

# Performance Review Body Monitoring Report 2023

The 2023 monitoring consists of three reports:

1. **PRB Monitoring Report 2023**
2. Annex I – Safety report
3. Annex II – Investments report

The 2023 monitoring is complemented by a [Digital dashboard](#), including a detailed analysis per Member State.

September 2024

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## REMARKS FROM THE CHAIR

Traffic in Europe increased in 2023 reaching 91% of 2019 levels. Despite the lower levels of traffic compared to pre-COVID-19, there continues to be a deterioration in Union-wide capacity performance. As highlighted in previous monitoring reports, there is a pattern of a small number of Member States not providing the necessary capacity to effectively manage the rapid return of traffic post COVID-19 and this has impacted on the network as a whole.

Some ANSPs continue to underinvest in staff and in capacity projects, despite having funds available in their performance plans. At the same time, it is important to acknowledge that COVID-19 did impact on the ability of ANSPs to undertake their ATCO training plans. In addition, due to the impact of Russia's war of aggression against Ukraine, there has been significant shifts in traffic with some Member States experiencing considerably higher levels of traffic than expected; presenting a challenge to affected ANSPs in terms of capacity planning. The PRB accepts that this has impacted on an ANSP's ability to effectively manage operations and meet performance targets and should be taken into consideration when reflecting on an individual ANSP's performance in meeting capacity and environmental targets.

However, performance needs to improve quickly. It is important that ANSPs focus on delivering their planned investment programmes on time and budget to unlock much needed capacity. It is equally important that ANSPs focus on realising their ATCO training plans as soon as possible, utilise new ATCOs, look at ways to improve rostering schemes and increase sector capacities. These actions will allow ANSPs to open more sectors, offer more sector-opening hours, and enable higher throughput in the shorter term.

Given the interdependency between capacity and environment, it is unsurprising to find that the poor Union-wide capacity performance translates into a poor environmental performance. As for 2022, the environmental target was missed by a substantial amount. The PRB's standalone traffic light system report highlights the varying performance of Member States and notes that the continued decline in performance is likely due to the factors including the impact of Russia's war of aggression against Ukraine and issues resulting from a lack of capacity.

Despite the mixed performance of Member States in relation to capacity, environment, and cost-efficiency, safety performance as measured under the performance and charging scheme remains positive. While most ANSPs can still meet targets by the end of RP3, the PRB encourages all ANSPs to focus on ensuring that all necessary measures are implemented in a timely manner.

As we near the end of RP3, Member States will be preparing performance plans to cover the period 2025 to 2029 (RP4). The PRB urges Member States to reflect on the past mixed performance of ANSPs, as highlighted in the various PRB reports, when preparing their forward-looking plans. This is the opportunity to put in place robust performance plans that include a sufficient level of ambition to ensure delivery of the necessary level of services required by airspace users in a cost effective and timely manner, together with adequate measures to incentivise their delivery.

On behalf of all the PRB members, I would like to thank the PRB Support Team for its invaluable help in preparing this report. I would also like to thank our colleagues from European Aviation Safety Agency (EASA) and from Eurocontrol, namely the Network Management Directorate and the Performance Review Unit for their contributions.



Cathy Mannion  
PRB Chair

## EXECUTIVE SUMMARY

This report presents the results of the monitoring of the air navigation services of the Single European Sky for the year 2023 assessing whether Member States achieved their targets in the key performance areas of safety, environment, capacity, and cost-efficiency.

Air traffic management in Europe in 2023 saw traffic growth continue to recover following the COVID-19 downturn (+9% compared to 2022, remaining 9% below traffic movements in 2019) and continued to be impacted by Russia's ongoing war of aggression against Ukraine.

Overall, safety management performance has remained strong. While a number of Member States have experienced some degradation, RP3 targets can still be met by the end of 2024 if attention is focused on ensuring that the necessary measures are implemented.

In a now all too familiar pattern, Union-wide capacity performance continues to deteriorate. A number of Member States have not implemented sufficient capacity measures to meet air traffic demand, despite traffic remaining 4% below the traffic forecast for 2023 (STATFOR October 2021 forecast). For some Member States, this lack of much needed capacity has occurred despite requesting, and being granted, deviations from the cost efficiency targets in order to invest in additional measures to achieve capacity targets. Most of these Member States have incurred lower actual costs compared to planned and only a minority achieved their 2023 en route capacity targets. This means that airspace users are incurring the costs of both increased delays and higher unit rates for the capacity that has not been provided.

This poor Union-wide capacity performance has a direct knock-on effect on the lack of achievement of the Union-wide environment target. Airspace users have had to fly longer routes and burn more fuel (at additional cost) to mitigate the effect of congested airspace.

The PRB's recommendations reflect this lack of progress and repeat the calls for ANSPs and Member States to quickly take the necessary steps - using the revenue provided within their performance plans - to invest in capacity-related measures.

### *Traffic 2023*

- ANSPs handled 9.1 million flights compared to 8.3 million flights in 2022, and 9.9 million flights in 2019.
- Service units amounted to 122 million compared to 109 million in 2022, still below the 125 million in 2019.
- At Union-wide level, service units continue to increase more quickly than movements. This leads to revenue for many ANSPs growing faster than the workload generated by additional movements. However, this is not uniform across all Member States, with a number of Member States experiencing the opposite.
- It is notable that some ANSPs experienced unexpected and significant higher growth in traffic compared to the EU average (due to the impact of Russia's war of aggression against Ukraine). At the same time, other ANSPs have yet to achieve the same levels of traffic as experienced in 2019.

### *Safety*

- 18 ANSPs achieved the RP3 targets for the effectiveness of safety management for all Management Objectives (one year before the end of RP3). The remaining 18 ANSPs can still meet the targets by the end of RP3, but will need to ensure measures are implemented. The risk that ANSPs will not meet the target has increased.

- Safety levels, measured through the safety PIs on occurrences, continue to improve with Union-wide rates of runway incursions and separation minima infringements decreasing again in 2023.
- The rate of accidents and serious incidents with ANS contribution continued to decrease, remaining in line with the trend over the past ten years.

### *Environment*

- The Union-wide horizontal flight efficiency (KEA) performance target was not achieved in 2023 (2.99% compared to the target of 2.40%) and performance was at the worst level since 2016. 25 Member States did not achieve their national targets.
- 2023 marked the first full year of the effects of Russia's war of aggression against Ukraine on environmental performance, which is reflected in the KEA score being 2.99% in 2023 compared to 2.96% in 2022.
- For terminal airspace, both additional ASMA (arrival sequencing and metering area) time and additional taxi-out time increased. Combined, this shows a +5% increase compared to 2022, mainly driven by taxi-out performance. However, it is worth noting that performance remains better than 2019 levels.

### *Capacity*

- The actual Union-wide average en route ATFM delay was 1.84 minutes per flight in 2023, 1.34 minutes per flight higher than the Union-wide target, and higher than in 2019, despite fewer IFR movements during the year. Note that traffic distribution was uneven across the network, impacting on ANSPs in different ways. For some ANSPs, this exacerbated existing capacity problems.
- 13 Member States did not achieve their local targets, indicating that some ANSPs still have unresolved capacity issues. Adverse weather also contributed significantly to en route ATFM delays in 2023.
- Six out of the 13 Member States which did not achieve capacity targets experienced double-digit traffic growth compared to 2022. Conversely, four Member States did not achieve their capacity targets even though traffic demand remained at or significantly below the forecasted level on average.
- Terminal capacity performance deteriorated compared to 2022 by 60% mostly due to disruptions, adverse weather, and non-ATC problems at airports. All-cause departure delays were 19.23 minutes per flight, 0.2 minutes per flight higher than in 2022.
- ANSPs and Member States should focus on delivering continuous capacity improvements in 2024 and during RP4 to catch up with traffic recovery and accommodate future traffic growth.

### *Cost-efficiency*

- In 2023, the real en route actual unit cost (AUC) Union-wide was -4.6% lower than the determined unit cost (DUC). En route actual costs were -3.4% below determined costs, while actual service units were +1.2% higher than the determined service units.
- The decrease in actual costs compared to plan was mainly attributable to staff costs and depreciation. Many ANSPs have not implemented their ATCO and investment plans and have not achieved their capacity targets.
- The en route actual unit cost for airspace users (AUCU) was +7.9% higher than the DUC (nominal), mainly due to the application of the 2023 inflation adjustment (where the weighted average actual index was +11% higher than the determined figure).
- The revenue gap due to COVID exceptional measures amounts to 5.7B€<sub>2017</sub> for en route charging zones, of which 737M€<sub>2017</sub> was included in 2023 unit rates (representing about 12% of 2023 unit rates).

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## 1 INTRODUCTION

- 1 The PRB Annual Monitoring Report 2023 analyses the performance of the air navigation services of the Single European Sky (SES) in 2023 against targets which were revised following the COVID-19 pandemic and the related traffic restrictions that heavily impacted European and global aviation. 2023 was the fourth year of the third reference period (RP3) and was marked by the ongoing recovery from the COVID-19 pandemic and continuation of Russia's war of aggression against Ukraine.
- 2 Under Commission Implementing Regulation (EU) 2019/317 (herein the Regulation), monitoring the performance of SES is one of the primary tasks of the Performance Review Body (PRB). It ensures that the European Commission, Member States, and stakeholders are informed about how Air Navigation Service Providers (ANSPs) perform in relation to their performance targets. The legal basis for monitoring the performance of air traffic management (ATM) in the SES area is defined in Article 11 of Regulation (EC) 549/2004 (the Framework Regulation) and in Article 3 of the Regulation.
- 3 The PRB continued to digitalise the results of the monitoring of ATM performance. The Member States' factsheet (i.e. previous Annex I) and the Member States' detailed analysis for experts (i.e. previous Annex II) are presented in a revised form as a digital dashboard. The web-based dashboard provides increased granularity and easier understanding of the data. The dashboard can be accessed at <http://www.sesperformance.eu>.
- 4 This monitoring report is complemented by the updated report on the traffic light system, which compares the environmental performance of Member States to previous years using the performance metrics included in the Regulation.
- 5 The monitoring report is supported by two annexes (in addition to the web-based dashboard):
  - Annex I – Safety report (produced by EASA); and
  - Annex II – Investments report (produced by the PRB).
- 6 For the Annual Monitoring Report 2023, the PRB used data provided and verified by Member States, the Performance Review Unit of Eurocontrol (PRU), the Network Manager (NM), and the European Union Aviation Safety Agency (EASA).



## 2 TRAFFIC SITUATION IN 2023

- IFR movements in 2023 were 4% lower than the STATFOR October 2021 base forecast, 9% below the 2019 actual values.
- En route service units in 2023 were 1.2% lower than the determined service units, 2% below the 2019 actual values.
- Service units are increasing more quickly than IFR traffic.

### 2.1 IFR movements

- A total of 9.1 million IFR movements were managed within the SES airspace in 2023. This represents an increase of +9% compared to 2022, reaching 91% of the levels of 2019.
- The STATFOR October 2021 base forecast envisaged 9.5 million IFR movements in 2023.<sup>1</sup> While traffic grew compared to 2022, ANSPs managed 4% less traffic than forecasted for the year 2023.
- The most recent forecast (STATFOR February 2024) envisages that, by the end of the reference period, IFR movements will grow +5% in the base scenario, +7% in the high scenario, and +2% in the low scenario compared to 2023 actual values. All forecast scenarios remain below the 2019 actual traffic levels (Figure 1).

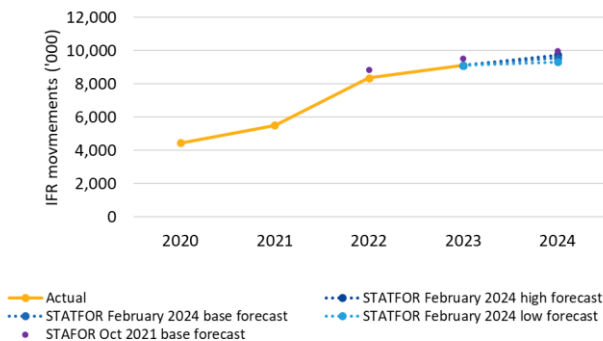


Figure 1 – Actual Union-wide IFR movements compared to the STATFOR October 2021 forecast, and projections of the STATFOR February 2024 high, base, and low forecasts (source: PRB elaboration on STATFOR forecast).

### 2.2 Service units

- Traffic is also measured by service units. These are calculated using the maximum take-off weight and distance flown by aircraft and form the basis for air navigation charges.
- In 2023, over 122 million en route service units were recorded, an increase of +13% compared to 2022. In 2019, prior to the pandemic, over 125 million were recorded, meaning that the en route

service units in 2022 reached 98% of the 2019 level.

- At Union-wide level, the en route actual service units were +1.2% higher than the determined service units (1.5 million service units) in 2023.
- The most recent forecast (STATFOR February 2024) envisages that, by the end of the reference period, the en route service units will grow by +5% in the base scenario, +9% in the high scenario, and +2% in the low scenario compared to 2023 actual values. In 2024, both the base and high scenarios exceed the 2019 service units by 3% and 6%, respectively (Figure 2).

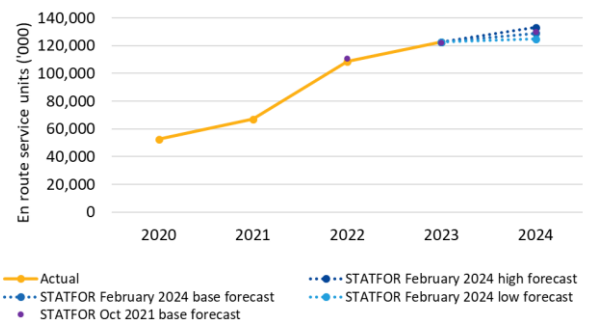


Figure 2 – Actual Union-wide en route service units compared to the STATFOR October 2021 forecast, and projections of the STATFOR February 2024 high, base, and low forecasts (source: PRB elaboration on STATFOR forecast).

<sup>1</sup> The final STATFOR forecast prior to the start of 2022 and the most used forecast within the performance plans.

### 3 SAFETY

- 18 ANSPs achieved the EoSM targets on all Management Objectives for RP3 in 2023.
- An increasing number of ANSPs are at risk of not meeting the target for RP3.
- Rate of runway incursions and separation minima infringements decreased in 2023 compared to previous years – a continuation of the downward trend.
- Only 12 ANSPs reported using some form of automated safety data recording systems for occurrences.

#### 3.1 Effectiveness of safety management

15 Safety is monitored through one key performance indicator (KPI): The effectiveness of safety management (EoSM) of the ANSPs.<sup>2</sup> The EoSM key performance indicator is composed of the following safety Management Objectives (MOs):

- Safety policy and objectives;
- Safety risk management;
- Safety assurance;
- Safety promotion; and
- Safety culture.

16 The EoSM for ANSPs is based on a set of 28 questions to determine the minimum level of maturity for each Management Objective. The answers are provided by the ANSPs and verified by the NSAs. The questions are developed by EASA and included in the supporting technical material to the Regulation. For each objective, the maturity level achieved is determined by the lowest maturity level of any question allocated to a Management Objective. In addition to the minimum level achieved for a Management Objective, an EoSM score is calculated.<sup>3</sup>

17 The applicable EoSM targets are defined for the end of the reference period (2024) with intermediate levels for each year of RP3. 18 out of 36 ANSPs achieved the RP3 targets in 2023, reaching a minimum of maturity level D in safety risk management and a minimum of maturity level C in all other Management Objectives. Figure 3 shows the aggregated results at Union-wide level.

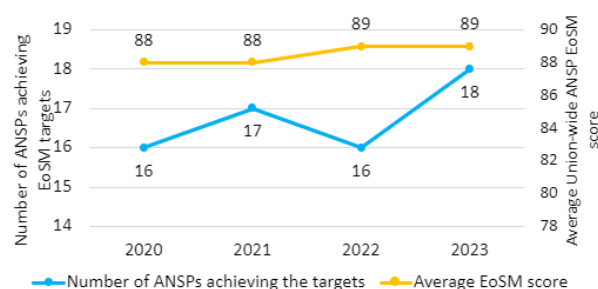


Figure 3 – Number of ANSPs achieving their targets in the first four years of RP3 along with their EoSM score (source: PRB elaboration).

- 18 Between 2022 and 2023, five ANSPs improved their minimum maturity level for at least one Management Objective (achieving the RP3 targets in 2023), while three ANSPs showed the minimum maturity level degrading and no longer achieved the target for at least one Management Objective (DSNA for all MOs except Safety Assurance, NAV Portugal for Safety Risk Management, and RO-MATSA for Safety Risk Management). For all three ANSPs, the NSA downgraded the EoSM scores based on the verification. According to the performance plans, a total of 21 ANSPs planned to reach the RP3 targets in 2023. However, nine ANSPs were not able to achieve these targets.
- 19 While in the past ANSPs performed better than planned within the safety risk management area of their performance plans, less progress has been observed in 2023, with only one additional ANSP reaching the target level D (Figure 4, next page). For other Management Objectives, 34 ANSPs had planned to already achieve the RP3 target level in 2022, but only 31 ANSPs managed to do so.

<sup>2</sup> The PRB monitors 36 ANSPs. This number includes 28 main en route ANSPs plus MUAC, SKYWAY, ANA Lux, three further Swedish ANSPs, and two further Polish ANSPs.

<sup>3</sup> Each of the 28 questions in the EoSM questionnaire can score from one (level A) up to four (level D). The sum of the scores is then normalised between 0 and 100 (maximum). The score gives an indication of how many areas (questions) the ANSPs need to improve.

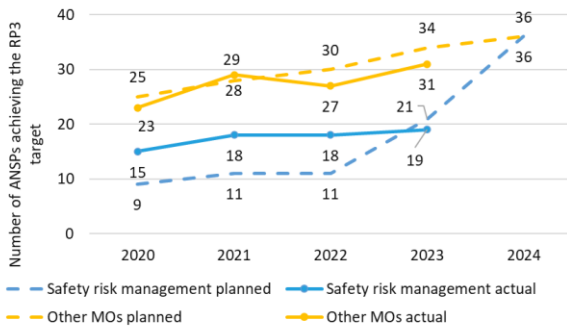


Figure 4 – Actual versus planned number of ANSPs achieving the level of the EoSM targets for RP3 ahead of 2024 (source: PRB elaboration), showing that the ANSPs are behind on their planned improvements.

20 Among the remaining 18 ANSPs that have not yet achieved the level of the RP3 targets, the majority need to improve in Safety Risk Management; some on all three questions under this Management Objective (indicated in navy blue in Figure 5). In their performance plans, the ANSPs anticipated that improvements to Safety Risk Management would come late in RP3 as shown in Figure 4 (15 ANSPs planned to reach the target during 2024). The ANSPs need to ensure that their planned measures are implemented in 2024, as well as any additional measures needed.

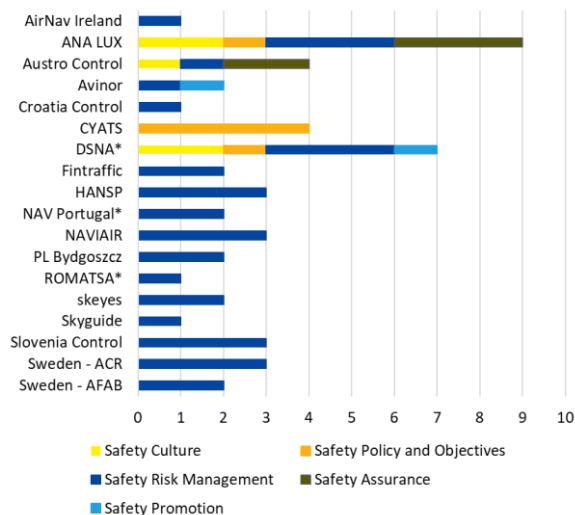


Figure 5 – Number of questions for specific Management Objectives ANSPs need to improve to achieve the EoSM targets (source: PRB elaboration), showing that many ANSPs still have a challenge to meet targets by 2024. "\*" indicates ANSPs downgrading compared with 2022.

21 Three ANSPs have a greater challenge to achieve the targets as they are behind their plan:

- ANA Lux slightly improved from 2022 and reached the target for Safety Promotion in

2023. Nevertheless, for other Management Objectives either no progress has been shown, or the situation degraded compared to 2022. For Safety Risk Management, ANA Lux needs to improve from level B to level D on all three questions. In this regard, ANA Lux needs to ensure that its planned measures are implemented and that additional measures are implemented to reach RP3 targets. The NSA notes that needed improvements are covered by Corrective Action Plans and these can be implemented in 2024.

- CYATS planned to achieve the RP3 targets in 2020. While the situation improved when compared to 2022, CYATS is yet to achieve the target for Safety Policy and Objectives. The causes appear to be similar to those noted in 2022 (i.e. no signed Safety Policy, unclear safety accountabilities, and a lack of formalised safety improvement plans). CYATS needs to resolve the issue of accountability and have the appropriate authority sign the existing Safety Policy.
- DSNA reached the RP3 targets in 2022 but recorded a deterioration in 2023. DSNA needs to recover the maturity levels in four out of five Management Objectives. However, the NSA considers the issues identified manageable, and by implementing additional measures as defined in a Corrective Action Plan, suggests that DSNA should be able to meet the RP3 targets by end 2024.

22 To achieve the targets by end of RP3, ANA Lux, CYATS, and DSNA need to take immediate steps to improve their performance. The respective NSAs have not signalled that the ANSPs will not achieve the RP3 targets.

23 As mentioned above, nine ANSPs are trailing behind their planned maturity levels, including ANA Lux, DSNA and CYATS. These ANSPs need to ensure that they recover and, where necessary, implement additional measures. All the remaining ANSPs are required to ensure that they implement the measures defined in their performance plans to reach the RP3 targets in 2024.

24 NSAs in seven Member States have signalled a possible risk of failure to reach targets by end of 2024. The reasons indicated are different:

- Challenges in implementing the measures needed to reach targets due to time and resource constraints;
  - The (perceived) prescriptive guidance material in EoSM questionnaire not allowing for alternative means to achieve the objectives and an alternative mean of compliance was not proposed;
  - Differences between NSAs and ANSPs in understanding the guidance (i.e. how to achieve a certain maturity level);
  - Missing resources to allow for the necessary training of staff, and inability to attract qualified staff and ensure continuity.
- 25 With one year left of RP3, the PRB and EASA consider that the risk that a number of ANSPs will not achieve the RP3 targets is increasing, most notably caused by not reaching the required maturity level in Safety Risk Management. Some ANSPs still have to develop and/or effectively implement procedures to satisfy the requirements related to the maturity level (typically the case for ANSPs needing to improve on all three questions under Safety Risk Management). Considering that these ANSPs not only have to define the necessary processes, but also have to demonstrate to the NSA that the processes are fully implemented, the ANSPs are at risk of not meeting the RP3 target. ANSPs only needing to improve one question should not be at risk (in most cases only the evidence of implementation is missing).
- 26 When assessing the performance plan for RP3, the PRB and EASA encouraged ANSPs to plan to reach targets in advance of the final year of RP3 and to ensure that the measures were precisely defined to encompass what was required to reach the targets. Safety Risk Management was the Management Objective where many ANSPs planned to reach the target in the last year of RP3, hence not having any contingency. In previous Annual Monitoring Reports, the PRB encouraged ANSPs and NSAs to ensure that measures were sufficient and implemented to mitigate the risk of not meeting the targets. As we move into the last year of RP3, the PRB now sees an increased risk that some ANSPs may not meet the RP3 targets.
- 27 A detailed assessment of the safety KPI at ANSP level is available in Annex I of this report.
- ### 3.2 Occurrences
- 28 In addition to the EoSM, two performance indicators (PIs) related to occurrences are monitored at Union-wide level (Figure 6, next page):
- Rate of runway incursions (RIs) which describes the total number of RIs with a safety impact that occurred at regulated airports in a Member State, divided by the total number of IFR and VFR airport movements.
  - Rate of separation minima infringements (SMIs) which describes the total number of SMIs with a safety impact that occurred within the airspace of all air traffic service units in a Member State.
- 29 In preparation of the Member States providing their monitoring report, EASA would extract the information needed to calculate the safety performance indicators (SPIs) from the occurrences reported in the European Central Repository (ECR), which are then sent to Member States for verification and elaboration in their Performance Maintenance Recorders (PMRs). However, so far in RP3, EASA has not been able to extract data from the ECR to provide information to compute the SPIs. This is due to the overall poor quality of the data uploaded to the ECR: A significant part of occurrences extracted from the ECR did not contain information on severity and risk, as required to compute the SPIs, and in many cases basic information was missing. Member States had to extract the occurrences from their own national databases with no further involvement from or verification by EASA.
- 30 Compared with 2022, in 2023, the rate of runway incursions and separation minima infringements both decreased (Figure 6, next page).<sup>4</sup>
- 31 When considering occurrences with ANS contribution, the rate between 2021 and 2022 remained stable despite the increasing traffic. However, while traffic still increases, the rate of SMI fell from 8.9 in to 7.8 occurrences per 100.000 flight hours from 2022 to 2023. The rate of runway incursions has decreased since 2021, and decreased

<sup>4</sup> Comparison of occurrence rates between RP2 and RP3 should be treated with caution as RP3 introduced changes that meant less occurrences are expected to be reported with the same performance. Currently, only occurrences with a safety impact are reported.

again in 2023 from 4.2 to 3.5 occurrences per 100,000 movements.

- 32 For separation minima infringements around 60% of Member States reported lower rates in 2023 compared to 2022. Most notably, Member States with a high number of flight hours (i.e. France, Germany, Spain, and Italy) all reported lower rates, which contributed to a lower Union-wide rate. For runway incursions around two-thirds reported lower rates, and Member States with a high number of movements all reported lower rates (except Spain). Details on the evolution of the rates per Member State over the course of RP3 can be found in in Annex I of this report.

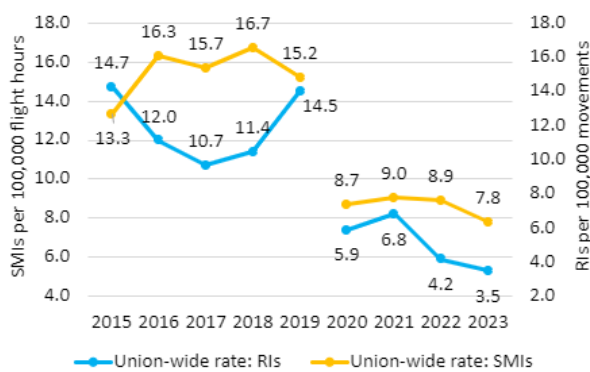


Figure 6 – Union-wide occurrences rate for separation minima infringement (SMI) and runway incursions (RIs) in the period 2015 to 2023 (source: PRB elaboration). Some years do not include data from all Member States as the corresponding monitoring reports did not provide the information required. For 2023, data from the Netherlands was not available.

- 33 Only three ANSPs (HungaroControl, Slovenia Control and Oro Navigacija) report the application of additional safety indicators. The indicators used are a mix of maturity indicators (e.g. SMS maturity) and occurrence indicators (e.g. ATM system or Airspace Infringements).

### 3.3 Automated safety data recording systems

- 34 The use of automated safety data recording systems by ANSPs as an element of their safety risk management framework is a performance indicator that measures how systematic automated safety reporting is in various Member States.
- 35 In 2023, 12 ANSPs reported using some form of automated safety data recording systems for recording separation minima infringement occurrences (ANS CR, Croatia Control, DSN, HungaroControl, SJSC, MUAC, LVNL, SE Oro Navigacija, SDATS, LPS SR, Skyguide, and ENAIRE). Four ANSPs reported using automated systems to also record

runway incursions (ANS CR, Croatia Control, SJSC, and ENAIRE).

- 36 During RP2 and RP3, only marginal improvements have been seen in the use of automated tools. In 2023, compared to 2022, two additional ANSPs introduced the use of the automated recording tools (SE Oro Navigacija and SDATS).

### 3.4 Serious incidents and accidents with ANS contribution

- 37 Under the performance and charging scheme, serious incidents and accidents involving air traffic management are not monitored. Nevertheless, as in past years, the PRB included figures which EASA has prepared, to give a more comprehensive picture of safety in ATM. The absolute number of accidents and serious incidents with ANS contribution in 2023 decreased compared with 2022 despite an increase in traffic (Figure 7).

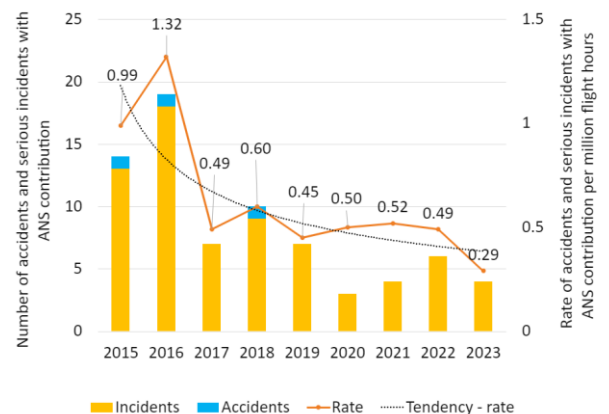


Figure 7 – Union-wide accidents and serious incidents with ANS contribution (source: EASA), showing that the rate of occurrences had a slightly downwards trend since 2017. ‘Contribution’ means that ANS services had a role to play in causing the occurrence.



## 4 ENVIRONMENT

- The 2023 Union-wide KEA performance target was not achieved by 0.59 percentage points (2.99% compared to a target of 2.40%).
- 25 Member States did not achieve their reference values in 2023.
- KEP and SCR improved slightly in 2023, however remained worse than in 2021.
- Terminal and ground environmental performance (additional ASMA and AXOT time) deteriorated by 5.1%, nevertheless remaining better than the 2019 pre-COVID-19 pandemic levels.
- The share of flights completing a CDO approach remained stable year-on-year, above the 2019 pre-COVID-19 pandemic levels.

### 4.1 En route performance

#### Flight efficiency of the actual flight path

- 38 Environmental performance is measured through one KPI: Horizontal en route flight efficiency of the actual flight path (KEA). KEA measures the additional distance flown in addition to the great circle distance. Additional distance flown is impacted by the trajectory selected by airspace users and also by airspace restrictions and ATM measures including air traffic flow management (ATFM)-related restrictions to reduce delay. The higher the KEA value, the worse the performance.
- 39 While the ongoing impact of airspace closures caused by Russia's war of aggression against Ukraine contributed to the Union-wide target not being achieved in 2023 (Table 1), there are other contributing factors including the effects of delay on en route flight efficiency. Eurocontrol previously estimated that closures of airspace due to the war of aggression added 0.28 percentage points to KEA in 2023, indicating that capacity constraints and network inefficiencies also played a role in missing the targets. Moreover, the PRB estimates that delay in excess of the Union-wide capacity targets contributed approximately 0.19 percentage points to the Union-wide KEA performance in 2023.
- 40 The impact of the capacity shortfall (0.19 percentage points) and airspace closures (0.28 percentage points) were not the only reasons for not achieving the Union-wide KEA target. The Union-wide target would still have been missed by 0.12 percentage points when accounting for these issues. As highlighted by the PRB in earlier monitoring reports, this demonstrates that ANSPs and Member States must take immediate action and

implement initiatives, including cross border Free Route Airspace where applicable, to improve horizontal flight efficiency and to focus on the interdependency between the environment and capacity KPAs by resolving capacity bottlenecks.

Environmental performance 2023		
	Union-wide target	Achieved performance
<b>KEA actual horizontal flight efficiency</b>	2.40%	2.99%

Table 1 – Comparison of 2023 Union-wide environment targets and actual environment performance.

- 41 The 2023 shortfall between actual-KEA and the Union-wide target of 0.59 percentage points is as observed in 2022 (Figure 8, next page). The similar performance in 2022 and 2023, despite it being the first full year to be affected by Russia's war of aggression against Ukraine, may indicate that the Union-wide impact of the ongoing airspace disruption has plateaued.
- 42 The PRB estimates that over 45 million kilometres of additional distance was flown in 2023 as a result of missing the Union-wide target by 0.59 percentage points. This equates to approximately 201 million kilograms of excess fuel burnt or some 635 million kilograms of CO<sub>2</sub>.<sup>5</sup>

<sup>5</sup> Fuel burn and CO<sub>2</sub> emissions are calculated based on the following conversion factors: 1 km = 0.53996 Nautical Mile; 1 Nautical Mile = 1/7.3 minutes; 1 minute = 60 kg fuel; 1 kg fuel = 3.15 kg CO<sub>2</sub>.

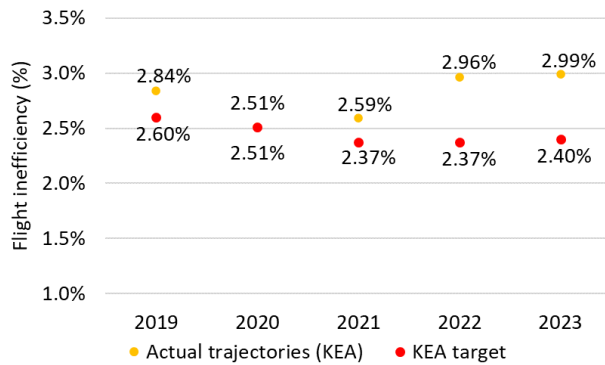


Figure 8 – KEA performance over the past five years (source: PRB elaboration), showing the deterioration of Member States' performance in 2023.

- 43 Russia's war of aggression against Ukraine has had a direct impact on the performance of KEA, and in particular on those in the vicinity of Belarus, Russia and Ukraine. Such an impact is outside of the control of those affected. Therefore, when assessing ANS performance in the environment KPA, the PRB also takes the change in the shortest constrained route (SCR) into account. If KEA degrades, but SCR improves or remains stable, then this is a positive outcome.
- 44 In 2023, 25 Member States did not achieve their reference values, the same as in 2022.
- Four Member States were within 0.2 percentage points of their targets: Austria, Croatia, Slovenia, and Spain. The SCR for these four Member States also remained stable compared to 2022.
  - 13 Member States missed their targets by between 0.2 and 1 percentage point: Belgium, Cyprus, Czech Republic, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Sweden, and Switzerland. Despite missing their KEA targets, the SCR improved for Belgium, Cyprus, Denmark, Germany, Greece, Hungary, the Netherlands, and Switzerland. This demonstrates that these Member States enabled shorter routes within their airspace compared to 2022. For France and Sweden the SCR remained stable, while it degraded compared to 2022 for Czech Republic, Ireland, and Italy.
  - The remaining eight Member States missed their targets by more than one percentage point. These states are geographically located near Russia, Ukraine, or Belarus and have had the effective usage of their airspace disrupted: Lithuania, Latvia, Estonia, Poland,

Finland, Slovakia, Romania, and Bulgaria. Among this group, only Poland's performance has improved (both KEA and SCR) compared to 2022.

#### Flight efficiency of the flight plan and route network

- 45 In addition to measuring horizontal flight efficiency, two performance indicators help to explain environmental performance: SCR and the planned horizontal flight efficiency (KEP):
- SCR indicates the shortest available routes that could have been planned by airspace users considering airspace constraints (e.g. activation of temporary segregated military training areas or RAD restrictions).
  - KEP indicates the efficiency of the routes planned by airspace users.
- 46 These performance indicators do not directly relate to fuel burn or CO<sub>2</sub> but help to explain the constraining factors that limit horizontal flight efficiency. The SCR is relevant because environmental performance correlates with traffic levels and available capacity and the SCR considers the available airspace (including capacity) and restrictions in the flight planning stage. It reflects the options airspace users had when planning their flights. KEP measures the efficiency of the routes planned by airspace users according to their own planning tools and criteria.
- 47 KEP and SCR improved slightly in 2023, however remain worse than 2021 figures (Figure 9, next page). This deterioration can be attributed to the ongoing disruption caused by the closure of Ukrainian, Russian, and Belorussian airspace. The slight improvement could be due to the airspace effectively adjusting to account for the new restrictions to routes. The gap between KEP and SCR has decreased each year since 2019 demonstrating that airspace users are planning routes increasingly closer to the shortest route available.

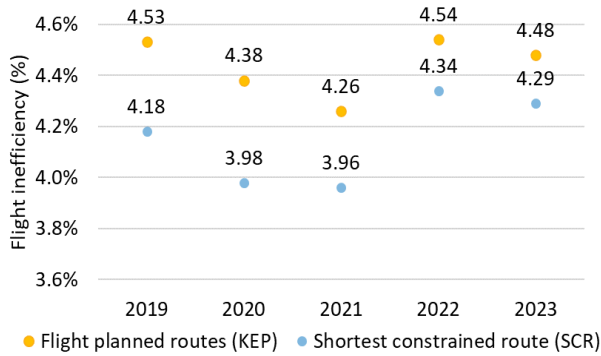


Figure 9 – KEP and SCR performance over the past five years (source: PRB elaboration).

### 4.2 Additional time spent taxiing out and holding in terminal airspace

48 Member States are required to report data for the additional time flights spent in terminal airspace and taxiing out at airports with more than 80,000 IFR movements and those included in the performance plans on a voluntary basis. The indicators measured are: Additional taxi-out time (AXOT), and additional arrival sequencing and metering (ASMA) time.<sup>6</sup>

49 Flights spent on average an additional 1.13 minutes per flight in the ASMA and 2.57 minutes of AXOT per flight in 2023. Combined, this shows a +5.1% increase in the total additional time compared to 2022, and a total increase of 35.53% compared to 2021. Despite this, 2023 represents a 21.6% improvement over pre-COVID-19 pandemic levels (Figure 10).

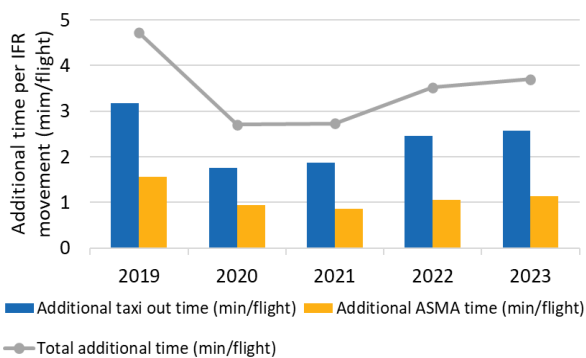


Figure 10 – Union terminal environmental performance (source: PRB elaboration), showing that additional ASMA times and performance in 2023 worsened compared to 2022. 2019 includes UK airports.

### 4.3 Continuous descent operations

50 Member States are required to report the proportion of approaches applying Continuous Descent Operations (CDO) for airports with more than 80,000 IFR movements and for those included in the performance plans on a voluntary basis. This performance indicator measures how efficiently aircraft approach airports, as optimum decent profiles reduce fuel burn and emissions. Several factors influence such operations, including weather, terminal area congestion, aircraft characteristics, restrictions for reduction of noise and airspace design.

51 Overall, the share of flights achieving CDO reached 33.0% in 2023, presenting a deterioration of 0.4 percentage points when compared to 2022 (33.4%). However, it remains better than pre-COVID-19 pandemic performance (31.7% in 2019). The share of flights completing a CDO approach remained more consistent throughout the year than in 2022, despite the number of IFR flights increasing over the summer months (Figure 11).

52 Maintaining the proportion of flights achieving a CDO throughout 2023 shows that the arrival operations of airports and ANSPs have been resilient and have continued to cope well with the challenges posed by increasing traffic.

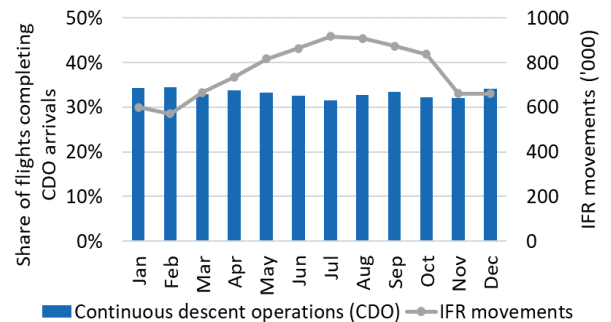


Figure 11 – Share of arrivals applying continuous descent operations (source: PRB elaboration), showing a weak relation between the traffic increase and the deterioration of the CDO procedures.

53 Performance in the terminal area for 2023 has not improved compared to 2022 and, as previously noted by PRB, Members States need to alleviate airport disruption and improve terminal

<sup>6</sup> AXOT: The difference between the actual taxi-out time of a flight and a statistically determined unimpeded taxi-out time (based on taxi-out times in periods of low traffic demand). Additional ASMA time: The difference between the actual ASMA time of a flight and a statistically determined unimpeded ASMA time (based on ASMA times in periods of low traffic demand).



environmental performance in line with the expected growth in traffic.

#### 4.4 Results of the Traffic Light System

- 54 The Traffic Light System presents the information relating to environmental performance captured within the Regulation in a simplified manner, to foster a wider discussion on how the environmental performance of ATM can be improved.<sup>7</sup> A detailed description of the Traffic Light System, including its methodology and results are presented in a separate report published alongside this annual monitoring report.
- 55 The results from the Traffic Light System are presented in Figure 12 (next page). In 2023, the Union-wide environmental performance deteriorated due to factors including capacity-related issues and the continued impact of Russia's war of aggression against Ukraine.
- 56 The results of the Traffic Light System for 2023 show that three Member States are in the green category (two in 2022), 18 Member States are in the amber category (19 in 2022), and seven Member States are in the red category (seven in 2022). Croatia, Poland, and Malta show the greatest improvement in the Traffic Light System, driven by their terminal scores, and strong KEA performance for Malta. However, of the three Member States, Malta alone met its KEA target.
- 57 On the other hand, Estonia, Finland, Ireland, Latvia, and Lithuania show the greatest deterioration in environmental performance. For four of these Member States, this is primarily due to the impact of airspace disruption caused by Russia's war of aggression against Ukraine, which has seen re-routings of flights – mostly from the Middle East and Asia – from Baltic and Northern Europe towards South-Eastern Europe, lengthening the trajectory flown and increasing their KEA value. In relation to Ireland, a new interface with the UK arrivals/departure corridors has impacted environmental performance.<sup>8</sup>
- 58 The Traffic Light System of 2023 shows an overall deterioration of terminal environmental performance, where the greatest deterioration of the AXOT score is seen in Ireland, Denmark, and Greece, while for the ASMA score, the greatest deterioration is seen in Ireland, Portugal, and Sweden. Finally, Bulgaria, Ireland, and Norway have the highest deterioration in CDO scores.
- 59 Malta, Norway, and Portugal are the only Member States that have met their KEA targets in 2023. Of these three, Malta remains in the green zone, whilst Norway and Portugal stay in the amber zone as their performance degraded slightly compared to 2022.

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<sup>7</sup> The indicators included in the Traffic Light System are en route horizontal flight efficiency (KEA), additional taxi-out time (AXOT), additional time spent in the terminal manoeuvring area (ASMA), and percentage of flights performing continuous descent operations (CDO) as per the Regulation.

<sup>8</sup> Confirmed by Network Manager during bilateral discussions.

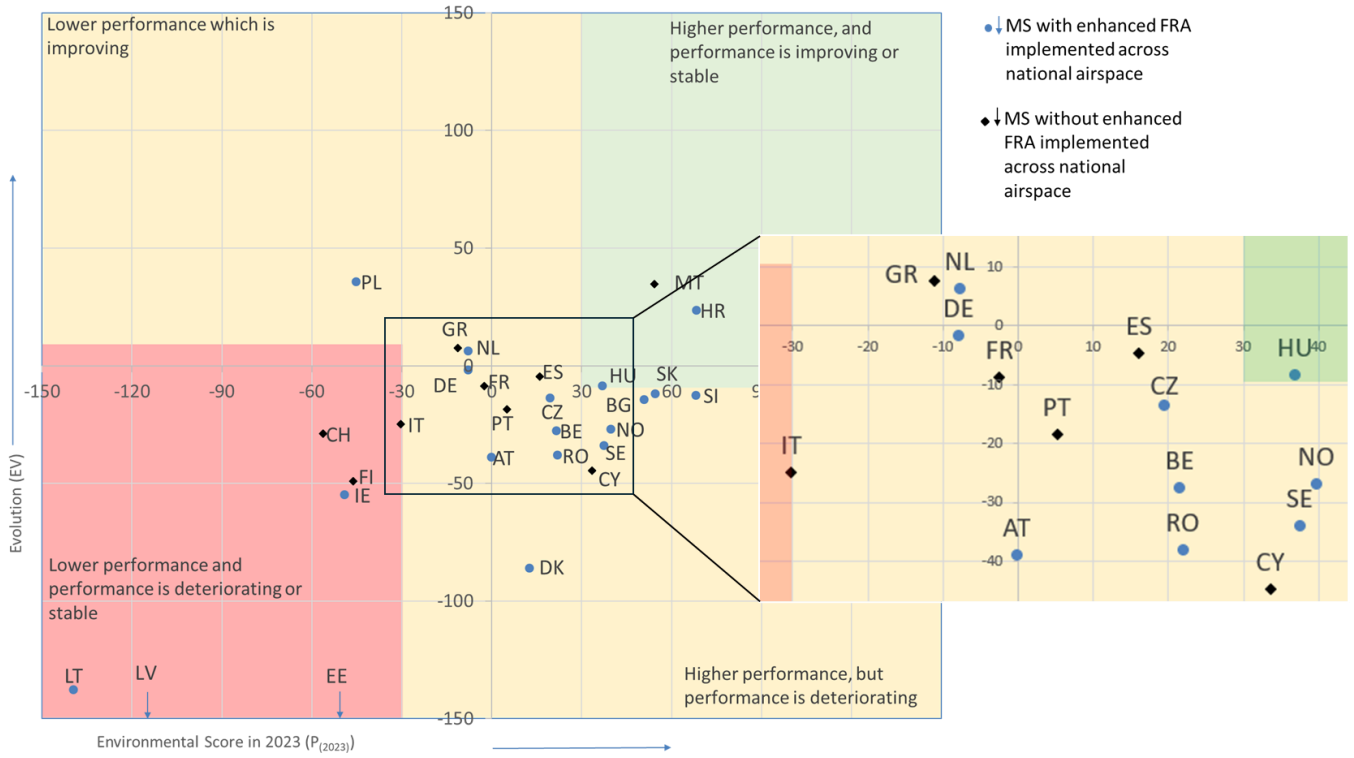


Figure 12 – Results from the 2023 Traffic Light System.

## 5 CAPACITY

- En route ATFM delays increased to 1.84 minutes per flight in 2023 compared to 1.70 minutes per flight in 2022 but were driven mostly by disruptions and adverse weather, while delays due to ATC capacity or staffing remained significant.
- Terminal capacity performance continued to deteriorate with delay increasing to 0.83 minutes per flight in 2023 compared to 0.52 minutes per flight in 2022, with the majority of delays being due to ATC disruptions and staffing issues, and non-ATC related airport capacity problems.
- Delays due to adverse weather were unusually high in 2023, highlighting the importance of cooperation between ANSPs and the NM to mitigate weather-related impacts in the future.

### 5.1 En route capacity

- 60 En route capacity is monitored by one KPI: The average en route air traffic flow management (ATFM) delay generated by en route area control centres (ACC).
- 61 In 2023, the Union-wide target for capacity was not achieved, mainly because some ANSPs could not accommodate the increase of IFR movements and the unusually high weather-related delays. Average en route ATFM delay was 1.84 minutes per flight (after post-ops adjustments), 1.34 minutes per flight higher than the Union-wide target (Table 2).

En route capacity performance (min/flight) 2023		
	Union-wide target	Achieved performance
Average en route ATFM delay per flight	0.50	1.84

Table 2 - Comparison of 2023 Union-wide en route capacity target and actual capacity performance (minute per flight) after the NM post-operations delay attribution process.

- 62 The traffic demand in 2023 approached pre-COVID-19 pandemic levels. En route ATFM delay per flight in 2023 was 10% higher (worse) than in 2019, while the number of IFR movements in 2023 was still 8.6% below 2019 levels. While acknowledging that there were network-level non-ATC disruptions in 2023, the overall capacity performance was disappointing and showed that some ANSPs in key areas did not sufficiently improve capacity provision and resolve well-known constraints before the traffic recovery.

- 63 Compared to 2022, total delay increased by +19% to 16.7M minutes, while there were +9% more IFR movements. Average delay per flight increased from 1.70 min/flight in 2022 to 1.84 min/flight in 2023. The main cause of delay in 2023 was lack of ATC capacity, followed by weather and ATC disruptions (Figure 13).

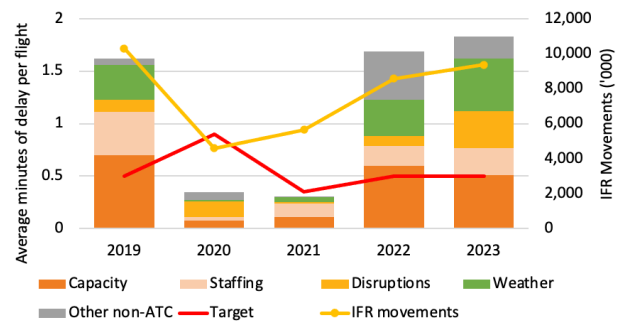


Figure 13 - En route ATFM delays by delay cause and year since 2019 (source: PRB elaboration), showing that delay per flight continued to increase in 2023 compared to 2022.

- 64 In 2023, most of the delays were accumulated during the summer season (Figure 14, next page). During June, July, and August 2023, there was an average of 2.93 minutes of delay per flight. Delays in March and April were unusually high compared to previous years, mainly due to ATC disruptions. The main causes of delays overall were a lack of ATC capacity, ATC disruptions (together representing 47% of all delays in 2023 at 0.86 minutes per flight), and weather (representing over 27% of all yearly delays, at 0.53 minutes per flight).

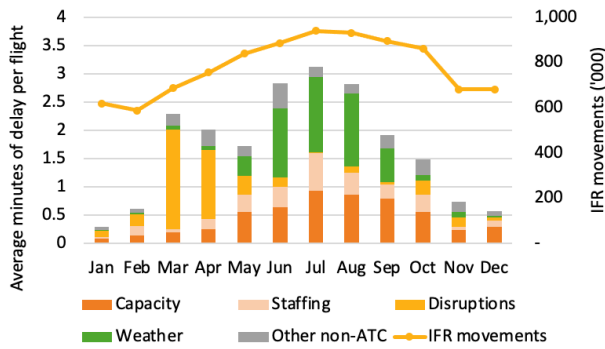


Figure 14 - Average monthly en route ATFM delay per delay codes and instrument flight rule flights (source: PRB elaboration), showing the unusually high delays in March and April and that majority of the delays in 2023 were generated during the summer season.

65 While the average en route ATFM delays and number of IFR movements increased from 2022 to 2023, the average delay per delayed flight shows a slight improvement compared to last year (Figure 15). The Union-wide delay per delayed flight equals 16.45 minutes per delayed flight in 2023 (2% lower than in 2022). 11% of the total flights were delayed in 2023 and 4% of the flights exceeded more than 15 minutes of delay. As these figures indicate, only a low percentage of the IFR flights were affected by en route ATFM delays, resulting in highly concentrated delays, which negatively impact network performance. More evenly distributed delays would be more optimal and improve network stability and predictability.

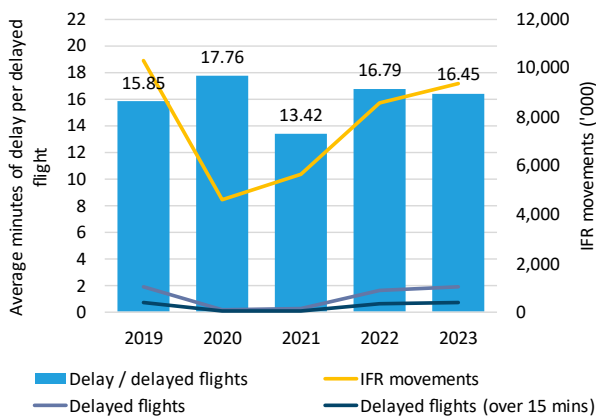


Figure 15 - Average delay per delayed flight value, instrument flight rule flights and flights realising delays (source: PRB elaboration), showing a slight improvement in the average delay per delayed flights value in comparison to 2022.

66 The distribution of delayed flights per duration of delay in 2023 was similar to that of 2019; the share of flights which suffered delays longer than 15 minutes remained around 37% in both years.

When comparing to 2022, there has been a slight improvement in the share of longer delays: Flights with delays longer than 15 minutes were 1.5 percentage points less than in 2022 (Figure 16).

67 The increased share of delays shorter than 15 minutes shows a slightly better network resilience than in 2022. On the other hand, delays longer than 60 minutes had a higher percentage in 2023 than in previous years (not counting 2020), mostly driven by industrial action and disruptions.

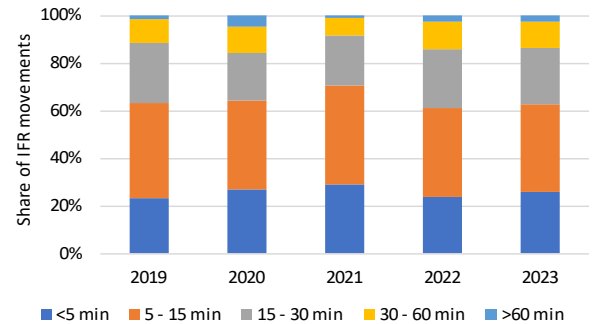


Figure 16 - The share of delayed flights that experienced a delay, ranging from less than 5 minutes to more than 60 minutes (source: PRB elaboration), showing slight improvement in the share of longer delays compared to 2022.

- 68 Delays increased in the majority of ACCs:
- In Germany, delays increased by 118% in Munich, from 0.54 to 1.18 min/flight, mainly as a result of the new ATC system implementation process.
  - In France, delays increased in Bordeaux, Brest, Marseilles, and Paris ACCs in 2023 compared to 2022. Delays increased most significantly in Marseille ACC by 127% (from 0.90 to 2.04 min/flight) mostly due to ATC industrial action and ATC staffing and Paris ACC by 155% (from 0.62 to 1.58 min/flight) mainly due to ATC industrial action.
  - In Spain, delays significantly increased in Sevilla and Madrid ACCs, and increased in Canarias ACC. Sevilla saw an increase of 110% from 0.19 to 0.40 min/flight, and Madrid saw an increase of 74% from 0.19 to 0.33 min/flight, in both cases mostly due to ATC Capacity.
  - In Hungary, delays in Budapest ACC increased by 11% from 0.92 to 1.02 min/flight, due to weather and the additional complexity related to the Ukrainian situation.
  - In Greece, Athinai-Macedonia ACC saw a major increase of 450% in en route delays from

0.16 to 0.88 min/flight, mostly related to ATC Staffing issues.

69 Some of the ACCs registered a slight improvement in performance:

- Karlsruhe and Bremen ACCs in Germany (from 2.63 to 1.64 and from 1.28 to 0.66 min/flight, respectively);
- Reims ACC in France (from 1.70 to 1.42 min/flight);
- Praha ACC in Czech Republic (from 1.55 to 0.11 min/flight);
- Warsaw ACC in Poland (from 1.49 to 0.24 min/flight). (Delays in Praha and Warsaw ACCs in 2022 were unusually high due to the impact of the war in Ukraine.)

70 As the major system implementations in 2022 led to the improvement of capacity performance at the relevant ACCs, the PRB expects that the benefits of new system implementations at ACCs in 2023 will have a positive impact in the coming years and the capacity performance of the transitioning ACCs will improve significantly.

71 2023 shows an interesting picture regarding en route capacity performance. While significant disruptions due to industrial actions and adverse weather resulted in increasing delays for the third consecutive year, the share of delays related to ATC capacity or ATC staffing decreased slightly, as did the share of long ATFM delays and average delay per delayed flights as well, when compared to 2022. However, the overall average en route ATFM delay in 2023 was a record high in RP3.

72 ANSPs along key traffic axes experienced strong traffic growth, which, combined with the yet unresolved shortages of air traffic controllers and the additional disruptions due to weather, led to the high delays. ANSPs will have to focus on delivering continuous, year-on-year improvements in their capacity performance and working together at the network level to mitigate the impact of disruptions.

### 5.2 Terminal capacity

73 Terminal capacity is monitored by one key performance indicator at the local level, which is the average airport arrival ATFM delay.

74 In 2023, the average Union-wide airport arrival ATFM delay increased by 59% to 0.83 minutes per flight compared to 2022 (Table 3). The top 20

busiest airports experienced a +11% increase in IFR arrivals on average, compared to 2022. Together with the increase in traffic, all these airports, except Berlin (Schoenefeld), Paris (Charles-de-Gaulle), and Paris (Orly) also registered an increase of arrival ATFM delays in 2023.

Terminal delay performance (min/flight)				
	2020	2021	2022	2023
Airport arrival ATFM delay per arrival	0.27	0.24	0.52	0.83

Table 3 – Airport arrival ATFM delay per arrival showing a 60% deterioration in 2023 compared to 2022.

75 Airport arrival ATFM delay in 2023 exceeded the airport arrival ATFM delay level of 2019 (0.77 min/flight in 2019, 0.83 min/flight in 2023).

76 The monthly distribution of airport arrival ATFM delay in 2023 and the causes behind the delays are shown in Figure 17. Weather and other non-ATC issues accounted for most of the delays throughout 2023. The majority of the airport arrival ATFM delay was generated during the summer holiday period. The uncharacteristically high delays in May 2023 were generated by a small number of airports (e.g. Athens, Copenhagen/Kastrup, Frankfurt, Lisbon), which faced disruptions (e.g. industrial action and technical failures), staffing, weather, or capacity issues.

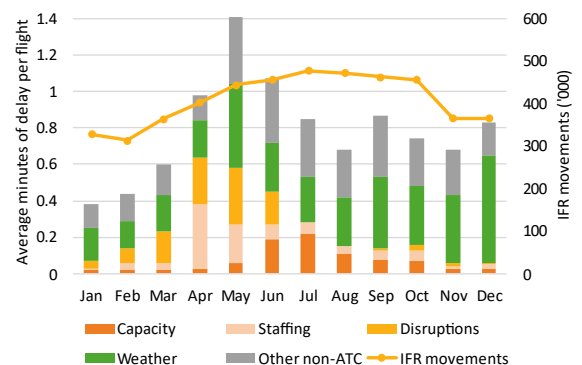


Figure 17 - Average airport arrival ATFM delay per delay codes, compared to instrument flight rule arrivals (source: PRB elaboration), showing weather and other non-ATC issues being the main drivers of delays during most of 2023.

77 When compared to 2022, the share of arrival ATFM delays related to ATC capacity and staffing issues increased to 19% from 17%, the share of

delays related ATC disruptions increased to 11% from 5%, while the share of other non-ATC related delays decreased to 31% from 41%. The share of delays due to adverse weather remained almost stable.

### 5.3 Gate-to-gate delay analysis

78 A gate-to-gate analysis that combines ATFM delays with other delay types and other sources of flight time extensions demonstrates the overall impact on performance. Three performance indicators defined in the Regulation are used to illustrate gate-to-gate delays:

- All cause pre-departure delays, including ATFM delays discussed in sections 5.1 and 5.2 (i.e. en route ATFM delays and airport arrival ATFM delays);
- Additional taxi-out time; and
- Additional time spent in terminal area on arrival (Arrival Sequencing and Metering Area).

79 The results for these performance indicators for 2022 and 2023 are shown in Table 4. On average, airspace users were delayed by 23.25 minutes per flight in 2023, out of which 2.67 minutes were caused by en route and airport ATFM regulations (i.e. the delays assessed under the Regulation and counted within all causes departure delay group).

Gate-to-gate delay performance (min/flight)		
	2022	2023
All cause departure delay per departure	19.03	19.23
Additional taxi-out time per departure	2.52	2.81
Additional ASMA time per arrival	1.10	1.21
<b>Total</b>	<b>22.65</b>	<b>23.25</b>

Table 4 - Values of gate-to-gate delay components in 2022 and 2023. All figures increased substantially compared to 2022.

80 Additional taxi-out time and ASMA time increased by 11% and 10%, respectively in 2023 compared

to 2022, while the increase in gate-to-gate delays was +2.7% in comparison to 2022.

### 5.4 Capacity-related measures taken by ANSPs

81 Capacity performance in 2023 shows that several ANSPs could not offer sufficient capacity to meet the growing traffic demand. At the same time, NSAs reported measures to recruit more ATCOs, implement changes in the airspace structures and sectorisation, and cooperate with the NM:

- Three Member States indicated ATM system upgrades as capacity enhancement measures;
- Six Member States reported measures related to changes in the rostering schemes or other changes in the working arrangements of ATCOs;
- One Member State reported more intensive coordination with military stakeholders as a means to improve capacity performance;
- One Member State reported the implementation of a complexity tool;
- One Member State reported a planned increase in sector capacity values;
- Four Member States reported measures to optimise the terminal manoeuvring areas (TMA) and the airspace around airports.

82 Member States reported that ANSPs recruited and trained 4.8% fewer ATCOs than what has been planned in the performance plans by the end of 2023. A total of 7,895 ATCOs in OPS FTEs at the end of the year were recorded. This represents a -1.3% decrease compared to the 7,997 FTEs in 2022, despite the increase planned by ANSPs. In absolute terms, ANSPs are 401 FTEs behind the planned number. The gap in the recruitment and training of ATCOs of 2022 failed to be reduced in 2023 and will have to be closed in 2024 in order to resolve staffing issues. To ensure this, ANSPs will have to add 529 FTEs in 2024 (+6.7% increase).

83 Of the six ANSPs (DSNA, DFS, ENAIRE, HungaroControl, HASP, Croatia Control) which have generated 90% of all en route ATFM delay minutes, only DSNA has substantially increased the number of ATCOs in OPS FTEs compared to 2022. Unless ANSPs, with the help of the Member States, find ways to improve the recruitment and training processes of ATCOs and ensure a steady increase of controllers, the delay situation in Europe will continue to deteriorate, even with new systems and tools.



84 The three ATM system upgrades, which negatively impacted the network in 2022 (Reims ACC, Prague ACC, Lisbon ACC), led to significant capacity improvement in 2023. However, the implementation of new ATM systems in Munich ACC, Paris ACC and Marseille ACC had a negative impact on network performance and caused notable delays. The PRB expects further capacity improvements from these implementations in the coming years.

### 5.5 Evolution of operational efficiency of ANSPs

85 Since 2021, the PRB has monitored additional operational aspects of capacity performance using the following indicators:

- The number of maximum sectors open at any given time by an ANSP, indicating the theoretical maximum capacity in terms of the number of sectors;
- The sum of sector-opening hours, indicating the capacity that has been provided by the ANSPs over a period; and
- The ratio of the number of ATCOs in OPS FTEs and the maximum sectors open at any given time.

86 After a significant increase from 2021 to 2022, the number of maximum sectors open at any given time continued to increase in 2023, reaching 2019 levels (100%). The sum of sector-opening hours over the year also increased to 2,407 thousand hours, 97% of 2019 figures. Despite sector openings being close to 2019 levels and traffic demand still being on average at 91% of 2019, more delays were generated in 2023 compared to 2019. This may be due to the impact of disruptions related to industrial actions and adverse weather. Table 5 shows the evolution of capacity provision.

87 The comparison of sector numbers and sector-opening hours between 2019 and 2023 indicates that there may be capacity reserves in the network. Delays would be reduced if these resources can be allocated to help constrained areas. Additionally, ANSPs were able to handle more traffic demand per sector-opening hour in 2023 than in 2022, indicating an improvement in sector capacities and/or better sector productivity.

Indicators of capacity provision	2019	2021	2022	2023
Sum of maximum sectors open	455 (100%)	376 (83%)	434 (95%)	455 (100%)
Sum of sector-opening hours (000')	2,469 (100%)	1,844 (75%)	2,272 (91%)	2,407 (97%)
IFR movements (000')	9,961 (100%)	5,471 (55%)	8,303 (83%)	9,075 (91%)

Table 5 - Indicators of capacity provision from 2019 to 2023 (source: PRB elaboration on DDR AIRAC datasets). IFR movements are shown for context. Figures in brackets show values compared to 2019 as percentages. Both indicators are close to 2019 levels, while IFR movements were 9% lower.

88 The ratio of ATCO FTEs to the sum of maximum sectors open indicates the operational efficiency of ANSPs, as it shows how many controllers are required to offer one sector of capacity.<sup>9</sup>

89 Table 6 shows that the number of ATCO FTEs required to operate one sector decreased by more than one FTEs/sector compared to 2022, and also being slightly lower than in 2019. This indicates a similar operational efficiency of ANSPs in 2023 as in 2019.

ATCO FTEs per the sum of maximum sectors open			
2019	2021	2022	2023
17.41	20.77	18.45	17.35

Table 6 – Number of ATCO FTEs required to maintain one sector, based on the maximum number of sectors open (source: PRB elaboration on DDR AIRAC datasets and annual monitoring reports). Operational efficiency improved in 2023, reaching 2019 levels, due to a decrease in the number of ATCOs in OPS.

90 ANSPs had more sectors open compared to 2022, while the number of IFR movements increased, and the number of ATCO FTEs decreased by 1.2%. As a result, ANSPs reached a similar operational efficiency level as attained in 2019; where the improvement in operational efficiency was achieved

<sup>9</sup> This indicator is not used for benchmarking of ANSPs but rather to observe the evolution of performance over time.

by a reduction in ATCO numbers rather than an increase in the number of available sectors.

- 91 The PRB's analysis indicates that capacity provision and operational efficiency of ANSPs improved once again after 2022, reaching 2019 levels. While this is positive, delays in 2023 were higher than in 2019, with fewer IFR movements (although traffic growth in 2023 was uneven across the network, with key areas experiencing traffic above 2019 levels).
- 92 In addition to further improving operational efficiency, ANSPs need to significantly increase capacity in the remaining years of RP3 to efficiently manage traffic growth. It is of the utmost importance that ANSPs realise their ATCO training plans, utilising new ATCOs as soon as possible, look at ways to improve rostering schemes and increase sector capacities. This will allow ANSPs to open more sectors, offer more sector-opening hours, and enable higher throughput.

### 5.6 Capacity incentive schemes

- 93 Following the exceptional measures Regulation, incentive schemes produce financial effects as from the first year following the adoption of the performance plan (Article 3(3)(b) of Implementing Regulation (EU) 2020/1627). Therefore, in respect of performance plans adopted in 2022, the incentive schemes apply from calendar year 2023 onwards and lead to subsequent unit rate adjustments in year n+2.
- 94 Based on the parameters defined by the Member States in their performance plans and their respective 2023 performance in en route capacity, seven ANSPs are subject to financial penalties. Another ten ANSPs are subject to financial bonuses (eight of them receiving the maximum bonus).<sup>10</sup>
- 95 The parameters show that the total amount of bonuses is 20.8M€, corresponding to 432,583 minutes of en route ATFM delay (avoided), while total penalties amount to 21.5M€, corresponding to 7,032,328 minutes of en route ATFM delay (in excess).
- 96 Based on the above, the average value of one minute of avoided delay below the target is 48.06€, whereas the average value of one minute of delay more than the target is 2.95€.
- 97 Similarly, for terminal capacity, based on the parameters defined in the performance plans, five ANSPs are subject to a financial penalty and nine ANSPs receive a financial bonus (eight of them realising the maximum bonus).
- 98 Based on the parameters of the terminal incentives, total bonuses amount to 5.5M€, corresponding to 349,214 minutes of avoided delay, whereas the sum of penalties is 2.1M€, corresponding to 831,653 minutes of excess delay. Thus, the average value of one minute of delay below the target is 15.74€, while the average value of one minute of delay more than the target is 2.48€.
- 99 As already indicated in the previous monitoring reports, the capacity incentive schemes are financially imbalanced: One minute of en route ATFM delay above the target (penalty) was worth 16 times less than one minute of avoided delay (bonus). It is clear that the parameters set by some Member States are neither efficient nor effective in steering behaviours towards the provision of capacity.

<sup>10</sup> The analysis of the incentive schemes in this report is based on the data submitted by Member States until the 1<sup>st</sup> of June 2024.



## 6 COST-EFFICIENCY

- In 2023, the Union-wide en route actual unit cost (AUC) was -4.6% lower than the determined unit cost (DUC).
- En route actual costs were -3.4% below determined costs, while actual service units were +1.2% higher than the determined service units.
- The en route actual unit cost for airspace users (AUCU) was +7.9% higher than the DUC (nominal), mainly due to the application of the 2023 inflation adjustment (where the weighted average actual index was +11% above the determined figure).

### 6.1 En route Union-wide year-on-year change of the average determined unit cost (DUC)

100 The Union-wide cost-efficiency target is the year-on-year variation of the Union-wide en route determined unit cost (DUC), starting from the 2019 baseline value.

101 The 2023 actual unit cost (AUC) variation from the 2019 baseline (-1.8%) is better than the trends derived from the Union-wide targets (+17%) and the RP3 performance plans (+3.1%). The resulting AUC (50.11€<sub>2017</sub>) is -4.7% lower than the Union-wide DUC aggregated from the RP3 performance plans (52.59€<sub>2017</sub>) (Table 7).<sup>11</sup>

En route Union-wide cost-efficiency performance 2023			
	Union-wide target	DUC	AUC
Union-wide DUC/AUC (€ <sub>2017</sub> )	59.02	52.59	50.17
Variation from the 2019 baseline	+17%	+3.1%	-1.7%

Table 7 – Comparison of 2023 Union-wide cost-efficiency target, determined and actual performance.

102 The 2023 Union-wide AUC was better than the en route cost-efficiency target due to a combination of lower actual costs and higher service units than planned (Table 8):

- Lower costs: The aggregated results show that Member States decreased actual costs by -218M€<sub>2017</sub> (-3.4%) compared to the determined costs for en route charging zones. This

decrease is mainly attributable to significantly lower staff costs than planned (-189M€<sub>2017</sub>); and

- Higher traffic: The actual 2023 service units at Union-wide level were +1.2% higher than the determined services units for the year.

En route Union-wide cost-efficiency performance 2023			
	Determined	Actuals	Difference
Costs (B€ <sub>2017</sub> )	6.4	6.1	-3.5%
Costs (B€)	6.8	7.2	+4.9%
Service units	120.9M	122.4M	+1.2%

Table 8 – Actual 2023 costs and service units compared to plan (at Union-wide level).

103 In terms of traffic, the comparison between actual and planned service units showed significant variations between Member States: En route service units were higher than planned for 15 charging zones, with notable differences in Croatia (+32%), Hungary (+29%), and Bulgaria (+26%), while for the remaining 14 charging zones the number of actual service units was below the plan, with the largest differences observed in Estonia (-48%), Finland (-39%), and Poland (-26%).

104 In terms of costs, 21 Member States incurred lower actual en route total costs than planned; 13 Member States by more than -5%. The Member States with the largest percentage reduction in actual costs were Malta (-22%), Finland (-18%), and Estonia (-18%). Three Member States - Denmark, Sweden, and Switzerland - increased actual costs by +5% or more compared to determined (+5% for

<sup>11</sup> The sources of the data for the monitoring of cost-efficiency are the following: The 2023 NSA monitoring reports and the en route and terminal reporting tables as submitted by the Member States in June 2024. These are complemented with the NSA Report on the verification of cost risk sharing for 2023 submitted in September 2024 for the cost exempt of the ANSPs.

Denmark, +13% for Sweden, and +16% for Switzerland).

- 105 The total en route revenue gap to be recovered according to the exceptional measures Regulation amounts to 5.7B€<sub>2017</sub>.<sup>12</sup> The adjustments from the revenue gap included in 2023 unit rates amounted to 737M€<sub>2017</sub> (representing about 12% of 2023 unit rates).

## 6.2 Differences in inflation between actual and determined

- 106 As in 2022, there was a significant difference between the actual and determined annual inflation rates in 2023 (+4.5 p.p. on average). Since 2017, the weighted cumulative gap between actual and planned inflation indexes averaged +11%, with four Member States reporting differences exceeding +20%: Hungary (+28%), Estonia (+28%), Czech Republic (+25%), Poland (+22%), and Slovakia (+22%). As a result, the Union-wide actual costs were higher in nominal terms compared to determined (+4.9%), while lower in real terms (-3.5%).
- 107 This discrepancy suggests that ANSPs' costs are not keeping pace with inflation. As already indicated in the 2022 monitoring report, this difference may be due to i) a disconnect between ANSPs costs and general inflation trends; and/or ii) potential biases in the inflation index used, which may not accurately reflect the ANSPs' cost structures. The PRB recommends the NSAs to conduct a thorough analysis of the actual cost increases experienced by ANSPs to ensure that airspace users are not overcharged through the inflation mechanism laid out in Article 26 of the Regulation. This analysis should focus on identifying which costs have increased due to inflation and those that have not. Based on this analysis, NSAs should calculate the appropriate portion of the inflation adjustment that reflects the real cost increases and require the reimbursement to airspace users. Additionally, NSAs must ensure that there is no double counting of inflation between the inflation adjustment and the amounts claimed in the cost risk sharing mechanism.

## 6.3 Cost differences in Member States with approved capacity deviation plan for RP3

- 108 In their submitted performance plans, 11 Member States initially presented a deviation from the criteria to achieve capacity targets (criterion d) i) of Section 1.4 of Annex IV of the Regulation). This deviation was considered justified for five Member States. Out of these, four Member States reported lower actual costs compared to planned for 2023: Czech Republic (-14M€<sub>2017</sub>, or -12%), Poland (-13M€<sub>2017</sub>, or -6.8%), Hungary (-10M€<sub>2017</sub>, or -9%), and Slovakia (-0.5M€<sub>2017</sub>, or -0.9%). Portugal (+1.3M€<sub>2017</sub>, or +0.9%) reported higher actual costs compared to determined.
- 109 Czech Republic and Slovakia achieved the 2023 en route capacity target, in contrast to Poland, Hungary, and Portugal. Since 2021, the five Member States have underspent -165M€<sub>2017</sub> (-9.5% on average) compared to the planned total costs: Poland (-75M€<sub>2017</sub>, or -13%), Czech Republic (-36M€<sub>2017</sub>, or -11%), Hungary (-28M€<sub>2017</sub>, or -9.1%), Slovakia (-13M€<sub>2017</sub>, or -8.2%), and Portugal (-13M€<sub>2017</sub>, or -3.4%).
- 110 This cost evolution raises concerns, as there is little evidence, to date, that the additional funds allocated to address capacity deviations have been effectively utilised to resolve the associated issues. For instance, apart from Slovakia, the relevant Member States have consistently failed to achieve the planned number of ATCOs each year since 2021.
- 111 The deviations in cost-efficiency targets were permitted contingent upon the implementation of specific planned measures. While the PRB acknowledges the challenges faced by ANSPs in fully implementing the approved measures, airspace users should not bear these costs without commensurate improvements in capacity. For this reason, the PRB will take into consideration the implementation of the RP3 performance plans when assessing the RP4 cost-efficiency targets and recommends that the NSAs concerned submit a detailed report of planned capacity-related measures implemented during 2024. Should the RP3 planned measures not be implemented by the end of RP3, the PRB recommends the NSAs to

<sup>12</sup> The revenue gap amount entails the sum of 5.7B€<sub>2017</sub> incurred in 2020-2021, an additional gap of 2.7M€<sub>2017</sub> from 2022 after Member States revised their performance plans, and a further correction of -2.5M€<sub>2017</sub> from 2023, after the adoption of Belgium's performance plan. Additionally, the amount presented includes 88M€<sub>2017</sub> of revenue gap for Norway, which will be financed by the Norwegian State and as a result will not be charged to the users.

ensure the reimbursement of capital related amounts, and consider requiring the recovery of other amounts received by ANSPs for measures not implemented.

#### 6.4 Verification of cost eligibility

- 112 The NSAs must ensure the eligibility of the costs charged as part of the cost base for air navigation charges: In Article 15(2) of Regulation (EU) 550/2004, the Member States/ANSPs are only allowed to include items in their cost base (determined costs) which are related to eligible air navigation services and facilities.
- 113 As mentioned in the PRB Chair letter to the NSAs on 2<sup>nd</sup> December 2022, costs relating to U-space and to ANS provision in third countries are not eligible for inclusion in the cost base. In addition, the costs relating to these services should be identified separately in the ANSPs' accounts.
- 114 In the monitoring reports, the NSAs were requested to report the findings of their verifications of actual costs, and where applicable, the corrections made to the actual costs following this verification. Four NSAs reported that they are still in the process of verifying costs (Bulgaria, Ireland, Poland, and Spain). Seven NSAs reported corrections made to the actual costs after verification (Cyprus, Czech Republic, Finland, Germany, Latvia, Malta, and Sweden).
- 115 Ten NSAs (Czech Republic, Hungary, Italy, Lithuania, Norway, Portugal, Slovakia, Slovenia, Spain, and Switzerland) reported that the costs for non-ANS activities or ANS provided to third countries have been presented separately in the ANSPs accounts as required in Article 12(3) of Regulation 550/2004. However, most NSAs (25) reported that they had verified that such costs had been excluded from the en route cost base. One NSA (Portugal) planned to carry out a supplementary supervision exercise, while one (Germany) is still conducting verifications. Three NSAs (Belgium, Estonia, and Poland) did not provide sufficient information. The PRB recommends the Member States concerned to take immediate action to enforce the application of Article 12(3) of Regulation 550/2004 and that the NSAs concerned provide

more detailed information on their oversight activities regarding the compliance of cost eligibility in the RP4 performance plans.

#### 6.5 En route costs by cost entity

- 116 This section analyses actual and determined 2023 costs for the individual entities defined in the performance and charging scheme (ANSPs, MET, NSA, and Eurocontrol). A summary of the results is presented in Table 9 (next page).
- 117 The Union-wide en route actual costs for 2023 amounted to 6.14B€<sub>2017</sub>. 89%, or 5.44B€<sub>2017</sub>, of these costs were attributable to the ATSPs/CNSPs. Their actual costs were -4.1% below the determined costs (5.67B€<sub>2017</sub>).
- 118 The costs for the MET providers for the year 2023 amounted to 181M€<sub>2017</sub>, or 2.9% of the Union-wide en route total actual costs. Actual MET costs were -8.8% below the determined values (198M€<sub>2017</sub>).
- 119 NSAs' 2023 costs were 122M€<sub>2017</sub>, equivalent to 2.0% of the Union-wide en route total actual costs. Actual NSA costs were +4.3% above the determined values (117M€<sub>2017</sub>). Under the Regulation, NSAs' costs are not corrected for inflation for charging purposes. If they were corrected for inflation, the actual NSAs' costs would be -5.5% below the determined values.
- 120 Eurocontrol's actual 2023 costs reported by the SES States amounted to 398M€<sub>2017</sub>, representing 6.5% of the Union-wide en route total actual costs.<sup>13</sup> Eurocontrol's actual costs were +7.6% above the determined values presented in the performance plans (370M€<sub>2017</sub>) mainly due to the fact that, as for the NSAs, determined and actual costs are not corrected for inflation in accordance with the Regulation. If they were corrected for inflation, the actual 2023 Eurocontrol costs would be -3.3% below the determined values.<sup>14</sup>

<sup>13</sup> The actual Eurocontrol costs for 2023 are based on the provisional figures made available by Eurocontrol in May 2024.

<sup>14</sup> The determined Eurocontrol costs presented in the RP3 performance plans were based on Eurocontrol's budgets established in 2021 and in 2022.

Comparison of 2023 actual and determined en route costs by entity				
	Actual costs (M€ <sub>2017</sub> )	Determined costs (M€ <sub>2017</sub> )	Difference (M€ <sub>2017</sub> )	Difference (%)
<b>Union-wide total costs</b>	<b>6,140</b>	<b>6,358</b>	<b>-218</b>	<b>-3.4%</b>
ATSP/CNSP	5,440	5,674	-233	-4.1%
<i>MET</i>	181	198	-17	-8.8%
<i>NSA</i>	122	117	+5.0	+4.3%
<i>Eurocontrol</i>	398	370	+28	+7.6%

Table 9 – Comparison of 2023 actual and determined en route costs by entity (source: PRB elaboration).

### 6.6 En route costs by cost category

121 This section analyses actual and determined costs for 2023 across the main cost categories. A summary of the results is presented in Table 10 (next page). Detailed information by Member State is provided in the dashboard.

#### Staff costs

122 Union-wide en route actual staff costs for 2023 amounted to 3.79B€<sub>2017</sub>, -4.8% below the determined costs (3.98B€<sub>2017</sub>). The actual pension costs (which are included in the staff costs) summed to 720M€<sub>2017</sub>, -0.6% lower than the determined values (725M€<sub>2017</sub>).

123 At Member State level, the results show significant variation. Germany shows the greatest disparity between planned and actual staff costs in absolute values (-79M€<sub>2017</sub>, or a -11% gap). Other Member States with significant underspends were France (-49M€<sub>2017</sub>), Italy (-35M€<sub>2017</sub>), and the Netherlands (-18M€<sub>2017</sub>). On a percentage basis, Member States with the largest percentage gap between planned and actual staff costs in en route charging zone were Finland (-19%), Estonia (-17%), and Malta (-16%). Sweden (+22M€<sub>2017</sub>, or +16%) reported a substantial increase in staff costs beyond what was planned.

124 At the Union-wide level, actual ATCO FTEs were -4.7% lower than planned. At Member State level the results varied significantly as well (ranging from -31% for Greece to +11% for Slovakia). The PRB notes that many ANSPs with lower actual ATCO FTEs than planned have not met their capacity targets and have generated significant delays for airspace users. The PRB recommends that NSAs put in place measures to ensure that ANSPs implement the relevant ATCO recruitment they

committed to in their performance plans to improve capacity performance.

#### Other operating costs

125 Union-wide en route actual other operating costs for 2023 amounted to 1.40B€<sub>2017</sub>, or -1.3% below the determined costs (1.42B€<sub>2017</sub>). Italy reported the highest underspend compared to the plan (-20M€<sub>2017</sub>), followed by Poland (-10M€<sub>2017</sub>), Bulgaria (-8.2M€<sub>2017</sub>), Czech Republic (-5.8M€<sub>2017</sub>), Belgium-Luxembourg (-4.6M€<sub>2017</sub>), and Croatia (-4.4M€<sub>2017</sub>). The Member States with the highest overspend in other operating costs compared to plan are: Germany (+11M€<sub>2017</sub>), Switzerland (+11M€<sub>2017</sub>), the Netherlands (+11M€<sub>2017</sub>), Norway (+5.5M€<sub>2017</sub>), France (+4.9M€<sub>2017</sub>), and Sweden (+3.4M€<sub>2017</sub>).

126 When analysing the percentage difference, 16 Member States reported underspending by more than 5% of the determined costs, with Bulgaria (-37%), Malta (-33%), Czech Republic (-24%), Poland (-22%), and Croatia (-21%) being the largest. At the other end of the spectrum, Switzerland presented the largest overspend (+32%).

Comparison of 2023 actual and determined en route costs by cost category				
	Actual costs (M€ <sub>2017</sub> )	Determined costs (M€ <sub>2017</sub> )	Difference (M€ <sub>2017</sub> )	Difference (%)
<b>Union-wide total costs</b>	<b>6,140</b>	<b>6,358</b>	<b>-218</b>	<b>-3.4%</b>
<i>Staff costs</i>	3,794	3,984	-189	-4.8%
<i>Other operating costs</i>	1,402	1,420	-18	-1.3%
<i>Depreciation costs</i>	689	739	-50	-6.8%
<i>Cost of capital</i>	269	247	+22	+8.9%
<i>Exceptional costs</i>	4.3	-12	+16	-136%
<i>Costs for exempted VFR flights</i>	19	20	-1.5	-7.5%

Table 10 – Comparison of 2023 actual and determined en route costs by cost category (source: PRB elaboration).

### Depreciation costs

- 127 Union-wide actual en route depreciation costs for 2023 amounted to 689M€<sub>2017</sub>, or -6.9% below the determined costs (739M€<sub>2017</sub>). Several differences between determined and actual en route costs were reported. In terms of absolute values, France, which underspent -12M€<sub>2017</sub> (-7% of determined values), showed the largest variation between determined and actual depreciation.
- 128 When analysing the percentage difference, 17 Member States were more than 5% below their determined costs. Greece (-73%), Finland (-38%), Norway (-36%), and Estonia (-32%) reported the largest percentage underspend for en route charging zone, while Slovakia (+31%) reported the largest percentage overspend.<sup>15</sup>

### Cost of capital

- 129 Union-wide en route actual cost of capital for 2023 amounted to 269M€<sub>2017</sub>, some +8.9% above the determined costs (247M€<sub>2017</sub>), with significant variation at Member State level. Italy was the largest contributor to this difference, with +11M€<sub>2017</sub> more than planned (+29%). Spain Continental (+9.3M€<sub>2017</sub>), Netherlands (+5.9M€<sub>2017</sub>) and Sweden (+4.3M€<sub>2017</sub>), are other examples of large differences. Nine Member States reported actual cost of capital at least 5% higher than the determined values for en route charging zone, while 14 Member States reported at least 5% lower than

the determined. Greece (-61%), Germany (-45%), Finland (-41%), and Estonia (-37%) were the Member States showing the largest lower actual cost of capital compared to plan.

- 130 The difference was mainly attributable to higher actual interest rates on debt than foreseen in the performance plans (on average +0.7 percentage points), while the total asset base was +1.6% higher than determined and the gearing of the ANSPs remained overall in line with the performance plans.

### Exceptional costs

- 131 Union-wide en route exceptional costs for 2023 amounted to +4.3M€<sub>2017</sub>, corresponding to an increase of +16M€<sub>2017</sub> above the determined costs of -12M€<sub>2017</sub>. The main contributor to the difference was Switzerland, which no longer reports exceptional costs (as opposed to last year where it reported -12M€<sub>2017</sub>). Further details are included in the dashboard.

## 6.7 Costs related to investments

- 132 The costs related to investments include cost of capital, depreciation costs, and leasing costs for new and existing investments. The costs relate to the investment plans which are included in the performance plans.
- 133 The en route and terminal actual costs for investments in 2023 amounted to 1,084M€<sub>2017</sub>.

<sup>15</sup> As reported by the NSA, the overspent is related to the fact that determined costs of investments were lowered in the plan by the amount underspent in RP2.



Member States spent -59M€<sub>2017</sub> (-5%) less than determined (1,143M€<sub>2017</sub>).<sup>16</sup>

- 134 The gap was due to different payment cycles, postponements, and/or delays in investments. There was significant variation between Member States (e.g. Greece -85%, Malta -30%, Estonia -28%, Slovakia +31%). Annex II of this report provides a detailed analysis at Union-wide level and per ANSP of the costs related to investments.
- 135 Out of the -59M€<sub>2017</sub> underspend on costs of new and existing investments in 2023 for en route and terminal charging zones combined, Member States reported that they will reimburse -57M€<sub>2017</sub> via cost risk sharing mechanism, in accordance with Article 28 of the Regulation.
- 136 When considering the data submitted in the cost risk sharing reports (September 2024), the difference to be reimbursed to airspace users equals -59M€ (of which -34M€ for en route and -25M€ for terminal charging zones).<sup>17</sup>

### 6.8 Actual unit cost incurred by users (AUCU)

- 137 The actual unit cost incurred by users (AUCU) is calculated separately for en route and terminal as the sum of the determined unit costs and the adjustments stemming from the year divided by the actual traffic. The AUCU expressed in nominal terms and in local currency for each Member State is detailed in the dashboard. In this section, the Union-wide AUCU is presented in nominal euros.
- 138 The AUCU, in a specific year, can be interpreted as the “true” cost of the service from the airspace users’ point of view. It reflects the price per service unit that is charged *in fine* to users for the services provided in the year. It includes the determined cost of the specific year and “anticipates” the costs/reimbursements related to the adjustments incurred during that year that would be charged

or reimbursed in future years’ unit rates in accordance with Article 25(2) of the Regulation.<sup>18</sup>

- 139 The Union-wide en route and terminal AUCU for the year 2023 are shown in Table 11. The true cost per en route service unit in 2023 was +7.9% (or +4.42€) higher than the DUC, and the true cost per terminal service unit in 2023 was +1.1% (or 2.32€) higher than the DUC. The main difference for en route stems from the inflation adjustment, while for terminal from other revenues and the inflation adjustment.<sup>19</sup>

	Actual Unit Cost for Users 2023 (nominal €)	
	En route	Terminal
DUC	56.05	202.60€
Inflation adj.	+4.99	+19.60€
Cost exempt cost risk sharing <sup>20</sup>	+0.43	-2.26
Traffic risk sharing adj.	-0.08	+6.37
Traffic adj. (costs)	-0.07	+0.15
Financial incentives	-0.02	+0.56
Modulation of charges	0.00	+0.23
Cross-financing	0.00	0.00
Other revenues	-0.82	-20.31
Application lower unit rate	-0.00	-2.03
<b>Total adj.</b>	<b>+4.42 (+7.9%)</b>	<b>+2.32 (+1.1%)</b>
<b>AUCU</b>	<b>60.48</b>	<b>204.92</b>

Table 11 – 2023 Union-wide actual unit cost incurred by users (AUCU) (source: PRB elaboration).

<sup>16</sup> En route actual 857M€<sub>2017</sub>, en route determined 877M€<sub>2017</sub>. Terminal actual 177M€<sub>2017</sub>, terminal determined 190M€<sub>2017</sub>. According to the monitoring reports submitted by the Member States, the total actual costs of investments for 2022 were 1,026M€<sub>2017</sub>, -38M€<sub>2017</sub> (or -3.6%) lower than determined (1,064M€<sub>2017</sub>).

<sup>17</sup> As of the date of this report’s publication, Italian NSA has not submitted the report on the verification of cost risk sharing for 2023 for the cost exempt of the ANSPs. Consequently, the data presented in the paragraph does not reflect the adjustments that may arise from Italy’s cost risk sharing mechanism. Based on the information available in Italy’s reporting tables, the reported adjustment for the combined charging zones related to the costs of new and existing investments is approximately 2.0M€.

<sup>18</sup> Following the exceptional measures Regulation, the Incentive schemes applies starting from calendar year 2023.

<sup>19</sup> Data regarding cost exempt from cost risk sharing (items of Article 28(3)) are based on the NSA Report on the verification of cost risk sharing submitted in September 2024.

<sup>20</sup> Items of Article 28(3).

## 6.9 Regulatory result

- 140 The PRB calculates, for each monitoring period, the “regulatory result”. This corresponds to the revenues (or losses) generated by the activities of a specific year that exceed (or are lower than) the direct and indirect operating costs of an ANSP, and so provides for a reasonable return on assets to contribute towards necessary capital improvements.
- 141 The notion of regulatory result focuses on the ANSP results stemming from the ANS activity in the year. It is therefore different from the net accounting profit disclosed in ANSPs financial statements. In addition, it does not consider any opportunity cost. The regulatory result, when expressed as a percentage of revenue, can be equated to a “margin” generated by the ANSP with respect to the activity of the year, but it is not comparable to the margin that would be calculated straight from an ANSP’s financial statements. For each ANSP, the regulatory result is calculated as the sum of the embedded monetary value of the return on equity (RoE), the cost risk sharing result (including the inflation adjustments), the traffic risk sharing, and the incentive scheme (Table 12). The regulatory result for each ANSP is detailed in the dashboard. In this section, for the sake of consolidation at Union-wide level, it is presented in nominal 2023 euros.
- 142 The Union-wide en route regulatory result for 2023 is 508M€, representing 7.3% of the total yearly revenues (Table 12). The cost sharing component of the regulatory result, which accounts for 328M€ (65% of the total 2023 result), was strongly influenced by the significant inflation adjustment recorded by most ANSPs.
- 143 Three ANSPs recorded negative regulatory results in 2023: Skyguide (-31M€, or -19% of the yearly revenues), LVNL (-5.8M€, or -2.9%) and NAVIAIR (-5.4M€, or -6.3%). The ANSPs with the highest regulatory result were: ENAV (+119 M€, or +18%), DSNL (+93M€, or 7.0%), DFS (+39M€, or 4.4%), and ENAIRE (+39M€, or 5.7%, in aggregate for the two en route charging zones). When presented as percentage of the yearly revenues, the ANSPs showing the highest values are: EANS (22%), BULATSA (21%), and MATS (21%).

	2023 en route regulatory result (M€)
Gain/loss ANSPs cost risk sharing	328
Gain/loss ANSPs traffic risk sharing	1.7
Gain/loss ANSPs incentives	-2.0
ANSPs actual embedded RoE	180
<b>Regulatory result</b>	<b>508</b>

Table 12 – 2023 Union-wide regulatory result (source: PRB elaboration).

- 144 When divided by the actual service units, the (unit) regulatory result is directly comparable with the AUCU. The regulatory result per actual en route service unit was equal to 4.15€ in 2023, which means that 6.9% of the true cost of the service was related to the “margin” generated by the ANSPs with respect to their 2023 activities.
- 145 Cumulatively, from the beginning of RP3 until 2023 included, ANSPs recorded a total regulatory result of 1.7B€, representing +7.3% of the cumulative revenues over the three-year period.

## 7 CIVIL-MILITARY COOPERATION

- The availability of military airspace for civil operations remains consistently high and the effectiveness of the airspace reservation process has improved.
- The interest of civil airspace users in planning and using military airspace has increased.
- The implementation of interoperable ASM systems can further enhance the performance of the ATM network.
- No coordination issues have been reported in 2023, despite the ongoing impact of the war of aggression against Ukraine.

### 7.1 Implementation of Flexible Use of Airspace

146 The performance of ATM in Europe also depends on the efficient use of the airspace, which is facilitated by optimised and efficient civil-military cooperation, notably through the implementation of the Flexible Use of Airspace (FUA) concept. The concept aims to accommodate all airspace users' requirements to the maximum possible extent through collaborative airspace use planning (AUP).<sup>21</sup>

147 All Member States have reported via current Local Singles European Sky Implementation reports (LSSIP), full implementation of FUA, except for Malta that is excluded from its implementation. The situation regarding the implementation of airspace management (ASM) technical systems has not changed since 2021. Most of the Member States use the Eurocontrol-developed and the NM-supported free software tool LARA (Local and Sub-regional airspace management support system) that conforms to the regulatory requirements related to the application of FUA. The implementation of adequate supporting systems, as required by Article 5(3) of Regulation 2150/2005, remains ongoing (Figure 18) and not fully harmonised in terms of interoperability with other systems. Based on the NSA reports, the level of implementation of ASM tools is not uniform nor always interoperable, which could reduce the expected performance within the European ATM Network (e.g. by not being able to provide ASM data in real time as required by the Regulation).

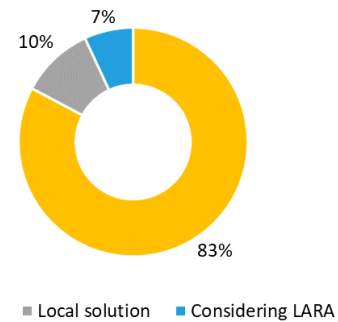


Figure 18 – Implemented airspace management (ASM) support systems (source: PRB elaboration on LSSIP data).

### 7.2 Monitoring the civil-military cooperation

148 The analysis hereafter is based on data made available to the PRB. Some data is not available because of its sensitivity, such as operational data relating to the airspace coordination corridors established over central and eastern Europe.

149 Military activities can influence the civil airspace environment, with varying degrees of impact across Member States. The implementation of the FUA concept was a common mitigating measure, allowing for dynamic management of airspace to accommodate both civil and military needs. Countries such as Czech Republic, Poland, Romania, and Lithuania reported substantial impacts due to extensive military activities, necessitating closer cooperation between civil and military authorities to modify airspace structure and its management.

<sup>21</sup> The airspace planning process is described in detail [here](#).



150 The Regulation identifies three performance indicators to monitor the use of and impact of airspace reservations (Annex I, Section I, 2.2 c, d, and e):

- The effective use of reserved or segregated airspace (ERSA), calculated as the ratio between time initially requested for an airspace allocation and actual use of that time, as reported to the Network Manager;
- The rate by which airspace users can plan their flights via available airspace structures to fly the shortest route while considering the airspace the military has released (RAI);<sup>22</sup> and
- The rate by which airspace users are actually using the available airspace structures also considering the airspace the military has released (RAU).

The Regulation also establishes a key performance indicator for the monitoring of the capacity KPA that provides an indicative value to use if the ASM delay cause is considered:

- The average minutes of en route ATFM delay per flight attributable to air navigation services (attributable to ASM delay causes).

All indicators are calculated and monitored both at local and at Union-wide levels.

151 The Regulation does not establish targets for the civil-military cooperation but encourages Member States to add a military dimension in local performance plans (Article 8(4)). To date, no Member State has developed such targets.

### 7.3 Use of reserved airspace

152 According to the data provided by the NM, the military authorities terminated 19% of the airspace established cause no longer required. This indicates an effective strategic civil-military ASM level 1 process supported by the NM-driven network and airspace design optimisation activities.

153 In 2023, following the airspace optimisation process, fewer areas (3,824) remained for military use (4,729 in 2022). Additionally, also fewer of those areas were used (1,238 compared to 3,448 in

2022). The figures indicated increased airspace availability for civil use.

154 The use of reserved airspace is monitored via the ERSA indicator, which provides several aspects, primarily how effectively airspace is allocated and used. The higher the value is, the more successful the military is in estimating its airspace needs.<sup>23</sup> In 2023, airspace booking effectiveness improved from 55% (2022) to 59% (2023) (Figure 19) despite increased military activities.

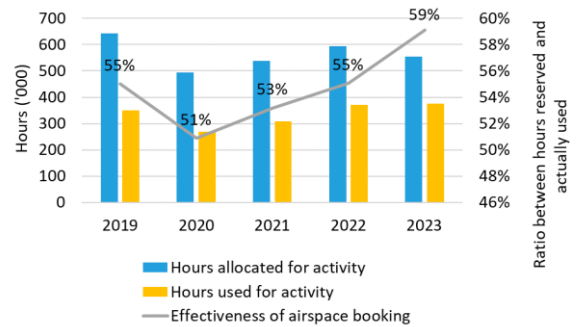


Figure 19 – Number of hours of airspace initially reserved for the Military versus actual hours used (source: PRB elaboration), indicating the rate of use is improving.

155 The airspace made available by the military can improve performance if airspace users can plan their flights accounting for that airspace (as measured by the RAI indicator) and actually use it (as measured by the RAU indicator) (Figure 20 and Figure 21, next page). Higher RAU/RAI values indicate improved effectiveness of the collaboration. The Union-wide transition from a conventional route network system to free route airspace (FRA) makes the long-term trend analysis of RAI/RAU difficult; therefore, the figure only considers the three most recent years (2021 - 2023). The European network provides different reserved airspace-crossing options in FRA and non-FRA airspace. While in non-FRA airspace traffic uses conditional routes (CDRs) to transit military reservations, in FRA, a reserved volume of airspace could be transited at any point. Due to the differences in both concepts, the indicators must be analysed separately for FRA and non-FRA (Figure 20 and Figure 21).

156 The NM's data for 2023 indicates that 96% of airspace that can be reserved by the military was

<sup>22</sup> Conditional routes (CDR) and restricted or segregated airspace (RSA).

<sup>23</sup> The ratio does not describe the performance impact or level of civil-military cooperation but is one source of data/information that can help to understand the level of cooperation between civil and military airspace use within a Member State. Other important factors can include the geopolitical situation and complexity of traffic/airspace.

available for civilian flights when planning and executing a flight. This demonstrates that military airspace had a limited impact on civilian traffic in 2023.<sup>24</sup>

157 The release of airspace and ongoing FRA implementation has created opportunities for airspace users to plan shorter routes. 63% of General Air Traffic (GAT) flights had the opportunity to plan via CDRs to cross restricted areas. 31% of GAT flights had the opportunity to plan directly through a released restricted area. Of these opportunities, 69% were used in the case of CDRs and 40% in the case of direct crossing. The RAI/RAU indicators show a significant increase in planning and using the CDRs between 2022 and 2023, mainly due to traffic growth and limited free routing options through restrictions in congested areas. Finally, the actual use of opportunities to plan and fly freely through airspace reservations without CDRs remained stable.

158 Higher airspace availability values and increases in actual use of opportunities to fly through 'military' restricted areas indicate a positive trend in the civil-military cooperation regarding airspace use.

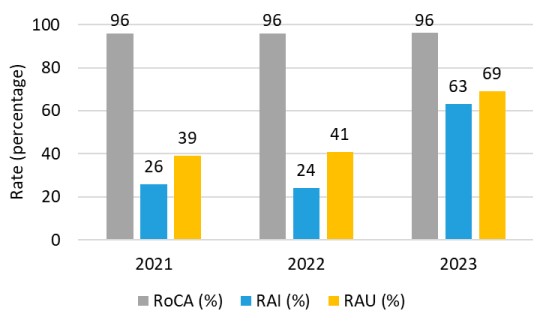


Figure 20 – The rate of availability (RoCA), planning (RAI) and using (RAU) the available conditional routes CDR for flight planning (source: PRB elaboration on NM data).

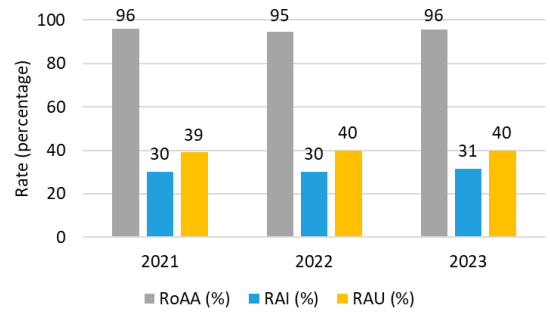


Figure 21 – The rate of availability (RoAA), planning (RAI), and using (RAU) the available restricted and segregated airspace for flight planning (source: PRB elaboration on NM data).

### 7.4 Delays caused by military activities

159 Military activity is often quoted as a source of delays. The overall ratio of delays attributable to the ASM and military activities compared to other causes remains below 2.5% (Figure 22) for the last five years. In 2023, the value of ASM-related delays decreased to 1.0%, despite growing traffic levels.<sup>25</sup>

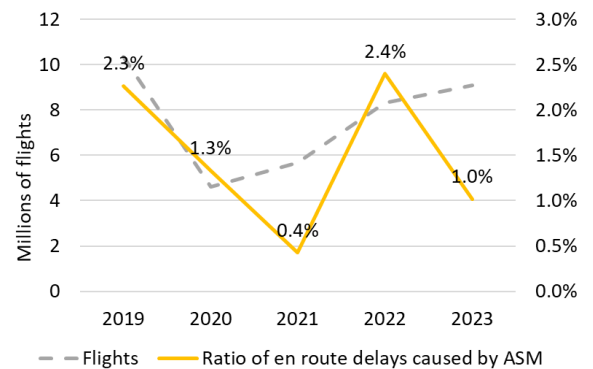


Figure 22 – Ratio of ATFM en route delays attributable to ASM activities (source: PRB elaboration).

<sup>24</sup> The statement is supported by the stable high values of the NM’s internal indicators RoCA and RoAA defined by the ASM Handbook. RoCA - Rate of CDRs available for planning and use; RoAA – Rate of airspace (RSA) available for planning and use; Airspace Management Handbook for the Application of the Concept of the Flexible Use of Airspace (Eurocontrol: ERNIP Part 3).

<sup>25</sup> Such impact may be slightly higher, given that some of the military activities may be recorded as special event or routing related categories. A detailed analysis is not possible due to a lack of data.

## 8 NETWORK FUNCTIONS FRAMEWORK FOR MONITORING THE NETWORK MANAGER FUNCTION

- The Network Manager has achieved the RP3 targets in 2023.
- The environment target was not achieved in 2023, largely driven by the impact of Russia's war of aggression against Ukraine and a lack of en route capacity.
- Measures initiated by the Network Manager saved 11.9% of en route ATFM delays, achieving the target of 10% in 2023.
- The Network Manager's approved 2023 budget is -12% lower than the cost-efficiency target in the Network Manager's performance plan.

### 8.1 Framework for monitoring the Network Manager function

160 The legal framework governing the activities of the Network Manager (NM) for its task within the Single European Sky is defined in Commission Implementing Regulation (EU) 2019/123. The Regulation tasks the Commission with approving the Network Performance Plan (Article 19) and with monitoring the performance of the network functions as well as assessing whether the performance targets contained in the Network Performance Plan are met (Article 37(2)). The PRB is assisting the Commission in this task (Article 3(k)). This chapter summarises the results of this monitoring.

161 All data used for this monitoring is provided to the PRB by the NM and is endorsed by the Network Management Board. For this report, the PRB requested and received additional data from the NM to better understand the impact of the NM's actions.

### 8.2 Safety

#### Effectiveness of safety management

162 The safety key performance indicator for the NM is the level of the effectiveness of safety management (similar to the effectiveness of safety management KPI described in Section 3 for ANSPs). The NM planned to achieve level C or above in all Management Objectives other than safety risk management by 2023. For safety risk management, the NM planned to achieve level D by 2024.

163 In 2023, the NM achieved level D in safety policy and objective and in safety risk management and level C for all other Management Objectives. The maturity levels have been verified by EASA.

Consequently, NM has achieved the RP3 targets one year before the end of the reference period.

#### Over-deliveries of aircraft into regulated sectors

164 In addition to the KPI relating to the effectiveness of the safety management systems, the NM is required to collect data on the over-delivery of aircraft into sectors, where ATFM regulations are applicable. This indicator is a measure of the extent to which (number of flights) the capacity limits are exceeded for a sector where ATFM regulations are imposed.

165 The NM reported that the over-delivery indicator decreased from 11.5% in 2022 to 9.3% in 2023 (Figure 23, next page). This is largely due to improvements seen in certain airspace (Reims, Madrid, Bordeaux, Munich, and Vienna ACCs). The over-delivery indicator in 2023 is below the pre-COVID-19 pandemic level of 12.4%.

166 The NM reported the implementation of a number of actions and initiatives to reduce volatility and improve flight planning (e.g. to remove Yo-Yo flights plans and flight plans with sharp turn angles) and keep airborne flights as close as possible to the flight plan to reduce the need for airborne changes, to reduce time deviations from the plan, and to capture all the flights in regulations as early as possible). The expected effect of implemented/to be implemented actions on the percentages of over-deliveries are not provided.

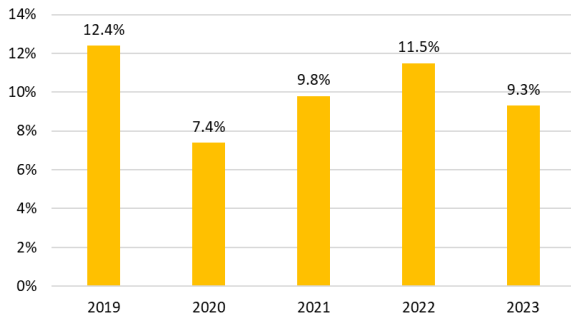


Figure 23 – Percentage of over-deliveries since 2018 (source: PRB elaboration), showing that performance improved in 2023 and below pre-COVID-19 pandemic levels.

### 8.3 Environment

- 167 The environment KPI for the NM measures the efficiency of the European route network and how airspace users plan their routes in terms of horizontal flight efficiency (i.e. KEP, which is similar to the environment performance indicator for Member States).
- 168 The KEP target in 2023 was not achieved, with a value of 4.72% compared to a target of 3.94% (Figure 24). This deficit was largely driven by the impact of Russia's war of aggression against Ukraine and the high level of ATC industrial action.

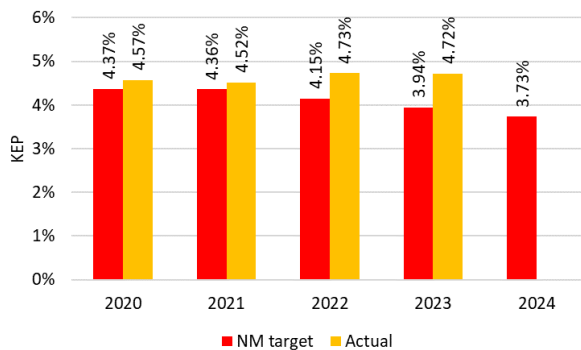


Figure 24 – Network Manager KEP target and performance achieved, showing the 2023 target was not achieved by 0.78 percentage points.

- 169 The inefficiency of the route network design (RTE-DES) improved from 1.88% in 2022 to 1.79% in 2023, achieving much of the reduction in route design efficiency anticipated in the ERNIP by 2030. The NM notes that the SCR remained steady in 2023, following a spike in 2022 due to Russia's war of aggression against Ukraine.
- 170 The additional information provided by the NM to the PRB highlighted actions taken by the NM to

improve horizontal flight efficiency, including: Enhancing the Group Re-Routing Tool to continue proposing more efficient routes. The NM noted the difficulty of measuring the actual impact but, based on the information received, it is estimated that the acceptance of such proposals remained stable at 2% in 2023, but with the number of proposals offered increasing from 800k to 1,000k. Collaboration with airlines and ANSPs led to fuel and cost savings, as well as enhanced network predictability and operational efficiency. In its 2022 monitoring report, the PRB concluded that further cooperation is necessary to fully realise the potential benefits highlighted by the NM. Achieving this should remain a key objective for the NM.

### 8.4 Capacity

- 171 There are two KPIs in the performance area of capacity for the NM:
- The share of en route ATFM delay savings due to collaborative decision making (CDM) network procedures, and Network Manager Operations Centre (NMOC) actions.<sup>26</sup>
  - The percentage of arrival ATFM delay savings from the collaborative decision-making network procedures and NMOC actions.
- 172 Table 13 (next page) shows the capacity performance achieved by the NM in 2023. Both the target on en route ATFM delay savings and the target on arrival ATFM delay savings were met.
- 173 The total number of en route ATFM delay minutes increased further compared to 2022. This means that the 0.3 percentage point increase in en route delay savings translates to nearly 2.5 million minutes saved. Despite the increase in the total minutes of en route ATFM delay, summer delays were lower in 2023 than in 2022. Conversely, disruptions in the network were at a 10-year high value of 0.39 minutes per flight.

<sup>26</sup> The Network Manager stated that delay savings were calculated conservatively and take into account rerouting proposals and NMOC direct action (i.e. forced overrides of ATFM regulations).

Network Manager capacity KPI targets and actual values in 2023		
	Target	Actual
Percentage of en route ATFM delay savings	10.0%	11.9%
Percentage of arrival ATFM delay savings	5.0%	9.6%

Table 13 – Comparison of capacity KPI targets and actual performance of the Network Manager.

- 174 In 2023 the NM focused on flights with significant ATFM delays to mitigate major disruptions as far as possible. As in 2022, the NM prepared a set of measures and guidelines for the summer period of 2023. This helped keep summer delays in 2023 lower than in the previous year.
- 175 Despite the actions carried out by the NM, actual values of the network performance indicators show a slight worsening of performance in 2023 compared to 2022, apart from the minor improvement in the share of weekend ATFM delays. The NM also noted that volatility was higher in the network than in 2022, mostly due to ATC industrial action and adverse weather. The values of the network performance indicators are shown in Table 14.

Network Manager capacity PIs, actual values in 2023 and in 2022		
	2023	2022
Number of flights with ATFM delay greater than 15 minutes	5.7%	5.0%
Avg. daily percentage of ATFM regulations with less than 200 minutes of delay	49%	48%
Average proportion of weekend ATFM delays	32%	33%

Table 14 - Network performance indicators, actual values in 2023 and 2022. Source: Network Manager Annual Report.

- 176 The NM noted that to improve network performance adverse weather impacts must be addressed collaboratively on the network level. This includes improving the representation at the weekly meeting of the Enlarged NDOP Coordination Cell in the coming years to enable a closer and more effective cooperation of all stakeholders.

### 8.5 Cost-efficiency

- 177 The cost-efficiency performance indicator for monitoring is the actual unit cost for the execution of the NM tasks. The indicator is calculated as the ratio of actual costs to service units at the level of the geographical area where the Network Manager executes its tasks.
- 178 The NM's approved 2023 budget (140M€<sub>2017</sub>) is -19M€<sub>2017</sub> (-12%) lower than the planned costs (160M€<sub>2017</sub>).<sup>27</sup> The actual en route service units for the Network area in 2023 (170.3M) is +27M (+19%) higher than the planned services units (143.3M) (based on STATFOR May 2021 base forecast). The actual inflation index (124) was +13 percentage points (or +11%) higher than the determined inflation index used in the NM's performance plan (112).
- 179 As a result, the actual unit cost in 2023 for the Network Manager was 0.82€<sub>2017</sub>, which is -26% lower

<sup>27</sup> In 2022, the NM implemented a new methodology regarding the internal tax on remuneration, a change that occurred after the approval of the performance plan. This approach led to a reduction of the nominal costs planned in the performance plan, with a decrease of -13M€ (or -6.6%) for 2023 and -15M€ (or -7.5%) for 2024. The determined costs referenced in this report are adjusted to accommodate the revised approach.

than the determined unit cost (1.11€<sub>2017</sub>) (Table 15).

<b>Network Manger cost-efficiency KPI 2023</b>		
	Perfor- mance plan	Actual
<b>Unit cost of the Network Man- ager tasks (€<sub>2017</sub>)</b>	1.11	0.82

Table 15 – Comparison of cost-efficiency KPI and actual performance of the Network Manager.

- 180 The NM reported several measures to improve its cost-efficiency. In 2023 the estimated impact of these measures amounted to 13M€ in nominal terms (or 10.5M€<sub>2017</sub> in real terms). These measures included i) stopping flight plan processing at the IFPU (Integrated Initial Flight Plan Processing System Unit); ii) stopping the duplication of IT; iii) consolidating data centres and cloud services; iv) hiring at lower entry grades (admin reform); v) extension of Infrastructure monitoring within existing cost base; and vi) growth of Data Services within existing cost base.
- 181 Regarding the investments, the NM reported one investment (iNM) that was above the 5M€ of asset value. iNM is the digital transformation programme of the NM. The reported actual 2023 CAPEX of this project amounts to 74M€, which is -21% compared to the planned (94M€).

## 9 INTERDEPENDENCIES BETWEEN KEY PERFORMANCE AREAS

- Member States confirmed in their performance plans that retaining safety levels has priority over other performance areas and that the changes planned during RP3 should not degrade safety.
- Lagging performance indicators (RIs and SMIs) show positive developments over RP3.
- The PRB estimated that 0.19 percentage points of the increase in KEA was the consequence of the increased delays in 2023.
- In 2023 ANSPs provided capacity at similar cost compared to 2019.

### 9.1 Interdependencies relating to the safety KPA

- 182 To ensure the safety of services provided by ANSPs, the Commission Implementing Regulation (EU) 2017/373 defines the safety management system that ANSPs must have in place (safety policies and safety risk assessment, safety assurance and safety promotion) and the processes ANSPs need to apply when changing the functional system.<sup>28</sup>
- 183 Compliance with these regulatory requirements should ensure that safety levels are not compromised when implementing changes to airspace, staffing, or ATM functional systems.
- 184 In addition, ANSPs are required by Commission Implementing Regulation (EU) 2017/373 to define and monitor safety performance through indicators. The EoS also requires definition of safety indicators to monitor safety performance for the maturity level set as the RP3 target level. As only three ANSPs reported the use of additional safety indicators (in addition to those prescribed by the performance and charging regulation), the use of indicators to monitor the interdependency between the Safety KPA and other KPAs may be limited currently, or at least not reported.
- 185 The prescribed indicators on RIs and SMIs both have improved over RP3, i.e. rates have been decreasing.

### 9.2 Interdependencies between the environment and capacity KPAs

- 186 The PRB Annual Monitoring Report for 2022 highlighted that Russia's war of aggression against

Ukraine and the higher en route ATFM delay observed in 2022 (compared to previous years) contributed to significantly worsen horizontal flight efficiency.

- 187 In 2023, delay has continued to increase. This, in addition to the continued impact on flight trajectories of Russia's war of aggression against Ukraine, has contributed to KEA deteriorating to 2.99%, and missing the target by 0.59 percentage points (the same deficit as in 2022).
- 188 In 2023, en route ATFM delay reached 1.84 minutes of delay per flight, 1.34 minutes above the target; a deterioration of 0.14 minutes compared to 2022. Based on the outcome of the interdependency study, the PRB estimates that 0.19 percentage points of the value of KEA is caused by the deterioration in the capacity KPA beyond the Union-wide target.<sup>29</sup> In terms of fuel burn, this equates to approximately 66M kgs of excess fuel burnt or 209M kgs of excess CO<sub>2</sub> compared to what would be expected if the Union-wide targets were achieved.
- 189 This interdependency highlights the impact that the lack of capacity has on ATM performance and the importance of ensuring the provision of capacity, in a timely manner, to match traffic demand.

### 9.3 Interdependencies between the capacity and cost-efficiency KPAs

- 190 Since the Annual Monitoring Report 2021, the PRB has monitored the interdependency between cost-

<sup>28</sup> Commission Implementing Regulation (EU) 2017/373 laying down common requirements for providers of air traffic management (air navigation service and other air traffic management network functions and their oversight).

<sup>29</sup> Calculated by taking the difference between the actual performance and the target (1.34) and multiplying by the impact that PRB study calculated each minute of en route ATFM delay per flight has on horizontal flight efficiency (0.14).  $1.34 \times 0.14 = 0.19$  percentage point increase in horizontal flight efficiency as a result of 1.34 minutes of additional delay per flight compared to the Union-wide target. The report can be consulted [here](#).



efficiency and capacity by examining the ratio of capacity provided to the costs associated with providing this capacity. The capacity provided is measured as the sum of sector-opening hours in a year, while costs are measured as the actual en route total costs for the same year. Table 16 shows an improvement in this metric in 2023 compared to 2022, almost reaching 2019 levels. If ANSPs increase their capacity provision as planned, it is likely that by the end of RP3, the indicator will show a significant improvement compared to 2019. This indicator cannot be considered in isolation and should be viewed in the context of other factors such as the delay situation. The average en route ATFM delay was 10% higher in 2023 than in 2019, thus incurring additional costs to airspace users.

Evolution of Union-wide actual costs per sum of sector-opening hours		
2019	2022	2023
2,538€ <sub>2017/h</sub>	2,639€ <sub>2017/h</sub>	2,548€ <sub>2017/h</sub>

Table 16 – Union-wide total costs per sum of sector-opening hours of 2023 compared to 2022 and 2019. (source: PRB elaboration on DDR AIRAC datasets and monitoring data). There was an improvement compared to 2022, nearly reaching 2019 levels.

- 191 Another key aspect of the interdependency between capacity and cost-efficiency is how investments in ATM systems and other elements of the infrastructure contribute to capacity provision. ANSPs continued to invest into ATM system upgrades and new system implementations, as well as additional ATCO tools to improve capacity performance. While some of these investments had visible benefits in terms of increased sector capacities, the full benefit of these cannot be realised until the shortage of ATCOs is also resolved.
- 192 The PRB reiterates its view that NSAs should require all system transitions are accompanied by an appropriate capacity study, a process to estimate anticipated benefits, and subsequent monitoring to identify, quantify and report on the actual benefits achieved.



## 10 CONCLUSIONS AND RECOMMENDATIONS

193 The conclusions from the PRB monitoring of 2023 performance are summarised for each KPA in this section, followed by a specific PRB recommendation.

### 10.1 Safety

194 Based on the analysis presented in Section 3, the PRB makes the following conclusions with associated recommendations:

195 **Conclusion 1:** Several ANSPs improved their performance achieving higher intermediate levels in 2023. Nine ANSPs are behind their planned performance and did not improve sufficiently or deteriorated during 2023. 18 ANSPs still need to improve in 2024 to reach the RP3 target, especially in the area of Safety Risk Management.

196 **SAF-1:** Member States should engage with ANSPs to ensure that they reach their planned maturity levels for all Management Objectives by implementing their planned measures and, if needed, define and implement additional measures supported by appropriate resources.

197 **Conclusion 2:** Several ANSPs have shown degraded performance in 2023, most notably three ANSPs (from the Member States of France, Portugal and Romania) no longer achieve the RP3 targets.

198 **SAF-2:** Member States should ensure that ANSPs implement the additional measures (e.g. processes, resources, training, reviews) to recover their planned maturity levels of the Management Objectives and reach RP3 targets by 2024.

199 **Conclusion 3:** Seven Member States have noted that their ANSPs are at risk of not meeting the RP3 targets in 2024. Actions required to meet the necessary maturity levels in some cases entails both defining and implementing new processes.

200 **SAF-3:** Where Member States have identified a risk of the ANSP not meeting the RP3 targets, Member States should ensure that needed measures are taken to mitigate such risks, e.g. by bringing necessary resources.

### 10.2 Environment

201 Based on the analysis presented in Section 4, the PRB makes the following conclusions with associated recommendations:

202 **Conclusion 1:** The Union-wide environment target was missed by 0.59 percentage points. This under-performance is a result of continued capacity issues and Russia's war of aggression against Ukraine, which impacted Union-wide performance by an estimated 0.28 percentage points. KEP and SCR improved slightly.

203 **ENV-1:** Given the continued high delays and shift in traffic flows, Member States and ANSPs must work to resolve capacity bottlenecks, expand FRA, and implement enhanced FRA without unnecessary RAD restrictions to enable more direct routes.

204 **Conclusion 2:** The PRB estimates that approximately 0.26 percentage points of horizontal en route flight inefficiency originates from the average of 1.84 minutes of en route ATFM delay per flight in 2023.

205 **ENV-2:** All ATM operational decision-makers must consider the interdependency between delays and horizontal flight efficiency during both planning and tactical phases. They should also ensure resilience to mitigate the impact of delays on environmental performance.

206 **Conclusion 3:** Terminal and airport surface environmental performance show mixed results in 2023. The proportion of flights operating CDOs remained stable, however the additional ASMA time and AXOT both increased slightly, mainly due to airport disruption during the summer period, leading to additional fuel burn.

207 **ENV-3:** Member States should seek to alleviate airport disruption and improve terminal environmental performance in line with the expected growth in traffic.

### 10.3 Capacity

208 Based on the analysis presented in Section 5, the PRB makes the following conclusions with associated recommendations:

209 **Conclusion 1:** Average en route ATFM delays reached 1.84 minutes per flight in 2023, missing the target by 1.34 minutes per flight. This shows no improvement in capacity performance at Union-wide level compared to pre-COVID-19 pandemic years, and further deteriorating compared to 2022.

- 210 **CAP-1:** ANSPs and NSAs should focus on a continuous improvement of capacity performance by realising their planned measures in order to close existing capacity gaps and prepare for the RP4 traffic levels.
- 211 **Conclusion 2:** Adverse weather impacted the functioning of the European ATM Network significantly in 2023, causing a record-high 0.53 minutes of average en route ATFM delay per flight, also impacting the volatility of the network.
- 212 **CAP-2:** ANSPs should work together and with the Network Manager to better prepare and plan for adverse weather phenomena and find mitigation measures at the network level (e.g. through the better use of available technologies and more advanced tools and services).
- 213 **Conclusion 3:** Following the COVID-19 pandemic and the subsequent recovery of traffic, ANSPs reported measures to increase the number of ATCOs in OPS FTEs as one of the most important capacity improvement measures. Despite this, not only were ANSPs further behind the planned ATCO numbers at the end of 2023 than they were in 2022, but the actual number of controllers was also lower at the end of 2023 than in 2022.
- 214 **CAP-3:** ANSPs should close the gap with ATCO recruitment and training plans and bring additional controllers into operations or otherwise find ways to relieve the shortage of controllers, e.g. with more cross-border cooperations and ATCO mobility schemes to accommodate further traffic growth.

#### 10.4 Cost-efficiency

- 215 Based on the analysis presented in Section 6, the PRB makes the following conclusions with associated recommendations:
- 216 **Conclusion 1:** Union-wide, the 2023 en route actual costs were -3.5% (-225M€<sub>2017</sub>) lower than the determined values. For a number of ANSPs this reflects the non-realisation of the approved performance plans, in particular in ATCO recruitment and implementation of investment projects, thereby negatively affecting present and future operational performance.
- 217 **CEF-1:** The PRB will take into consideration the implementation of the RP3 performance plans when assessing the RP4 cost-efficiency targets. The PRB reiterates its recommendations made in the Annual Monitoring Reports of 2022 and 2021, urging the Member States to take immediate, adequate, and proportionate action to implement the relevant ATCO and investment plans they committed to in their performance plans.
- 218 **Conclusion 2:** In 2023 there was a significant difference between the actual and forecast inflation indexes, with the weighted average being +11% higher than forecast. However, the ANSPs' actual costs are not increasing at the same rate as inflation.
- 219 **CEF-2:** The PRB recommends the NSAs to conduct an annual analysis to identify the appropriate portion of the inflation adjustment that reflects actual cost increases. NSAs should consider requiring the reimbursement of excess funds received by ANSPs due to the inflation mechanism. Additionally, NSAs should ensure that there is no double counting of the inflation effect between the inflation adjustment and the amounts claimed in the cost risk sharing mechanism.
- 220 **Conclusion 3:** Some Member States with approved capacity deviation planned for RP3 reported significantly lower actual costs compared to planned, while not achieving the 2023 en route capacity target.
- 221 **CEF-3:** The PRB will take into consideration the implementation of the RP3 performance plans when assessing the RP4 cost-efficiency targets and recommends that the NSAs concerned submit a detailed report of planned capacity-related measures implemented during 2024. Should the RP3 planned measures not be implemented by the end of RP3, the PRB recommends the NSAs to ensure the reimbursement of capital related amounts, and consider requiring the recovery of other amounts received by ANSPs for measures not implemented.
- 222 **Conclusion 4:** Ten NSAs reported that the costs for non-ANS activities or ANS provided to third countries have been presented separately in the ANSPs' accounts, as required by Article 12(3) of Regulation 550/2004. Some NSAs stated that they are still conducting verifications on the cost base eligibility, while others did not provide sufficient information.
- 223 **CEF-4:** The PRB recommends that the Member States concerned take immediate action to follow up on the application of Article 12(3) of Regulation

550/2004 and that the NSAs provide more detailed information on their oversight activities regarding the compliance of cost eligibility in the RP4 performance plans.