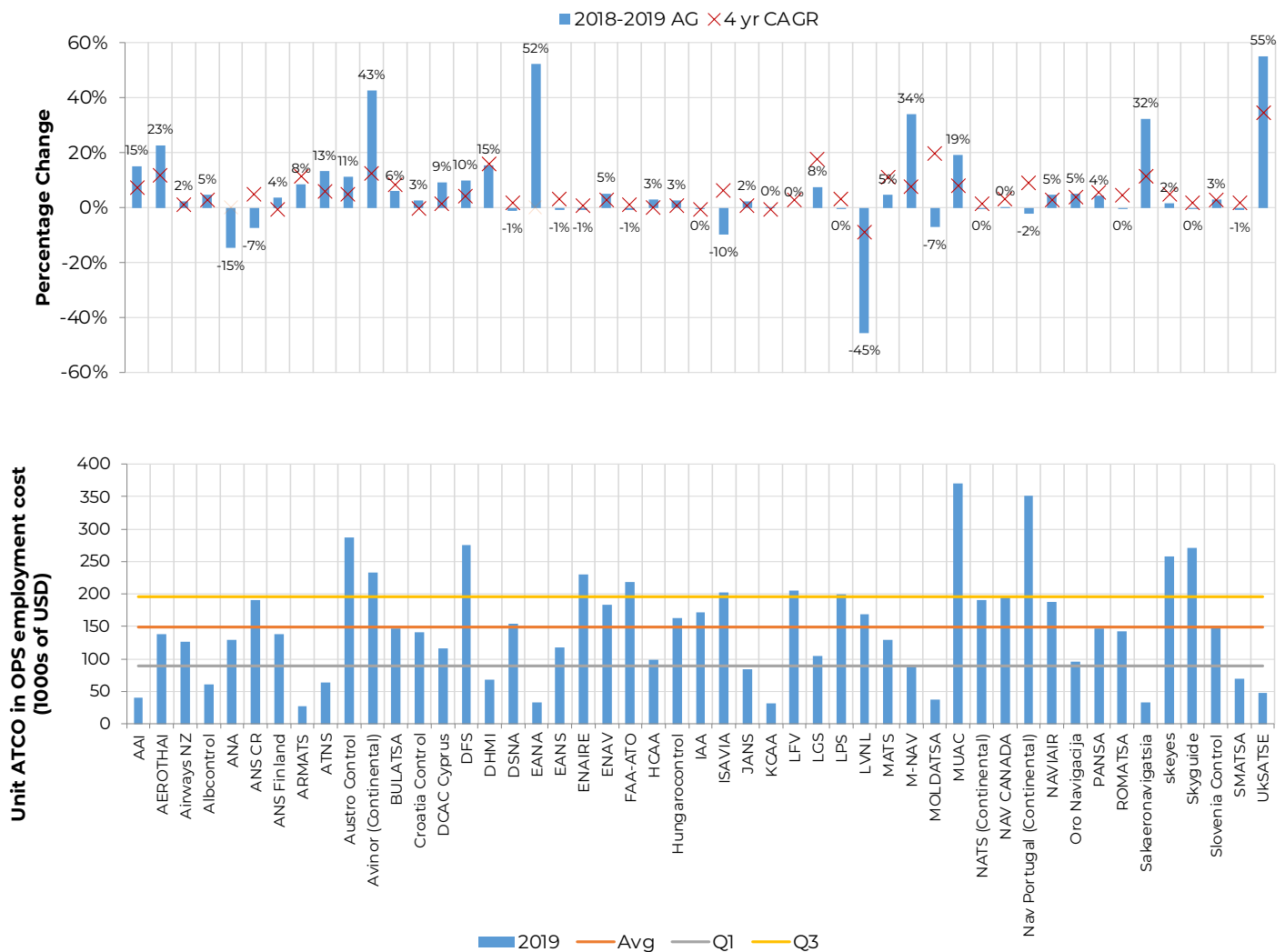


Figure 14 - Annual ATCO in OPS employment cost (USD)

The 2019 average unit ATCO in OPS employment cost is USD 149,243. All ANSPs submitting continental data for 2019 did so for 2018; the 2018 average was USD 145,942.

Specific comments from ANSPs are below:

### ANA (Luxembourg)

This KPI has decreased for ANA compared to 2018 although the total ATCO staff number has increased. The reason for this is that the increase in ANA's ATCO staff is driven by the recruitment of new trainees who don't have the same salary as the other staff who were already on a much higher level in their career.

### Avinor (Norway)

The following justification is taken from the [ACE Report 2019](#).

Avinor faced significantly increased ATM/CNS provision costs in 2019, primarily due to the large increase in employed contributions to staff pensions which results in the increase in ATCO employment costs. The occupational pension scheme in the Norwegian Public Service Pension Fund closed on 1 January 2019 and a contribution based retirement scheme was introduced on the same date.

### **EANA (Argentina)**

Argentina faced economic crisis and devaluation of the national currency in 2019. Therefore the annual growth rates for KPIs containing EANA's cost data will be significantly higher in this report where inflation rates have not been applied.

### **M-NAV (North Macedonia)**

*The following justification is taken from the [ACE Report 2019](#).*

In 2019, the unit employment costs for M-NAV employees were affected by a) increases in employer contributions to social security and pensions, and b) payment of bonuses linked to increased traffic.

### **UkSATSE (Ukraine)**

*The following justification is taken from the [ACE Report 2019](#).*

The 2019 increase in staff costs mainly reflects a catch-up effect since unit employment costs had been significantly reduced in 2014, 2015 and 2016 after the traffic downturn caused by the establishment of restricted/prohibited areas in UkSATSE airspace due to military conflicts in the Eastern region of Ukraine (Crimea).

### Indicator 3A: Annual employment cost per ATCO in OPS (USD) – PPP adjusted

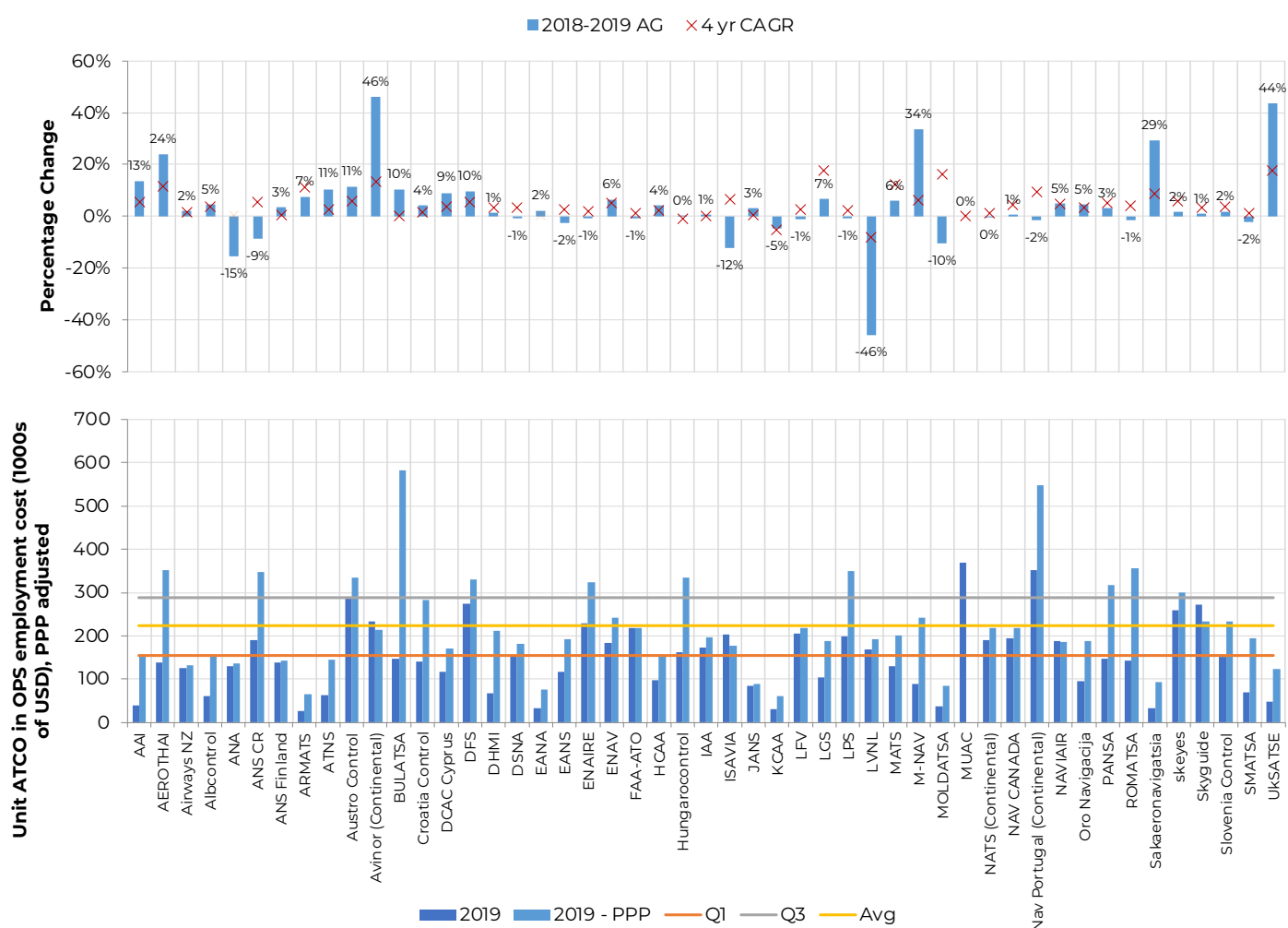


Figure 15 - Annual ATCO in OPS employment cost (USD) - PPP adjusted

The 2019 average unit ATCO in OPS employment cost, after PPP adjustment, is USD 222,798. All ANSPs submitting continental data for 2019 did so for 2018; the 2018 average was USD 217,606.

## 2019 Continental - Productivity

**Indicator 3B: Annual Working hours per ATCO in OPS** (Formula: ATCOs in OPS hours / No. ATCOs in OPS)

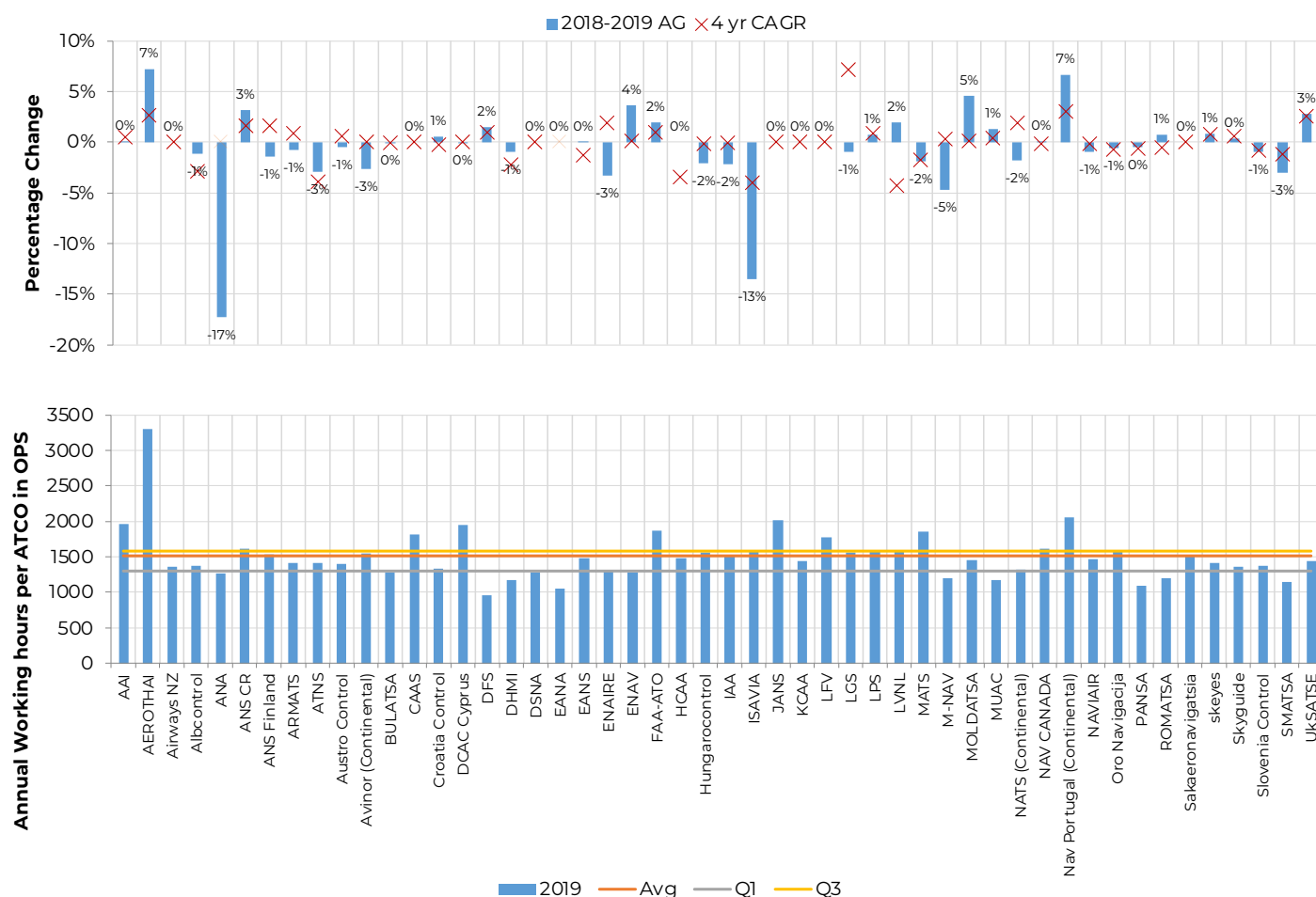


Figure 16 - Annual Working hours per ATCO in OPS

The 2019 average annual working hours per ATCO in OPS is 1,508 hours. Differences in this metric are influenced by the number of staff working full time. All ANSPs submitting continental data for 2019 did so for 2018; the 2018 average was 1,513 hours.

Specific comments from ANSPs are listed below:

### ANA (Luxembourg)

There was no change in 2019 in the total annual working hours compared to 2018. However, ANA employed more trainees to: ensure the continuity of a good level of service; replace the forthcoming pension entries; and ensure staffing of the planned third positions in TWR and APP.

### ISAVIA (Iceland)

Annual working hours decreased significantly due to collapse of the second largest airliner in Iceland (WOW Air).

## 2019 Continental - Productivity

**Indicator 3C: Annual IFR hours per ATCO in OPS** (Formula: IFR flight hours / No. ATCOs in OPS)

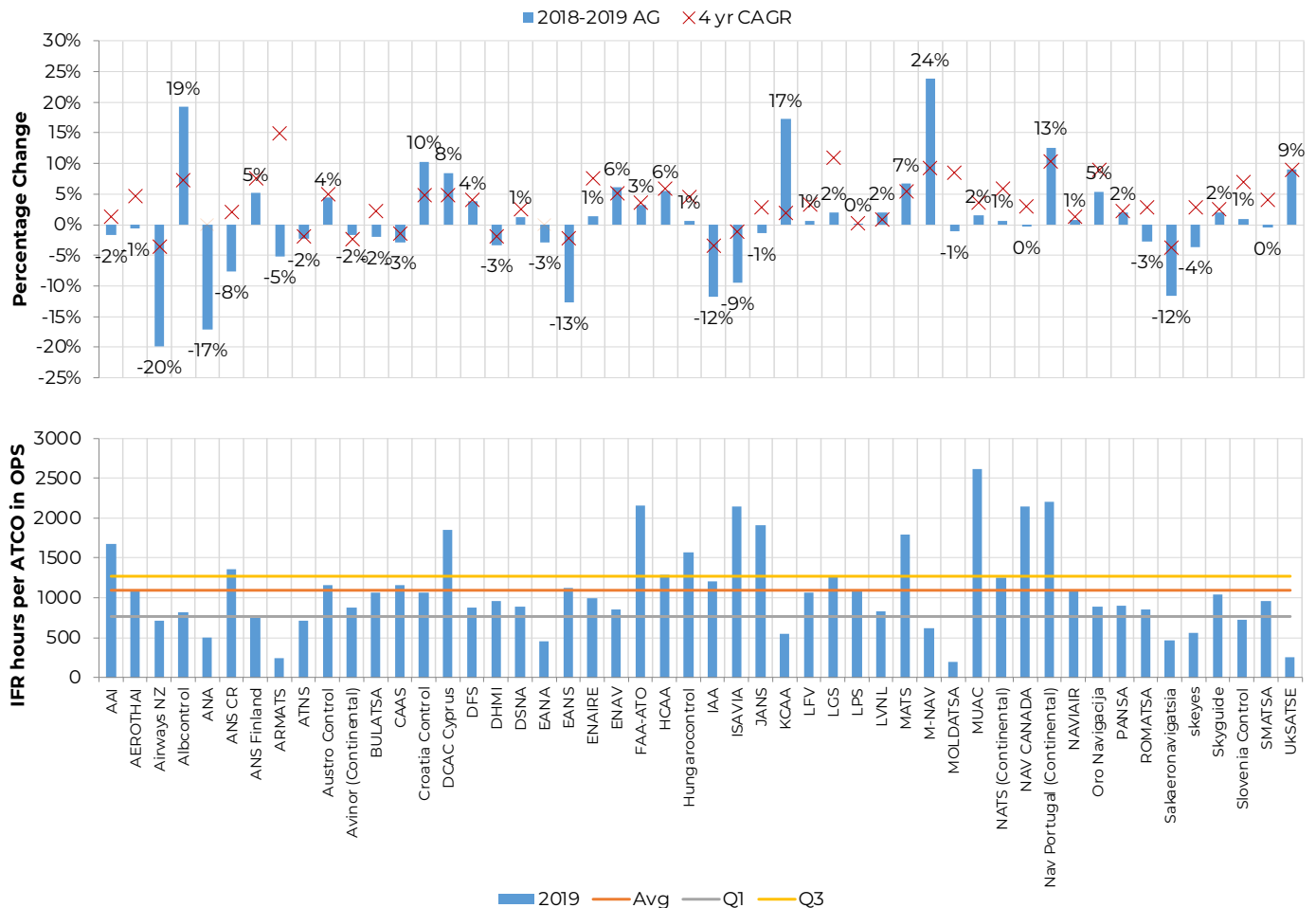


Figure 17 - IFR hours per ATCO in OPS

The 2019 average annual IFR hours per ATCO in OPS was 1,095 hours. All ANSPs submitting continental data for 2019 did so for 2018; the 2018 average was 1,090.

Specific comments from ANSPs are listed below:

### Airways NZ (New Zealand)

The drop in IFR hours per ATCO in OPS for Airways NZ in 2019 can be explained by the decrease in traffic as a result of COVID, noting that Airways NZ's data was measured between July 2019 and June 2020.

### ATNS (South Africa)

IFR flight hours has declined by 5.6% and in respect of Oceanic the reduction in IFR flights hours was almost 50%, and this was as a result of SAA cancellation of many regional and international sectors.

### KCAA (Kenya)

In 2019, KCAA introduced a new automated methodology to more accurately calculate IFR flight hours, which has resulted in a 25% increase in IFR flight hours between 2018 and 2019.

## 2019 Continental - Productivity

**Indicator 3D: Ratio of Frontline Service Staff to ATCO in OPS** (Formula: No. Frontline Service Support Staff / No. ATCOs in OPS)

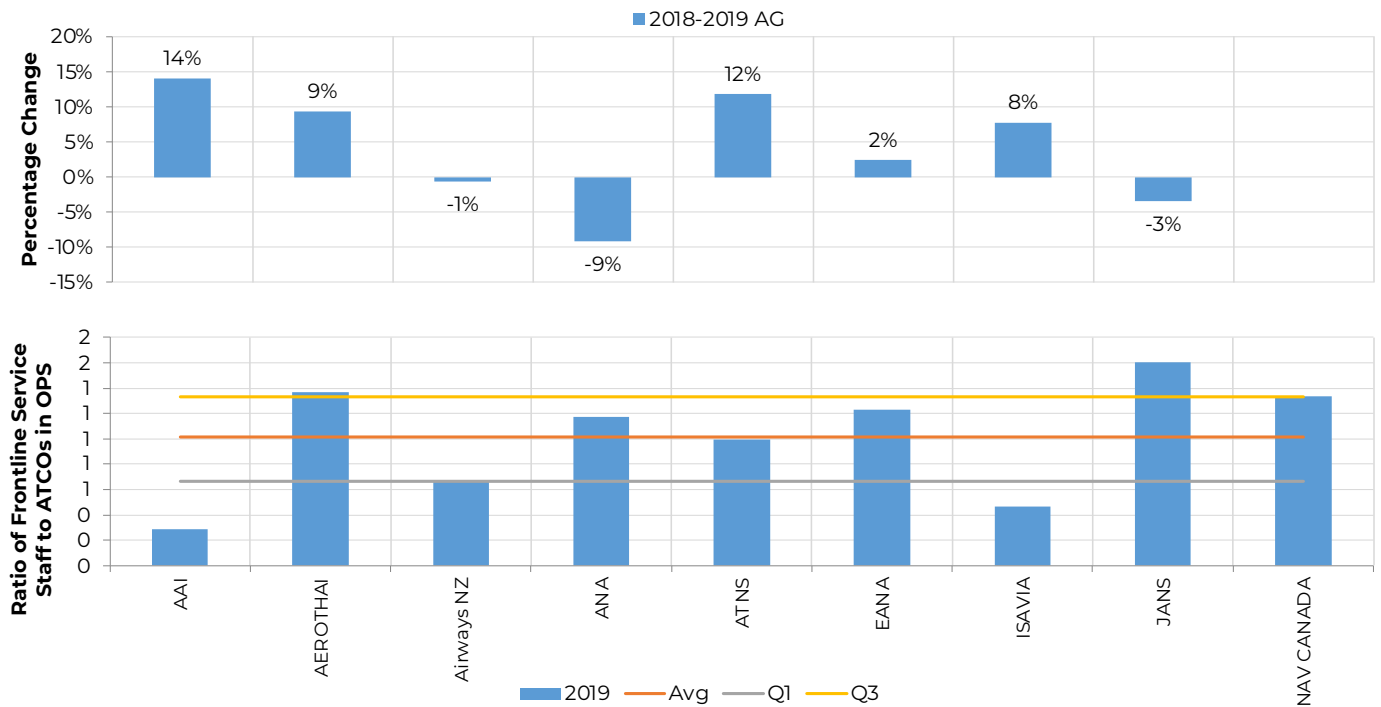


Figure 18 - Ratio of frontline service staff to ATCO in OPS

The 2019 average ratio of frontline service staff to ATCO in OPS is 1.01. The 2019 average of only the ANSPs that submitted for 2019 and 2018 is 1.01, an increase compared to 0.85 in 2018. Please note there is no four year CAGR data points for this KPI because ANSPs have only submitted frontline service staff data in 2018 and 2019.

# OCEANIC COST EFFICIENCY AND PRODUCTIVITY: 2019

## 2019 Oceanic - Cost efficiency

**Indicator 1: Cost per IFR flight hour (USD)** (Formula: Total costs / IFR flight hours)

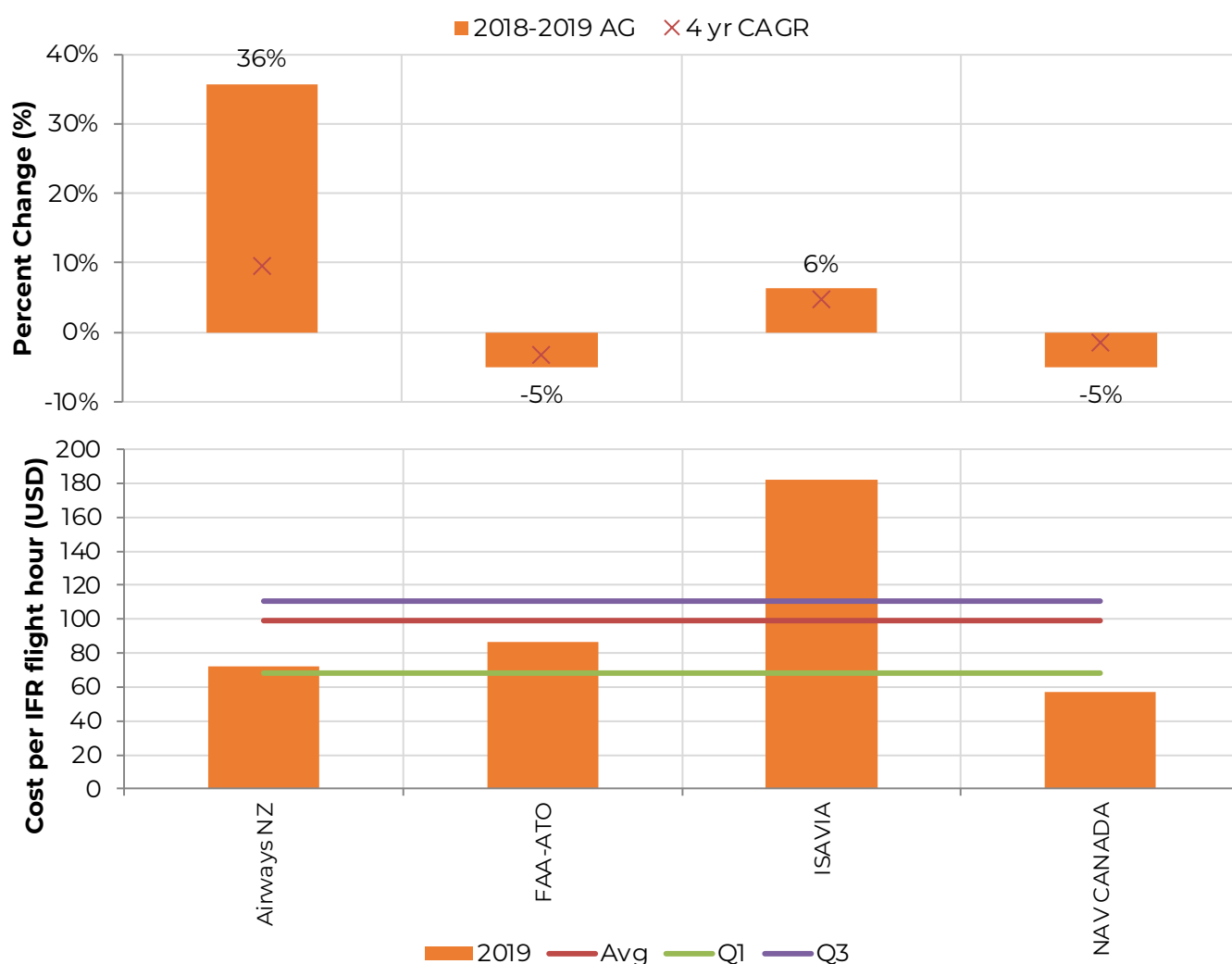


Figure 19 - Cost per IFR flight hour (USD)

The 2019 average cost per IFR flight hour is USD 99; for comparison, this figure for continental flights is USD 547. All ANSPs submitting oceanic data for 2019 did so for 2018; the 2018 average for these ANSPs was 94 USD.

Specific comments from ANSPs are listed below:

### Airways NZ (New Zealand)

Just prior to this year (see page 30 of the ANSP View 2019 <sup>7</sup>) Airways NZ reorganised their airspace; some continental airspace was moved from Christchurch ACC to Auckland ACC, when previously the Auckland ACC was predominately Oceanic operations. Airways NZ are therefore in a situation where the IFR hours is correctly split between continental and oceanic, but the people (and costs) haven't been fully split out yet. This results in Oceanic ANS showing more people and continental less than really should be attributed. The change seen, however, is mostly due to reduced IFR hours as a result of COVID-19 and wage increases.

<sup>7</sup> Available on the GBWG page of [myCANSO](#), under Publications.

## 2019 Oceanic - Cost efficiency

**Indicator 2A: ATCOs in OPS employment cost per ATCOs in OPS hour (USD)** (Formula: ATCOs in OPS employment costs / ATCOs in OPS Hours)

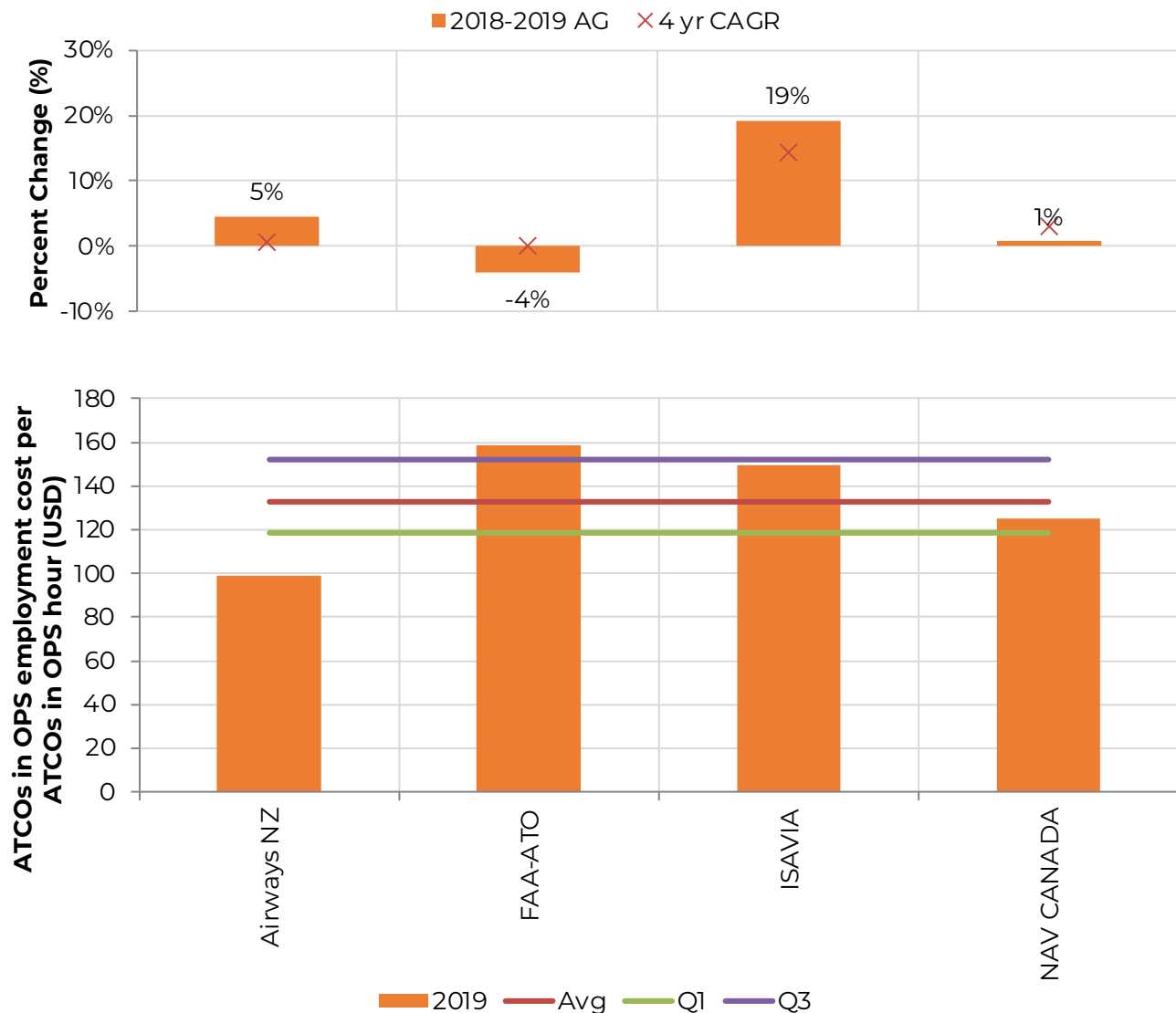


Figure 20 - ATCOs in OPS employment per ATCOs in OPS hour (USD)

The 2019 oceanic average employment cost per ATCO in OPS hour is USD 133. For comparison, the 2019 figure for continental airspace is USD 104. All ANSPs submitting oceanic data for 2019 did so for 2018; the 2018 average was USD 127.

Specific comments from ANSPs are listed below:

### ISAVIA (Iceland)

Total ATCO employment cost decreased for ISAVIA as did the working hours but IFR hours did not decrease in the same proportion leading to the result that ATCO employment cost per IFR flight hour as a ratio increased.



## Indicator 2A: ATCOs in OPS employment cost per ATCOs in OPS hour (USD) – PPP adjusted

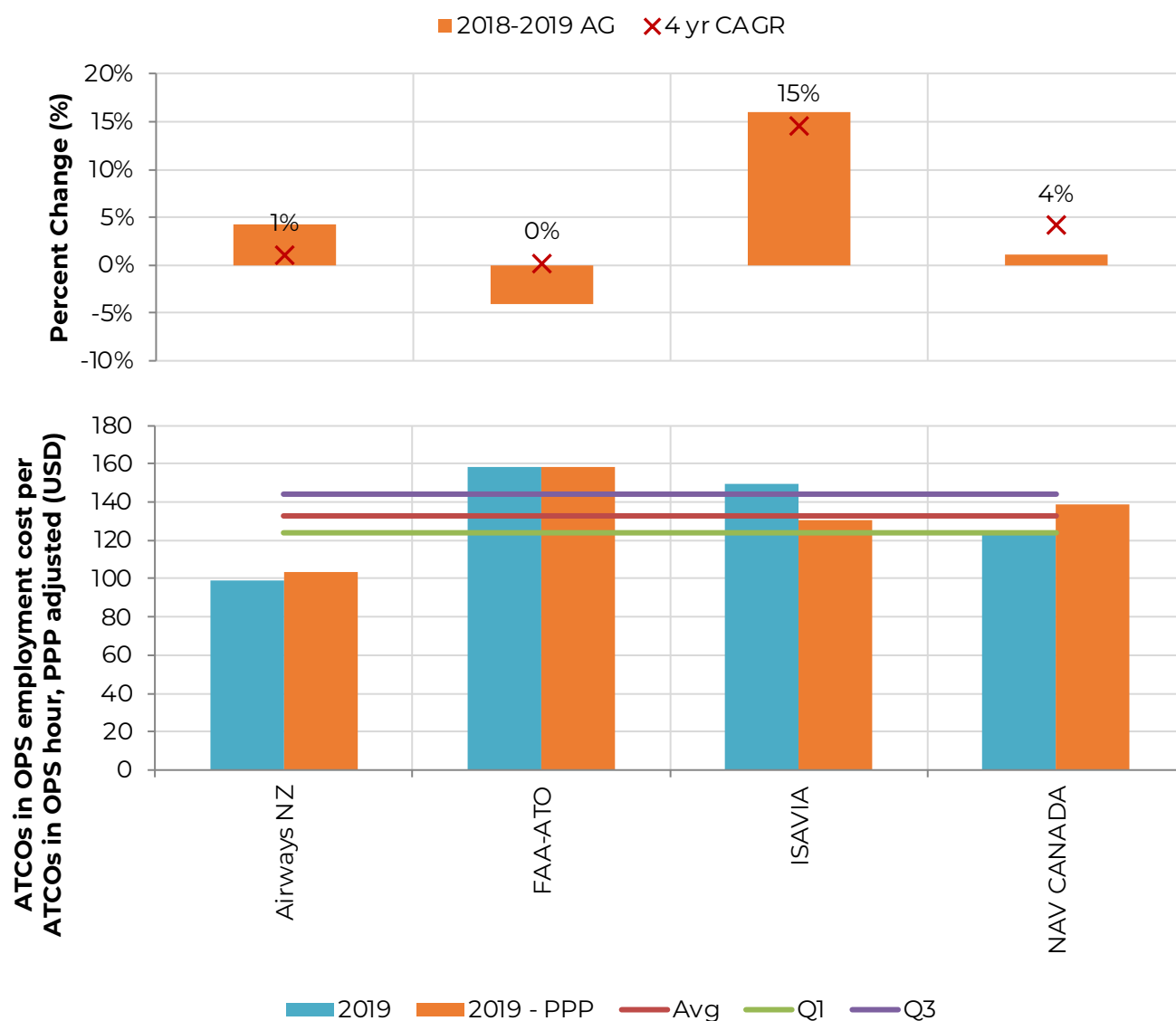


Figure 21 - ATCOs in OPS employment per ATCOs in OPS hour (USD) - PPP adjusted

The 2019 oceanic average employment cost per ATCO (PPP Adjusted) in OPS hour is USD 133, the average figure for continental airspace is USD 154. All ANSPs submitting oceanic data for 2019 did so for 2018; the 2018 average was USD 129.

## 2019 Oceanic – Productivity

**Indicator 2B: ATCOs in OPS hour productivity** (Formula: IFR flight hours / ATCOs in OPS Hours)

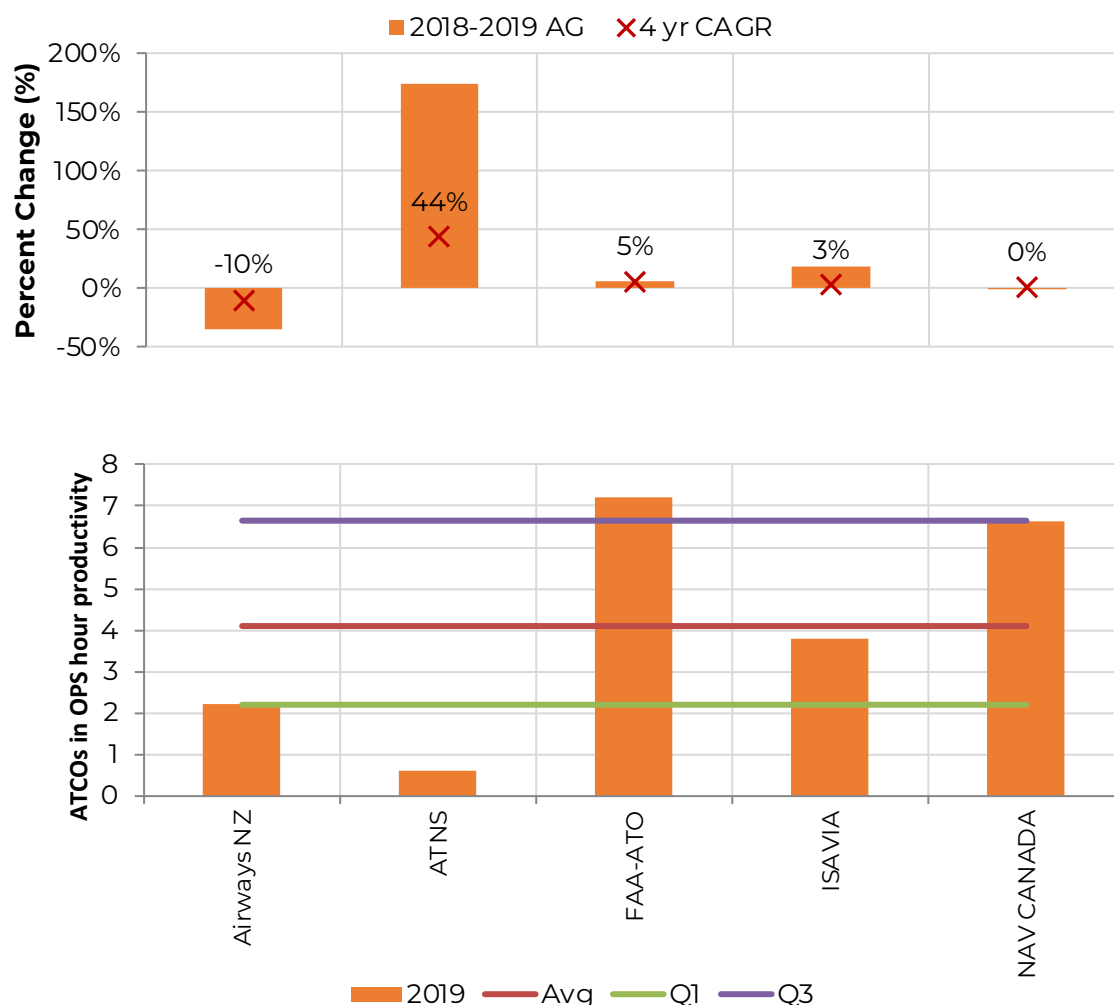


Figure 22 - ATCOs in OPS hour productivity

The 2019 average ATCOs in OPS hour productivity is 4.09 IFR flight hours per ATCO in OPS hours, significantly higher than the continental figure of 0.73. All ANSPs submitting oceanic data for 2019 did so for 2018; the 2018 average is 4.07, showing a slight increase for 2019.

Specific comments from ANSPs are listed below:

### Airways NZ

Just prior to this year (see page 30 of the ANSP View 2019<sup>8</sup>) Airways NZ reorganised their airspace; some continental airspace was moved from Christchurch ACC to Auckland ACC, when previously the Auckland ACC was predominately Oceanic operations.

Airways NZ are therefore in a situation where the IFR hours is correctly split between continental and oceanic, but the people (and costs) haven't been fully split out yet. This results in Oceanic ANS showing more people and continental less than really should be attributed. The change seen, however, is mostly due to reduced IFR hours as a result of COVID-19.

### ATNS

While ATNS are not able to submit oceanic costs, they have provided productivity figures, hence their inclusion in this KPI.

IFR flight hours handled by ATNS declined by almost 50% as a result of SAA cancelling many of its regional and international sectors. ATCO in OPS also dropped by 82% due to the impact of the pandemic.

<sup>8</sup> Available on the GBWG page of [myCANSO](#), under Publications.

## 2019 Oceanic - Cost efficiency

**Indicator 2C: Costs excluding ATCOs in OPS employment costs per IFR hour (USD)** (Formula: IFR flight hours / ATCOs in OPS Hours)

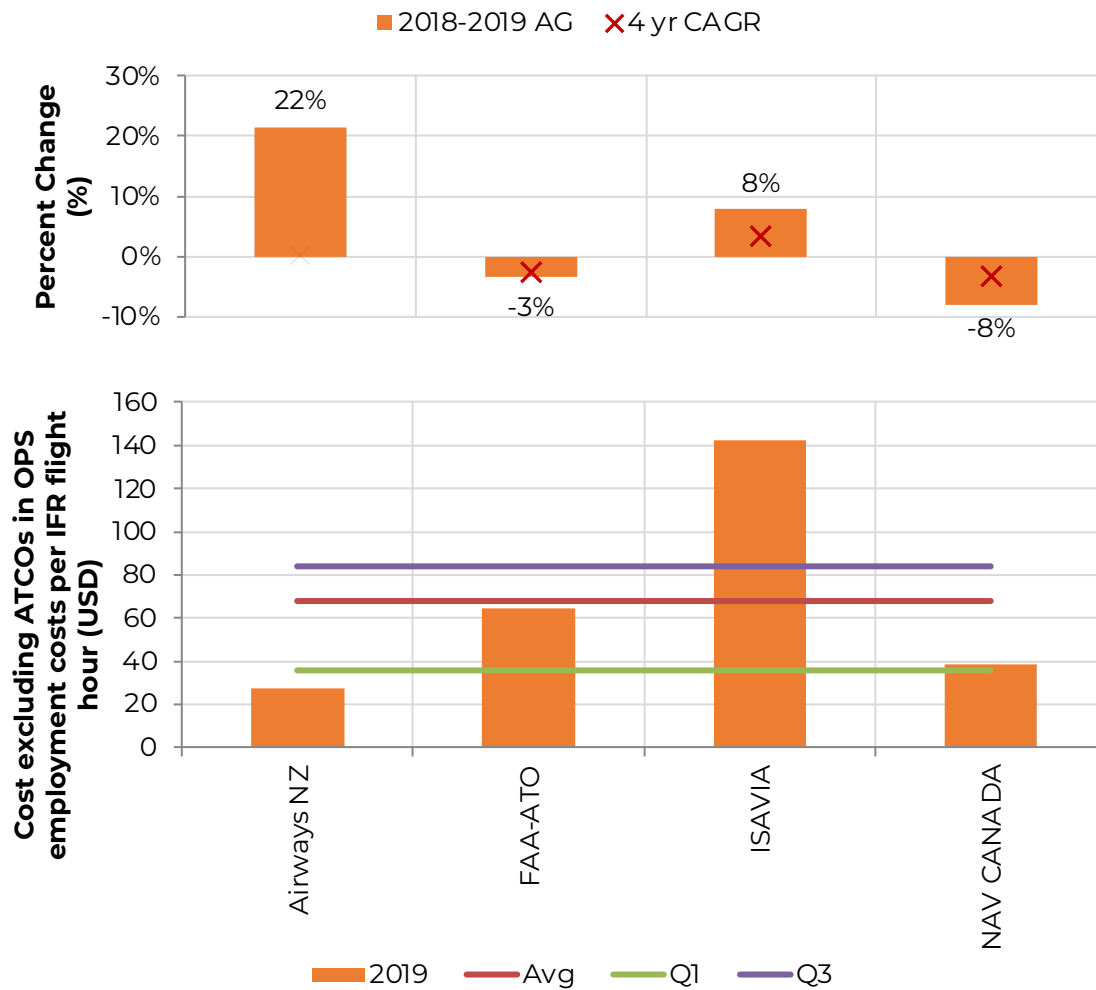


Figure 23 - Cost excluding ATCOs in OPS employment costs per IFR flight hour (USD)

The 2019 average cost excluding ATCOs in operations employment cost per IFR flight hour is USD 68. All ANSPs submitting oceanic data for 2019 did so for 2018; the 2018 average was 66.

Specific comments from ANSPs are listed below.

### Airways NZ (New Zealand)

Significant drop in this metric is due to the drop in traffic as a result of COVID-19.

## 2018 Oceanic - Cost efficiency

### Indicator 2D: Proportion of total costs made up of ATCO in OPS employment costs (USD)

(Formula: ATCO in OPS employment costs/Total Costs)

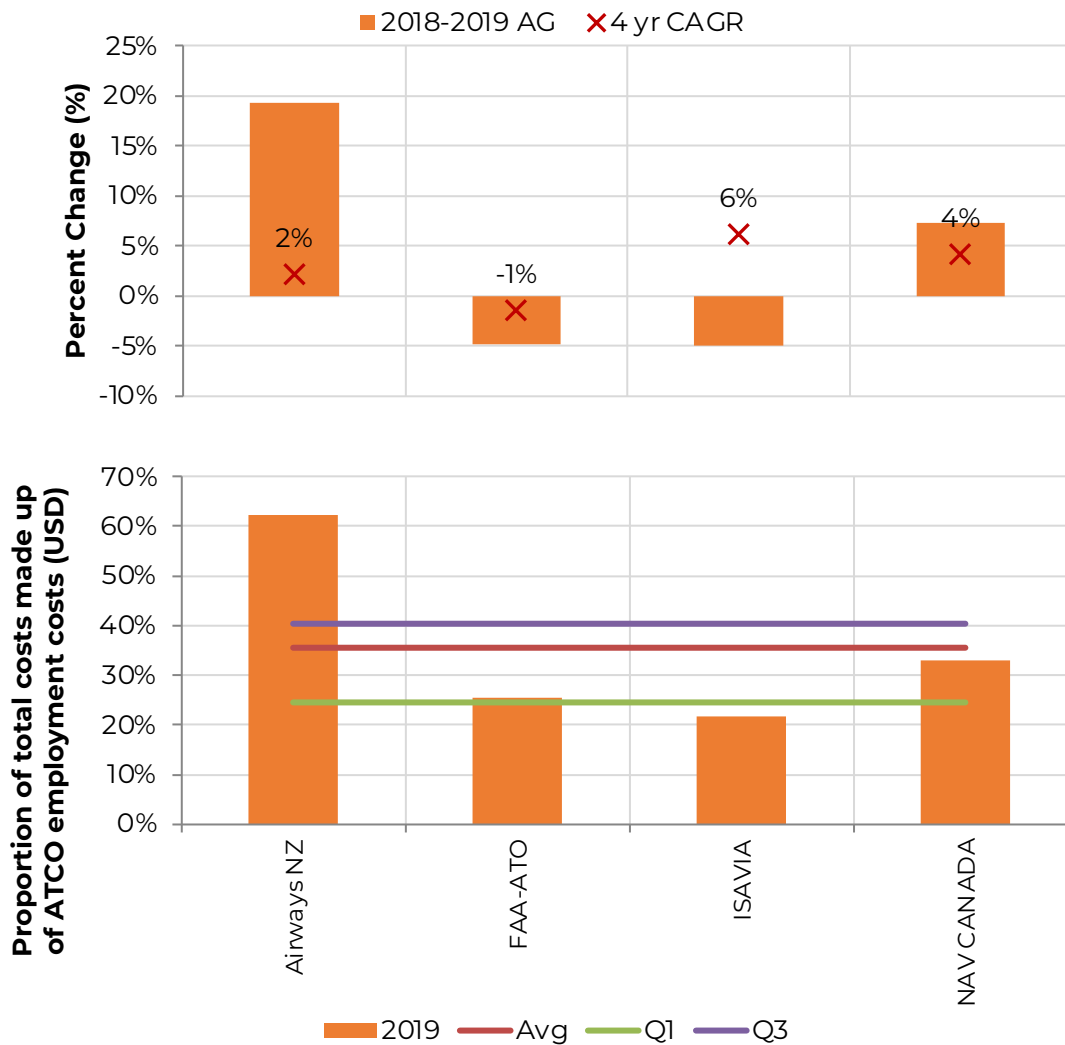


Figure 24 - Proportion of total costs made up of ATCO in OPS employment costs (USD)

The 2019 average for the proportion of total costs made up of ATCO in OPS employment costs is 36%. All ANSPs submitting oceanic data for 2019 did so for 2018; the 2018 average was 29%.

Specific comments from ANSPs are listed below:

#### Airways NZ (New Zealand)

Some continental costs within oceanic figures were unable to be extracted as part of moving a sector of airspace from Christchurch ACC to Auckland ACC, where Auckland ACC was predominantly oceanic operations.

## JOINT CONTINENTAL AND OCEANIC COST EFFICIENCY: 2019

### 2019 Continental and Oceanic - Cost efficiency

**Indicator CO1: Cost per IFR hour (USD)** (Formula: Total costs / IFR flight hours)

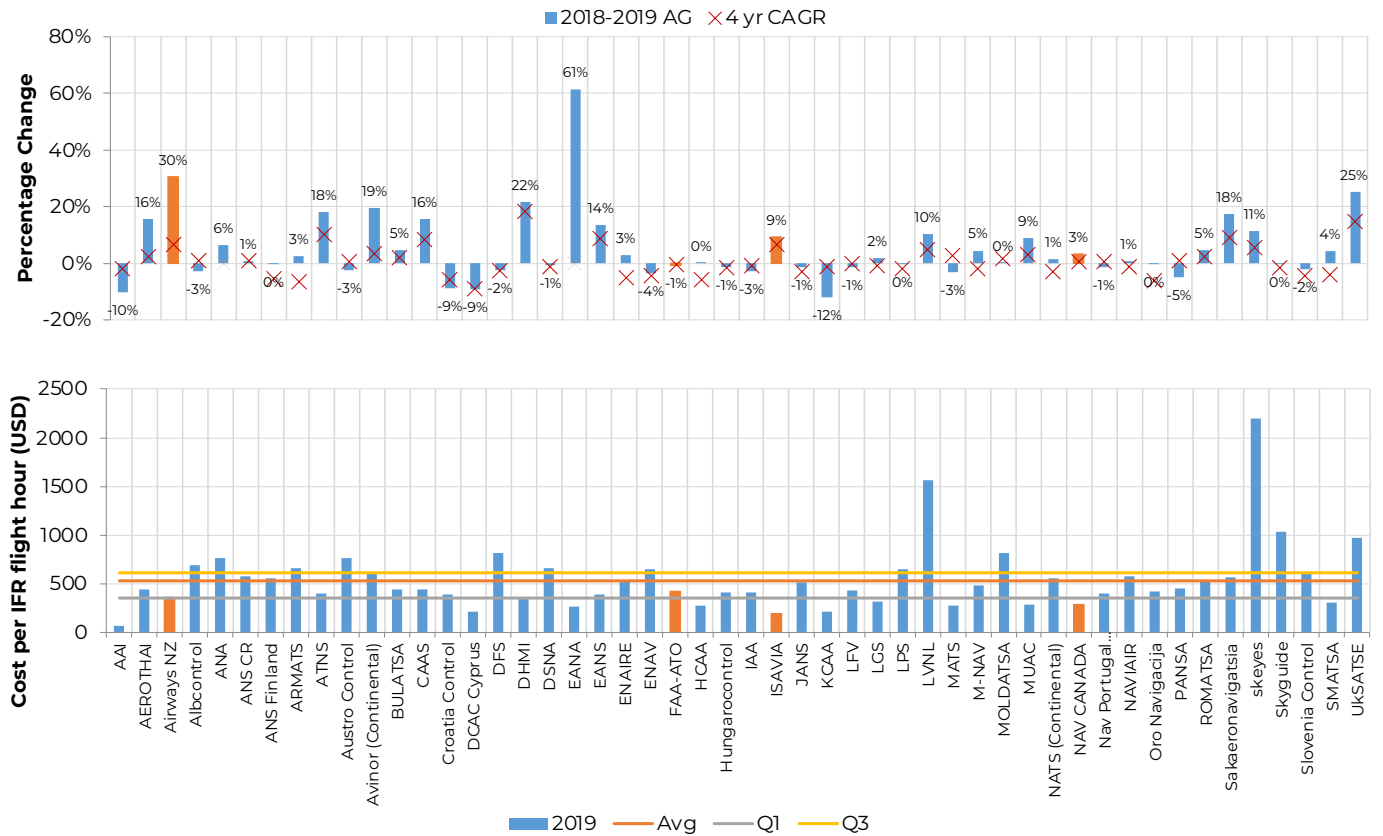


Figure 25 - Cost per IFR flight hour (USD)

The 2019 average cost per IFR flight hour is USD 542. All ANSPs that submitted in 2019 did so in 2018; the 2018 average was USD 518.

## 2019 Continental and Oceanic - Cost efficiency

**Indicator CO2D: Employment cost of ATCOs in OPS as a percentage of total costs** (Formula: ATCOs in OPS employment costs / Total costs)

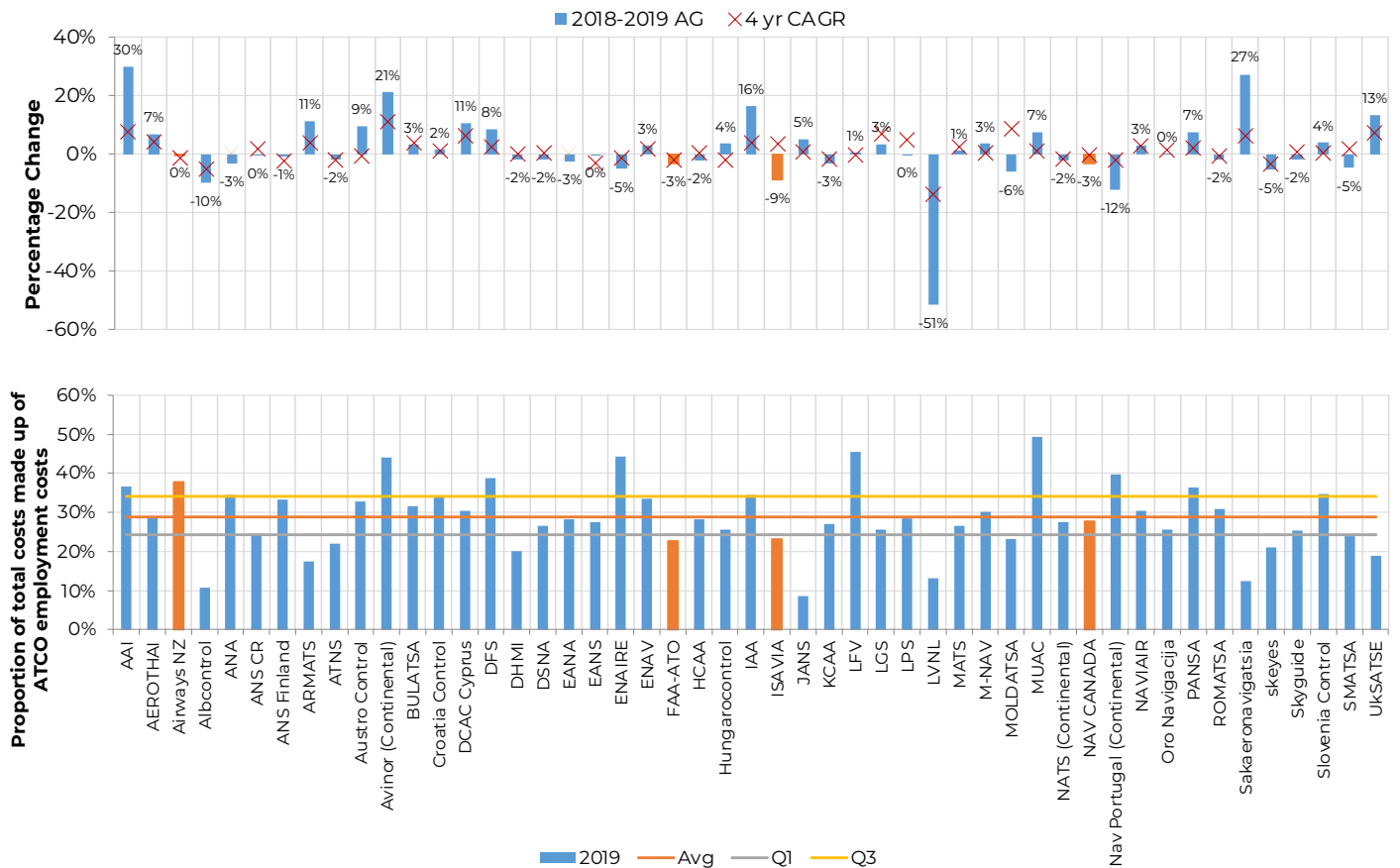


Figure 26 - Employment cost of ATCOs in OPS as a percentage of total cost

The 2019 average employment cost of ATCOs in OPS as a percentage of total costs is 29%. All ANSPs that submitted data in 2019 did so in 2018; the 2018 average was 28%.

## SUMMARY OF PERFORMANCE TRENDS

### Key findings:

- Increases in costs outweighed increases in traffic in 2019, in contrast to 2018.
- Increases in employment costs were consistent with those recorded in the last two years.
- The rate of ATCO productivity increase slowed in 2019.
- In contrast to the previous two years, costs excluding ATCO in OPS employment costs per IFR flight hour increased for the majority of ANSPs.

In an industry that is today still experiencing the impacts of the COVID-19 pandemic, 2019 is regularly referred to as a reference year for normal traffic levels. However, slowing traffic growth in 2019 resulted in a number of the key trends from previous years being reversed.

### Cost Efficiency

In the case of total cost efficiency, 57% of 52 ANSPs experienced an increase in cost per IFR flight hour, compared to only 43% in 2018, when comparing the same set of ANSPs. The rate of traffic growth fell in 2019, with combined IFR flight hours growth falling from 4.58% (2017-2018) to 1.63% (2018-2019), when comparing the same set of ANSPs.

In contrast to 2018, the majority of ANSPs also saw an increase in their 'Costs excluding ATCO in OPS employment costs' relative to traffic during 2019, which will have contributed to the observed worsening in cost efficiency. The effect of this increase will have been heightened by continued increases in ATCO costs per ATCO hour, with 75% of continental and 60% of oceanic service providers reporting an increase in this metric.

### Productivity

The proportion of ANSPs experiencing increases in ATCO productivity is significantly reduced compared to previous years: 59% of ANSPs saw an increase in their ATCO productivity when compared to 78% in 2018. It appears that the cause for this is the slowing in IFR flight hours growth and an increase in ATCO in OPS hours – total number of continental and oceanic ATCO in OPS increased 1.14% 2018-2019, compared to 0.72% between 2017-2018.

Analysis presented in the Annex 1 - Impact of COVID-19 on 2019 performance shows that six ANSPs have a financial year that extends beyond December 2019. Their data has therefore been affected by the reduced traffic caused by the pandemic.

### Cost-efficiency vs Productivity

Despite ATCO productivity growth slowing, the KPI did still increase for the majority of ANSPs. Therefore it can be deduced that the reduced cost efficiency is influenced by increasing ATCO in OPS employment costs and other costs, in the face of slowing traffic growth.

### Future performance

The impact of the COVID-19 pandemic on ANSP performance will significantly impact the results of future reports. It is very likely that the slowing of ATCO productivity and falling of cost efficiency will continue worsen as a dramatic drop in IFR flight hours is anticipated in the data of all ANSPs. Costs and ATCO hours are unlikely to fall at a proportional rate, as ANSPs have been required to keep their airspace open during the pandemic, but with severely depleted traffic.

The challenge will be to recover ATCO productivity and cost efficiency in a sustainable manner by incorporating solutions that ensure ANSPs improve their resilience to future changes in traffic demand. Resilience and cost scalability are key themes in the contextual information questions in the 2016-2020 data collection cycle, and will provide the basis for the theme of next year's report.

If you are interested in participating in next year's report or the CANSO GBWG, then please get in touch via [info@canso.org](mailto:info@canso.org).

# ANNEX 1 - IMPACT OF COVID-19 ON 2019 PERFORMANCE

During the 33rd meeting of the GBWG (GBWG/33), the group discussed how the impact of the COVID-19 pandemic on IFR flight hours will affect performance trends. While this will be more relevant to the 2016-2020 data collection cycle, a small collection of ANSPs' performance could be affected in the 2015-2019 data, where their reporting periods cross into 2020.

To summarise the extent to which 2015-2019 data is impacted, in collaboration with FAA-ATO, we have set out details of the timeline of COVID-19 in this document.

As highlighted in the participation section of the Global ANS Performance Report, the reporting periods of members' organisations are not aligned in all instances. The performance data of those ANSPs that have reporting periods running into the first part of 2020 may be impacted by the drop in traffic caused by the COVID-19 pandemic.

Figure 27 provides a view on the number of COVID-19 cases recorded across the different regions of the globe through the course of 2020. The Western Pacific Region was the first region within which there was a significant spike in recorded COVID-19 infections, beginning in late January, and peaking during the w/c 10th February. The rise of recorded infections then began to spread across the globe, with Europe noticing a significant spike in March, peaking at the start of April. Recorded cases then began to increase significantly in the Americas and Eastern Mediterranean during the month of April and May. Africa followed next, with recorded cases building to a peak during late-May and June. The last region to see a spike in recognised infections was South-East Asia, where recorded cases peaked during July and August. The number of deaths due to COVID-19 follows a similar regional pattern during 2020.

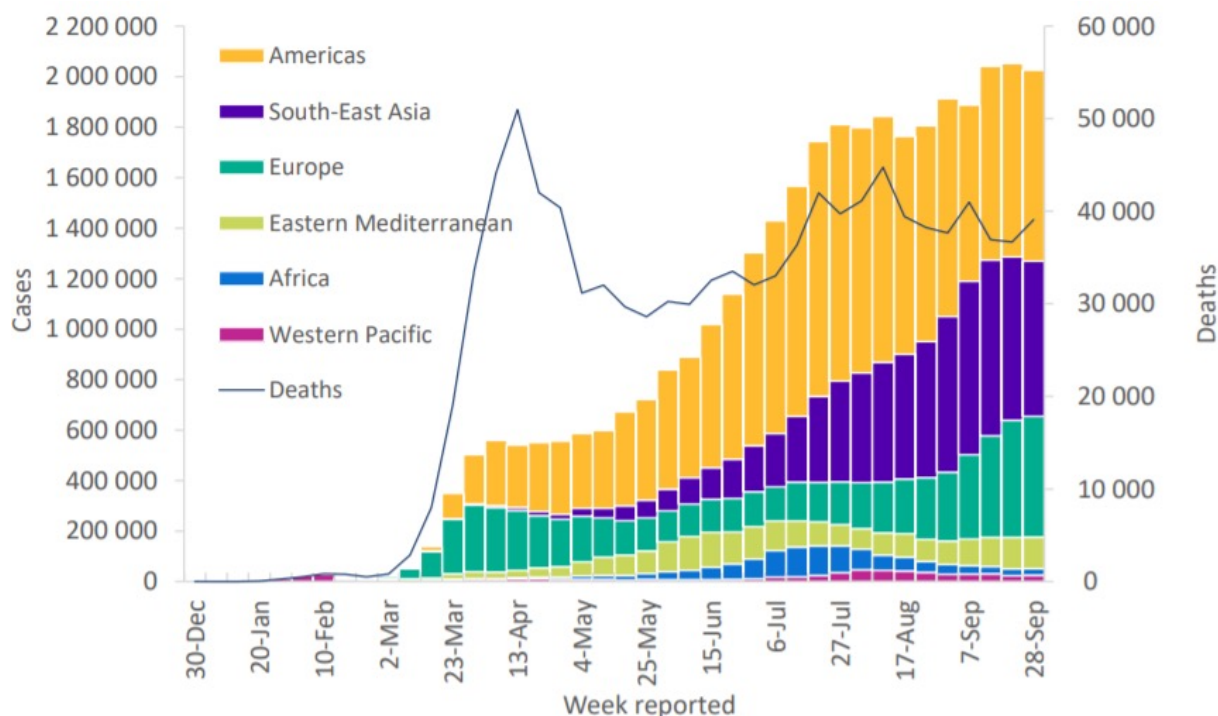


Figure 27 - Number of COVID-19 cases reported weekly by WHO Region, and global deaths, 30 December to 04 October<sup>10</sup>

<sup>9</sup> <https://www.bbc.co.uk/news/world-51235105>

<sup>10</sup> Taken from [WHO COVID-19 weekly update](#) 5th October



To some extent, aircraft movements across 2020 (as shown in Figure 28) follow a similar regional staggered pattern to the distribution of cases shown in Figure 27. Figure 28 highlights the clear reduction in aircraft movements in Asia in February, several weeks ahead of the marked traffic decreases seen in other regions (NB: the CANSO Asia Pacific region used in Figure 28 contains a subset of the countries included in the WHO's Western Pacific region<sup>11</sup>). During this initial stage of the pandemic, Europe and North America only faced minor traffic decreases, as travel bans were limited to certain routes to and from China during the early stages of the pandemic.

During March 2020, the timeframe within which aircraft movements in the remaining regions dropped was, however, far more truncated than that of the increase in number of COVID-19 cases. This reflects the sudden, and wide reaching, travel restrictions imposed by governments to prevent further infections being introduced to their respective countries through their borders at the start of the pandemic. This drop in movements also reflects the drastic shift of passenger opinion towards an avoidance of air travel to reduce the risk of catching COVID-19<sup>12</sup>.

### Percent change in movements by region

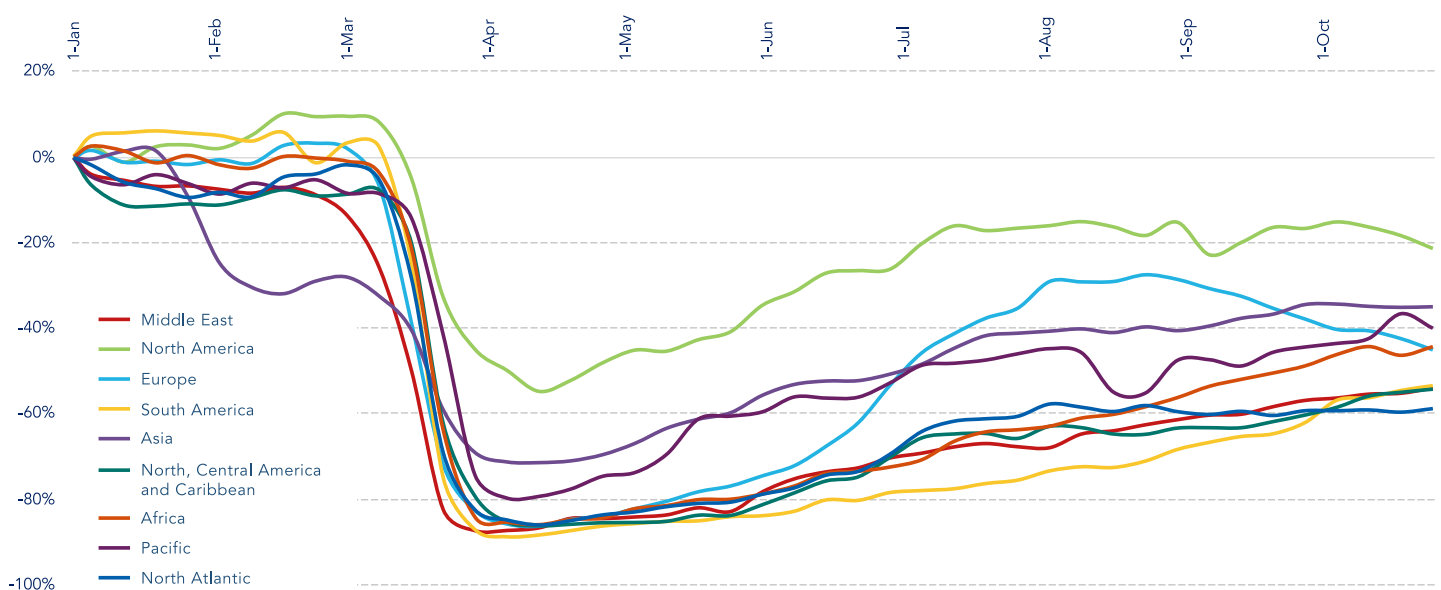


Figure 28 - Percentage change in aircraft movements by region, during 2020. Taken from [CANSO ATM Traffic Analysis Report](#) (November 2020)

There is a clear correlation between the rise in coronavirus cases globally and the unprecedented and sustained drop in traffic seen during the first months of 2020. The effect this will have had on ANSPs with regards to their performance data will be significant, notably affecting those ANSPs in Asia approximately one month earlier than others across the rest of the world.

In collaboration with FAA-ATO, we have highlighted those ANSPs' whose reporting period stretches into 2020, to identify 2019 performance data that may have been significantly affected by the impact of the COVID-19 pandemic. This must be taken into context when interpreting the trends of those affected ANSPs included in the 2019 Performance Data section.

<sup>11</sup> <https://www.who.int/countries/>

<sup>12</sup> <https://www.iata.org/en/pressroom/pr/2020-07-07-01/>

## Reporting periods and COVID-19



Figure 29 - ANSPs with reporting periods running into 2020

As part of the 'general' tab in the 2020 submissions workbook, a question regarding the potential impact of the COVID-19 on the data provided in the reference period was included. The responses for the ANSPs' in question are provided in the table below:

ANSP	Comment
AAI	"COVID-19 has had an impact on the last two months of the control period (February and March 2020)"
Airways NZ	"Significant drop in IFR hours and revenue while cost base increasing."
ATNS	"COVID-19 impacted on ATNS movements, revenue and achievement of planned projects especially for the months of February and March"
CAAS	"COVID-19 has resulted in a significant decline in IFR flight hours in February and March 2020"
JANS	"It had a big impact on IFR flight hours. In particular, IFR flight hours in March decreased by about 29% compared to the same month of previous year. I can't forecast impact but I think the 2020 KPI will decrease significantly."
KCAA	"Suspension of passenger flights due COVID-19."

The information above provides insight into where trends in the 2019 performance data are likely to be skewed due to the overlapping of some reporting periods with 2020 and thus the impacts of the COVID-19 pandemic. The findings should be noted in particular for any analyses of the performance of AAI, ATNS, CAAS and JANS, and even more so for Airways NZ and KCAA.

The 2016-2020 data collection cycle will provide a unique insight into the impact of the pandemic on ANSP performance. The Global Benchmarking Workgroup will look for opportunities for early reporting on performance trend impacts on the group's global cohort of members, and will be complemented by working discussions during GBWG/36 in October 2021.

# ANNEX 2: DATA DEFINITIONS

## CONTEXTUAL DATA ELEMENT DEFINITIONS

Data Element	Definitions
IFR hours per sq. km	This is the result of dividing the number of IFR hours for the current year of data by surface area (in square kilometres).
Sq. km – oceanic and continental	The size (the surface area) of the airspace for which an ANSP is responsible. This should include the area where ANS have been delegated to the ANSP by another provider, and exclude the area in which ANS have been delegated to another ANSP. The sq. km here should be consistent with ACC coverage with respect to total area. Differentiation for facilities controlling only upper or lower airspace will be addressed by item 3 below. (Source: PRU D1).
Percentage surveillance coverage at 30,000ft - primary radar	Surveillance coverage from primary radar.
Percentage surveillance coverage at 30,000ft - secondary radar	Surveillance coverage from secondary radar.
Percentage surveillance coverage at 30,000ft - ADS-B	Surveillance coverage from ADS-B.
Percentage surveillance coverage at 30,000ft - Space based ADS-B	Surveillance coverage from space-based ADS-B.
Percentage ADS-C coverage at 30,000 ft	Surveillance coverage from ADS-C.
Number of FIRs	A Flight Information Region is airspace of defined dimensions within which flight information service and alerting service are provided.
Number of ACC facilities	ACC facilities are the ATC units providing ATC services to en-route traffic in control areas under its jurisdiction. Part of an ACC may also provide approach services.
Number of co-located ACC and approach facilities	An ACC unit is described above. An approach control unit is an ATC unit providing ATC services to arriving, departing and over-flying flights within the airspace in the vicinity of an airport.
Number of stand-alone approach facilities	Definition of an approach control unit is above.
Number of co-located approach and tower facilities	Definition of an approach control unit is above. Tower facilities, or a tower control unit, is an ATC unit at an airport responsible for the provision of ATC services in respect of flights that are landing and taking off and other traffic that is on the active runway(s).
Number of co-located approach, tower and ACC facilities	For definitions see above.
Number of stand-alone towers	Definition of a tower control unit is above.

## INPUT DATA DEFINITIONS

Data Element	Definitions
Total Costs	The sum of operating costs, depreciation/amortisation and cost of capital related to providing continental and oceanic ATC/ATFM services. Meteorological costs and EUROCONTROL costs (if applicable) are not included.
IFR flight hours	Total number of controlled IFR flight hours in continental and oceanic airspace.
ATCO hours	Total annual working hours for ATCOs in operations – including breaks and overtime. Holiday is not included.
ATCO employment cost	Total employment costs including gross wages and salaries, payments for overtime and other bonuses, employer contribution to social security scheme and taxes, pension contributions and other benefits for 'ATCOs in operations'. This excludes: mission related expenditures, including travel expenditures and training fees, as these are considered operating costs.
Other costs	Total operating costs minus ATCO in OPS employment costs.
Number of ATCOs	The number of FTE ATCOs – whose employment costs were included in "ATCO employment cost" – participating in an activity that is either directly related to the control of traffic or is a necessary requirement for ATCOs to be able to control traffic.
Number of Frontline Service Support Staff	Sum of ATC assistants, ops support, ops support (non-ATCOs), technical support staff for operational maintenance monitoring and control, technical support staff for planning and development. ATCOs on other duties, and outsourced frontline service support.

# ANNEX 3: KEY PERFORMANCE INDICATORS

The detailed metrics for determining the cost efficiency and productivity of continental and oceanic air navigation services are set out in Figure 30. These performance indicators are derived from the CANSO ANS Performance Framework.

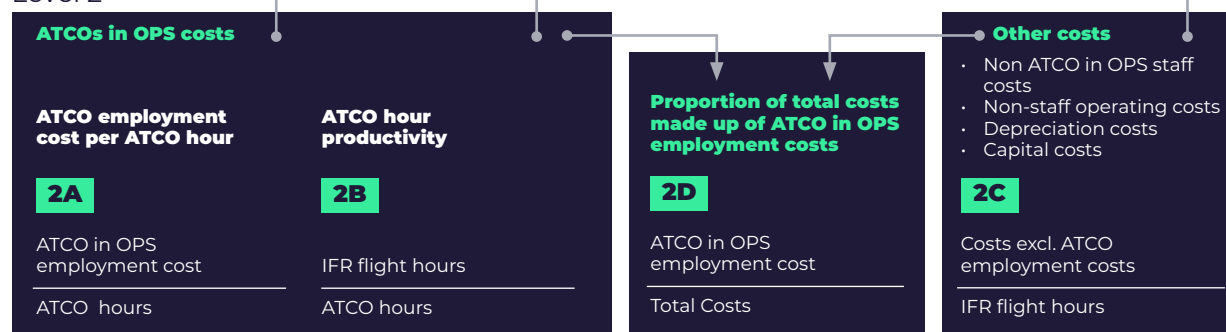
## DETERMINING PERFORMANCE METRICS

The CANSO ANS Performance Framework was established to create common performance indicators for global ANS data. Based on a tiered structure, the framework was developed in 2014 by the CANSO Global Benchmarking Workgroup (GBWG). It aims to demonstrate the drivers of cost efficiency.

Level 1



Level 2



Level 3

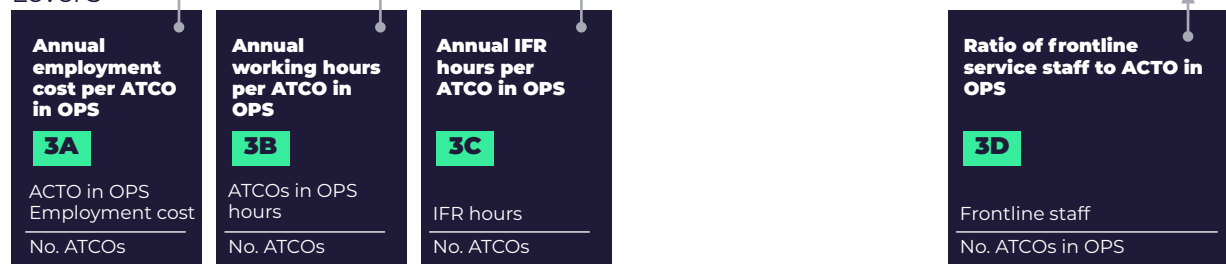


Figure 30 - CANSO ANS performance framework

Over the years, the GBWG has worked to identify alternative KPIs to investigate the drivers of the KPIs in the framework, in particular KPI 2C. Last year, KPI 3D was added to framework to better understand the proportion of 'frontline service support staff' to ATCO in OPS in an ANSP.

It is important to note the dependence of the higher tier metrics on the lower tier. This can be established as follows:

$$\text{KPI 1} = \frac{(\text{KPI 2A})}{(\text{KPI 2B})} + \text{KPI 2C}$$

$$\text{KPI 2A} = \frac{(\text{KPI 3A})}{(\text{KPI 3B})}$$

$$\text{KPI 2B} = \frac{(\text{KPI 3C})}{(\text{KPI 3B})}$$

$$\text{KPI 2D} = \frac{\left( \frac{\text{KPI 2A}}{\text{KPI 2B}} \right)}{\text{KPI 1}} + \frac{\text{KPI 1} - \text{KPI 2C}}{\text{KPI 1}}$$

# ANNEX 4: CONTEXTUAL DATA

Please note contextual data is only included for CANSO GBWG submitters.

## ANSP: AIRPORTS AUTHORITY OF INDIA

In your opinion, what are the main drivers or issues for performance within your region?	Consistent traffic growth in APAC
What are the main initiatives you are undertaking to improve your performance?	Adopting latest ATM technologies like space based ADS-B
Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic	Closure of neighbouring ANSP airspace

### Legal status:

A government entity empowered to manage and use the revenues it generates through charges for the services it provides.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	OCEANIC	COMMENTS
<b>Operational data</b>			
IFR hours per sq. km.	1.034		
Sq. km. – oceanic and continental	3,570,000	6,400,000	
Percentage surveillance coverage at 30,000ft – primary radar	100.0	0.00%	
Percentage surveillance coverage at 30,000ft – secondary radar	100.0	0.00%	
Percentage surveillance coverage at 30,000ft – ADS-B	100.0	0.00%	
Percentage surveillance coverage at 30,000ft – Space based ADS-B	0.0	100.00%	
Percentage ADS-C coverage at 30,000 ft	0.0	100.00%	
Number of FIRs	1	3	3 Oceanic FIRs are also partially continental.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	OCEANIC	COMMENTS
<b>Facilities</b>			
Number of ACC facilities	0		
Number of co-located ACC and approach facilities	0		
Number of stand-alone approach facilities	0		
Number of co-located approach and tower facilities	76		
Number of stand-alone towers	5		
Number of co-located ACC, approach and tower facilities	16		



<b>Does your ANSP have stated objectives? If so, what are they?</b>	<b>Yes. We have 10 strategic objectives supporting our vision of "a sustainable quality excellent air navigation service provider."</b>
<b>In your opinion, what are the main drivers or issues for performance within your region?</b>	<b>Augmentation of air traffic (demand/volume), aviation technology and infrastructure development are significant drivers for performance improvement in region. It is important to adopt technology that can scale up both operation and infrastructure to support air traffic growth.</b>
<b>What are the main initiatives you are undertaking to improve your performance?</b>	<ol style="list-style-type: none"> <li><b>1. We are in the process of transitioning to the new ATM system which will be fully operated in February 2020.</b></li> <li><b>2. We have been working with ANSPs in Asia Pacific to develop and employ multi-nodal ATFM to improve air traffic flow within the region.</b></li> <li><b>3. We have been working with the Thai government and the military to improve the commercial use of Thai airspace.</b></li> </ol>
<b>Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic</b>	<ol style="list-style-type: none"> <li><b>1. ATCO in ops hours is increased due to process of training and working on transitioning to the new ATM system.</b></li> <li><b>2. ATCO in ops and Non-ATCO in ops employment cost are higher due to the adjustment of pension contribution refer to LABOUR PROTECTION ACT (NO.7) B.E. 2562 (2019).</b></li> </ol>

### Legal status:

A company established as a public-private partnership to provide the services on behalf of the government, and part-owned by the government.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	1.113	
Sq. km. – oceanic and continental	777,760	
Percentage surveillance coverage at 30,000ft – primary radar	5%	
Percentage surveillance coverage at 30,000ft – secondary radar	100%	
Percentage surveillance coverage at 30,000ft – ADS-B	0	
Percentage surveillance coverage at 30,000ft – Space based ADS-B	0	
Percentage ADS-C coverage at 30,000 ft	0	
Number of FIRs	1	

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Facilities</b>		
Number of ACC facilities	1	
Number of co-located ACC and approach facilities	0	
Number of stand-alone approach facilities	1	
Number of co-located approach and tower facilities	6	
Number of stand-alone towers	14	
Number of co-located ACC, approach and tower facilities	0	

Does your ANSP have stated objectives? If so, what are they?	Creating flexible and responsive operations. Focus on sustainability. Growing partnerships with tomorrow's customers and suppliers eg. UAV and space based technologies. Implementing new ATM platform which will result in one ATM platform for both continental and oceanic operations replacing the current setup with two systems
In your opinion, what are the main drivers or issues for performance within your region?	Fairly rigid staff costs and low ability to respond quickly with staffing changes due to collective agreement constraints and long training times, less predictability with customer schedule volatility, reactionary behaviour by customers to industry demands/trends. Emerging technology eg. Digital towers
What are the main initiatives you are undertaking to improve your performance?	Building a new ATM platform incorporating both continental and oceanic operations as well as electronic flight strips into all towers. Cross skilling of workforce, up skilling and airspace resectorisation review initiated
Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic	Impact of COVID-19 is felt in our data set due to our financial year ending 30 June 2020. Plus a continuance from previous year where continental airspace was transferred to Auckland ACC but as yet unable to separate continental costs from oceanic costs so oceanic costs will appear higher (as noted in last year's report) and continental costs lower.

### Legal status:

A government entity empowered to manage and use the revenues it generates through charges for the services it provides.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	OCEANIC	COMMENTS
<b>Operational data</b>			
IFR hours per sq. km.	0.2448	0.0035	
Sq. km. – oceanic and continental	863,100	28,790,000	
Percentage surveillance coverage at 30,000ft - primary radar	40.0%	0.00%	approx values
Percentage surveillance coverage at 30,000ft - secondary radar	100.0%	0.00%	
Percentage surveillance coverage at 30,000ft - ADS-B	90.0%	5.00%	approx values
Percentage surveillance coverage at 30,000ft - Space based ADS-B	0.0	0.00%	
Percentage ADS-C coverage at 30,000 ft	100.0%	100.00%	
Number of FIRs	1	1	

CONTEXTUAL DATA ELEMENT	CONTINENTAL	OCEANIC	COMMENTS
<b>Facilities</b>			
Number of ACC facilities	0	1	
Number of co-located ACC and approach facilities	1	0	
Number of stand-alone approach facilities	0	0	
Number of co-located approach and tower facilities	6	0	
Number of stand-alone towers	11	0	ZQN tower now Aerodrome only with approach being provided by ACC
Number of co-located ACC, approach and tower facilities	0	0	

Does your ANSP have stated objectives? If so, what are they?	Yes, objectives are stated in the corporate Business Plan developed currently for years 2015 to 2019. Objectives covers current 4 KPAs: SAF, ENV, CAP and CEF
In your opinion, what are the main drivers or issues for performance within your region?	EU regulations on Performance and Charging Scheme
What are the main initiatives you are undertaking to improve your performance?	Internal performance monitoring system with predefined objectives to be met
Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic	Continuing network measures in the European NM area. Adverse network effects when some of the neighbouring ACCs had capacity issues, effectively "walling in" the Czech airspace.

## Legal status:

A corporatised entity with special status, not governed by normal commercial law but by a specific founding law or statute (and wholly owned by the government).

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	3.624	
Sq. km. – oceanic and continental	76,900	
Percentage surveillance coverage at 30,000ft - primary radar	100%	
Percentage surveillance coverage at 30,000ft - secondary radar	100%	
Percentage surveillance coverage at 30,000ft - ADS-B	100%	
Percentage surveillance coverage at 30,000ft - Space based ADS-B	100%	
Percentage ADS-C coverage at 30,000 ft	100%	
Number of FIRs	1	

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Facilities</b>		
Number of ACC facilities	1	
Number of co-located ACC and approach facilities	1	To avoid confusion in above and current lines, there is only one ACC (Praha), which is co-located with APP
Number of stand-alone approach facilities	0	
Number of co-located approach and tower facilities	3	
Number of stand-alone towers	1	
Number of co-located ACC, approach and tower facilities	0	

## ANSP: AIR NAVIGATION SERVICES FINLAND OY (PREVIOUSLY FINAVIA)

Does your ANSP have stated objectives? If so, what are they?	Objectives are defined in RP3 performance plan (RP3 performance plans will be updated in 2021)
In your opinion, what are the main drivers or issues for performance within your region?	COVID-19
What are the main initiatives you are undertaking to improve your performance?	Remarkable staff cost savings in 2020 and 2021
Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic	Good traffic development in 2019.

### Legal status:

A corporatised entity with special status, not governed by normal commercial law but by a specific founding law or statute (and wholly owned by the government). General Companies act is applied.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	0.309	
Sq. km. – oceanic and continental	411,000	
Percentage surveillance coverage at 30,000ft – secondary radar	100%	
Number of FIRs	1	
<b>Facilities</b>		
Number of ACC facilities	1	
Number of co-located ACC and approach facilities	1	
Number of stand-alone approach facilities	0	
Number of co-located approach and tower facilities	5	
Number of stand-alone towers	15	
Number of co-located ACC, approach and tower facilities	1	

## ANSP: AIR TRAFFIC & NAVIGATION SERVICES (SOUTH AFRICA)

Does your ANSP have stated objectives? If so, what are they?	Yes, these objectives includes Financial, Customer Service Related objectives, Internal Process Improvement, Human Resources Related objectives as well as Shareholder related objectives
In your opinion, what are the main drivers or issues for performance within your region?	The current issue relates to the impact of COVID-19 on our business
What are the main initiatives you are undertaking to improve your performance?	Stakeholder Engagement, Investigation of alternative funding, Influencing government regulations relating to COVID-19 measures
Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic	Yes, COVID-19

### Legal status:

A government entity empowered to manage and use the revenues it generates through charges for the services it provides.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	OCEANIC	COMMENTS
<b>Operational data</b>			
IFR hours per sq. km.	0.030	-	No oceanic IFR flight hours submission
Sq. km. – oceanic and continental	9,279,080	12,720,920	
Percentage surveillance coverage at 30,000ft - primary radar	92.0	0.00%	
Percentage surveillance coverage at 30,000ft - secondary radar	98.0	0.00%	
Percentage surveillance coverage at 30,000ft - ADS-B	0.0	0.00%	
Percentage surveillance coverage at 30,000ft - Space based ADS-B	0.0	0.00%	
Percentage ADS-C coverage at 30,000 ft	0.0	95.00%	
Number of FIRs	2	1	



CONTEXTUAL DATA ELEMENT	CONTINENTAL	OCEANIC	COMMENTS
<b>Facilities</b>			
Number of ACC facilities	0	0	
Number of co-located ACC and approach facilities	0	0	
Number of stand-alone approach facilities	0	0	
Number of co-located approach and tower facilities	9	0	
Number of stand-alone towers	10	0	
Number of co-located ACC, approach and tower facilities	2	0	

## Legal status:

A government entity empowered to manage and use the revenues it generates through charges for the services it provides.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	0.5492	
Sq. km. – oceanic and continental	840,000	
Number of FIRs	1	
<b>Facilities</b>		
Number of ACC facilities	1	
Number of co-located ACC and approach facilities	0	
Number of stand-alone approach facilities	1	
Number of co-located approach and tower facilities	0	
Number of stand-alone towers	2	
Number of co-located ACC, approach and tower facilities	0	

# ANSP: DEVLET HAVA MEYDANLARI İŞLETMESİ GENEL MÜDÜRLÜĞÜ

## Legal status:

A government entity empowered to manage and use the revenues it generates through charges for the services it provides.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	1.511	
Sq. km. – oceanic and continental	982,000	
Number of FIRs	2	
<b>Facilities</b>		
Number of ACC facilities	2	
Number of co-located ACC and approach facilities	3	
Number of stand-alone approach facilities	0	
Number of co-located approach and tower facilities	44	
Number of stand-alone towers	0	
Number of co-located ACC, approach and tower facilities	0	

Does your ANSP have stated objectives? If so, what are they?	Yes, ST01: Provide En-route and terminal ANS STO2: Maintain ATM technical systems STO3: Provide environment management STO4: Maintain technical and operational infrastructure of the aerodrome STO5: Manage resources STO6: Support State authorities
In your opinion, what are the main drivers or issues for performance within your region?	2019 continued the trend of the previous years where both traffic volume and passenger numbers grew at Luxembourg airport and airspace. This increase was managed well as infrastructure, layout and training of staff was adequate to that level of traffic years before it happened.
What are the main initiatives you are undertaking to improve your performance?	We are renewing our technical infrastructure to offer state-of-the art service and also adding working positions in both TWR and APP in the coming years to more efficiently handle the traffic.
Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic	Our ATM delay increased a little, related to traffic restrictions put in place after the surveillance chain upgrade. They have since been removed. 2020 will show a very different picture though.

### Legal status:

A government department or authority that is subject to government accounting and treasury rules, and staff are employed under civil service pay and conditions.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	7.185	
Sq. km. – oceanic and continental	4000	
Number of FIRs	1	
<b>Facilities</b>		
Number of ACC facilities	0	
Number of co-located ACC and approach facilities	0	
Number of stand-alone approach facilities	1	
Number of co-located approach and tower facilities	1	
Number of stand-alone towers	0	
Number of co-located ACC, approach and tower facilities	0	

## ANSP: DIRECTION DES SERVICES DE LA NAVIGATION AÉRIENNE

Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic

The year 2019 was marked by an unprecedented drop in traffic from the summer, as well as by the bankruptcies of major companies for the French market (Thomas Cook, Aigle Azur, XL Airways)

### Legal status:

A government entity empowered to manage and use the revenues it generates through charges for the services it provides.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	OCEANIC	COMMENTS
<b>Operational data</b>			
IFR hours per sq. km.	2.459		
Sq. km. – oceanic and continental	1,010,000	15,437,214	
Number of FIRs	5	2	
<b>Facilities</b>			
Number of ACC facilities	5	0	
Number of co-located ACC and approach facilities	0	0	
Number of stand-alone approach facilities	0	0	
Number of co-located approach and tower facilities	12	6	
Number of stand-alone towers	74	4	
Number of co-located ACC, approach and tower facilities	0	2	

Does your ANSP have stated objectives? If so, what are they?	The year 2019 was marked by an unprecedented drop in traffic from the summer, as well as by the bankruptcies of major companies for the French market (Thomas Cook, Aigle Azur, XL Airways)
In your opinion, what are the main drivers or issues for performance within your region?	Improve Operational Safety, reduce ATC delays, achieve better space redesigns and more coordination between regional ansp
What are the main initiatives you are undertaking to improve your performance?	By planning and executing of a new 4 year investment plan which focus on core CNS equipment and networking, physical infrastructure and strong training for all the workers
Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic	Economic crisis and devaluation of the national currency

## Legal status:

A government entity empowered to manage and use the revenues it generates through charges for the services it provides.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	OCEANIC	COMMENTS
<b>Operational data</b>			
IFR hours per sq. km.	0.0266		
Sq. km. – oceanic and continental	16,300,000.0		
Percentage surveillance coverage at 30,000ft - ADS-B only	90%	2.00%	
Percentage ADS-C coverage at 30,000 ft only	90%	100.00%	
Number of FIRs	5		
<b>Facilities</b>			
Number of ACC facilities	5	0	
Number of co-located ACC and approach facilities	0		
Number of stand-alone approach facilities	0		
Number of co-located approach and tower facilities	54		
Number of stand-alone towers	0		
Number of co-located ACC, approach and tower facilities	0		

## Legal status:

A corporatised entity with special status, not governed by normal commercial law but by a specific founding law or statute (and wholly owned by the government).

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	0.988	
Sq. km. – oceanic and continental	77,400	
Percentage surveillance coverage at 30,000ft - primary radar	0.0	EANS does not have primary radars for air surveillance. There are plans to get a feed from military in the future.
Percentage surveillance coverage at 30,000ft - secondary radar	100.0	There is Mode A/C (EANS secondary radars) as well as Mode S (WAM) coverage.
Percentage surveillance coverage at 30,000ft - ADS-B	100.0	Although EANS has full ADS-B coverage, it is not used operationally yet.
Percentage surveillance coverage at 30,000ft - Space based ADS-B	0.0	EANS has taken an indicative quotation for the service, but there are now plans to start using the service yet.
Percentage ADS-C coverage at 30,000 ft	0.0	EANS does not need ADS-C because of its geographical location.
Number of FIRs	1	
<b>Facilities</b>		
Number of ACC facilities	0	
Number of co-located ACC and approach facilities	0	
Number of stand-alone approach facilities	0	
Number of co-located approach and tower facilities	0	
Number of stand-alone towers	0	
Number of co-located ACC, approach and tower facilities	1	

Does your ANSP have stated objectives? If so, what are they?	The year 2019 was marked by an unprecedented drop in traffic from the summer, as well as by the bankruptcies of major companies for the French market (Thomas Cook, Aigle Azur, XL Airways)
In your opinion, what are the main drivers or issues for performance within your region?	Europe is strongly driven by the SES Performance and Charging scheme regulation in the EU, and EUROCONTROL vision at wider level (ECAC). 2019 performance in Europe was still influenced by the capacity crunch of year 2018 where ATFM delays were significant. Though less impact of whether related delays was observed in 2019, delays management still required action in 2019. Traffic was growing in many countries of Europe, particularly in Spain, showing significant deviation with what was planned in the RP2 performance plans.
What are the main initiatives you are undertaking to improve your performance?	ENAIRE establishes its priorities and main initiatives in their Strategic Plan (in 2019 "Flight Plan 2020" which has been adapted in 2020 in order to adapt to the new circumstances and is now being updated during 2021)
Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic	Traffic in 2019 was higher than expected and planned in the RP2 performance plan, although was already showing signs of slowing towards the end of the year

### Legal status:

A government entity empowered to manage and use the revenues it generates through charges for the services it provides.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	0.759	
Sq. km. – oceanic and continental	2,190,000	
Number of FIRs	3	
<b>Facilities</b>		
Number of ACC facilities	5	
Number of co-located ACC and approach facilities	0	
Number of stand-alone approach facilities	3	
Number of co-located approach and tower facilities	14	
Number of stand-alone towers	7	
Number of co-located ACC, approach and tower facilities	0	



# ANSP: FEDERAL AVIATION ADMINISTRATION – AIR TRAFFIC ORGANIZATION

## Legal status:

A government department or authority that is subject to government accounting and treasury rules, and staff are employed under civil service pay and conditions.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	OCEANIC	COMMENTS
<b>Operational data</b>			
IFR hours per sq. km.	1.714	0.0367	
Sq. km. – oceanic and continental	14,832,411	60,628,411	
Number of FIRs	21	5	
<b>Facilities</b>			
Number of ACC facilities	21	3	
Number of co-located ACC and approach facilities	3	2	
Number of stand-alone approach facilities	25		
Number of co-located approach and tower facilities	132		
Number of stand-alone towers	131		
Number of co-located ACC, approach and tower facilities	1		

Does your ANSP have stated objectives? If so, what are they?	Development of a Balanced Scorecard model is in progress.
In your opinion, what are the main drivers or issues for performance within your region?	The main driver of the European performance is the performance scheme
What are the main initiatives you are undertaking to improve your performance?	The ANSPs have to bear cost and traffic risk however they do not have influence on traffic. Having incentives on the level of delays as well, HungaroControl is interested in the further development of capacities (technological investments, airspace management procedures, training).
Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic	Continuously significant growth in traffic.

### Legal status:

A corporatised entity with special status, not governed by normal commercial law but by a specific founding law or statute (and wholly owned by the government).

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	2.707	
Sq. km. – oceanic and continental	104,000	
Percentage surveillance coverage at 30,000ft - primary radar	100%	
Percentage surveillance coverage at 30,000ft - secondary radar	100%	
Percentage surveillance coverage at 30,000ft - ADS-B	100%	(not used operationally)
Percentage surveillance coverage at 30,000ft - Space based ADS-B	0%	
Percentage ADS-C coverage at 30,000 ft	0%	
Number of FIRs	2	

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Facilities</b>		
Number of ACC facilities	0	
Number of co-located ACC and approach facilities	1	
Number of stand-alone approach facilities	0	
Number of co-located approach and tower facilities	0	
Number of stand-alone towers	1	
Number of co-located ACC, approach and tower facilities	0	

**Legal status:**

A corporatised entity with special status, not governed by normal commercial law but by a specific founding law or statute (and wholly owned by the government).

CONTEXTUAL DATA ELEMENT	CONTINENTAL	OCEANIC	COMMENTS
<b>Operational data</b>			
IFR hours per sq. km.	0.0566		
Sq. km. – oceanic and continental	5,400,000		Combined oceanic/ continental
Number of FIRs	1	2	
<b>Facilities</b>			
Number of ACC facilities	1	1	
Number of co-located ACC and approach facilities	1	1	
Number of stand-alone approach facilities	0	0	
Number of co-located approach and tower facilities	1	0	
Number of stand-alone towers	2	0	
Number of co-located ACC, approach and tower facilities	0	0	

Does your ANSP have stated objectives? If so, what are they?	We have stated objectives such as “Enhance aviation safety”, “Expand air navigation capacity to meet ever increasing air traffic volume”, “Improve convenience through upgrading efficiency of aviation services”, “Increase efficiency of operation including cost reductions”, “Enhance efficiency of air navigation services”, and “Focus on environmental consciousness such as CO2 emissions reduction and noise abatement”.
In your opinion, what are the main drivers or issues for performance within your region?	1. Functional enhancement of the Tokyo metropolitan airports and major airports. 2. Redesign of en-route airspace composition.
What are the main initiatives you are undertaking to improve your performance?	1. Introduction of Integrated Air Traffic Control Data Processing System 2. Enhancement of capacity and efficiency of the Tokyo metropolitan airports and major airports. 3. Reorganization of airspace and air routes related to the above.
Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic	The IFR flight hour in Fukuoka FIR has increased by 1.96% compared to the previous year. But the increase rate is smaller than average increase rate of 2.1% from previous year. As part of the reason, typhoons and COVID-19 can be considered.

## Legal status:

A government department or authority that is subject to government accounting and treasury rules, and staff are employed under civil service pay and conditions.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	0.291	
Sq. km. – oceanic and continental	8,400,000	
Percentage surveillance coverage at 30,000ft - primary radar	100.0	Except oceanic sectors
Percentage surveillance coverage at 30,000ft - secondary radar	100.0	Except oceanic sectors
Percentage surveillance coverage at 30,000ft - ADS-B	0.0	Installation ongoing
Percentage surveillance coverage at 30,000ft - Space based ADS-B	0.0	Installation ongoing
Percentage ADS-C coverage at 30,000 ft	100.0	Applicable within oceanic sectors
Number of FIRs	1	

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Facilities</b>		
Number of ACC facilities	4	
Number of co-located ACC and approach facilities	0	
Number of stand-alone approach facilities	0	
Number of co-located approach and tower facilities	13	
Number of stand-alone towers	20	
Number of co-located ACC, approach and tower facilities	0	

Does your ANSP have stated objectives? If so, what are they?	Maintain Safety, increase efficiency
In your opinion, what are the main drivers or issues for performance within your region?	Safety and efficiency
What are the main initiatives you are undertaking to improve your performance?	KCAA has developed KPIs for measurement of key performance areas.
Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic	Suspension of passenger flights due COVID-19.

## Legal status:

A government entity empowered to manage and use the revenues it generates through charges for the services it provides.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	1.448	
Sq. km. – oceanic and continental	77,052	
Percentage surveillance coverage at 30,000ft - primary radar	40.0	
Percentage surveillance coverage at 30,000ft - secondary radar	100.0	
Percentage surveillance coverage at 30,000ft - ADS-B	100.0	
Percentage surveillance coverage at 30,000ft - Space based ADS-B	0.0	
Percentage ADS-C coverage at 30,000 ft	25.0	
Number of FIRs	1	
<b>Facilities</b>		
Number of ACC facilities	1	
Number of co-located ACC and approach facilities	1	
Number of stand-alone approach facilities	2	
Number of co-located approach and tower facilities	3	
Number of stand-alone towers	5	
Number of co-located ACC, approach and tower facilities	1	

Does your ANSP have stated objectives? If so, what are they?	1.) Safety management. Preparing for COMMISSION IMPLEMENTING REGULATION (EU) 2017/373. 2.) Modernization of technologies (VOR/DME, PBN, CPDLC, etc.).
In your opinion, what are the main drivers or issues for performance within your region?	Volatility of traffic. Territory, cost-effectiveness pressures

### Legal status:

A corporatised entity with special status, not governed by normal commercial law but by a specific founding law or statute (and wholly owned by the government).

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	0.952	
Sq. km. – oceanic and continental	95,900	
Percentage surveillance coverage at 30,000ft - primary radar	35.0%	Single coverage in Riga TMA
Percentage surveillance coverage at 30,000ft - secondary radar	100.0%	Minimum Double coverage is available
Percentage surveillance coverage at 30,000ft - ADS-B	100.0%	Not used operationally
Percentage surveillance coverage at 30,000ft - Space based ADS-B	0.0%	
Percentage ADS-C coverage at 30,000 ft	0.0%	
Number of FIRs	1	
<b>Facilities</b>		
Number of ACC facilities	0	
Number of co-located ACC and approach facilities	1	
Number of stand-alone approach facilities	0	
Number of co-located approach and tower facilities	0	
Number of stand-alone towers	1	
Number of co-located ACC, approach and tower facilities	0	



## ANSP: MACEDONIAN AIR NAVIGATION SERVICE PROVIDER

<b>Does your ANSP have stated objectives? If so, what are they?</b>	<b>M-NAV strategic objectives are stated in company's Strategic business plan, and are constantly promoted as such. They include: achieving international and national standards in Safety, Quality and Security, optimize airspace capacity, optimise cost effectiveness, comply with associated SES Regulations, Guidelines and SES II, Support national and international environment standards, enhance Human Resources Management, adopt managerial structures to future SES Requirements.</b>
<b>In your opinion, what are the main drivers or issues for performance within your region?</b>	<b>Progressive implementation of the objectives stated in the European ATM Master Plan Ivl 3, rapid traffic growth, enhanced regional cooperation and sharing mutual experiences for best practices.</b>
<b>What are the main initiatives you are undertaking to improve your performance?</b>	<b>The new ATM System Project, optimisation of Human Resources and flexible sectorisation on daily basis in order to reduce Europe- wide en- route delays.</b>

### Legal status:

A government entity empowered to manage and use the revenues it generates through charges for the services it provides.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	1.513	
Sq. km. – oceanic and continental	24,900	
Percentage surveillance coverage at 30,000ft – secondary radar	100%	SSR radar only
Number of FIRs	1	
<b>Facilities</b>		
Number of ACC facilities	0	
Number of co-located ACC and approach facilities	0	
Number of stand-alone approach facilities	0	
Number of co-located approach and tower facilities	1	
Number of stand-alone towers	0	
Number of co-located ACC, approach and tower facilities	1	

<b>Does your ANSP have stated objectives? If so, what are they?</b>	<b>Yes. We have a 5 year Business Plan with objectives and targets steaming from EU regulation for Capacity, Environment, Cost-Efficiency and Safety</b>
<b>In your opinion, what are the main drivers or issues for performance within your region?</b>	<b>SES Regulations and specifically Performance scheme works as the main driver to improve efficiency as well as traffic demand and customer satisfaction.</b>  <b>On the other hand, economic regulation is not oriented to encourage more and better efficiency by ANSPs. Additionally, SES regulation, its timeframe and requirements also contribute to increase ANSP's burden doesn't allowing ANSPs to gain some traction with a stable regulatory framework</b>
<b>What are the main initiatives you are undertaking to improve your performance?</b>	<b>Implement new ATM systems to respond to the increase digitalisation of the sector, as well the CNS infrastructure, to keep/ improve our capacity, safety and productivity indicators.</b>
<b>Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic</b>	<b>Traffic continued to grow during 2019, on top of 4-year continuous growth, with a deviation of the initial traffic assumptions by more than +21% between 2015 and 2019.</b>

### Legal status:

A corporatised entity with special status, not governed by normal commercial law but by a specific founding law or statute (and wholly owned by the government).

CONTEXTUAL DATA ELEMENT	CONTINENTAL	OCEANIC	COMMENTS
<b>Operational data</b>			
IFR hours per sq. km.	0.642		
Sq. km. – oceanic and continental	671,000	5,180,000	
Percentage surveillance coverage at 30,000ft - primary radar	0.0	0.00%	
Percentage surveillance coverage at 30,000ft - secondary radar	86.0	15.00%	
Percentage surveillance coverage at 30,000ft - ADS-B	90.8	26.30%	
Percentage surveillance coverage at 30,000ft - Space based ADS-B	0.0	0.00%	
Percentage ADS-C coverage at 30,000 ft	0.0	100.00%	
Number of FIRs	1	1	

CONTEXTUAL DATA ELEMENT	CONTINENTAL	OCEANIC	COMMENTS
<b>Facilities</b>			
Number of ACC facilities	1	1	
Number of co-located ACC and approach facilities	1	0	
Number of stand-alone approach facilities	0	0	
Number of co-located approach and tower facilities	7	0	
Number of stand-alone towers	3	0	
Number of co-located ACC, approach and tower facilities	0	0	

## Legal status:

A corporatised entity with special status, not governed by normal commercial law but by a specific founding law or statute (and wholly owned by the government).

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	0.939	
Sq. km. – oceanic and continental	75,300	
Number of FIRs	1	
<b>Facilities</b>		
Number of ACC facilities	1	
Number of co-located ACC and approach facilities	0	
Number of stand-alone approach facilities	0	
Number of co-located approach and tower facilities	3	
Number of stand-alone towers	1	
Number of co-located ACC, approach and tower facilities	0	

<b>Does your ANSP have stated objectives? If so, what are they?</b>	<b>Objectives related to the Performance Plan/SES Regulations and 4 key performance areas: safety, capacity, cost-effectiveness and environment.</b>
<b>In your opinion, what are the main drivers or issues for performance within your region?</b>	<b>SES Regulations, FABs Performance Plans requirements, Performance and Charging Scheme regulations; changes in traffic paths due to the Ukrainian situation.</b>
<b>What are the main initiatives you are undertaking to improve your performance?</b>	<b>Airspace modernisation, separation of air traffic flows, reducing delays, shortening the flight paths, reducing CO2 emissions, roster plan extended by additional ATCOs, implementation of Traffic Complexity Tool and improving the competitiveness offered by the Polish Air Navigation Services Agency services for users of Polish airspace.</b>
<b>Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic</b>	<b>Revision of the Baltic Functional Airspace Block Performance Plan for Air Navigation Services for second reference period (2015-2019) concerns only cost-efficiency KPA for 2017-2019. Following partial closure of the Ukrainian airspace, Poland lost a lot of overflying "heavy traffic" (A380, B747, B777) going from North/West to the South/East, crossing southern half of Warsaw FIR.</b>

## Legal status:

A government entity empowered to manage and use the revenues it generates through charges for the services it provides.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	1.556	
Sq. km. – oceanic and continental	334,000	
Percentage surveillance coverage at 30,000ft - primary radar	0.0	
Percentage surveillance coverage at 30,000ft - secondary radar	100.0	
Percentage surveillance coverage at 30,000ft - ADS-B	0.0	
Percentage surveillance coverage at 30,000ft - Space based ADS-B	0.0	
Percentage ADS-C coverage at 30,000 ft	0.0	
Number of FIRs	1	

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Facilities</b>		
Number of ACC facilities	1	
Number of co-located ACC and approach facilities	1	
Number of stand-alone approach facilities	3	
Number of co-located approach and tower facilities	0	
Number of stand-alone towers	15	
Number of co-located ACC, approach and tower facilities	0	

<b>In your opinion, what are the main drivers or issues for performance within your region?</b>	<b>In no-COVID-19 times – capacity.</b>
<b>What are the main initiatives you are undertaking to improve your performance?</b>	<b>Carefully planned capacity (staff, technology) and cost efficiency.</b>
<b>Were there any factors that impacted your individual ANSP performance in your 2019 reporting period, as shown in the KPIs in this report? For example, exceptional events in the year related to traffic.</b>	<b>Only with impact to TERMINAL, bankruptcy of national airline – Adria Airways</b>

### Legal status:

A corporatised entity with special status, not governed by normal commercial law but by a specific founding law or statute (and wholly owned by the government).

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	3.173	
Sq. km. – oceanic and continental	20,000	
Percentage surveillance coverage at 30,000ft - primary radar	100%	
Percentage surveillance coverage at 30,000ft - secondary radar	100%	
Percentage surveillance coverage at 30,000ft - ADS-B	0.0	
Percentage surveillance coverage at 30,000ft - Space based ADS-B	0.0	
Percentage ADS-C coverage at 30,000 ft	0.0	
Number of FIRs	1	
<b>Facilities</b>		
Number of ACC facilities	0	
Number of co-located ACC and approach facilities	1	
Number of stand-alone approach facilities	0	
Number of co-located approach and tower facilities	2	
Number of stand-alone towers	2	
Number of co-located ACC, approach and tower facilities	0	

## ANSP: SERBIA AND MONTENEGRO AIR TRAFFIC SERVICES SMATSA LLC

In your opinion, what are the main drivers or issues for performance within your region?

SES requirements.

### Legal status:

Limited liability company, 100% state-owned (92% owned by Serbia and 8% owned by Montenegro). Integrated civil/military ANSP.

CONTEXTUAL DATA ELEMENT	CONTINENTAL	COMMENTS
<b>Operational data</b>		
IFR hours per sq. km.	2.270	
Sq. km. – oceanic and continental	127,000	
Percentage surveillance coverage at 30,000ft - primary radar	100.0%	
Number of FIRs	1	
<b>Facilities</b>		
Number of ACC facilities	1	
Number of co-located ACC and approach facilities	1	
Number of stand-alone approach facilities		
Number of co-located approach and tower facilities	7	
Number of stand-alone towers	1	
Number of co-located ACC, approach and tower facilities		



# ANNEX 5: KPI DATA

## 1: CONTINENTAL COST PER IFR HOUR (USD)

Formula: Total costs (USD) / IFR flight hours

ANSP	KPI	2018-2019 AGR	4-year CAGR
AAI	66.07	-10.02%	-1.70%
AEROTHAI	442.07	15.64%	2.49%
Airways NZ	492.58	30.37%	6.90%
Albcontrol	691.05	-2.62%	1.08%
ANA	763.31	6.32%	
ANS CR	575.22	0.68%	0.83%
ANS Finland	556.74	-0.37%	-5.47%
ARMATS	656.82	2.72%	-6.57%
ATNS	402.08	18.31%	10.05%
Austro Control	758.20	-2.52%	0.64%
Avinor (Continental)	605.27	19.45%	3.59%
BULATSA	439.81	4.72%	2.15%
CAAS	442.14	15.72%	8.56%
Croatia Control	389.36	-8.57%	-5.83%
DCAC Cyprus	207.37	-9.12%	-8.79%
DFS	810.83	-2.25%	-2.39%
DHMI	355.73	21.84%	18.47%
DSNA	656.43	-0.61%	-1.21%
EANA	261.22	61.19%	
EANS	382.52	13.62%	8.78%
ENAIRE	524.91	2.95%	-4.89%
ENAV	645.93	-3.57%	-4.14%
FAA-ATO	445.61	-0.37%	-0.40%
HCAA	272.49	0.04%	-5.65%
HungaroControl	403.76	-1.46%	-1.48%

ANSP	KPI	2018-2019 AGR	4-year CAGR
IAA	412.51	-2.82%	-0.84%
ISAVIA	278.70	35.16%	21.57%
JANS	510.92	-1.46%	-2.99%
KCAA	211.73	-11.89%	-1.03%
LFV	427.74	-1.27%	-0.19%
LGS	319.97	1.93%	-0.72%
LPS	643.21	-0.12%	-1.97%
LVNL	1558.65	10.27%	4.88%
MATS	272.23	-3.14%	2.81%
M-NAV	481.33	4.53%	-1.90%
MOLDATSA	810.90	0.03%	1.59%
MUAC	286.23	9.03%	3.20%
NATS (Continental)	555.68	1.40%	-2.83%
NAV CANADA	331.45	4.27%	0.67%
Nav Portugal (Continental)	401.91	-1.25%	0.74%
NAVIAIR	570.10	0.78%	-1.14%
Oro Navigacija	416.28	-0.40%	-6.07%
PANSA	450.79	-4.79%	0.97%
ROMATSA	537.72	4.79%	2.51%
Sakaeronavigatsia	560.19	17.59%	9.12%
skeyes	2199.33	11.44%	5.57%
skyguide	1028.09	-0.15%	-1.38%
Slovenia Control	604.16	-2.10%	-4.17%
SMATSA	301.06	4.32%	-3.90%
UKSATSE	967.76	25.39%	14.97%

## 2A: CONTINENTAL ATCOS IN OPS EMPLOYMENT COST PER ATCO IN OPS HOUR (USD)

Formula: ATCOs in OPS employment costs / ATCOs in OPS hours

ANSP	KPI	2018-2019 AGR	4-year CAGR
AAI	20.66	14.77%	6.65%
AEROTHAI	41.93	14.38%	8.71%
Airways NZ	92.11	2.26%	1.20%
Albcontrol	43.54	5.86%	5.74%
ANA	102.73	3.23%	
ANS CR	118.02	-10.31%	3.06%
ANS Finland	89.74	5.25%	-2.26%
ARMATS	19.37	9.22%	10.55%
ATNS	44.79	16.68%	10.18%
Austro Control	205.00	11.84%	4.18%
Avinor (Continental)	151.18	46.39%	12.27%
BULATSA	113.99	6.09%	8.39%
Croatia Control	105.04	1.97%	-0.09%
DCAC Cyprus	59.62	9.04%	1.42%
DFS	286.65	8.26%	3.10%
DHMI	58.10	16.56%	18.67%
DSNA	119.47	-1.18%	1.68%
EANA	32.04	52.32%	
EANS	79.56	-0.92%	4.45%
ENAIRE	177.41	2.37%	-1.21%
ENAV	142.40	1.50%	2.64%
FAA-ATO	116.62	-2.62%	0.06%
HCAA	66.42	3.09%	3.73%
HungaroControl	104.19	4.88%	0.83%
IAA	113.18	2.02%	-0.51%
ISAVIA	127.72	4.42%	10.73%
JANS	41.55	2.10%	0.65%
KCAA	21.80	0.13%	-0.74%
LFV	116.11	0.00%	2.79%
LGS	67.06	8.61%	9.85%
LPS	126.36	-0.75%	2.32%
LVNL	107.15	-46.51%	-4.64%

ANSP	KPI	2018-2019 AGR	4-year CAGR
MATS	69.75	6.68%	13.04%
M-NAV	75.02	40.51%	7.32%
MOLDATSA	25.27	-11.19%	19.53%
MUAC	314.86	17.49%	7.48%
NATS (Continental)	145.09	1.67%	-0.68%
NAV CANADA	120.88	0.10%	3.43%
Nav Portugal (Continental)	171.23	-8.41%	5.71%
NAVIAIR	127.90	5.52%	2.95%
Oro Navigacija	60.00	5.73%	4.41%
PANSA	134.81	4.82%	6.15%
ROMATSA	118.04	-0.92%	5.06%
Sakaeronavigatsia	21.28	32.13%	11.55%
skeyes	182.43	0.84%	4.15%
skyguide	198.53	-0.48%	1.18%
Slovenia Control	109.89	3.73%	3.55%
SMATSA	59.95	2.21%	3.04%
UKSATSE	32.87	50.58%	30.93%

## 2A: CONTINENTAL ATCOS IN OPS EMPLOYMENT COST PER ATCO IN OPS HOUR (USD), PPP ADJUSTED

ANSP	KPI	2018-2019 AGR	4-year CAGR
AAI	79.17	13.33%	4.80%
AEROTHAI	106.40	15.49%	8.82%
Airways NZ	96.13	1.96%	1.57%
Albcontrol	112.60	5.81%	6.72%
ANA	107.37	2.15%	
ANS CR	215.40	-11.49%	3.81%
ANS Finland	93.17	4.94%	-0.95%
ARMATS	46.83	8.19%	10.40%
ATNS	102.76	13.83%	6.72%
Austro Control	239.07	12.01%	5.27%
Avinor (Continental)	138.65	49.93%	13.24%
BULATSA	452.76	10.30%	0.31%
Croatia Control	212.61	3.81%	1.69%
DCAC Cyprus	87.46	9.13%	3.59%
DFS	345.21	8.12%	4.34%
DHMI	179.94	2.30%	5.91%
DSNA	141.52	-0.88%	3.47%
EANA	73.54	2.28%	
EANS	129.17	-2.45%	3.84%
ENAIRE	250.29	2.60%	0.00%
ENAV	188.54	2.71%	4.99%
FAA-ATO	116.62	-2.62%	0.06%
HCAA	105.68	4.11%	5.86%
HungaroControl	213.72	2.29%	-0.84%
IAA	129.33	2.87%	0.36%
ISAVIA	111.33	1.60%	10.98%
JANS	43.82	3.32%	0.67%
KCAA	42.23	-4.82%	-5.12%
LFV	123.14	-1.00%	2.60%
LGS	120.72	7.69%	9.91%
LPS	221.70	-1.55%	1.42%
LVNL	121.48	-47.03%	-3.98%

ANSP	KPI	2018-2019 AGR	4-year CAGR
MATS	107.98	7.98%	14.13%
M-NAV	203.32	40.22%	5.76%
MOLDATSA	58.45	-14.25%	16.04%
NATS (Continental)	164.95	1.37%	-0.56%
NAV CANADA	134.33	0.46%	4.58%
Nav Portugal (Continental)	266.26	-7.77%	6.18%
NAVIAIR	126.44	5.97%	5.02%
Oro Navigacija	118.20	5.15%	3.97%
PANSA	291.73	3.63%	6.00%
ROMATSA	295.82	-2.20%	4.61%
Sakaeronavigatsia	60.83	29.19%	8.64%
skeyes	212.08	1.01%	5.20%
skyguide	170.76	0.57%	2.89%
Slovenia Control	170.93	2.84%	4.48%
SMATSA	168.75	0.74%	2.37%
UKSATSE	86.42	39.61%	14.87%

## 2B: CONTINENTAL ATCOS IN OPS HOUR PRODUCTIVITY

Formula: IFR flight hours / ATCOs in OPS hours

ANSP	KPI	2018-2019 AGR	4-year CAGR
AAI	0.85	-1.81%	0.79%
AEROTHAI	0.33	-7.22%	1.91%
Airways NZ	0.52	-19.79%	-3.62%
Albcontrol	0.59	20.62%	10.47%
ANA	0.39	0.20%	
ANS CR	0.84	-10.55%	0.42%
ANS Finland	0.49	6.63%	5.89%
ARMATS	0.17	-4.48%	13.94%
ATNS	0.51	0.60%	2.13%
Austro Control	0.83	4.93%	4.28%
Avinor (Continental)	0.57	1.01%	-2.38%
BULATSA	0.82	-2.03%	2.16%
CAAS	0.63	-2.96%	-1.51%
Croatia Control	0.79	9.68%	5.11%
DCAC Cyprus	0.95	8.49%	4.77%
DFS	0.91	2.27%	3.09%
DHMI	0.82	-2.44%	0.30%
DSNA	0.69	1.28%	2.46%
EANA	0.43	-2.98%	
EANS	0.76	-12.64%	-0.91%
ENAIRE	0.76	4.81%	5.45%
ENAV	0.66	2.37%	5.09%
FAA-ATO	1.15	1.15%	2.63%
HCAA	0.87	5.57%	9.54%
HungaroControl	1.01	2.65%	4.63%
IAA	0.79	-9.77%	-3.39%
ISAVIA	1.35	4.68%	2.92%
JANS	0.95	-1.38%	2.86%
KCAA	0.38	17.26%	1.97%
LFV	0.60	0.68%	3.17%
LGS	0.82	3.00%	3.54%
LPS	0.69	-0.55%	-0.54%

ANSP	KPI	2018-2019 AGR	4-year CAGR
LVNL	0.52	-0.03%	5.43%
MATS	0.96	8.83%	7.29%
M-NAV	0.52	29.93%	8.93%
MOLDATSA	0.13	-5.38%	8.38%
MUAC	2.23	0.26%	3.19%
NATS (Continental)	0.95	2.51%	3.84%
NAV CANADA	1.33	-0.49%	3.17%
Nav Portugal (Continental)	1.07	5.50%	6.97%
NAVIAIR	0.74	1.80%	1.40%
Oro Navigacija	0.56	5.97%	9.66%
PANSA	0.82	2.46%	2.83%
ROMATSA	0.71	-3.54%	3.35%
Sakaeronavigatsia	0.31	-11.65%	-3.71%
skeyes	0.40	-4.53%	2.02%
skyguide	0.76	1.73%	1.92%
Slovenia Control	0.53	1.90%	7.80%
SMATSA	0.83	2.62%	5.23%
UKSATSE	0.18	6.06%	6.22%



## 2C: CONTINENTAL COSTS EXCLUDING ATCOS IN OPS EMPLOYMENT COSTS PER IFR HOUR (USD)

Formula: Costs excluding ATCOs in OPS employment costs / IFR flight hours

ANSP	KPI	2018-2019 AGR	4-year CAGR
AAI	41.83	-20.61%	-5.03%
AEROTHAI	314.08	12.78%	1.00%
Airways NZ	314.59	28.60%	8.05%
Albcontrol	617.50	-1.33%	1.82%
ANA	500.97	8.13%	
ANS CR	435.04	0.81%	0.29%
ANS Finland	371.80	0.09%	-4.25%
ARMATS	541.53	0.54%	-7.25%
ATNS	313.72	18.98%	10.70%
Austro Control	510.44	-6.39%	1.01%
Avinor (Continental)	339.13	4.98%	-2.39%
BULATSA	301.24	3.16%	0.56%
Croatia Control	257.10	-9.34%	-6.27%
DCAC Cyprus	144.60	-12.75%	-10.77%
DFS	495.55	-6.80%	-3.77%
DHMI	284.57	22.45%	18.50%
DSNA	482.69	0.06%	-1.36%
EANA	187.25	62.91%	
EANS	277.62	13.69%	10.20%
ENAIRE	292.93	7.54%	-3.68%
ENAV	430.14	-4.87%	-4.99%
FAA-ATO	344.10	0.67%	0.27%
HCAA	195.83	1.01%	-5.78%
HungaroControl	300.17	-2.65%	-0.69%
IAA	269.85	-9.54%	-2.60%
ISAVIA	184.34	65.19%	33.99%
JANS	467.06	-1.90%	-3.07%

ANSP	KPI	2018-2019 AGR	4-year CAGR
KCAA	154.34	-31.10%	-0.39%
LFV	233.56	-1.76%	-0.03%
LGS	237.76	0.76%	-2.62%
LPS	460.00	-0.09%	-3.62%
LVNL	1353.29	31.43%	8.37%
MATS	199.75	-3.56%	1.96%
M-NAV	336.18	3.05%	-2.08%
MOLDATSA	622.41	2.07%	-0.46%
MUAC	145.03	2.11%	2.32%
NATS (Continental)	402.30	2.28%	-2.22%
NAV CANADA	240.34	5.73%	0.84%
Nav Portugal (Continental)	242.51	8.57%	2.11%
NAVIAIR	397.26	-0.42%	-2.20%
Oro Navigacija	309.40	-0.47%	-6.50%
PANSA	286.34	-8.44%	-0.22%
ROMATSA	371.15	5.75%	2.91%
Sakaeronavigatsia	490.80	14.14%	8.32%
skeyes	1739.04	13.09%	6.59%
skyguide	766.53	0.56%	-1.60%
Slovenia Control	394.84	-4.04%	-4.30%
SMATSA	228.69	5.91%	-4.44%
UKSATSE	784.10	22.05%	13.39%

## 2D: CONTINENTAL PROPORTION OF TOTAL COSTS MADE UP OF ATCO IN OPS EMPLOYMENT COSTS (USD)

Formula: ATCO in OPS employment Costs / Total Costs

ANSP	KPI	2018-2019 AGR	4-year CAGR
AAI	0.37	29.91%	7.65%
AEROTHAI	0.29	6.61%	4.08%
Airways NZ	0.36	-2.21%	-1.78%
Albcontrol	0.11	-9.88%	-5.30%
ANA	0.34	-3.10%	
ANS CR	0.24	-0.42%	1.78%
ANS Finland	0.33	-0.93%	-2.36%
ARMATS	0.18	11.33%	3.85%
ATNS	0.22	-1.97%	-1.97%
Austro Control	0.33	9.33%	-0.74%
Avinor (Continental)	0.44	21.32%	11.03%
BULATSA	0.32	3.40%	3.86%
Croatia Control	0.34	1.68%	0.94%
DCAC Cyprus	0.30	10.60%	6.13%
DFS	0.39	8.30%	2.45%
DHMI	0.20	-1.94%	-0.13%
DSNA	0.26	-1.83%	0.45%
EANA	0.28	-2.60%	
EANS	0.27	-0.17%	-3.09%
ENAIRE	0.44	-5.12%	-1.50%
ENAV	0.33	2.81%	1.89%
FAA-ATO	0.23	-3.38%	-2.11%
HCAA	0.28	-2.39%	0.36%
HungaroControl	0.26	3.68%	-2.17%
IAA	0.35	16.35%	3.85%
ISAVIA	0.34	-26.21%	-11.50%
JANS	0.09	5.05%	0.87%
KCAA	0.27	-3.09%	-1.64%
LFV	0.45	0.60%	-0.18%
LGS	0.26	3.46%	6.85%
LPS	0.28	-0.08%	4.94%
LVNL	0.13	-51.48%	-13.76%

ANSP	KPI	2018-2019 AGR	4-year CAGR
MATS	0.27	1.20%	2.48%
M-NAV	0.30	3.46%	0.43%
MOLDATSA	0.23	-6.18%	8.57%
MUAC	0.49	7.48%	0.92%
NATS (Continental)	0.28	-2.20%	-1.56%
NAV CANADA	0.27	-3.52%	-0.42%
Nav Portugal (Continental)	0.40	-12.09%	-1.90%
NAVIAIR	0.30	2.85%	2.71%
Oro Navigacija	0.26	0.19%	1.37%
PANSA	0.36	7.45%	2.23%
ROMATSA	0.31	-1.97%	-0.83%
Sakaeronavigatsia	0.12	27.20%	6.16%
skeyes	0.21	-5.22%	-3.29%
skyguide	0.25	-2.03%	0.67%
Slovenia Control	0.35	3.97%	0.24%
SMATSA	0.24	-4.52%	1.88%
UkSATSE	0.19	13.23%	7.21%

### 3A: CONTINENTAL ANNUAL EMPLOYMENT COST PER ATCO IN OPS (USD)

Formula: ATCOs in OPS employment costs / No. ATCOs in OPS

ANSP	KPI	2018-2019 AGR	4-year CAGR
AAI	40508.98	14.88%	7.22%
AEROTHAI	138608.96	22.58%	11.61%
Airways NZ	125632.82	2.26%	1.20%
Albcontrol	60092.77	4.62%	2.70%
ANA	129983.46	-14.57%	
ANS CR	190593.23	-7.45%	4.78%
ANS Finland	138288.07	3.79%	-0.71%
ARMATS	27421.08	8.41%	11.50%
ATNS	63313.35	13.29%	5.85%
Austro Control	287431.80	11.27%	4.82%
Avinor (Continental)	233427.80	42.52%	12.29%
BULATSA	146581.67	6.06%	8.37%
Croatia Control	140254.14	2.52%	-0.35%
DCAC Cyprus	116206.37	8.99%	1.50%
DFS	275045.70	9.89%	4.12%
DHMI	68431.88	15.43%	16.01%
DSNA	153396.04	-1.18%	1.68%
EANA	33582.87	52.32%	
EANS	117956.43	-0.89%	3.13%
ENAIRE	229979.62	-0.99%	0.72%
ENAV	182786.70	5.18%	2.73%
FAA-ATO	218681.75	-0.68%	1.04%
HCAA	98433.65	3.09%	0.20%
HungaroControl	162933.89	2.75%	0.69%
IAA	172149.88	-0.19%	-0.59%
ISAVIA	202392.56	-9.67%	6.30%
JANS	83726.82	2.10%	0.65%
KCAA	31386.57	0.13%	-0.74%
LFV	205862.57	0.00%	2.85%
LGS	104328.84	7.56%	17.68%
LPS	198782.97	-0.05%	3.19%
LVNL	169088.78	-45.46%	-8.75%

ANSP	KPI	2018-2019 AGR	4-year CAGR
MATS	129802.84	4.63%	11.08%
M-NAV	89661.34	33.92%	7.63%
MOLDATSA	36874.48	-7.11%	19.71%
MUAC	369652.39	18.98%	7.96%
NATS (Continental)	191207.26	-0.16%	1.26%
NAV CANADA	195576.32	0.22%	3.29%
Nav Portugal (Continental)	351741.00	-2.29%	8.94%
NAVIAIR	187963.64	4.51%	2.83%
Oro Navigacija	94965.19	5.15%	3.72%
PANSA	146997.79	4.32%	5.44%
ROMATSA	142395.90	-0.17%	4.51%
Sakaeronavigatsia	32435.49	32.13%	11.55%
skeyes	258332.71	1.71%	4.95%
skyguide	271089.16	-0.16%	1.81%
Slovenia Control	150570.92	2.80%	2.67%
SMATSA	69082.84	-0.83%	1.83%
UKSATSE	47262.65	54.83%	34.31%

### 3A: CONTINENTAL ANNUAL EMPLOYMENT COST PER ATCO IN OPS (USD), PPP ADJUSTED

ANSP	KPI	2018-2019 AGR	4-year CAGR
AAI	155195.44	13.43%	5.36%
AEROTHAI	351706.14	23.76%	11.72%
Airways NZ	131124.97	1.96%	1.57%
Albcontrol	155414.75	4.57%	3.66%
ANA	135851.09	-15.46%	
ANS CR	347853.84	-8.67%	5.54%
ANS Finland	143570.91	3.49%	0.62%
ARMATS	66281.57	7.38%	11.35%
ATNS	145256.73	10.51%	2.52%
Austro Control	335205.39	11.45%	5.92%
Avinor (Continental)	214086.54	45.97%	13.25%
BULATSA	582216.92	10.28%	0.29%
Croatia Control	283875.11	4.37%	1.42%
DCAC Cyprus	170450.51	9.08%	3.68%
DFS	331239.22	9.75%	5.37%
DHMI	211943.28	1.31%	3.53%
DSNA	181705.95	-0.88%	3.47%
EANA	77074.43	2.28%	
EANS	191498.85	-2.43%	2.53%
ENAIRE	324454.66	-0.77%	1.94%
ENAV	242025.29	6.44%	5.08%
FAA-ATO	218681.75	-0.68%	1.04%
HCAA	156620.41	4.11%	2.25%
HungaroControl	334223.55	0.21%	-0.98%
IAA	196703.59	0.64%	0.27%
ISAVIA	176420.92	-12.11%	6.54%
JANS	88297.17	3.32%	0.67%
KCAA	60809.93	-4.82%	-5.12%
LFV	218335.80	-1.00%	2.66%
LGS	187801.53	6.64%	17.75%
LPS	348773.78	-0.85%	2.28%
LVNL	191700.52	-45.98%	-8.13%

ANSP	KPI	2018-2019 AGR	4-year CAGR
MATS	200952.79	5.91%	12.15%
M-NAV	243002.83	33.64%	6.06%
MOLDATSA	85287.24	-10.30%	16.21%
NATS (Continental)	217383.33	-0.45%	1.38%
NAV CANADA	217337.70	0.58%	4.44%
Nav Portugal (Continental)	546934.42	-1.60%	9.43%
NAVIAIR	185817.67	4.95%	4.89%
Oro Navigacija	187084.97	4.57%	3.28%
PANSA	318102.29	3.13%	5.30%
ROMATSA	356867.62	-1.46%	4.06%
Sakaeronavigatsia	92705.79	29.19%	8.64%
skeyes	300320.56	1.88%	6.01%
skyguide	233168.57	0.89%	3.53%
Slovenia Control	234207.10	1.91%	3.59%
SMATSA	194470.27	-2.26%	1.17%
UKSATSE	124252.99	43.56%	17.84%



## 3B: CONTINENTAL ANNUAL WORKING HOURS PER ATCO IN OPS

Formula: ATCOs in OPS hours / No. ATCOs in OPS

ANSP	KPI	2018-2019 AGR	4-year CAGR
AAI	1960.39	0.09%	0.53%
AEROTHAI	3305.56	7.17%	2.67%
Airways NZ	1364.00	0.00%	0.00%
Albcontrol	1380.19	-1.17%	-2.87%
ANA	1265.29	-17.24%	
ANS CR	1614.92	3.19%	1.67%
ANS Finland	1541.00	-1.38%	1.59%
ARMATS	1415.32	-0.74%	0.86%
ATNS	1413.60	-2.91%	-3.93%
Austro Control	1402.14	-0.51%	0.62%
Avinor (Continental)	1544.08	-2.64%	0.01%
BULATSA	1285.94	-0.02%	-0.02%
CAAS	1819.00	0.00%	0.00%
Croatia Control	1335.20	0.54%	-0.27%
DCAC Cyprus	1948.96	-0.04%	0.08%
DFS	959.52	1.51%	0.99%
DHMI	1177.87	-0.97%	-2.24%
DSNA	1284.00	0.00%	0.00%
EANA	1048.00	0.00%	
EANS	1482.55	0.02%	-1.27%
ENAIRE	1296.32	-3.28%	1.95%
ENAV	1283.65	3.63%	0.09%
FAA-ATO	1875.22	1.99%	0.98%
HCAA	1482.00	0.00%	-3.40%
HungaroControl	1563.84	-2.03%	-0.14%
IAA	1521.00	-2.17%	-0.08%
ISAVIA	1584.69	-13.49%	-4.00%
JANS	2015.00	0.00%	0.00%
KCAA	1440.00	0.00%	0.00%
LFV	1773.00	0.00%	0.06%
LGS	1555.72	-0.97%	7.14%
LPS	1573.20	0.71%	0.85%

ANSP	KPI	2018-2019 AGR	4-year CAGR
LVNL	1578.08	1.98%	-4.32%
MATS	1860.96	-1.92%	-1.73%
M-NAV	1195.20	-4.69%	0.29%
MOLDATSA	1459.09	4.60%	0.15%
MUAC	1174.03	1.26%	0.45%
NATS (Continental)	1317.85	-1.79%	1.95%
NAV CANADA	1617.92	0.12%	-0.13%
Nav Portugal (Continental)	2054.17	6.69%	3.06%
NAVIAIR	1469.60	-0.96%	-0.12%
Oro Navigacija	1582.83	-0.55%	-0.66%
PANSA	1090.39	-0.48%	-0.66%
ROMATSA	1206.37	0.76%	-0.53%
Sakaeronavigatsia	1524.00	0.00%	0.00%
skeyes	1416.08	0.86%	0.77%
skyguide	1365.50	0.32%	0.62%
Slovenia Control	1370.20	-0.90%	-0.85%
SMATSA	1152.42	-2.97%	-1.17%
UKSATSE	1437.79	2.82%	2.59%

### 3C: CONTINENTAL ANNUAL IFR HOURS PER ATCO IN OPS

Formula: IFR flight hours / No. ATCOs in OPS

ANSP	KPI	2018-2019 AGR	4-year CAGR
AAI	1671.02	-1.72%	1.32%
AEROTHAI	1082.95	-0.57%	4.63%
Airways NZ	705.85	-19.79%	-3.62%
Albcontrol	816.97	19.21%	7.30%
ANA	495.48	-17.08%	
ANS CR	1359.61	-7.69%	2.10%
ANS Finland	747.75	5.16%	7.57%
ARMATS	237.84	-5.19%	14.92%
ATNS	716.55	-2.33%	-1.88%
Austro Control	1160.08	4.40%	4.93%
Avinor (Continental)	877.07	-1.66%	-2.37%
BULATSA	1057.78	-2.05%	2.14%
CAAS	1153.23	-2.96%	-1.51%
Croatia Control	1060.47	10.27%	4.83%
DCAC Cyprus	1851.12	8.44%	4.85%
DFS	872.38	3.81%	4.11%
DHMI	961.71	-3.39%	-1.95%
DSNA	882.92	1.28%	2.46%
EANA	454.00	-2.98%	
EANS	1124.43	-12.63%	-2.17%
ENAIRE	991.35	1.37%	7.50%
ENAV	847.05	6.09%	5.18%
FAA-ATO	2154.46	3.17%	3.64%
HCAA	1284.07	5.57%	5.81%
HungaroControl	1572.93	0.57%	4.48%
IAA	1206.71	-11.73%	-3.47%
ISAVIA	2144.92	-9.44%	-1.20%
JANS	1908.96	-1.38%	2.86%
KCAA	546.96	17.26%	1.97%
LFV	1060.14	0.68%	3.23%
LGS	1268.99	2.00%	10.93%
LPS	1085.01	0.15%	0.31%

ANSP	KPI	2018-2019 AGR	4-year CAGR
LVNL	823.41	1.95%	0.88%
MATS	1790.94	6.74%	5.43%
M-NAV	617.72	23.83%	9.24%
MOLDATSA	195.63	-1.02%	8.54%
MUAC	2618.02	1.53%	3.66%
NATS (Continental)	1246.60	0.67%	5.86%
NAV CANADA	2146.36	-0.37%	3.03%
Nav Portugal (Continental)	2206.64	12.56%	10.24%
NAVIAIR	1087.47	0.82%	1.28%
Oro Navigacija	888.55	5.38%	8.93%
PANSA	893.92	1.97%	2.15%
ROMATSA	854.88	-2.81%	2.80%
Sakaeronavigatsia	467.45	-11.65%	-3.71%
skeyes	561.24	-3.70%	2.80%
skyguide	1036.44	2.05%	2.55%
Slovenia Control	719.36	0.99%	6.89%
SMATSA	954.70	-0.43%	4.00%
UkSATSE	257.33	9.05%	8.96%

### 3D: RATIO OF FRONTLINE SERVICE STAFF TO ATCO IN OPS

Formula: No. Frontline Service Staff / No. ATCOs in OPS

ANSP	KPI	2018-2019 AGR
AAI	0.29	14.03%
AEROTHAI	1.37	9.26%
Airways NZ	0.67	-0.65%
ANA	1.17	-9.23%
ATNS	0.99	11.75%
EANA	1.23	2.42%
ISAVIA	0.46	7.69%
JANS	1.61	-3.37%
NAV CANADA	1.33	

## 1: OCEANIC COST PER IFR HOUR (USD)

Formula: Total costs / IFR flight hours

ANSP	KPI	2018-2019 AGR	4-year CAGR
Airways NZ	71.96	35.74%	9.63%
FAA-ATO	86.65	-5.08%	-3.23%
ISAVIA	181.92	6.29%	4.84%
NAV CANADA	57.15	-5.02%	-1.45%

## 2A: OCEANIC ATCO IN OPS EMPLOYMENT COST PER ATCO IN OPS HOUR (USD)

Formula: ATCOs in OPS employment costs / ATCOs in OPS Hours

ANSP	KPI	2018-2019 AGR	4-year CAGR
Airways NZ	98.89	4.60%	0.69%
FAA-ATO	158.56	-4.04%	0.16%
ISAVIA	149.63	19.21%	14.30%
NAV CANADA	125.06	0.75%	2.99%

## 2A: OCEANIC ATCO IN OPS EMPLOYMENT COST PER ATCO IN OPS HOUR (USD), PPP ADJUSTED

ANSP	KPI	KPI - PPP	2018-2019 AGR	4-year CAGR
Airways NZ	98.89	103.21	4.29%	1.05%
FAA-ATO	158.56	158.56	-4.04%	0.16%
ISAVIA	149.63	130.43	15.99%	14.56%
NAV CANADA	125.06	138.98	1.12%	4.14%

## 2B: OCEANIC ATCO IN OPS HOUR PRODUCTIVITY

Formula: IFR flight hours / ATCOs in OPS hours

ANSP	KPI	2018-2019 AGR	4-year CAGR
Airways NZ	2.21	-35.37%	-10.05%
ATNS	0.61	174.15%	43.61%
FAA-ATO	7.20	6.22%	5.04%
ISAVIA	3.80	17.97%	2.69%
NAV CANADA	6.63	-1.13%	0.39%

## 2C: OCEANIC COSTS EXCLUDING ATCOS IN OPS EMPLOYMENT COSTS PER IFR HOUR (USD)

Formula: Costs excluding ATCOs in OPS employment costs / IFR flight hours

ANSP	KPI	2018-2019 AGR	4-year CAGR
Airways NZ	27.19	21.51%	
FAA-ATO	64.64	-3.41%	-2.73%
ISAVIA	142.57	7.84%	3.35%
NAV CANADA	38.28	-8.09%	-3.18%

## 2D: OCEANIC PROPORTION OF TOTAL COSTS MADE UP OF ATCO IN OPS EMPLOYMENT COSTS (USD)

Formula: ATCO in OPS employment Costs / Total Costs

ANSP	KPI	2018-2019 AGR	4-year CAGR
Airways NZ	0.62	19.23%	2.11%
FAA-ATO	0.25	-4.83%	-1.47%
ISAVIA	0.22	-4.93%	6.17%
NAV CANADA	0.33	7.28%	4.10%

## CO1: COMBINED COST PER IFR HOUR (USD)

Formula: Total costs /IFR flight hours

ANSP	KPI	2018-2019 AGR	4-year CAGR
AAI	66.07	-10.02%	-1.70%
AEROTHAI	442.07	15.64%	2.49%
Airways NZ	356.44	30.48%	6.52%
Albcontrol	691.05	-2.62%	1.08%
ANA	763.31	6.32%	
ANS CR	575.22	0.68%	0.83%
ANS Finland	556.74	-0.37%	-5.47%
ARMATS	656.82	2.72%	-6.57%
ATNS	402.08	18.31%	10.05%
Austro Control	758.20	-2.52%	0.64%
Avinor (Continental)	605.27	19.45%	3.59%
BULATSA	439.81	4.72%	2.15%
CAAS	442.14	15.72%	8.56%
Croatia Control	389.36	-8.57%	-5.83%
DCAC Cyprus	207.37	-9.12%	-8.79%
DFS	810.83	-2.25%	-2.39%
DHMI	355.73	21.84%	18.47%
DSNA	656.43	-0.61%	-1.21%
EANA	261.22	61.19%	
EANS	382.52	13.62%	8.78%
ENAIRE	524.91	2.95%	-4.89%
ENAV	645.93	-3.57%	-4.14%
FAA-ATO	416.72	-0.59%	-0.57%
HCAA	272.49	0.04%	-5.65%
HungaroControl	403.76	-1.46%	-1.48%
IAA	412.51	-2.82%	-0.84%
ISAVIA	190.75	9.18%	6.51%
JANS	510.92	-1.46%	-2.99%
KCAA	211.73	-11.89%	-1.03%
LFV	427.74	-1.27%	-0.19%
LGS	319.97	1.93%	-0.72%
LPS	643.21	-0.12%	-1.97%

ANSP	KPI	2018-2019 AGR	4-year CAGR
LVNL	1558.65	10.27%	4.88%
MATS	272.23	-3.14%	2.81%
M-NAV	481.33	4.53%	-1.90%
MOLDATSA	810.90	0.03%	1.59%
MUAC	286.23	9.03%	3.20%
NATS (Continental)	555.68	1.40%	-2.83%
NAV CANADA	284.54	3.31%	0.51%
Nav Portugal (Continental)	401.91	-1.25%	0.74%
NAVIAIR	570.10	0.78%	-1.14%
Oro Navigacija	416.28	-0.40%	-6.07%
PANSA	450.79	-4.79%	0.97%
ROMATSA	537.72	4.79%	2.51%
Sakaeronavigatsia	560.19	17.59%	9.12%
skeyes	2199.33	11.44%	5.57%
skyguide	1028.09	-0.15%	-1.38%
Slovenia Control	604.16	-2.10%	-4.17%
SMATSA	301.06	4.32%	-3.90%
UKSATSE	967.76	25.39%	14.97%



## CO2D: COMBINED PROPORTION OF TOTAL COSTS MADE UP OF ATCO IN OPS EMPLOYMENT COSTS (USD)

Formula: ATCO in OPS employment Costs / Total Costs

ANSP	KPI	2018-2019 AGR	4-year CAGR
AAI	0.37	29.91%	7.65%
AEROTHAI	0.29	6.61%	4.08%
Airways NZ	0.38	-0.17%	-1.28%
Albcontrol	0.11	-9.88%	-5.30%
ANA	0.34	-3.10%	
ANS CR	0.24	-0.42%	1.78%
ANS Finland	0.33	-0.93%	-2.36%
ARMATS	0.18	11.33%	3.85%
ATNS	0.22	-1.97%	-1.97%
Austro Control	0.33	9.33%	-0.74%
Avinor (Continental)	0.44	21.32%	11.03%
BULATSA	0.32	3.40%	3.86%
Croatia Control	0.34	1.68%	0.94%
DCAC Cyprus	0.30	10.60%	6.13%
DFS	0.39	8.30%	2.45%
DHMI	0.20	-1.94%	-0.13%
DSNA	0.26	-1.83%	0.45%
EANA	0.28	-2.60%	
EANS	0.27	-0.17%	-3.09%
ENAIRE	0.44	-5.12%	-1.50%
ENAV	0.33	2.81%	1.89%
FAA-ATO	0.23	-3.41%	-2.10%
HCAA	0.28	-2.39%	0.36%
HungaroControl	0.26	3.68%	-2.17%
IAA	0.35	16.35%	3.85%
ISAVIA	0.23	-8.87%	3.32%
JANS	0.09	5.05%	0.87%
KCAA	0.27	-3.09%	-1.64%
LFV	0.45	0.60%	-0.18%
LGS	0.26	3.46%	6.85%
LPS	0.28	-0.08%	4.94%

ANSP	KPI	2018-2019 AGR	4-year CAGR
LVNL	0.13	-51.48%	-13.76%
MATS	0.27	1.20%	2.48%
M-NAV	0.30	3.46%	0.43%
MOLDATSA	0.23	-6.18%	8.57%
MUAC	0.49	7.48%	0.92%
NATS (Continental)	0.28	-2.20%	-1.56%
NAV CANADA	0.28	-3.14%	-0.26%
Nav Portugal (Continental)	0.40	-12.09%	-1.90%
NAVIAIR	0.30	2.85%	2.71%
Oro Navigacija	0.26	0.19%	1.37%
PANSA	0.36	7.45%	2.23%
ROMATSA	0.31	-1.97%	-0.83%
Sakaeronavigatsia	0.12	27.20%	6.16%
skeyes	0.21	-5.22%	-3.29%
skyguide	0.25	-2.03%	0.67%
Slovenia Control	0.35	3.97%	0.24%
SMATSA	0.24	-4.52%	1.88%
UKSATSE	0.19	13.23%	7.21%

# ANNEX 6: EXCHANGE RATES

All exchange rates are the 2019 average for local currency per US Dollar. For sources please see Annex 7.

ANSP	Currency	2019 Exchange Rate
AAI	INR	0.0142
AEROTHAI	THB	0.0322
Airservices	AUD	0.6952
Airways NZ	NZD	0.6588
Albcontrol	ALL	0.0091
ANA	EUR	1.1195
ANS CR	CZK	0.0436
ANS Finland	EUR	1.1195
ARMATS	AMD	0.0021
ATNS	ZAR	0.0692
Austro Control	EUR	1.1195
Avinor (Continental)	NOK	0.1136
BULATSA	BGN	0.5882
CAAS	SGD	0.7331
Croatia Control	HRK	0.1510
DCAC Cyprus	EUR	1.1195
DFS	EUR	1.1195
DHMI	TRY	0.1762
DSNA	EUR	1.1195
EANA	ARS	0.0208
EANS	EUR	1.1195
ENAIRE	EUR	1.1195
ENAV	EUR	1.1195
FAA-ATO	USD	1.0000
HCAA	EUR	1.1195
HungaroControl	HUF	0.0034
IAA	EUR	1.1195
Isavia	ISK	0.0082
JANS	JPY	0.0092
KCAA	KSH	0.0098
LFV	SEK	0.1057

ANSP	Currency	2019 Exchange Rate
LGS	EUR	1.1195
LPS	EUR	1.1195
LVNL	EUR	1.1195
MATS	EUR	1.1195
M-NAV	MKD	0.0182
MOLDATSA	MDL	0.0569
MUAC	EUR	1.1195
NATS (Continental)	GBP	1.2764
NAV CANADA	CDN	0.7537
NAV Portugal (Continental)	EUR	1.1195
NAVIAIR	DKK	0.1499
Oro Navigacija	EUR	1.1195
PANSA	PLN	0.2605
ROMATSA	RON	0.2360
Sakaeronavigatsia	GEL	0.3548
SANS	SAR	0.2667
skeyes	EUR	1.1195
skyguide	CHF	1.0062
Slovenia Control	EUR	1.1195
SMATSA	RSD	0.0085
UkSATSE	UAH	0.0387

# ANNEX 7: ACRONYMS AND ABBREVIATIONS

<b>ACI</b>	Airports Council International
<b>ANS</b>	Air navigation services
<b>ANSP</b>	Air navigation service provider
<b>ASK</b>	Available seat kilometres
<b>ATC</b>	Air traffic control
<b>ATCO</b>	Air traffic controller
<b>ATM</b>	Air traffic management
<b>CANSO</b>	Civil Air Navigation Services Organisation
<b>CAPEX</b>	Capital Expenditure
<b>GBWG</b>	Global Benchmarking Workgroup
<b>GDP</b>	Gross domestic product
<b>IATA</b>	International Air Transport Association
<b>IFR</b>	Instrument flight rules
<b>KPI</b>	Key performance indicator
<b>MET</b>	Aeronautical Meteorological
<b>OPS</b>	Operations
<b>PPP</b>	Purchasing power parity
<b>PRU</b>	Performance Review Unit
<b>RPK</b>	Revenue passenger kilometres
<b>USD</b>	United States Dollar
<b>VFR</b>	Visual flight rules

# ANNEX 8: SOURCES

## Definitions:

EUROCONTROL Specification for Economic Information Disclosure V2.6

EUROCONTROL Specification for Economic Information Disclosure V3.0

## ACE benchmarking report data dashboard:

[Eurocontrol.int/ACE/ACE-Home.html](https://eurocontrol.int/ACE/ACE-Home.html)

## Industry Trends:

[IATA annual review – 2020](#)

[aci.aero/news/2020/05/19/aci-reveals-top-20-airports-for-passenger-traffic-cargo-and-aircraft-movements/](#)

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[aci.aero/wp-content/uploads/2020/10/Key-Statistics-ACI-World-WATR-2020\\_Final.pdf](#)

## Exchange rate data:

[data.oecd.org/conversion/exchange-rates.htm](#)

[bankofengland.co.uk/boeapps/iadb/index.asp?Travel=NlxIRx&levels=2&XNotes=Y&A3790XNode3790.x=7&A3790XNode3790.y=5&Nodes=&SectionRequired=I&HideNums=-1&ExtraInfo=true#BM](#)

[xe.com/currencytables/](#)

[exchangerates.org.uk/US-Dollar-USD-currency-table.html](#)

## IMF World Economic Outlook database:

[imf.org/external/pubs/ft/weo/2017/01/weodata/index.aspx](#)

## PPP rate data:

[data.oecd.org/conversion/purchasing-power-parities-ppp.htm](#)

[imf.org/external/datamapper/PPPEX@WEO/OEMDC/ADVEC/WEOWORLD](#)



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[canso.org](https://canso.org)

