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NETWORK OPERATIONS REPORT 2024

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1 EXECUTIVE SUMMARY

The Network Operations Report 2024 provides a comprehensive overview of 2024 network performance, highlighting the key conclusions and the issues that the EUROCONTROL Network Manager (NM) and the wider stakeholder community need to address going forward.

Thanks to the significant efforts made by operational stakeholders – airspace users, ANSPs, airports, military, ground handlers, States, and EUROCONTROL's Network Manager – and considering the robust plan that had been agreed upon, there was an increase in punctuality, stability, predictability, and capacity in the European aviation network in the first part of the year. As a result of this joint work and cooperation, the clear common objective of making 2024 a manageable year was on track. However, Summer 2024's operational complexities and the significant increase in traffic proved to be very challenging.

The growth of European air traffic in 2024 was unprecedented and will continue steadily throughout this decade. Traffic is rapidly growing and is expected to be close, at the European ATM network level, to the volume of traffic reached during Summer 2019. In many parts of the network, the traffic is already 20-30% (or even higher) than the traffic in 2019. To this significant traffic increase, other complexities are to be considered: the non-availability of Ukrainian airspace due to the war of aggression in Ukraine, the significant increase in military requirements for more intensive training, national and multinational military exercises, as well as the requests for more airspace related to the introduction of 5th generation fighter aircraft. In addition, weather evolutions are adding another layer of complexity in the planning and management of European airspace.

1.1 Key performance outcomes

There were 10.7 million flights in the network in 2024, 4.9% more than 2023 (on average 1,160 more daily flights). Traffic continued to recover from COVID-19 pandemic, although the network was still strongly impacted by the Russian invasion in Ukraine and the conflict in Israel.

There were 5% more flights in summer 2024 than the same operational period in 2023. Most ACCs were managing increases in traffic of more than 10% above 2023 levels, notably in the south-east axis: Tirana (+23%), Zagreb (+15%), Ljubljana (+13%), Makedonia (+13%), Athens (+13%) and Malta (+13%). The growth in traffic for Tbilisi (+30%) and Baku FIRs (+40%) was partly due to a change in air operators routings resulting from the situation in the Middle East.

During summer 2024, the south-east axis also had the highest ATFM delays of any axis – 8.7 million minutes (+49.9%) - with 45% due to weather and almost half in three ATC centres (Budapest, Karlsruhe and Zagreb.) The south-west axis had just over 1.3 million flights (+8.9%). It had 6.3 million minutes of ATFM delay with 40% due to weather. Four ATC centres (Marseille, Reims, Karlsruhe and Barcelona) generated 40% of ATFM delays on the south-west axis. The south-west axis saw better average arrival on-time performance (by 5.3 p.p.) than the south-east axis.

The weather-related ATFM delay (at 1.93 minutes/flight) was 41.0% of total ATFM delays and was over 48.7% more than in 2023. For safety reasons, aircraft avoid convective weather, reducing the number of aircraft flying through the affected airspace. As flights try to re-route into non-weather affected areas, there is a knock-on effect when these other areas are already operating in a saturated environment at the limit of their capacity – resulting in additional ATC Capacity delays.

Airline schedule delay during 2024 was 17.4 minutes/flight decreasing by 0.1 minutes when compared to 2023 where the average delay was also 17.5 minutes. Reactionary (knock-on delay) saw an increase of 0.7 minutes; airline delays also saw a small reduction of 0.1 minutes.

The network departure (66.2%) and arrival punctuality (71.9%) increased compared to 2023. First rotation departure punctuality was 79.1% and 84.8% for arrival. A key objective for NM was to improve first rotation punctuality, as it sets the tone for the rest of the day's operations.

Preparations for the winter season 2024/2025 were finalised towards the end of 2024 and preparations for the summer 2025 began, taking into consideration the priorities agreed. The early preparation of the NOP 2025/2026-2029, of the consolidated Transition Plan for Major Projects in Europe for Winter 2024/2025 will contribute to mitigating structural capacity issues. In addition, detailed preparations are continuing for major events and military exercises. Network impact assessments and mitigation measures have been prepared for many military exercises, while cooperation has been increased with NATO in the evaluation of possible training areas to meet the challenging needs resulting from the ongoing Russian aggression in Ukraine.

NMOC's direct actions led to a reduction of 2,798,000 minutes of en-route ATFM delay and 807,000 minutes of airport ATFM delay. It maintained its en-route ATFM delay saving performance at 11.3% (target of >10%); and maintained airport ATFM delay savings at 9.7% (target 5%).

1.2 Main causes of delay

It is essential to evaluate all the issues influencing 2024 performance to prepare for summer 2025 and beyond.

En-route ATFM delay was 2.1 minutes per flight, which corresponds to, on average, 61,915 minutes of daily ATFM delays.

In 2024, 79.9% of en-route ATFM delays were concentrated on the Intra NM south-east and south-west axes.

En-route ATC capacity (8.9 million minutes) was the major cause for delays in 2024 and represented 39.4% of en-route ATFM delay.

Weather also had a significant impact on operations during 2024, especially in July. At 8.1 million minutes, weather accounted for 35.9% of en-route ATFM delays.

Weather and ATC capacity are mutually dependent as flights try to re-route into non-weather affected areas which are already saturated.

In summer 2024, delays were much higher than expected and well above 2023 levels.

During this period, some enhancements to the Cross-Border Weather (XBW) procedure were introduced based on the application of playbooks with rerouting scenarios for two main areas of Europe (Balkans and Reims/London/MUAC/KUAC- 4ACCs initiative). Weather based NM RADs relaxation was also applied pre-practically.

These initiatives have had limited success for several reasons. First, the lack of approval of some of these measures by some of the impacted ANSPs, whose performance may have been adversely affected by their implementation. Secondly, the lack of confidence in a forecast provided only twice a day, without sufficient continuity or granularity, which makes operational decision-making difficult. Finally, the lack of anticipation in decision-making, a point also related to the lack of confidence in the forecasts, which, combined with the fear of poor performance, leads ANSPs to delay decisions until the latest possible moment, which contributed to the general volatility of regulated traffic.

1.3 Network Manager measures and reinforced cooperation with operational stakeholders

The NM Airport Function reinforced input, advice, and coordination from within the airport community to the decision-making process of the NMOC in relation to flow management and demand/capacity-balancing (DCB).

Flight efficiency results in 2024 were lower than 2023. The NM area, en-route fuel burn per flight for narrow bodies remained stable around 4.3 tonnes. While KEP (planned route extensions) improved significantly in 2024, KEA (actual route extensions) remained flat overall, reflecting the constraints in the network during summer (KEA was worse than 2023 during June-September months and better or flat the rest of the year). The en-route Requested FL indicator increased again in 2024, 0.2pp over 2023, getting back to level seen in 2019. This increase shows that it was a more complex operational situation.

NM continued to support flexible RAD procedures whilst enhancing ATFM operations. It supported ENAIRE's use of scenarios to manage capacity problems, since NM considers the approach does not undermine flight efficiency.

NM's flight efficiency task force continued to support aircraft operators find best available routes.

Operational volatility was slightly higher than in 2023. NM still needs to reiterate the need for ATFM regulation discipline with FMPs. Several FMPs adjusted regulation parameters too often and too quickly. It also needs to encourage airport adoption of CDM processes which offer greater time predictability compared standard OBT update methods.

1.4 Lessons learned

The poor summer performance demonstrates that there is a need to urgently introduce further structural improvements. A strong commitment by all involved stakeholders will be needed too.

The preparations for summer 2025 will build on lessons learned from summer 2024, leveraging the strengthened cooperation within the Datalink Support Groups. NM will continue to work alongside ANSPs, airlines, and service providers to ensure datalink resilience, optimise performance monitoring, and refine operational procedures—ensuring that datalink remains a key enabler of network efficiency and capacity.

In addition, detailed preparations are continuing for major events and military exercises. Network impact assessments and mitigation measures have been prepared for many military exercises, while cooperation has been increased with NATO in the evaluation of possible training areas to meet the challenging needs resulting from the ongoing Russian aggression in Ukraine.

Given the reluctance to act pre-tactically, NM will re-assess the weather procedure and propose to develop further the "play-book" approach to tackle standard weather scenarios when they materialise.

Summer 2024 was managed with strong cooperation and partnership between the NM, Member States and operational stakeholders.

The vast majority of the ANSPs fulfilled the commitments made in the NOP. With the introduction of the Rolling NOP and four joint priorities, significant improvements were achieved compared with the previous year. Airports and ANSPs should continue to improve their flexibility mechanisms to better match the changes in the demand as the traffic demand is more and more volatile. NMOC will also work with ACCs to improve network ATFM capabilities in the FMPs.

Bad weather hit operations earlier in summer (July) and continued through July-September.

There is still room for improvement as far as the network response to bad weather is concerned.

The pivotal role in increasing airport-related sustainability of the whole ATM network system and its resilience was played by the NM Airport Function. Flights identified for curfew monitoring, were proposed slot improvements that avoided flight cancellations and significantly reduced the delays. It created a permanent, collaborative interface between the airport operations and NMOC.

The network encountered fewer industrial actions in 2024. However, considering the current economic conditions, NM anticipates that industrial action will once again pose a significant risk in 2025.

1.5 Conclusion

There were 22.7 million minutes of en-route ATFM delay in 2024 – a daily average of 61,915 minutes. This is 23.0% higher than 2023, but with 4.9% more traffic. En-route ATFM delay per flight was 2.07 minutes, higher than 2023 (1.81 minutes).

Summer 2024 was very complex and difficult summer. Traffic was up by 4.9 % with some ACCs experiencing double digit traffic growth due Ukrainian war and Middle East situation.

NM has already started to prepare Summer 2025 tackling all the main complexities described above. As a result, NM developed challenging actions in close cooperation with the operational stakeholders to address the operational performance complexities of the network in 2025 and beyond:

- Available capacity needs to be optimised and better managed.
    - Every effort needs to be made to increase capacity specifically regarding ATCO recruitment and improved rostering.
    - Adaptations should be made to the Network Operations Plan (NOP) to ensure better forecasting, more frequent updates and more granularity on what resources are available in the ANSPs;
    - All stakeholders must implement the operational actions commitments in the NOP;
    - Management of weather on a network-wide level needs to be improved and the Network Manager needs to be resourced to provide this service;
    - Flight plan adherence must increase;
    - First rotation must continue to be prioritised;
    - Sectorisation solutions should be put in place for saturated elementary ATC sectors;
    - Weekly NDOP teleconferences should be organised with participation at the appropriate level operational executives.

2 INTRODUCTION & SCOPE

The purpose of this document is to provide an overview of the European ATM network performance in 2024 in the areas of traffic, punctuality, capacity / ATFM delays, network and ground operations, and flight efficiency. The airspace users' opinion on the network performance is also included.

The report analyses the annual results considering the main events that took place in the course of the year.

The document structure is as follows:

Section 1: Executive Summary.

Section 2: Introduction & Scope.

Section 3: Network Overview contains the annual performance of the European ATM network: traffic, delays and punctuality, and flight efficiency.

Section 4: Traffic in Detail is a detailed analysis of traffic growth in 2024 in the NM area and adjacent regions.

Section 5: En-Route Performance analyses the influence of events and disruptions; capacity and ACC performance.

Section 6: Airports is an analysis of the performance of airport operations.

Section 7: Flight Efficiency looks at the progress of airspace design and flight planning indicators

Section 8: References.

Annex I: Airspace Users' View outlines the users' perspective on how the network performed in 2024.

Annex II: ACC contains a traffic and capacity evolution for each ACC in 2024.

Annex III: Airports contains capacity, delay, arrival/departure punctuality status and a NM performance assessment of each of the significant airports in 2024.

3 NETWORK OVERVIEW

3.1 TRAFFIC

Traffic in the NM Area continued to recover from COVID-19 pandemic and was higher than in 2023, although the network was still strongly impacted by the Russian invasion in Ukraine and the conflict in Israel/Gaza (see figure below). Network traffic in the 2024 was 4.9% higher than the same operational period in 2023 – on average 1,362 more daily flights.

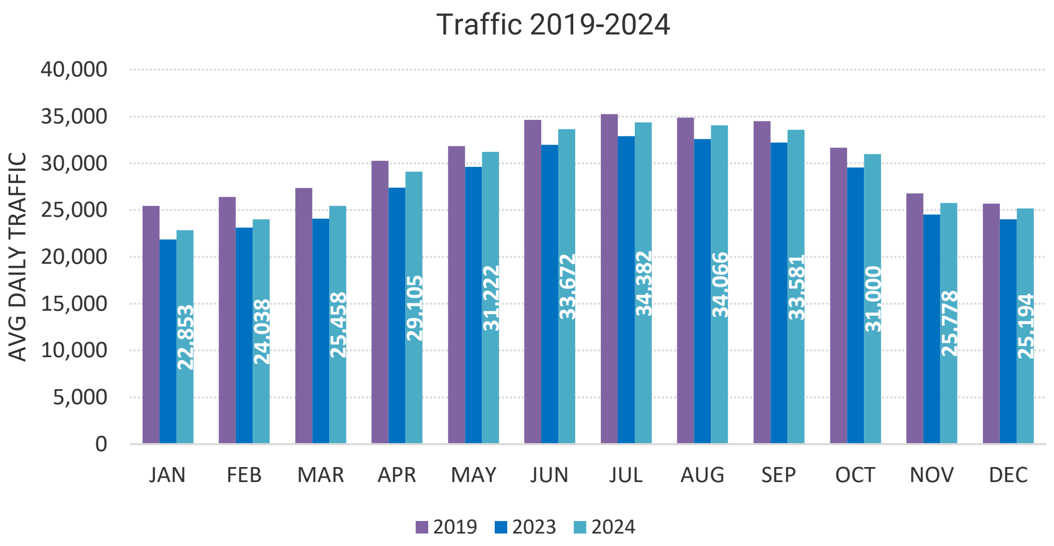


Figure 1 Monthly Network Traffic Evolution

Traffic reached 33,000 daily flights by the beginning of June and stayed at that level through to end of September. Friday 14 June was the highest summer daily traffic at 35,713 flights.

The largest market segment over 2024 was Mainline. It averaged 10,395 flights/day, which was +6.2% growth compared to the same period in 2023. Low Cost was 9,865 flights/day (+7.8%) and Regional 3,700 flights/day (+1.4%). The Business segment averaged 2,065 flights/day, which was 0.4% higher than 2023. The other segments had similar levels to 2023. The restrictions following the invasion of Ukraine particularly affected the Charter market.

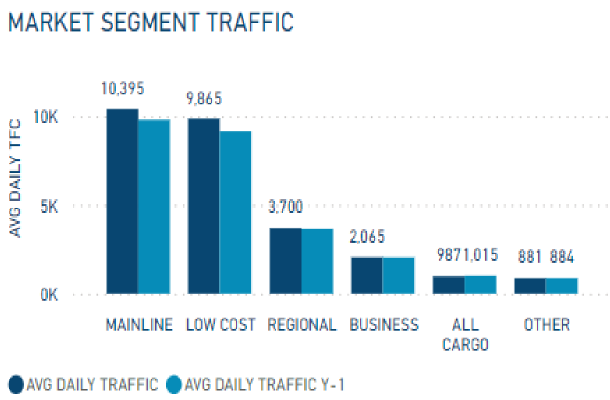


Figure 2 Market segment 2024 traffic

In 2024, Ryanair was the busiest carrier (3,052 flt/day), followed by easyJet (1,553 flt/day) and Turkish Airlines (1,436 flt/day).

The level of non-operated airline schedules was 6.0% for 2024. This indicator was impacted by extreme weather events and ATC capacity shortages throughout the year.

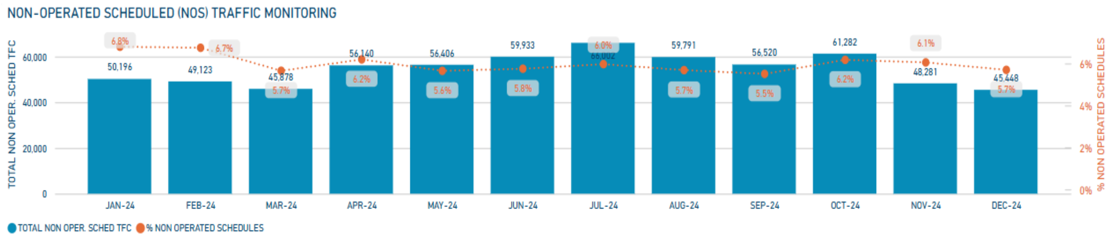


Figure 3 Non-Operated Scheduled traffic 2024

Istanbul airport was the busiest airport in 2024 with, on average, 1,401 flights per day, followed by Amsterdam/Schiphol (1,336) and London/Heathrow (1,302).
The Russian invasion of Ukraine and the subsequent airspace and operator restrictions continued to cause significant problems. Summer traffic levels in some ACCs, notably in the south-east axis, had double-digit traffic growth compared to 2019.

The Intra-NM traffic flow was 55.3% of the network traffic in 2024. Its growth of 5.6% drove the network growth along with the 7.2% increase in out-of-area.
Together they added on average, 1,164 flights/day to the network during 2024.

Domestic traffic decreased slightly (−0.1%).

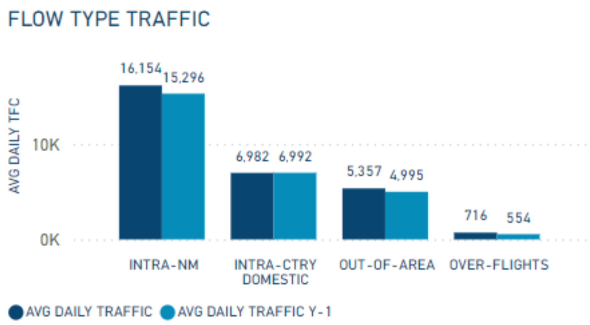


Figure 4 Flow type traffic 2024

All Top 20 ACCs had more traffic than 2023. Roma, Zagreb and Zurich ACCs had double-digit traffic growth. Roma ACC traffic increase was partially due to the transfer of airspace from Brindisi ACC: the northern sectors of Brindisi ACC are under Roma ACC control since 13 June 2024.

Double digit traffic growth in Cairo and Tirana was partially due to aircraft operators avoiding routes through Teheran due to geopolitical tensions in the Middle East.

3.2 ALL CAUSES DELAY

Airline schedule delay was 17.8 minutes per flight in 2024, the same as 2023 (Figure 4). Reactionary (knock-on) remained at 8.0 minutes; airline related delay decreased in 2024 to 4.3 minutes per flight. The main area of increase was in ATFM causes (3.7 mins per flight) with 0.3 minute increase in ATFM en-route causes. However, the stability in the years average delay per flight, masks considerably worse summer performance, where for example in July 2024 airline recorded ATFM delays increased to 7.2 minutes per flight vs. 4.8 in July 2023.

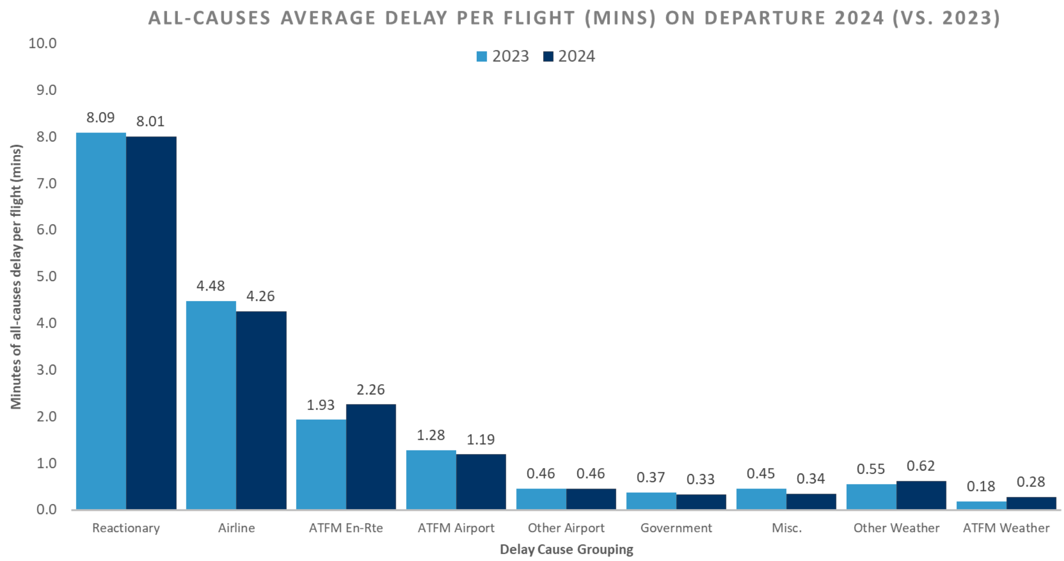


Figure 5 average delay per flight comparison 2024 v 2023

3.3 NETWORK ON-TIME PERFORMANCE

In summer 2024, network departure (60.1%) and arrival punctuality (66.8%) deteriorated compared to 2023. This decrease was partially due to high traffic volume which necessitated additional sectors and/or ATFM measures to handle the expected overload, particularly on the south-east and south-west axes. Adverse weather conditions also played a role in affecting punctuality.

In 2024, network departure (66.2%) and arrival punctuality (71.9%) increased compared to 2023. First rotation departure punctuality was 79.1% and 84.8% for arrival. A key objective for NM was to improve first rotation punctuality, as it sets the tone for the rest of the day's operations. This includes increasing the number of open sectors in the first rotation period during summer 2024. NM had highlighted several ACCs which must increase first rotation opening sectors during summer 2024.
Moreover, it should be noted that the share of Out of Area arrivals is the highest during the First Rotation phase; a flight will be exempted from ATFM regulations if departing from outside the ATFCM area. This means that almost 1 in 5 flights arriving during the first rotation phase is not impacted by ATFM delays.

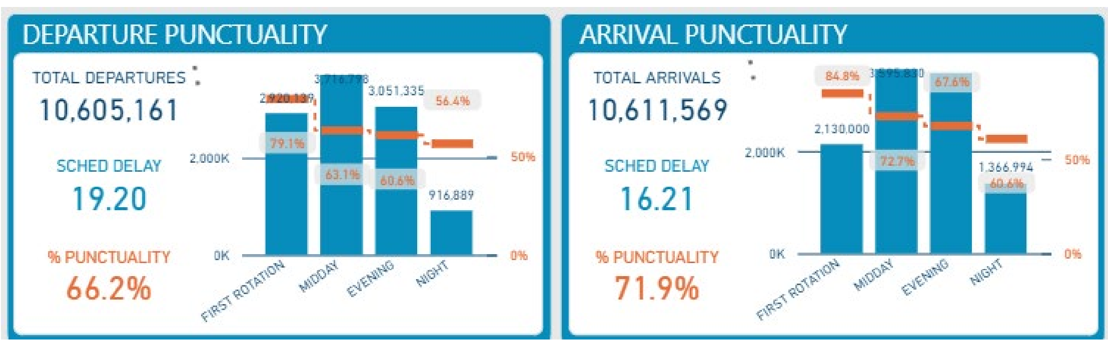


Figure 6 network punctuality 2024

3.4 ON-TIME PERFORMANCE AIRPORTS

In general, there was a mixed picture for 2024 airport departure punctuality.

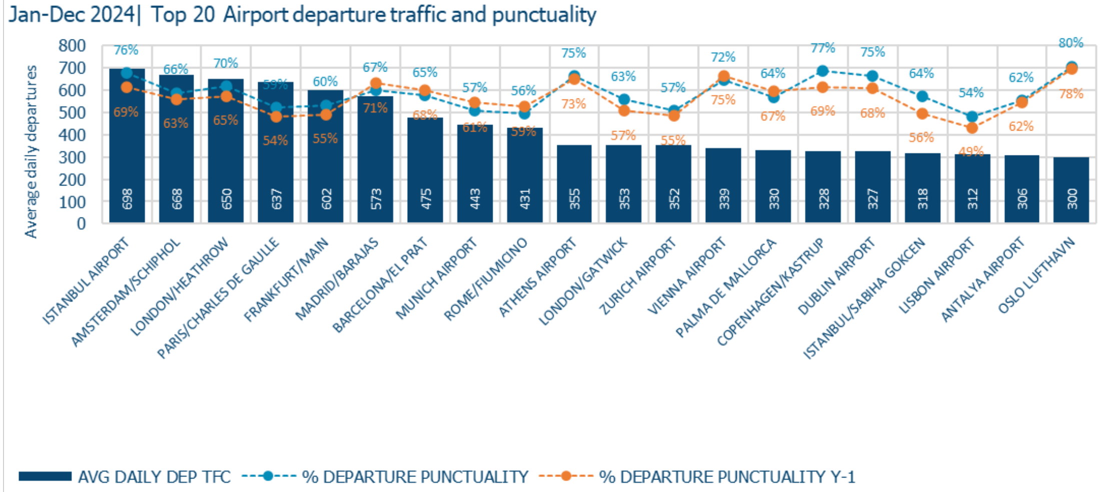


Figure 7 departure punctuality[1] of top 20 airports in 2024

Seven of the Top 20 busiest airports had departure punctuality below 60% in 2024 – such as Paris Charles de Gaulle, Frankfurt, Rome Fiumicino, London/Gatwick, Zurich, Istanbul Sabiha Gökçen and Lisbon.
Four of the Top 20 had departure punctuality above 70% - Madrid Barajas, Athens, Vienna and Oslo

Although traffic and delays increased, June and August departure punctuality stayed at 59%, the same as in 2023. However, it significantly fell to 53% in July. Consequently, the average departure punctuality from June to August dropped from 59% to 57% compared to 2023.

Scandinavian airports like Trondheim, Stavanger, Stockholm, Bergen, Helsinki, Copenhagen, and Oslo had the best departure punctuality, averaging over 75%. In contrast, Napoli, Fiumicino, and Bergamo had poor records with less than 45% punctuality.

Ground delays, especially during first wave operations, decreased compared to 2023 and was up to -18% in August. This offset the rise in ATFM delay, leading to a 1% reduction in average departure delay during the first wave and contributing to an overall 8% improvement in cumulative arrival delay later in the day.

The highest average departure delay per flight in the top 10 airports were observed in Rome, Palma and Munich with Rome and Munich having around 30% of the delay coming from the ground delay while only 12% in Palma.

Three of the airports continue to experience increased time to deliver ground services. Net turnaround times were beyond scheduled times, and they also experienced network ATFM delays – see example below of network turnaround times in 2024 vs. 2023, the impact of summer season ATFM delays can clearly be seen in the red coloured peaks. (see example in Figure 7).

[1] Operational estimate of departure punctuality from ETFMS and schedule data

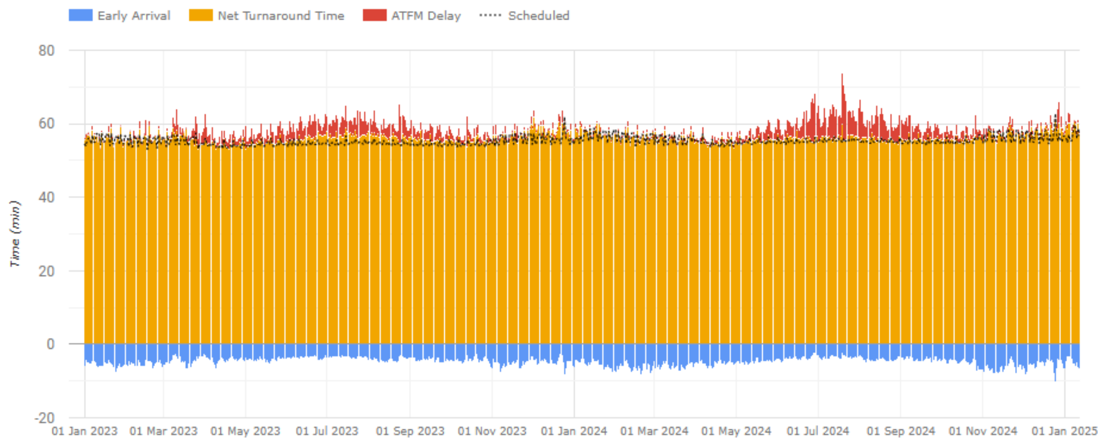


Figure 8 turnaround times 2023-2024

3.5 NETWORK ATFM OPERATIONS

3.5.1 En-route ATFM

En-route ATFM delay increased by 23.0% compared to 2023. En-route ATFM delay per flight was 2.1 minutes, which corresponds to, on average, 61,915 minutes of daily ATFM delays. July experienced the highest delays, averaging 5.7 minutes per flight.

In 2024 79.9% of en-route ATFM delays were concentrated on the Intra NM south-east and south-west axes.

In the peak summer period, Fridays and Saturdays saw over 140,000 minutes of ATFM delays (see Figure 8)

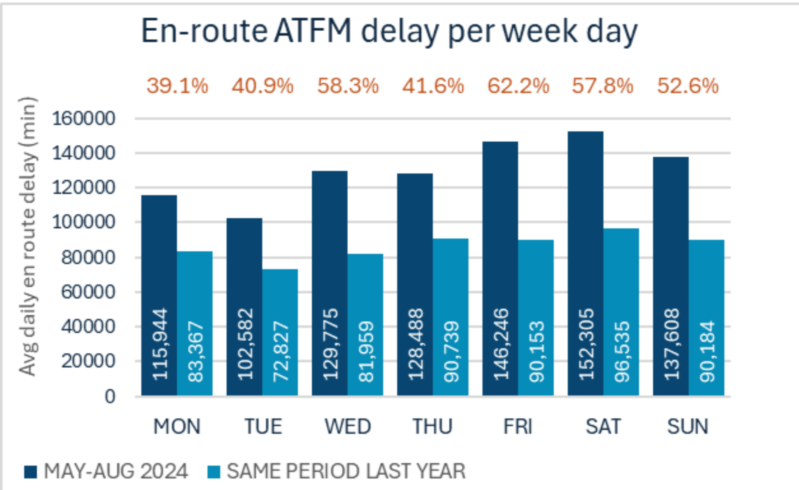


Figure 9 en-route ATFM delay per week day in summer 2024

En-route ATC capacity (8.9 million minutes) was the major cause for delays in 2024 and represented 39.4% of en-route ATFM delay.

Weather also had a significant impact on operations during 2024, especially in July. At 8.1 million minutes, weather accounted for 35.9% of en-route ATFM delays.

Weather and ATC capacity are mutually dependent as flights try to re-route into non-weather affected areas which are already saturated.

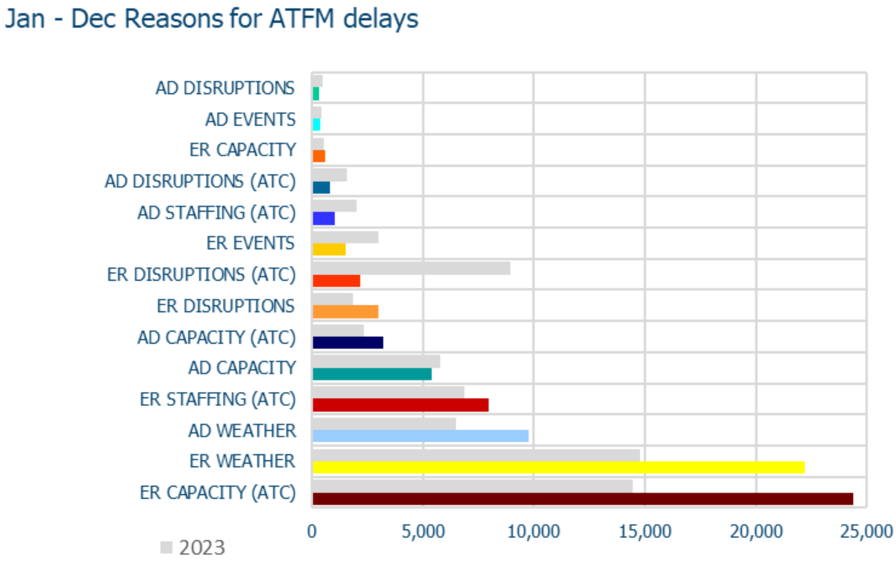


Figure 10 ATFM delay reasons in 2024

Karlsruhe, Marseille, Reims, Paris, Brest, Muenchen and Lisboa ACCs performed better than last year.

Budapest experienced three times as many delays compared to 2023, due to a combination of weather and staffing conditions and ATC capacity challenges. Weather impacted strongly operations during summer with more than 250,000 minutes of delays in June and in July. Capacity issues were mainly due to the increased traffic in the south-east axis, where sectors were already operating at full capacity.

Zagreb ACC had a 12.8% traffic increase, which was higher than forecast. It had a threefold increase in ATFM delays compared to 2023. ATC capacity issues in conjunction with weather issues generated high delays from end of June.

Sevilla ACC experienced over three times more delays compared to 2023, primarily due to the demand exceeding capacity to the Canary Islands. Barcelona ACC had ATC capacity issues due to high demand, mainly from June to October.

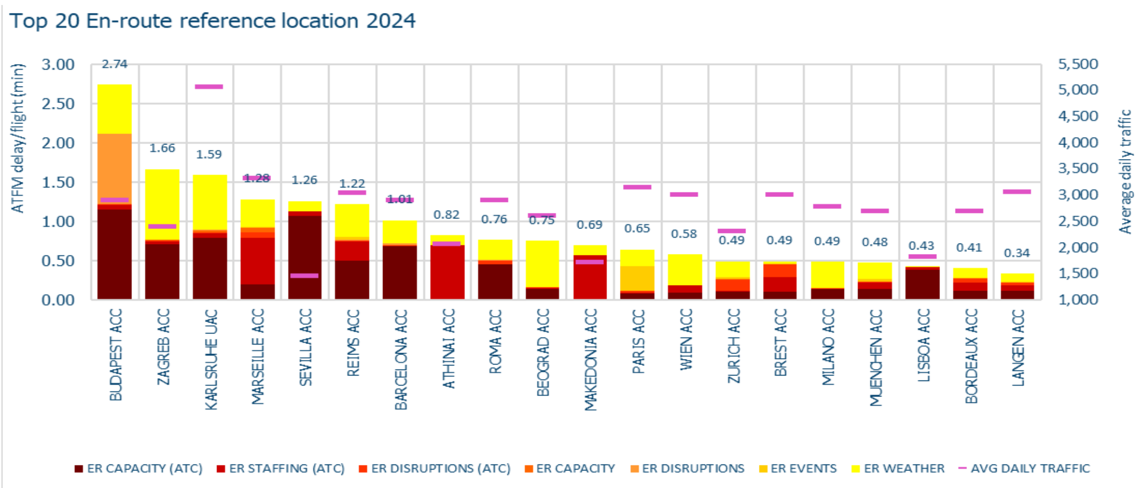


Figure 11 Top 20 en-route reference location 2024

The south-east axis had just over 2.0 million flights in 2024, an increase of 4.9%. It also experienced the highest rise in ATFM delays among all axes, with a 33.5% increase, totalling 10.4 million minutes. Almost half of these delays occurred in three ATC centres: Budapest, Karlsruhe, and Zagreb. The south-west axis had just over 3.08 million flights (+6.7%) and 11.3 million minutes of ATFM delay. Four ATC centres (Marseille, Reims, Karlsruhe and Barcelona) generated 30% of ATFM delays on the SW axis.

3.5.2 Airports ATFM

Airport ATFM increased by 9% compared to last year and was at 0.71 minutes per flight, corresponding to approximately 20,830 minutes of daily delay. Airport weather, aerodrome capacity and airport ATC capacity were the main regulation reasons.

Figure 11 below shows the Top 20 airports for ATFM delay / flight. Operations were primarily affected by weather conditions across Western Europe. London/Heathrow was the most impacted airport with a total of 728,000 minutes followed by Porto, Lisbon and London Gatwick. Heraklion recorded the greatest amount of delay minutes attributed to aerodrome capacity constraints.

Airport weather, Aerodrome capacity, and Airport ATC Capacity and Staffing were the main regulation reasons (Figure 9).

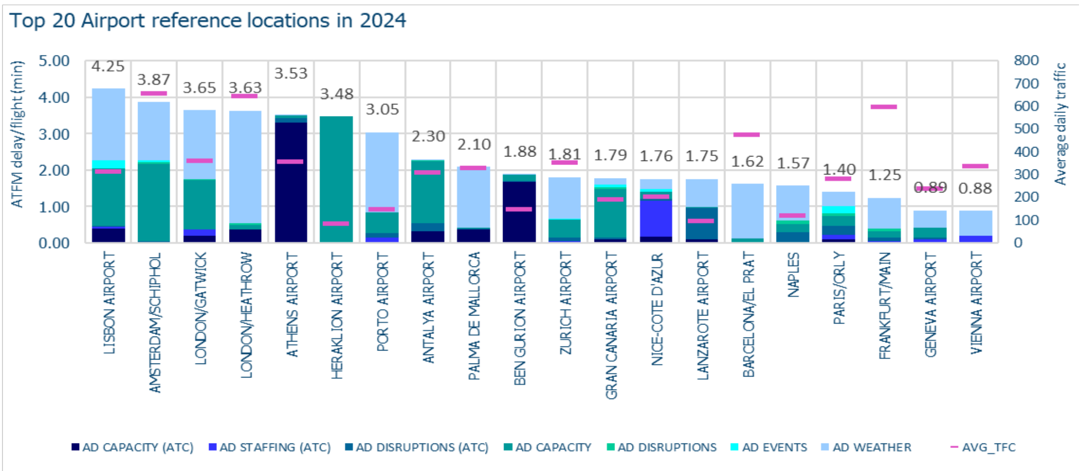


Figure 12 Top 20 airport reference location 2024

3.5.3 Weather

There were 9.2 million minutes of weather ATFM delay during the summer period, +49.9% compared to 2023. The weather-related ATFM delay per flight from May to September was 1.80 min/flight.

In summer 2024 some enhancements to the Cross-Border Weather (XBW) procedure were introduced based on the application of playbooks with rerouting scenarios for two main areas of Europe (Balkans and Reims/London/MUAC/KUAC - 4ACCs initiative). Weather based NM RADs relaxation was also applied pre-tactically.

These initiatives have had limited success for several reasons. First, the lack of approval of some of these measures by some of the impacted ANSPs, whose performance may have been adversely affected by their implementation. Secondly, the lack of confidence in a forecast provided only twice a day, without sufficient continuity or granularity, which makes operational decision-making difficult. Finally, the lack of anticipation in decision-making, a point also related to the lack of confidence in the forecasts, which, combined with the fear of poor performance, leads ANSPs to delay decisions until the latest possible moment, which contributed to the general volatility of regulated traffic.

Given the reluctance to act pre-tactically, NM will re-assess the weather procedure and propose to develop further the "play-book" approach to tackle standard weather scenarios when they materialise.

3.5.4 Regulated traffic volatility

Traffic count volatility for en-route regulations in 2024 was slightly higher than 2023 for capacity and staffing regulations - the highest in the last 7 years. Similarly, the weather-related volatility was joint highest with 2022. With little ATC industrial action in 2024, the volatility for disruption related regulations was also much lower than in any of the previous years.

Several FMPs adjusted regulation parameters too often and too quickly. This led to frequent updates to CTOTs (via slot messages.)

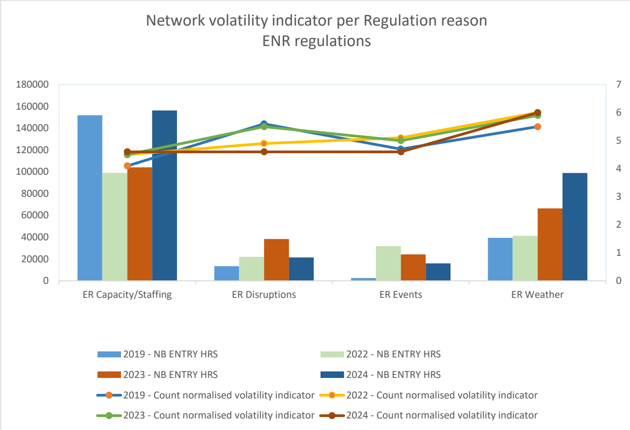


Figure 13 regulation volatility 2024

Ukrainian airspace closure since February 2022 has impacted flight efficiency significantly. In addition, political unrest in the Middle East, and the south Mediterranean region created inefficiencies at the interface of NM.

3.6 FLIGHT EFFICIENCY

NM estimates that 35.3 million tonnes of fuel were burnt in the en-route phase within the NM area during summer.

Aircraft burned 3.2 million tonnes of fuel within "NM area en-route" at the peak of summer (July and August).

The average fuel burn per "narrow-body" flight in the NM area was stable at 4.3 tonnes

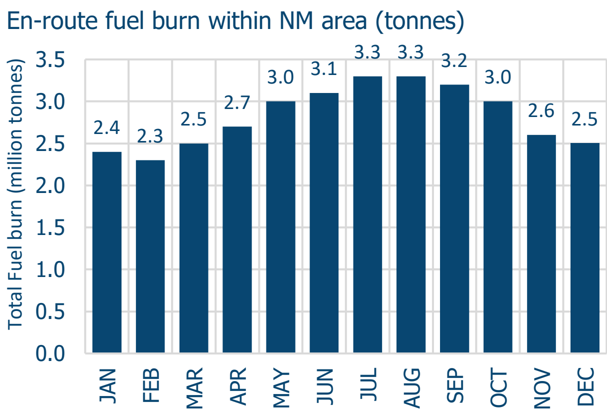


Figure 14 NM area en-route fuel burn 2024

Ukrainian airspace closure since February 2022 has impacted flight efficiency significantly. In addition, political unrest in the Middle East, and the south Mediterranean region created inefficiencies at the interface of NM.

3.6.1 Horizontal flight efficiency

While KEP improved significantly in 2024 over 2023, KEA remained flat overall, reflecting the constraints in the network during summer (KEA was worse than 2023 during June-September months and better or flat the rest of the year).

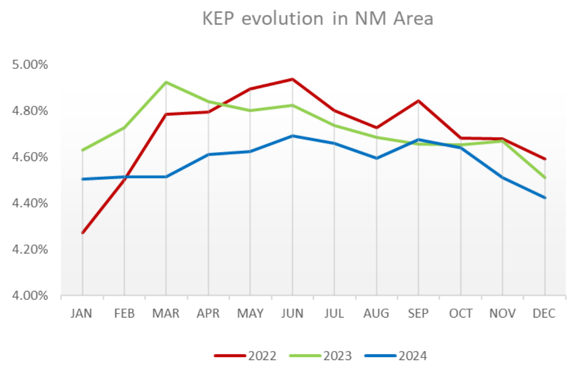


Figure 15 Flight planning indicator

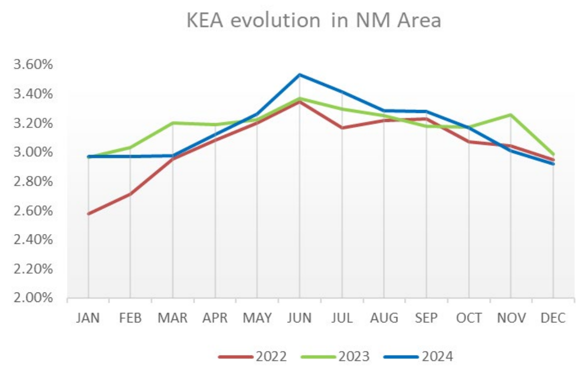


Figure 16 Actual distance flown indicator

3.6.2 Vertical flight efficiency

The non-adherence RFL indicator[2] increased again in 2024, 0.2pp over 2023, getting back to level seen in 2019.

With the increase in traffic, non-adherence to the RFL increased in 2024 over 2023, but it was still better than the pre-pandemic years (see Figure 16)

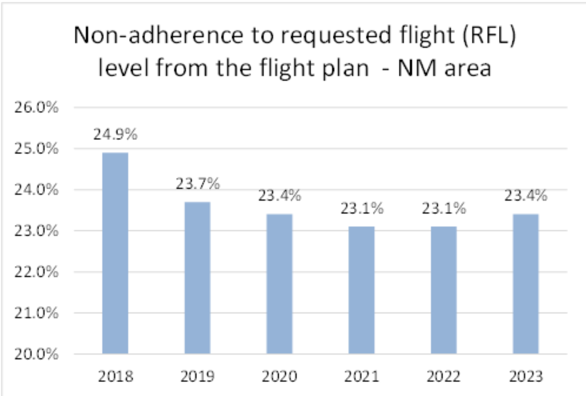


Figure 17 non-adherence RFL indicator

3.6.3 Scenarios

In 2018 and 2019, ANSPs implemented 8,600 and 7,500 scenarios, respectively. These are daily airspace restrictions (zero rate regulations) that essentially encourage aircraft operators to avoid specific airspace or incur high ATFM delays. In 2024, there have been more almost 6000 scenarios, up from 5,000 scenarios in 2023. The ENAIRE (50%), DSNA (28%) and NATS (13%) applied 91% of these scenarios.

NM has identified 19,300 flights in 2024 that re-filed to avoid a scenario at a cost of 1705 tonnes of extra fuel – around 88 kg of fuel per flight. Other flights may have anticipated scenarios and filed an initial FPL avoiding the restriction. But overall, NM considers the extra fuel burn as relatively low.

[2] The non-adherence to RFL measures the proportion of the en-route distance that is flown at a different flight level (at least 1,000ft difference) from the RFL in the flight plan. It captures both cases of (potentially) non-optimal flight planning when the pilot asks for a different flight level, but also ATC tactical improvements when restrictions in place at the flight planning stage are no longer needed. It also covers situations where a different flight level is cleared due to separation issues.

4 TRAFFIC IN DETAIL

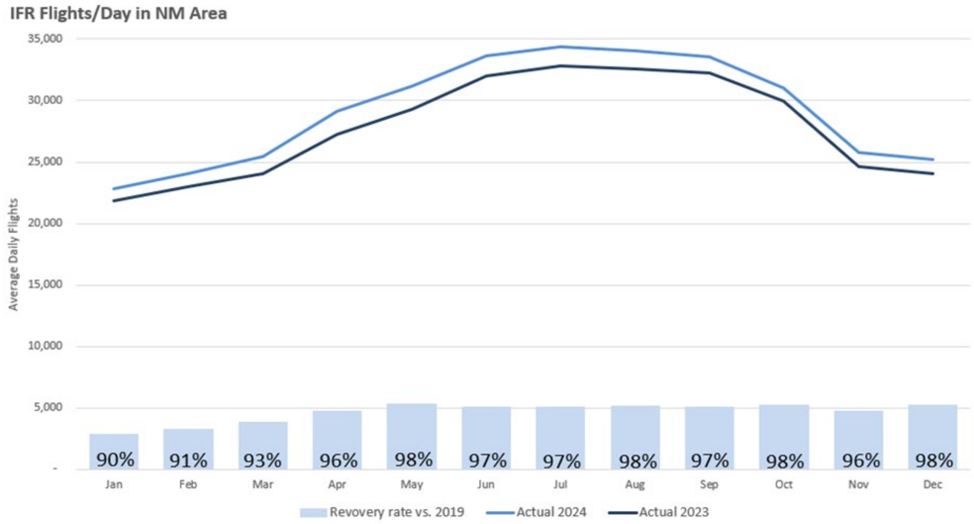


Figure 18 : IFR Flights average per day in NM Area (all flights including overflights)

In 2024, the average daily traffic in the NM Area increased by 5.2% compared to 2023 (accounting for the leap day in 2024, the adjusted growth was 4.9%). The largest contributor to this growth was flights within NM countries, which added 1,000 daily flights (+4.4%). International departures and arrivals followed, with an increase of 319 daily flights (+6.4%), while overflights contributed an additional 44 daily flights (+12.8%). The total number of flights was just below 10.7 million, with an average of 29,204 flights per day, peaking at 35,710 flights on Friday 14 June 2024. Compared to pre-pandemic levels, total flights in 2024 reached 96% of 2019. Geopolitical tensions – the conflicts in Ukraine, Israel and Gaza – continued to impose airspace restrictions and impacted overflights in several countries in the network.

Lower flight volumes in January and February, a typical seasonal trend, were further exacerbated in February by strikes involving ground staff at German airports and the Lufthansa Group of airlines, resulting in approximately 2,450 fewer flights during the month. The average growth rate compared to 2023 was +4.7% in January, +4.5% in February (effect of the leap year removed) and +5.8% in March. The first quarter of 2024 saw an increase of 5.0% on the same period in 2023, reaching 91.3% of 2019 levels.

With the start of summer, popular tourist destinations such as Spain, Greece, and Italy significantly boosted air traffic. April recorded the highest growth rate of the year at +6.9%, followed by May at +6.5% and June at +5.2%, compared to the same months in 2023. Overall, the second quarter of 2024 saw a 6.2% increase compared to the same period in 2023, reaching 97.1% of 2019 levels.

The summer months experienced the highest traffic volumes, with growth rates of +4.6% in July, +4.4% in August, and +4.0% in September compared to 2023. The third quarter recorded a 4.4% increase vs the same quarter in 2023, reaching 97.4% of 2019 levels.

In the fourth quarter, several airlines had to reduce capacity due to forced maintenance on engine affecting the Airbus Neo fleet. Despite this, October traffic rose by 3.5%, November by 4.5% and December by 4.8% compared to 2023. Overall, the fourth quarter saw a 4.2% increase, maintaining 97.4% of 2019 levels.

4.1 NETWORK CONTRIBUTORS

In 2024, 14 countries contributed to an increase of at least 50 daily flights to the network's local traffic (excluding overflights), compared to 19 countries in 2023. Conversely, local traffic declined in four countries in 2024, up from three in 2023.

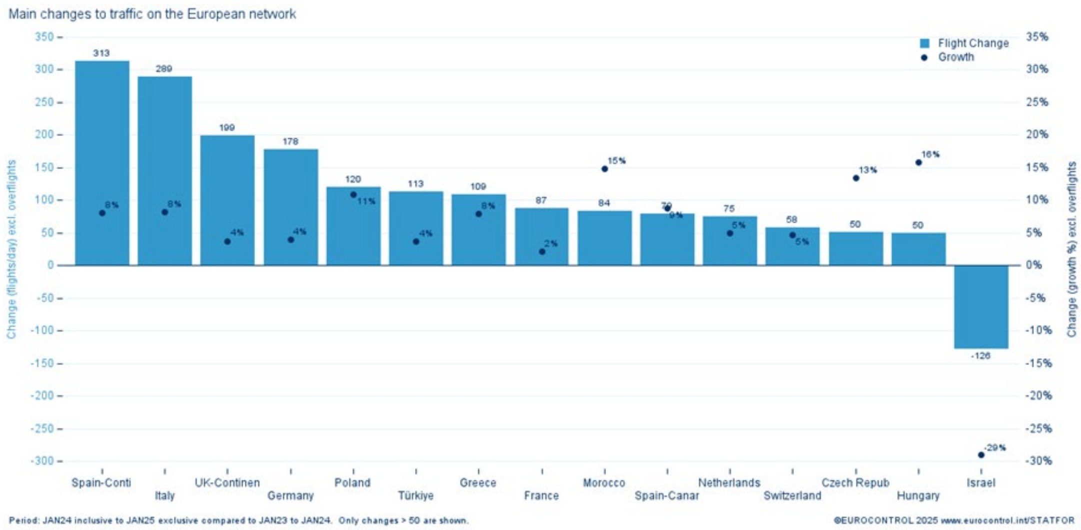


Figure 19 Main contributors to the flight growth (excluding overflights) in NM Area in 2024 (vs 2023)

The top seven contributors to growth in 2024 (compared to 2023) were Spain-Continental, Italy, UK, Germany, Poland, Türkiye and Greece.

Spain-Continental (+313 flights/day, +8.1%) was by far the top contributor owing to the increase of its flows to and from Italy (+41 flights/day, +13.3%), UK (+34 flights/day, +6.0%), Germany (+33 flights/day, +8.2%), Spain-Canaries (+25 flights/day, +13.9%).

Italy (+289 flights/day, +8.3%) was the second biggest contributor due to its flows to and from Spain-Continental (+41 flights/day, +13.3%), its domestic flow (+25 flights/day, +3.1%) and Germany (+23 flights/day, +7.2%).

UK (+199 flights/day, +3.8%) ranked third owing to its flows to and from Spain-Continental (+34 flights/day, +6.1%), Türkiye (+28 flights/day, +17.2%) and Spain-Canaries (+20 flights/day, +11.0%).

Germany (+178 flights/day, +3.9%) came next owing to its flows to and from Spain-Continental (+33 flights/day, +8.2%), Italy (+23 flights/day, +7.2%), Türkiye (+18 flights/day, +5.2%) and Greece (+14 flights/day, +8.9%).

Poland (+120 flights/day, +10.8%) was the fifth contributor owing to its flows to and from Spain-Continental (+18 flights/day, +39.6%), Italy (+17 flights/day, +24.5%), Türkiye (+12 flights/day, +23.5%) and Denmark (+10 flights/day, +40.8%). Poland had the fastest growth amongst the top contributors

Türkiye (+113 flights/day, +3.7%) was the sixth contributor due to its flows to and from UK (+28 flights/day, +17.2%), Germany (+18 flights/day, +5.2%), Poland (+12 flights/day, +23.5%) and the Russian Federation (+12 flights/day, +5.8%).

Greece (+109 flights/day, +7.9%) was the seventh contributor owing to its domestic flow (+23 flights/day, +6.5%), its flows to and from Germany (+14 flights/day, +8.9%), Italy (+9 flights/day, +9.9%), Poland (+9 flights/day, +21.7%) and UK (+8 flights/day, +4.3%).

In 2024, four countries experienced a decline in flights (excluding overflights) compared to 2023. Israel saw the largest decrease (-126 flights per day, -29.0%) due to ongoing airspace restrictions following the conflict in Israel and Gaza. Though not shown on the graph, Sweden recorded a drop of 15 flights per day (-1.7%), primarily driven by a weak domestic flow (-22 flights per day, -8.5%). Armenia and Norway also experienced reductions, with declines of 13 flights per day (-10.5%) and 12 flights per day (-0.9%), respectively.

Intra-European flights (within the NM area, excluding overflights) represented 80.6% of total traffic in 2024, amounting to 8.6 million flights, while flows beyond Europe accounted for 1.9 million flights (18.1%).

Regarding the recovery to 2019 flight levels (excluding overflights), 24 countries within the NM area experienced an increase in daily flights compared to 2019. The most significant increases were observed in Türkiye (+333 flights, +12%), Spain-Continental (+270 flights, +7%), Greece (+221 flights, +18%), Italy (+194 flights, +5%), Spain-Canaries (+141 flights, +17%), Albania (+109 flights, +140%), and Morocco (+100 flights, +18%).

In contrast, nine countries recorded at least 100 fewer daily flights compared to 2019. The largest declines were seen in Germany (-923 flights, -16%), the UK (-366 flights, -6%), Sweden (-261 flights, -24%), France (-236 flights, -5%), Israel (-175 flights, -36%), Finland (-129 flights, -21%), Norway (-126 flights, -9%), and Austria (-114 flights, -12%).

In general, countries in the South-East and South-West axes recovered faster than countries in the North-East and North-West axes.

Focusing on overflights (2024 vs 2023), ongoing airspace restrictions caused by conflicts in Ukraine and the Middel East led to shifting patterns, significantly impacting overflights in Georgia (+29%) and Armenia (+43%). Overflights in the Baltic countries, Estonia (+15%), Latvia (+19%), Lithuania (+13%) increased due to the rise in flights between Western Europe and Asia (China) by airlines unaffected by geopolitical sanctions between Russia and Europe. Portugal overflights increased driven by the recovery of South and Mid-Atlantic flows as well as increased use of western routes between Spain-Continental and Spain-Canaries and UK and Spain-Canaries.

Constrained airspace in Central Europe in the summer led to a shift to the west of the southeast bound flows and impacted overflights in the western Balkan countries, Italy (+10%) and Switzerland (+12%).

4.2 AIRPORT EVOLUTION

Nº	ICAO ID	AIRPORT NAME	TFC	%	Nº	ICAO ID	AIRPORT NAME	TFC	%
1	LTFM	ISTANBUL AIRPORT	700	1.7%	26	ESSA	STOCKHOLM/ARLANDA	261	0.8%
2	EHAM	AMSTERDAM/SCHIPHOL	668	6.4%	27	EDDB	BERLIN/BRANDENBURG	259	8.4%
3	EGLL	LONDON/HEATHROW	651	4.0%	28	EPWA	WARSAW AIRPORT	250	10.1%
4	LFPG	PARIS/CHARLES DE GAULLE	638	2.2%	29	LSGG	GENEVA AIRPORT	237	4.4%
5	EDDF	FRANKFURT/MAIN	602	2.0%	30	LEMG	MALAGA AIRPORT	233	8.4%
6	LEMD	MADRID/BARAJAS	574	7.7%	31	EDDL	DUSSELDORF AIRPORT	212	2.4%
7	LEBL	BARCELONA/EL PRAT	475	8.7%	32	EFHK	HELSINKI/VANTAA	209	7.7%
8	EDDM	MUNICH AIRPORT	443	7.8%	33	LFMN	NICE-COTE D'AZUR	203	1.5%
9	LIRF	ROME/FIUMICINO	431	18.1%	34	GCLP	GRAN CANARIA AIRPORT	190	8.0%
10	EGKK	LONDON/GATWICK	363	3.1%	35	EGGW	LONDON/LUTON	180	2.3%
11	LGAV	ATHENS AIRPORT	361	11.4%	36	LKPR	PRAGUE AIRPORT	178	14.8%
12	LSZH	ZURICH AIRPORT	353	6.0%	37	LHBP	BUDAPEST AIRPORT	172	17.0%
13	LOWW	VIENNA AIRPORT	339	5.3%	38	EDDH	HAMBURG AIRPORT	166	5.7%
14	EIDW	DUBLIN AIRPORT	333	0.9%	39	EGPH	EDINBURGH AIRPORT	164	4.5%
15	LEPA	PALMA DE MALLORCA	330	5.8%	40	LROP	BUCHAREST AIRPORT	161	5.9%
16	EKCH	COPENHAGEN/KASTRUP	329	5.8%	41	LIML	MILANO/LINATE	160	6.0%
17	LTFJ	ISTANBUL/SABIHA GOKCEN	319	5.3%	42	LEAL	ALICANTE AIRPORT	159	15.2%
18	LPPT	LISBON AIRPORT	313	0.6%	43	EDDK	COLOGNE/BONN AIRPORT	158	-0.6%
19	LTAI	ANTALYA AIRPORT	312	4.0%	44	LIME	MILANO/BERGAMO	150	7.9%
20	ENGM	OSLO LUFTHAVN	300	1.4%	45	LLBG	BEN GURION AIRPORT	148	-29.2%
21	LIMC	MILANO/MALPENSA	293	5.8%	46	LPPR	PORTO AIRPORT	146	2.1%
22	LFPO	PARIS/ORLY	283	-1.0%	47	LFML	MARSEILLE/PROVENCE	137	-0.7%
23	EGSS	LONDON/STANSTED	277	3.7%	48	EGBB	BIRMINGHAM AIRPORT	130	8.3%
24	EGCC	MANCHESTER AIRPORT	268	8.5%	49	LFLL	LYON SAINT-EXUPERY AIRPORT	125	1.6%
25	EBBR	BRUSSELS AIRPORT	265	3.1%	50	LTAC	ESENBOGA INTERNATIONAL AIRPORT	122	3.4%

Figure 20 Top 50 airports per average daily departure traffic in 2024 (vs. 2023)

The Top 10 airports remained the same as last year. Istanbul was the busiest airport for the third year in a row.

Six airports had double digit growth: Rome/Fiumicino, Athens, Warsaw, Prague, Budapest and Alicante.

Amsterdam Schiphol outpaced London Heathrow for the second year.

Rome Fiumicino had the highest traffic increase in the top 50 with + 18.1%.

Traffic decrease at Tel Aviv Ben Gurion airport was due to the complex situation in Middle East.

4.3 OUTSIDE EUROPE

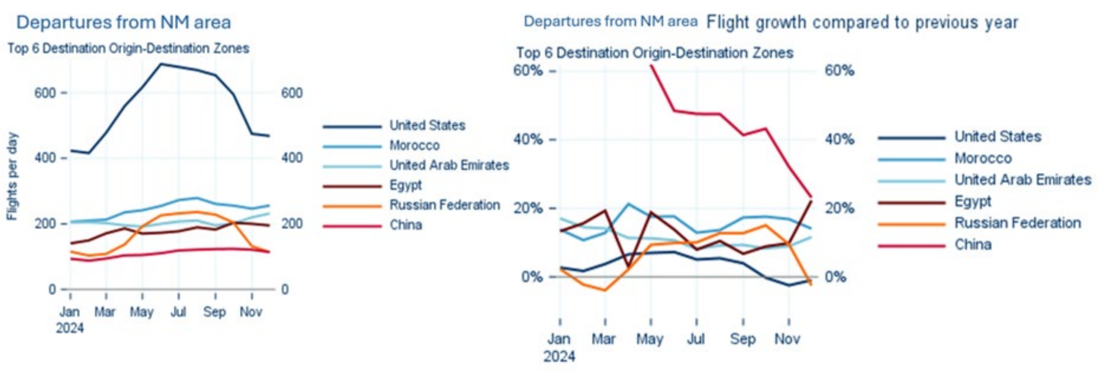


Figure 21 Top six extra-NM partners: Average number of flights/day and flight growth vs. 2023

In 2024, the United States remained the leading destination for flights, averaging 1,088 flights per day (both directions). This marked a 3.3% increase (+35 flights/day) compared to 2023. While the Mainline segment was the primary driver of growth (+38 flights/day, +4.4%), the Low-cost segment experienced the fastest expansion, rising by 17.2% owing partly to Norse Atlantic UK (+40.1%) and Condor (+37.8%).

Morocco ranked second, with an average of 488 daily flights (both directions), reflecting a 15.5% increase (+66 flights per day) from 2023. This growth was largely attributed to the Ryanair Group, which added 26 flights per day (+23.3%), and the easyJet Group, which contributed 17 additional flights per day (+59.7%). The Low-cost segment led the expansion, accounting for 64 extra daily flights (+25.1%) with increased capacity to France (+19 flights/day) and the UK (+13 flights/day).

The United Arab Emirates secured the third position among NM partners, registering 393 daily flights, a 10.3% rise from 2023. At country level, Poland, Spain-Continental, UK and Greece added each four daily flights. Growth in this market was due by both the Mainline segment (+21 flights per day, +9.9%) and the Low-cost segment (+11 flights per day, +11.8%).

Egypt ranked fourth, averaging 356 daily flights (both directions), reflecting a 12.1% increase from 2023. This surge was primarily driven by Low-cost carriers, including easyJet Group (+8 flights per day, +53.4%), Pegasus (+5 flights per day, +82.5%), and Wizz Air Group (+5 flights per day, +21.0%). At country level, UK (+10 flights/day), Türkiye (+9 flights/day), Germany (+8 flights/day) and Poland (+8 flights/day) contributed the most to the flight growth.

Despite ongoing airspace restrictions due to the Russian war with Ukraine, the Russian Federation ranked fifth, averaging 293 daily flights (both directions), recording an increase of 7.1% compared to 2023. This was primarily due to a significant increase in flights to and from Georgia (+18 flights per day, +279.1%) and Türkiye (+11 flights per day, +5.8%).

Continental China was the sixth NM partner, averaging 204 daily flights (both directions), marking a 56.3% increase from 2023. The Mainline segment was the key driver of growth (+64 flights/day, +76.8%), with notable increases in flights to and from the UK (+13 flights/day, +59.8%), Germany (+10 flights/day, +34.8%), and France (+8 flights/day, +71.2%). Additionally, the All-cargo segment expanded, adding 9 daily flights (+20.4%), primarily due to increased flows to and from Georgia (+2 flights/day, +678.0%) and Belgium/Luxembourg (+2 flights/day, +29.9%).

Apart from the Russian Federation (-68.2%), all NM partners surpassed pre-COVID-19 flight levels. Compared to 2019, the United States recorded a 7.2% increase, Morocco (+27.8%), the United Arab Emirates (+22.3%), Egypt (+18.4%), and Continental China (+7.6%).

4.4 AIRLINE INDUSTRY

Evolution of the total flights by market segment compared to 2023.

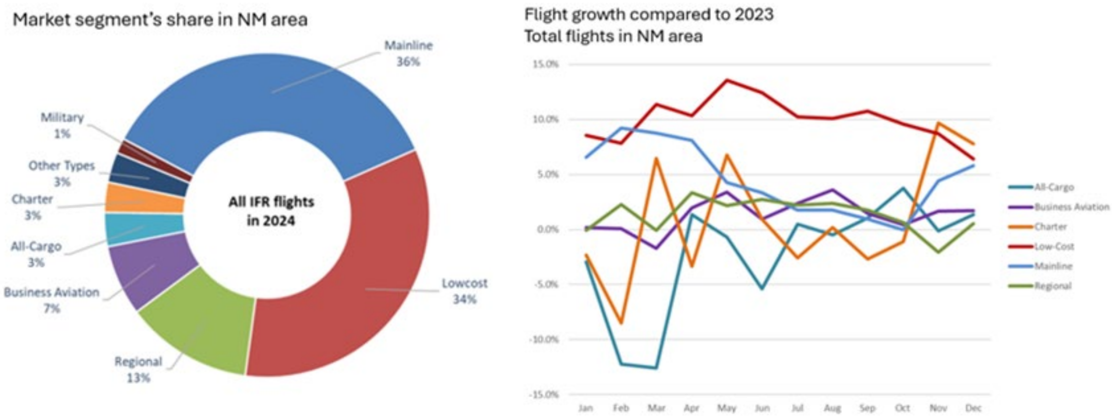


Figure 22 Left: Market segment's share in 2024 Right: Market segment's growth in 2024 (vs 2023)

In 2024, the low-cost segment was the primary driver of the total flight growth in the NM area, contributing an additional 905 flights per day, an increase of 10.1% compared to 2023. The countries with the highest growth in daily low-cost carrier flights (departures and arrivals) were Spain-Continental (+215 flights/day, +8.5%), Italy (+182 flights/day, +8.3%), the UK (+175 flights/day, +6.6%), Türkiye (+127 flights/day, +11.9%), and Germany (+107 flights/day, +7.8%). The Low-cost share of all flights was 33.8%, reflecting a 1.6 percentage point increase from 2023. Compared to pre-pandemic levels, the Low-cost segment surpassed 2019 flights by 3.0%.

The Mainline market segment more than halved Low-cost's performance and reported a 4.2% increase compared to 2023, adding 416 daily flights to the network. This can be partly explained by the weakness of the domestic flows, particularly in Norway (-18 flights/day, -15.3%), Türkiye (-16 flights/day, -2.8%), France (-15 flights/day, -7.7%) and Spain-Continental (-9 flights/day, -5.8%). Mainline's share of total traffic stood at 35.6%, reflecting a 0.2 percentage point decline from 2023. Compared to pre-pandemic levels, the Mainline segment stood at -5.6% below 2019 flight levels.

The business aviation segment grew by 1.4% compared to 2023 and added 29 flights per day, although its market share declined from 7.3% in 2023 to 7.1% in 2024. Notable increases in Spain-Continental (+10 flights/day) and Greece (+6 flights/day) were counterbalanced by decreases in Germany (-17 flights/day, France (-11 flights/day) and UK (-7 flights/day). Despite this, business aviation flights remained strong, surpassing 2019 levels by 9.6%.

The Regional segment recorded a modest 1.3% increase compared to 2023, adding 49 daily flights to the network. However, its share of total traffic declined by 0.4 percentage points to 12.7%. In terms of recovery to pre-COVID-19 flight levels, the Regional segment remained the most affected, standing -18.9% below 2019 levels.

The All-cargo performance fluctuated throughout 2024 compared to 2023, ranging from a low of -12.6% in March to a high of +3.7% in October. For the year as a whole, the segment decreased by -2.4%, with a 3.4% market share of total flights, down 0.2

percentage point on 2023. Compared to pre-pandemic levels, the All-cargo segment was at -2.3% below 2019 flight levels.

Despite the ongoing negative impact of airspace restrictions following the Russian Federation's war with Ukraine and the conflict in Israel, the Charter segment recorded a total number of flights equal to those in 2023. In 2024, its market share of total flights was 3.0%, down from 3.4% in 2023. Compared to pre-pandemic levels, Charter remained 16.1% below 2019.

Jet Fuel Prices Evolution in Europe

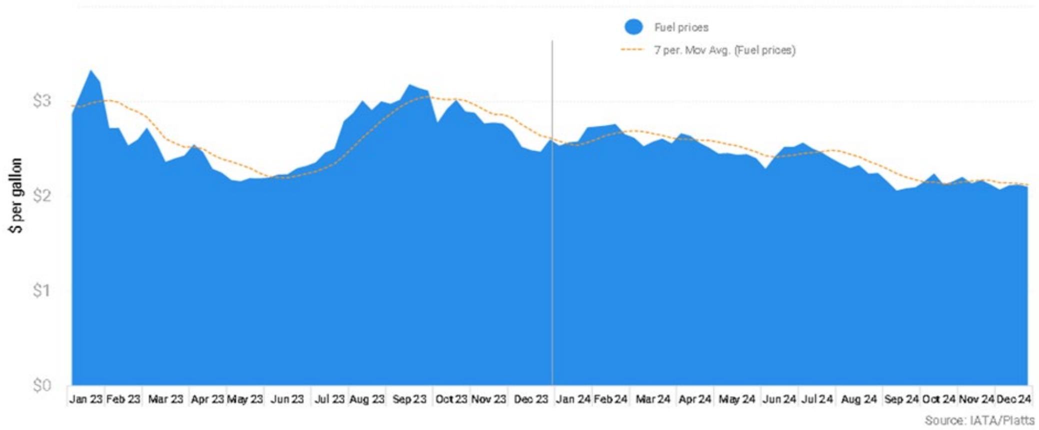


Figure 23 Jet fuel prices evolution

In 2024, European jet fuel prices averaged $2.4/gallon, a 10.2% decline compared to 2023 ($2.7/gallon). Jet fuel prices peaked in the first quarter at $2.6/gallon, dropped to $2.3/gallon in the third quarter and hit their lowest at $2.1/gallon in the final quarter of 2024, marking an 19% decline from January. Since September 2023, the 7-day average fuel price has generally been decreasing, except for increases in January and June 2024, following the new package of sanctions against Russia EU countries agreed over Russia's war in Ukraine. Moreover, OPEC+ members, responsible for nearly half of global oil production, have agreed voluntary output cuts of 2.2 million barrels per day since November 2023 to support market stability.

Inflation and air ticket prices evolution in Europe

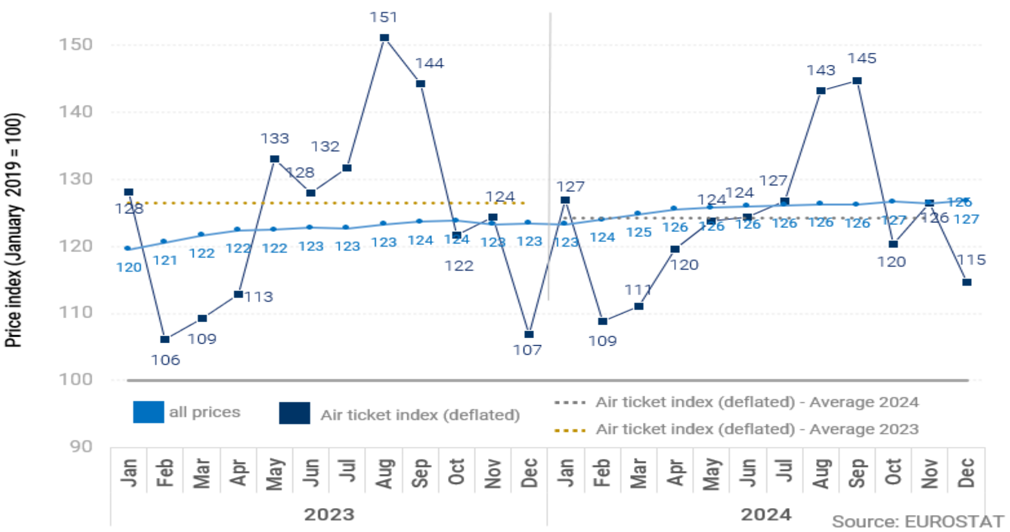


Figure 24 Inflation and air ticket prices evolution in Europe

Overall, all-prices inflation in 2024 was 2.5% higher than in 2023. Ticket prices fluctuated significantly in 2024, they were volatile in January, dropped in February before recovering and peaking in August and September. Prices declined again in October before returning to their January levels by December. Air ticket prices were slightly lower (-0.4%), in real terms in 2024 compared to 2023. The typical seasonal increase in prices at the beginning of the summer period was more controlled in 2024: limited air fares variation over the period May to July compared to August and September hikes. Consequently, 2024 Summer air ticket prices were on average lower than in Summer 2023. Nonetheless, air ticket prices (excluding the inflation) remained 12% higher than their pre-pandemic levels in 2019.

5 EN-ROUTE

5.1 ACC PERFORMANCE

5.1.1 Overview

There were 22.7 million minutes of en-route ATFM delay in 2024 – a daily average of 61,915 minutes. This is 23.0% higher than 2023, but with 4.9% more traffic.

In 2024, 79.9% of en-route ATFM delays were concentrated on the Intra NM south-east and south-west axes.

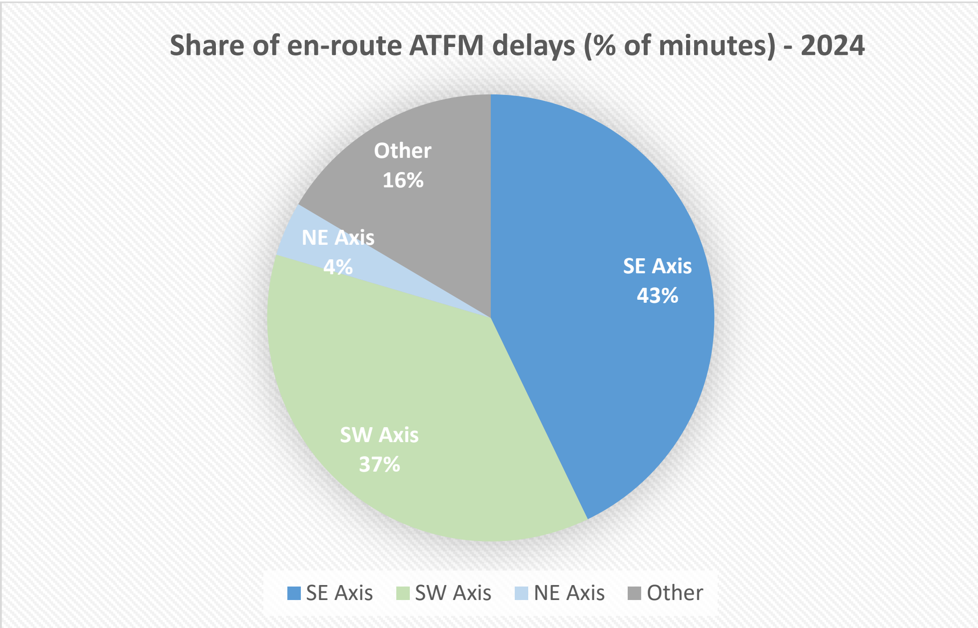


Figure 25 Share of en-route ATFM delays 2024

The poor performance in Summer 2024 where en-route ATFM delay per flight reached 5.7 min was a combination of factors for these high levels of ATFM delay: saturation and a lack of capacity in parts of the network, significant convective weather (thunderstorms etc.), less airspace available for re-routings due to the war in Ukraine, and increased military activity.

The Russian invasion of Ukraine and the subsequent airspace and operator restrictions continued to cause significant deviations from the normal routings in the eastern part of the network. Consequently, countries in the North-East (Baltic States, Finland, Sweden, Poland) lost traffic, while countries in the South-East of Europe (Hungary, Serbia, Albania, Greece) faced more traffic than expected.

Figure 26 shows the ACCs that had the biggest difference between the ATFM delay achieved and the guideline target in 2024.

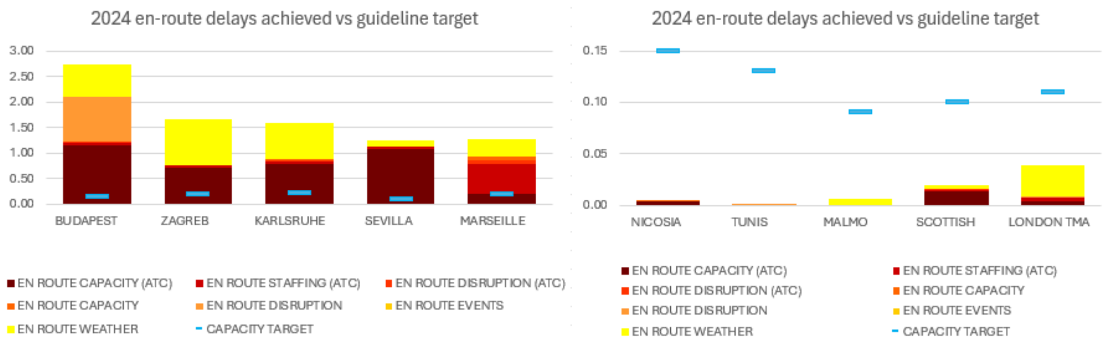


Figure 26 En-route delays achieved vs guideline target

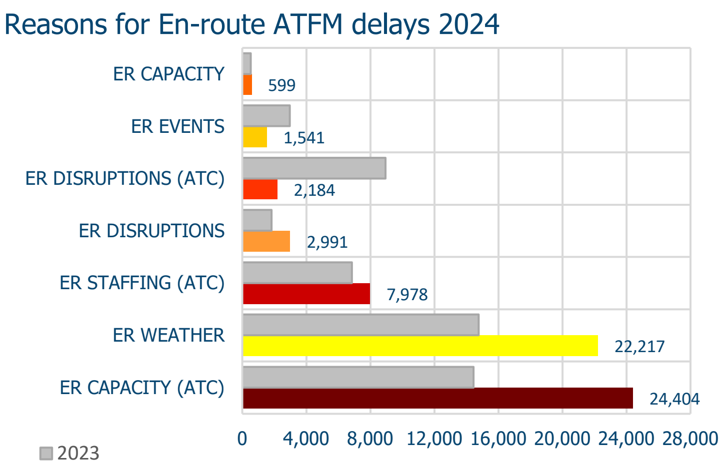


Figure 27 Reasons of en-route ATFM delays 2024

As mentioned before, en-route ATC capacity (8.9 million minutes) was the major cause for delays in 2024 and represented 39.4% of en-route ATFM delay.

Weather also had a significant impact on operations during 2024, especially in July. At 8.1 million minutes, weather accounted for 35.9% of en-route ATFM delays.

Weather and ATC capacity are mutually dependent as flights try to re-route into non-weather affected areas which are already saturated.

ATC staffing issues increased due to lack of ATCOs in several ACCs, especially during summer months.

On a positive note, there were few industrial actions during 2024. In addition, the network prepared and executed successfully several events, most notably the summer European football championships in Germany and the Paris Olympics.

5.1.2 Major ATM changes

The implementation of ICAS2 in Munich ACC was slower than planned, generating 35,600 minutes of ATFM delays from January to April 2024.

The 4Flight system implementation in Paris ACCs had notable impact on traffic and delays. A six-week live trial happened from 09 January to 14 February. During this period, sector capacities were generally reduced by 30%, with some sectors experiencing up to 50% reductions. This trial generated 158,820 minutes of ATFM delay. Another two-day live trial of the new ATM system in Paris ACCs (08-09 October) generated 23,637 minutes of ATFM delay. In November, Bordeaux and Brest ACCs started the training and live trial periods in preparation for the implementation of the 4-Flight system.

5.1.3 ACC evolution

Table 1 shows top 40 ACCs by ATFM delay 2024, excluding any delay re-attribution, further details available in Annex II.

COUNTRY	ACC	ACC Code	En-Route Delay	
NETWORK	NETWORK	ALL_DNM	2.10	↑
AUSTRIA	WIEN ACC	LOVVACC	0.58	↑
BOSNIA	BH ACC	LQSBACC	0.54	↑
BULGARIA	SOFIA ACC	LBSRACC	0.19	↑
CROATIA	ZAGREB ACC	LDZOACC	1.66	↑
CZECH REPUBLIC	PRAHA ACC	LKAAACC	0.14	↑
FRANCE	MARSEILLE ACC	LFMMACC	1.28	↓
FRANCE	REIMS ACC	LFEEACC	1.22	↓
FRANCE	PARIS ACC	LFFFALL	0.65	↓
FRANCE	BREST ACC	LFRRACC	0.49	↓
FRANCE	MARSEILLE TMA	LFMMAPP	0.43	↑
FRANCE	BORDEAUX ACC	LFBBALL	0.41	↑
GEORGIA	TBILISI ACC	UGGGACC	0.33	↑
GERMANY	KARLSRUHE UAC	EDUUUAC	1.59	↓
GERMANY	MUENCHEN ACC	EDMMACC	0.48	↓
GERMANY	BREMEN ACC	EDWWACC	0.40	↓
GERMANY	LANGEN ACC	EDGGALL	0.34	↑
GREECE	ATHINAI ACC	LGGGACC	0.82	↑
HUNGARY	BUDAPEST ACC	LHCCACC	2.74	↑
ITALY	ROMA ACC	LIRRACC	0.76	↑
ITALY	MILANO ACC	LIMMACC	0.49	↑
ITALY	PADOVA ACC	LIPPACC	0.22	↑
KOSOVO	KFOR SECTOR	LHKRACC	1.04	↓
MOROCCO	CASABLANCA ACC	GMMMACC	0.16	↓
EUROCONTROL	MAASTRICHT UAC	EDYYUAC	0.20	—
NETHERLANDS	AMSTERDAM ACC	EHAAACC	0.08	↑
NORTH MACEDONIA	MAKEDONIA ACC	LGMDACC	0.69	↑
NORTH MACEDONIA	SKOPJE ACC	LWSSACC	0.55	↑
POLAND	WARSZAWA ACC	EPWWACC	0.24	↑
PORTUGAL	LISBON ACC	LPPCACC	0.43	↓
ROMANIA	BUCURESTI ACC	LRBBACC	0.15	↓
SERBIA / MONTENEGRO	BEOGRAD ACC	LYBAACC	0.75	↑
SLOVAKIA	BRATISLAVA ACC	LZBBACC	0.13	↑
SPAIN	SEVILLA ACC	LECSACC	1.26	↑

SPAIN	BARCELONA ACC	LECBACC	1.01	↑
SPAIN	CANARIAS ACC	GCCCACC	0.37	↑
SPAIN	PALMA ACC	LECPACC	0.35	↑
SPAIN	MADRIC ACC	LECMALL	0.30	↓
SWITZERLAND	GENEVA ACC	LSAGACC	0.37	↑
SWITZERLAND	ZURICH ACC	LSAZACC	0.49	↑
UNITED KINGDOM	LONDON ACC	EGTTACC	0.13	↑

Table 1 TOP 40 ACCs by ATFM delay in 2024

5.2 PLANNED EVENTS AND DISRUPTIONS

5.2.1 EN-ROUTE PLANNED EVENTS

Out of twenty projects and events in 2024 three generated notable ATFM delays during implementation.

Table 2 shows the technical and the airspace related projects and events most of which have imposed capacity reductions resulting in delays generated during their respective implementation periods. Most of the listed projects, particularly those that generated delays, have been included in the NOP Transition Plan for the seasons 2023/2024 and 2024/2025.

Major Projects / Special Events 2024	Jan - March	April - June	July - Sept	Oct - Dec	ATFM Delay generated, min
France - Paris ACC					
4-flight ATM system trials and implementation					354084 min
2024 Summer Olympics opening ceremony					16868 min, Reduction flight programme
France - Marseille ACC					
4-flight ATM system upgrade					4947 min
France - Reims ACC					
4-flight ATM system upgrade					9972 min
Transfer of airspace below FL195 to Basel and Strasbourg APPs					29340 min en-route, 1391 min Strasbourg airport
Germany - Munchen ACC					
Transition to new ATM system (iCAS2)					35636
Germany - Bremen ACC					
Operations on Phoenix fall-back ATM system					2021 min
Germany					
UEFA Championship					No significant delay
UEFA EURO2024 Final					No significant delay
UK - London ACC					
2024 UEFA Europa League Final					No significant delay
UK - Edenborough airport					
Implementation new Electronic Flight Progress Strips equipment					3665 min
Albania - Tirana ACC					
ATM System upgrade					3143 min
Belgium - Brussels ACC					
ATM System upgrade					29264 min
The Netherlands - Amsterdam ACC					
Skydiving Teuge					4266 min
Spain - Grand Canaria ACC					
HERMES project					1942 min
China Presidential visit					3190 min
Switzerland - Zurich ACC					
Annual meeting of the World Economic Forum in Davos					997 min
Switzerland - Geneva ACC					

Crans Montana Air Display					2783 min
Switzerland - Zurich and Geneva ACCs					
ATM system instability & system upgrades					105827 min
Morocco - Marrakech air show 2024					
Marrakech TMA/airport					2310 min

Table 2 System Upgrade / Airspace related / Transition Projects

5.2.2 EN-ROUTE DISRUPTIONS

Table 3 shows an overview of the unplanned events or disruptions that imposed capacity reductions in certain ACCs in 2024.

Date	Location	Event	ATFM Delay Impact
02 – 09 January	*Langen*	*Issue with ATCO system*	*24,448 minutes*
14 to 17 January	*Bordeaux TMA*	*ATC industrial action*	*2,642 minutes*
07-08 February	*Reims*	*Computer system failure*	*1,528 minutes*
18 February	*Zurich*	*FDPS failure*	*1,928 minutes*
29 February	*Zurich*	*Radio system issue*	*1,860 minutes*
01-31 March	*Zurich* *Geneva*	*OPS system instability*	*16,711 minutes* *18,729 minutes*
08-09 April	*Marseille*	*Upgrade to 4Flight system*	*4,947 minutes*
15 April	*Oslo*	*FDPS failure*	*8,954 minutes*
25 April	*France*	*ATC industrial action*	*31,181 minutes*
16-28 May	*Lisbon TMA*	*New point merge implementation*	*26,569 minutes*
17 May	*Brest*	*FDPS failure*	*24,849 minutes*
17 May	*Madrid*	*FDPS failure*	*2,207 minutes*
22 May	*Madrid*	*DURANDAL military exercise*	*2,135 minutes*
23-31 May	*France*	*ATC industrial action*	*13,464 minutes*
01-30 June	*Brest*	*ATC frequencies issues*	*22,204 minutes*
02-13 June	*Karlsruhe*	*New software release*	*4,615 minutes*
01-30 June	*France*	*ATC industrial action*	*15,517 minutes*
10-20 June	*London*	*OC CASA trial*	*1,988 minutes*
19 June	*Tirana*	*ATC system upgrade*	*3,143 minutes*
25 June	*Geneva*	*Flooding of the ops room*	*29,714 minutes*
27 June	*Brindisi*	*Data exchange system outage*	*2,521 minutes*
26- 30 June	*Roma*	*Data exchange system outage*	*47,962 minutes*
27-28 June	*Maastricht UAC*	*FDPS failure*	*52,675 minutes*
28 June	*Marseille*	*Radio frequency issue*	*1,822 minutes*
01-31 July	*Bordeaux*	*Radar issue*	*12,159 minutes*
01-31 July	*Brest*	*ATC frequencies issues*	*21,319 minutes*
01-05 July	*Roma*	*OLDI failure*	*8,147 minutes*
11 July	*Paris*	*Communication system failure*	*2,392 minutes*
14 July	*Zagreb*	*OLDI failure between Zagreb and Brindisi*	*3,359 minutes*
16-17 July	*Marseille* *Roma*	*OLDI failure between Marseille and Roma ACCs*	*2,713 minutes* *2,079 minutes*
21 July	*Marseille*	*ATC industrial action*	*3,142 minutes*
30 July	*Maastricht UAC*	*iFMP outage*	*1,719 minutes*
01-31 August	*Skopje*	*FDPS limitation*	*6,548 minutes*

Date	Location	Event	ATFM Delay Impact
01-31 August	*Brest*	*ATC frequencies issues*	*25,499 minutes*
10 August	*Reims* *Bordeaux* *Maastricht UAC* *Vienna*	*CPDLC issue caused limited capacity in several ACCs*	*1,727 minutes* *409 minutes* *1,108 minutes* *569 minutes*
16-17 August	*Bodo*	*Power failure*	*6,097 minutes*
01 September	*Reims*	*Data link issue*	*4,870 minutes*
07 September	*Shanwick OACC*	*Technical issue with Oceanic Center systems*	*1,321 minutes*
10 September	*Zurich*	*FDP maintenance*	*2,036 minutes*
23 September	*Zagreb*	*Communication system failure*	*1,113 minutes*
24 September	*Marseille*	*Communication system failure.* *Precautionary measures in neighbouring ACCs*	*6,888 minutes* *Alger ACC: 1,492 minutes* *Barcelona ACC: 1,345 minutes* *Madrid ACC: 1,408 minutes*
04 October	*Karlsruhe UAC* *Munich* *Bremen*	*DFS control Center experienced technical issue which led to capacity reduction in several German*	*42,161 minutes*
04 and 15 October	*Bremen*	*Communication system issue*	*2,266 minutes*
20 October	*Milano*	*FDPS failure*	*9,772 minutes*
28–29 October	*Budapest*	*Radar maintenance*	*14,465 minutes*
22 November	*Karlsruhe UAC*	*FDPS instability*	*4,152 minutes*
23 November	*Maastricht UAC* *Bordeaux*	*Datalink system issues*	*1,523 minutes*
01-31 December	*Reims*	*Transfer of airspace below FL195 from Reims ACC to Basel and Strasbourg Approach sectors*	*29,485 minutes*
01-31 Dcember	*Barcelona*	*Local radar issues in Valencia TMA*	*11,537 minutes*
04-06 December	*France*	*ATC industrial action*	*58,582 minutes*
12-13 December	*Marseille*	*ATC industrial action*	*7,430 minutes*
17-18 December	*Marseille*	*ATC industrial action*	*7,654 minutes*

Table 3 Unplanned Events/Disruptions 2024

5.2.3 ACC ANALYSIS

The European Network Operations Plan (NOP) 2024–2029 has two delay values for each ACC:

- The required en-route delay/flight performance to achieve annual network delay target in 2024 (0.5 min/flight). This is also known as the "delay breakdown", or reference values.
- The forecast delay based on 2024 NOP capacity planning, excluding disruptions such as industrial action and technical failures.

Country	ACC	En-route delay				Traffic 2024 vs 2023		Capacity 2024 vs 2023	
		Reference value	Delay Forecast	Actual	Weather	Forecast	Actual	NOP Plan	Actual
Albania	Tirana ACC	0.06	0.08	0.08	0.06	11.2%	21.9%	5%	11%
Armenia	Yerevan ACC	0.01	0.00	0.00	0.00	6.0%	18.0%	0%	0%
Austria	Wien ACC	0.16	0.27	0.58	0.39	7.8%	4.8%	5%	0%
Belgium	Brussels ACC	0.14	0.17	0.08	0.02	5.9%	4.3%	3%	2%
Bosnia & Herzegovina	BH ACC	0.06	0.25	0.54	0.19	6.7%	8.4%	8%	0%
Bulgaria	Sofia ACC	0.10	0.02	0.19	0.18	8.0%	7.6%	10%	4%
Croatia	Zagreb ACC	0.18	0.47	1.66	0.89	7.0%	12.8%	7%	6%
Cyprus	Nicosia ACC	0.15	0.06	0.01	0.00	-5.7%	-6.0%	11%	-6%
Czech Republic	Praha ACC	0.10	0.14	0.14	0.10	9.8%	14.4%	8%	5%
Denmark	Kobenhavn ACC	0.04	0.27	0.05	0.00	5.3%	5.7%	3%	6%
Estonia	Tallinn ACC	0.02	0.01	0.01	0.00	7.1%	14.6%	3%	0%
Eurocontrol	Maastricht UAC	0.20	0.23	0.20	0.09	7.0%	4.6%	3%	3%
Finland	Helsinki ACC	0.02	0.01	0.00	0.00	7.5%	7.8%	30%	15%
France	Bordeaux ACC	0.12	0.13	0.41	0.13	6.2%	5.3%	8%	2%
	Brest ACC	0.13	0.25	0.49	0.03	6.9%	6.5%	5%	-3%
	Marseille ACC	0.18	0.65	1.28	0.36	7.8%	7.1%	10%	6%
	Paris ACC	0.09	0.70	0.64	0.22	6.5%	2.3%	10%	5%
	Reims ACC	0.20	0.55	1.22	0.42	7.0%	6.7%	10%	3%
Georgia	Tbilisi ACC	0.01	0.00	0.33	0.05	12.4%	28.9%	5%	13%
Germany	Bremen ACC	0.12	0.72	0.40	0.10	6.8%	6.8%	2%	7%
	Karlsruhe UAC	0.20	1.65	1.59	0.70	7.3%	4.8%	5%	4%
	Langen ACC	0.15	0.45	0.34	0.11	6.6%	2.2%	3%	0%
	München ACC	0.11	0.47	0.48	0.21	8.0%	5.2%	18%	12%
Greece	Athinai ACC	0.13	0.78	0.82	0.13	2.1%	6.3%	1%	0%
	Makedonia ACC	0.11	0.36	0.69	0.12	1.5%	8.0%	1%	0%
Hungary	Budapest ACC	0.13	1.47	2.73	0.63	8.1%	5.9%	0%	-13%
Ireland	Dublin ACC	0.03	0.03	0.00	0.00	8.1%	1.1%	5%	4%
	Shannon ACC	0.03	0.03	0.00	0.00	6.4%	2.7%	5%	3%
Israel	Tel Aviv ACC	0.01	0.01	0.01	0.00	-36.9%	-33.2%	6%	-6%
Italy	Brindisi ACC	0.03	0.05	0.01	0.01	7.0%	-4.6%	6%	-2%
	Milano ACC	0.09	0.10	0.49	0.34	8.2%	6.6%	5%	-4%
	Padova ACC	0.09	0.06	0.22	0.22	7.6%	10.9%	6%	3%
	Roma ACC	0.07	0.01	0.76	0.25	7.4%	14.9%	9%	-4%
Latvia	Riga ACC	0.02	0.01	0.00	0.00	5.2%	14.2%	5%	0%

Lithuania	Vilnius ACC	0.02	0.01	0.00	0.00	5.3%	11.8%	5%	0%
Malta	Malta ACC	0.01	0.01	0.00	0.00	9.1%	11.0%	2%	2%
Moldova	Chisinau ACC	0.01	0.00	0.00	0.00	8.4%	43.8%	0%	0%
Morocco	Agadir ACC	0.01	0.03	0.16	0.00	8.7%	11.4%	2%	8%
	Casablanca ACC	0.01	0.01	0.07	0.00	11.7%	14.5%	5%	11%
Netherlands	Amsterdam ACC	0.10	0.10	0.08	0.03	8.1%	5.3%	2%	0%
North Macedonia	Skopje ACC	0.06	0.47	0.54	0.24	3.8%	6.4%	0%	1%
Norway	Bodo ACC	0.04	0.04	0.03	0.00	2.9%	1.4%	0%	0%
	Oslo ACC	0.07	0.07	0.02	0.00	3.9%	1.6%	5%	0%
	Stavanger ACC	0.07	0.03	0.02	0.00	3.1%	-0.2%	15%	7%
Poland	Warszawa ACC	0.13	0.21	0.24	0.05	7.2%	8.1%	6%	0%
Portugal	Lisboa ACC	0.13	0.49	0.42	0.01	7.0%	7.4%	6%	15%
Romania	Bucuresti ACC	0.07	0.08	0.15	0.15	8.7%	6.5%	7%	0%
Serbia	Beograd ACC	0.07	0.41	0.75	0.59	6.9%	9.2%	5%	6%
Slovakia	Bratislava ACC	0.07	0.05	0.13	0.05	7.9%	13.2%	5%	0%
Slovenia	Ljubljana ACC	0.07	0.08	0.05	0.05	5.6%	8.3%	5%	6%
Spain	Barcelona ACC	0.18	0.44	1.01	0.29	7.6%	8.3%	4%	-5%
	Canarias ACC	0.20	0.18	0.37	0.09	6.9%	8.5%	4%	1%
	Madrid ACC	0.13	0.36	0.30	0.03	7.5%	6.6%	4%	4%
	Palma ACC	0.14	0.09	0.35	0.09	1.1%	5.9%	3%	-2%
	Sevilla ACC	0.09	0.28	1.25	0.13	8.8%	7.7%	7%	-4%
Sweden	Malmo ACC	0.09	0.04	0.01	0.01	6.6%	4.2%	15%	2%
	Stockholm ACC	0.04	0.02	0.01	0.01	4.5%	0.6%	24%	0%
Switzerland	Geneva ACC	0.16	0.19	0.36	0.10	7.4%	12.3%	5%	7%
	Zurich ACC	0.16	0.27	0.49	0.20	7.0%	10.8%	5%	6%
Turkiye	Ankara ACC	0.03	0.03	0.00	0.00	6.3%	4.1%	10%	5%
United Kingdom	London ACC	0.20	0.17	0.13	0.04	6.5%	3.9%	7%	3%
	London TC	0.11	0.09	0.04	0.03	6.0%	3.0%	5%	3%
	Prestwick ACC	0.10	0.08	0.02	0.00	6.1%	2.7%	5%	4%

Table 4 traffic growth, capacity /and delay for each ACC. Those ACCs that exceeded their reference value are highlighted in "amber". The "actual delay" does not include any delay re-attribution.

6 AIRPORTS

6.1 Influences on punctuality

As previously illustrated in section 3.2 the average airline schedule delay remained at 17.8 minutes per flight, unchanged from 2023. Reactionary (knock-on) delays stayed at 8.0 minutes, while airline-related delays remained an issue ranking second dropped with 4.3 minutes. Although the yearly average delay appeared stable, summer performance worsened significantly, with en-route ATFM delays in July 2024 rising to 7.2 minutes per flight compared to 4.8 minutes in July 2023.

6.1.1 Punctuality 2023-2024

Table 4 reports the annual departure and arrival punctualities in 2023 and 2024. Despite higher traffic in 2024, departure and arrival punctualities show respectively improvements of 1% and 1.5%. *Figure 28* shows that the monthly averaged punctualities were higher in 2024 compared to 2023, except for January and the summer months (from June to September).

Although the average departure punctuality was 66% in 2024, it significantly dropped between June and September, mainly because of the three following reasons:

1 - **WX conditions,** e.g. strong winds;

2 – **coinciding special events,** e.g. EURO2024 Finals in Germany, at the same time as Wimbledon finals in the UK, both on Sat 13th Jul 24, and

3 – **technical,** e.g. Microsoft / Crowd Strike on Fri 19th July 2024 affected several Cloud based systems used by various European and US carriers. Several airports were affected across Europe making passenger booking confirmation or check-in impossible.

	2024	2023
Departure punctuality	66%	65%
Arrival punctuality	72	71%

Table 5 Network - annual averages of departure and arrival punctuality

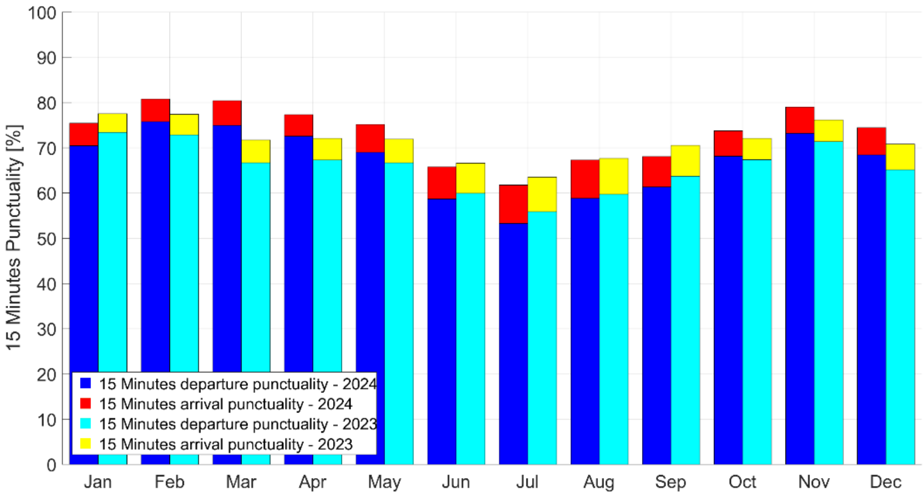


Figure 28 Network - monthly evolution of the arrival and departure punctuality in 2023 and 2024

Table 6 shows that the average departure and arrival delays in 2024 were lower compared to 2023. Figure 29 indicates that average delays were lower in 2024 compared to 2023 except for January and the summer months (from June to September).

	2024	2023
Average departure delay	17.1	17.6
Average arrival delay	14	14.7

Table 6 Network - annual averages of departure and arrival delays [min per flight]

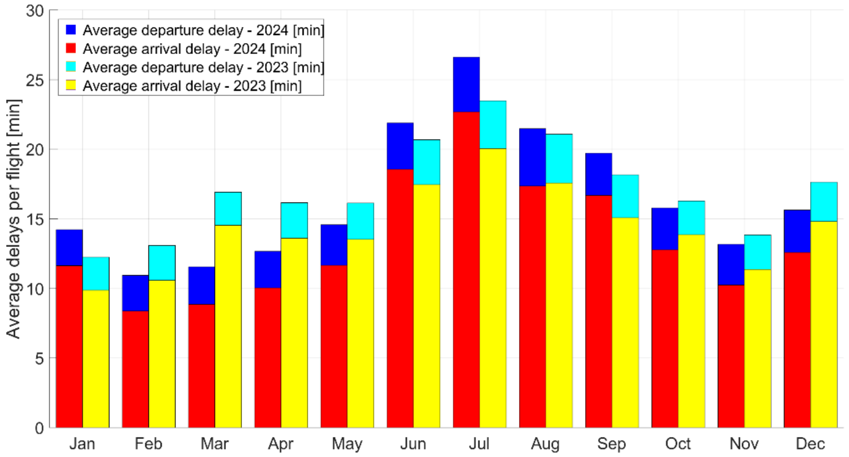


Figure 29 Network - monthly evolution of the average delays per flight in 2023 and 2024

6.1.2 Focus on peak-period

This section provides insight into the busy June-August period. Table 7 shows the summer average delays and indicates that higher delays were recorded during summer 2024 compared to summer 2023. The traffic increased by 4% for the same period. Figure 30 shows the evolution of the 4 causes of delay: ground delay, departure delays due to en-route and arrival (airports) regulation, and reactionary. Ground delay decreased by 7% while departure delay due to en-route regulation increased by 53%. Departure delay due to arrival regulation and reactionary remain at the same level than 2023.

	Summer 2024	Summer 2023
Average departure delay	23.4	21.8
Average arrival delay	19.5	18.4

Table 7 Network - summer averages of departure and arrival delays [min per flight]

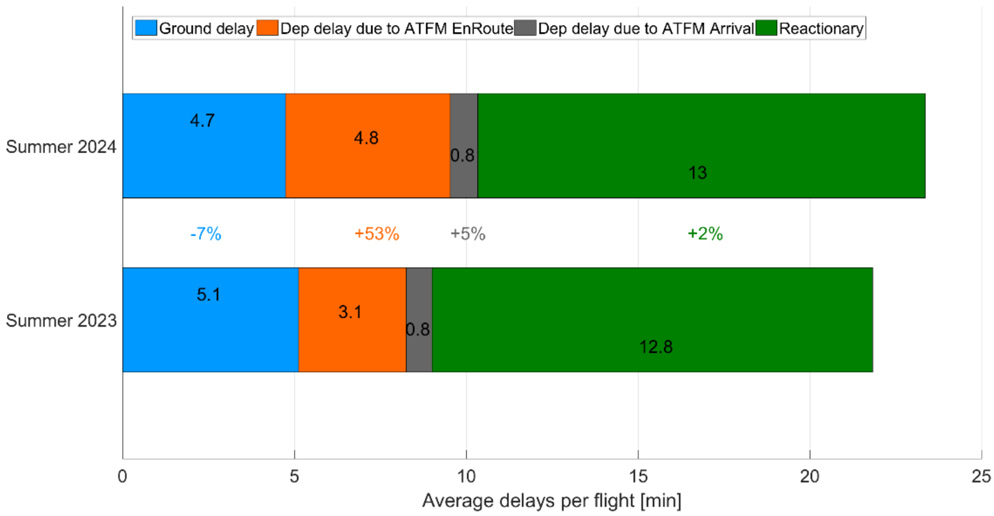


Figure 30 Network – summer average of the 4 causes of departure delay (ground delay, reactionary, departure delays due to ATFM En-route and Arrival)

6.1.3 Focus on the first rotation (first wave departures)[3]

First rotation delays have an operational knock-on effect that can propagate delays through the day. Figure 31 shows average ground delay and departure delay due to regulation (both en-route and arrival) for the first wave. Average ground delay for first rotations decreased by 10% from summer 2023 to 2024 while average departure delay due to ATFM increased by 31%.

It is worth noting that the impact of the ground delay on the network (knock-on effect) was reduced by 7%. Indeed 1 minute of first rotation ground delay during Summer 2024 led to 2.5 minutes of cumulated arrival delay in the network while it was 2.7 minutes during Summer 2023.

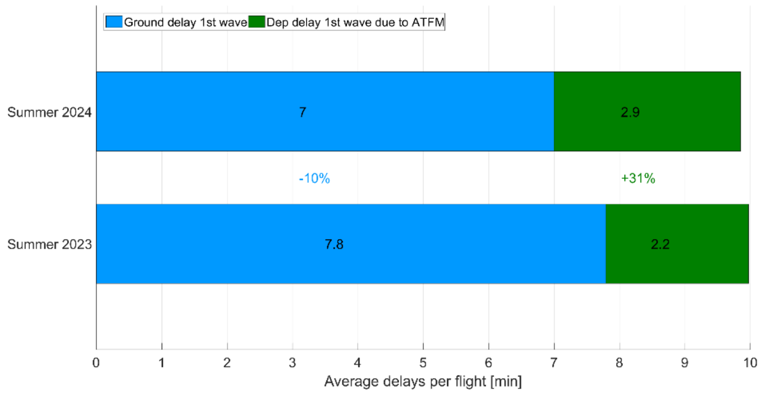


Figure 31: Network - summer average departure delays of the first wave

6.1.4 TURNAROUND TIMES

Figure 32 shows the scheduled turnaround time for a flight (the black dashed line), the available turnaround time (the yellow line), the actual turnaround time (the top of the grey area) as well as the ATFM delay (the red area).

At network level, scheduled, available and actual turnaround times were relatively stable year on year. The delta between scheduled and available widened in peak summer months as network effects (the increased volume of red from May to October 2024) saw reactionary (knock-on) delays increase. December for both years also saw slight dips in turnaround performance, however this was more ground handling related due to winter weather conditions.

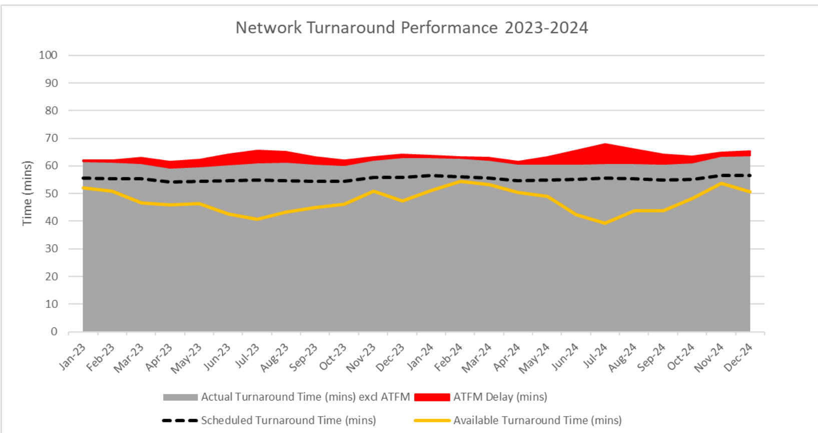


Figure 32 Network Turnaround Performance 2024 vs 2023

[3] NM's airport unit reports first rotation flights as departures between 3.00 and 10.00 UTC.

6.1.5 AIRLINE SCHEDULE RESILIENCE

Scheduling correctly is a difficult art: if too long a time is blocked for a flight, the airline will not be able to make best use of their resources - staff, airframes, infrastructure. Too short a time can arguably be worse as late flights generate rotational delay with late incoming aircraft and passengers from previous flights having to be accommodated.

When flights leave on time but arrive after the scheduled time of arrival, they cause reactionary (knock-one) delays. Consequently, schedule padding is essential for air carriers to find schedules which work with the typical patterns of delay, so that they can deliver passengers on time whilst getting maximum use out of their aircraft. Consequently, when delays decrease it takes one or two (IATA) seasons for the airline to adapt its schedule accordingly.

Two CODA scheduling indicators help airline schedulers determine the optimal schedule based on historical flight data (see Figure 33*)*.

The Block Time Overshoot (BTO) is the percentage of flights with an actual block time that exceeds the scheduled block time.

The Delay Difference Indicator - Flight (DDI-F) or departure delay recovery is the difference between departure and arrival punctuality expressed in minutes. This can is indicated as a positive or negative figure, for example, a flight departing with 20 minutes delay and arriving with 30 minutes arrival delay will have a DDI-F of +10 minutes.

The European DDI-F in 2024 was -4.7 minutes, this an increase in comparison to 2023 where the DDI-F was -4.2 minutes. In essence translating, it was easier to recover schedule delay compared to 2023.

The Block Time Overshoot (BTO) is the percentage of flights with an actual block time that exceeds the scheduled block time. The European BTO in 2024 decreased to 25.6% compared to 27.4% in 2023. This 1.8 p.p. difference shows that it was taking less time than planned to complete flights.

In summary, given the increased delay in the network the changes in the BTO and DDI-F indicate that airlines have added buffer to their schedules to absorb potential disruption (knock-on delays).

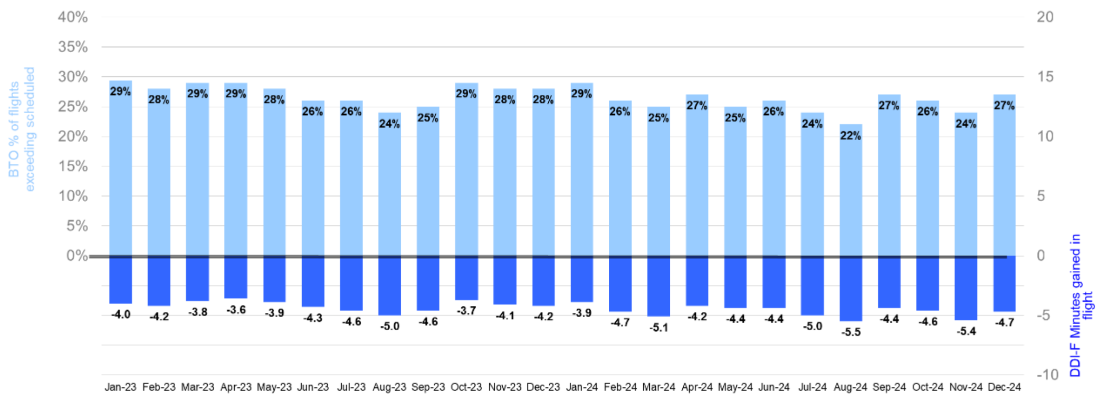


Figure 33 Block Time Overshoot (BTO) and Delay Difference Indicator - Flight (DDI-F) Network January 2023 – December 2024

6.2 AIRPORT PERFORMANCE

This section shows 2024 punctuality and schedule delays at the busiest top 80 airports.

6.2.1 Global evolution

Figure 34 shows that departure punctuality between 2023 and 2024 varied from one airport to another. The three airports with highest departure punctuality in 2024 were Stavanger, Trondheim and Bergen, while Lisbon, Naples, and Rome Fiumicino observed the lowest punctualities. Istanbul Sabiha Gökçen, Copenhagen and Istanbul had the highest increase in departure punctuality compared to 2023 while Tenerife Norte, Helsinki, and Budapest had the highest decrease. The highest arrival punctuality was in Norway (same top 3 than for departure punctuality), while the three airports with lowest arrival punctuality were Tel Aviv, Antalya and Belgrade. Those trends were also reflected in the average departure and arrival delays. To note that London Gatwick observed the largest reduction of departure delays between 2023 and 2024 benefitting from completed works and collaborative efforts for increasing resilience and punctuality.

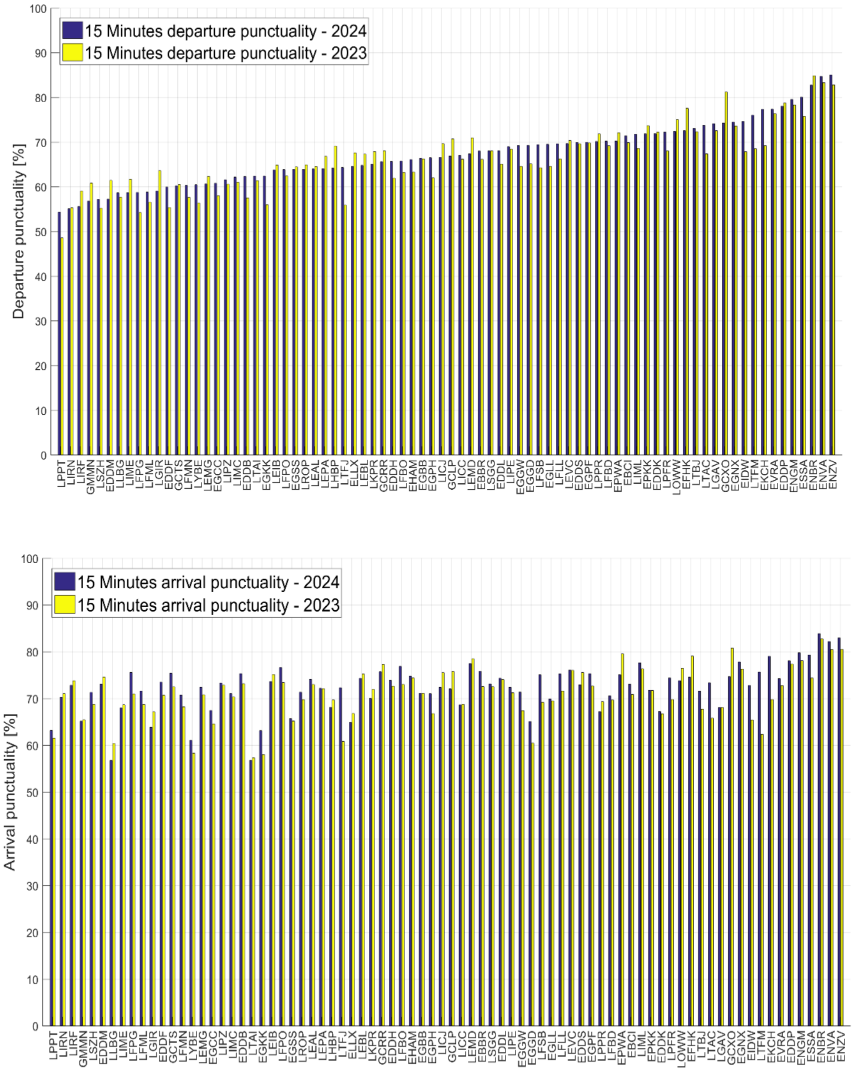


Figure 34. Airport departure(top) and arrival (bottom) punctuality in 2024 and 2023. Airports are sorted depending on 2024 departure punctuality.

6.2.2 Focus on peak-period 2024

This section provides insight into the period between June and August. This period sees increased traffic, higher delays and increased pressure on airport operations.

Figure 35 shows that many airports had lower punctuality during summer 2024 - some like Budapest, Vienna, and Antalya saw a significant drop compared to 2023. The reverse is true for Lisbon, Copenhagen and London Gatwick. Most airports also saw their arrival and departure delays increase in summer 2024 compared to 2023.

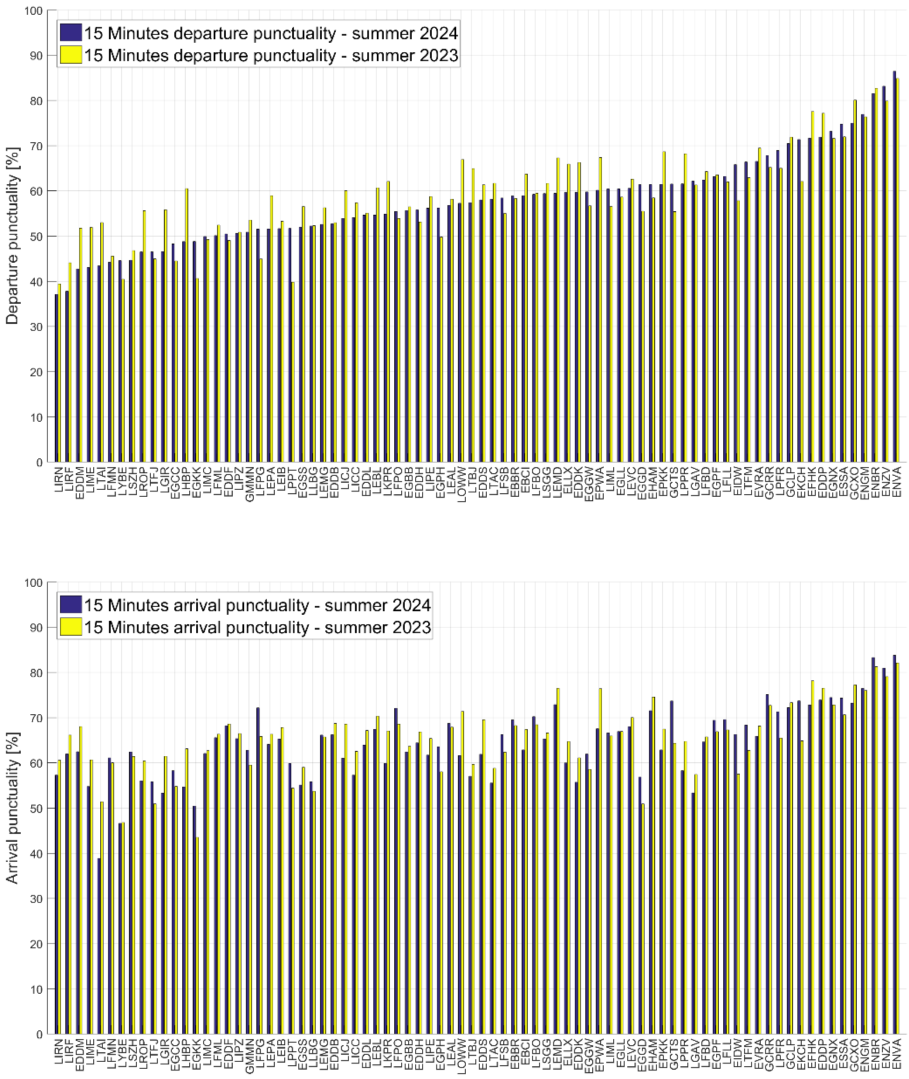


Figure 35. Airport departure(top) and arrival (bottom) punctuality in summers 2024 and 2023. Airports are sorted depending on summer 2024 departure punctuality.

6.2.3 Delay cause at airport locations

Figure 36 and Figure 37 show the average ground delay and departure delay related to ATFM regulations at individual airports for summers 2024 and 2023. The three airports with highest ground delay in 2024 are Rome Fiumicino, Casablanca and Munich, which saw their ground delay increase compared to 2023. The decrease of ground delay from summer 2023 to 2024 at Network level reported in Figure 35 is reflected in Figure 36 for most airports. The airports that show significant improvements are Lisbon, Belgrade and Gatwick.

Figure 37 shows that for most airports the departure delay due to ARRIVAL regulation remained at same level between the two summers, while departure delay due to ENROUTE regulation significantly increased. The airports with highest increase in departure delay due to ENROUTE regulation are Ankara, Palermo, and Catania.

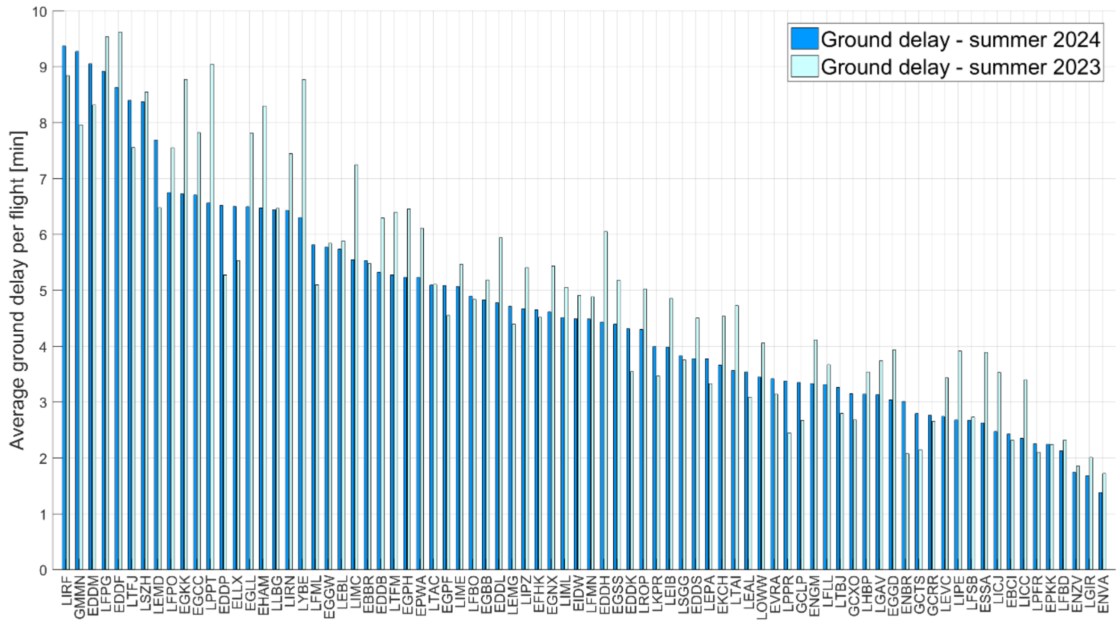


Figure 36. Airport average ground delay per flight in summers 2024 and 2023. Airports are sorted depending on summer 2024 average ground delay

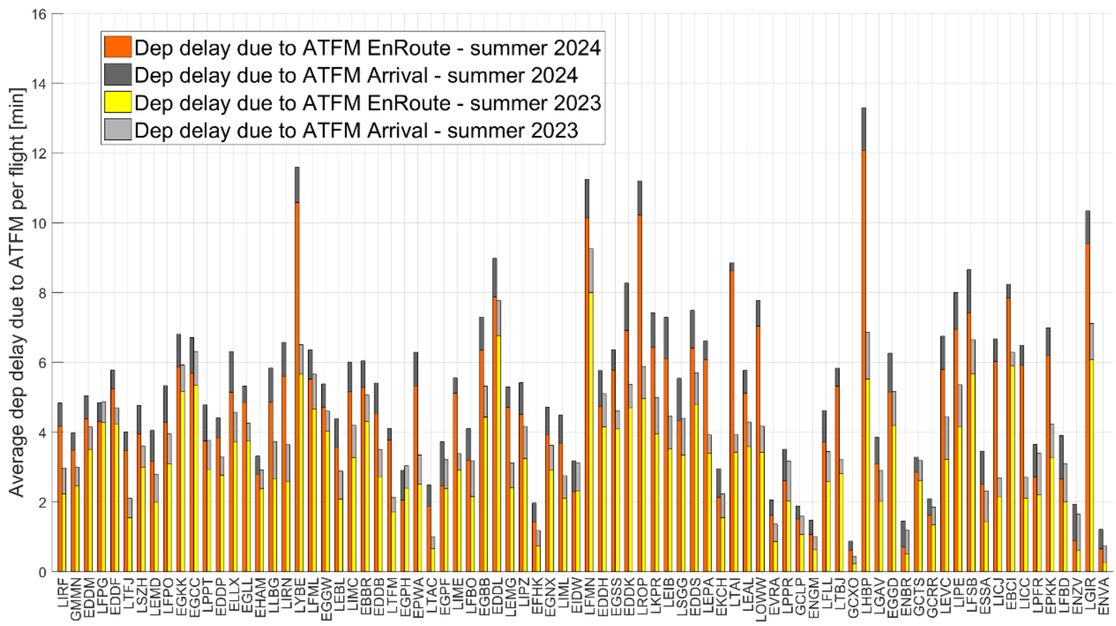


Figure 37. Airport average departure delay due to ATFM regulation (En-route and Arrival) in summers 2024 and 2023. Airports are sorted depending on summer 2024 average ground delay.

6.3 AIRPORT DISRUPTIONS

A number of unplanned disruptions imposed capacity reductions at certain airports *(see Table 7)*

Date	Location	Event	ATFM Delay Impact
01-31 January	*Lanzarote & Fuerteventura*	*ATC industrial action*	*7,691 minutes*
23 to 24 January	*Rome/Fiumicino*	*Single runway operations due to ALCMS (Airfield Lightning Control & Monitoring System) upgrade*	*4,492 minutes*
07 February	*Athens*	*ILS check*	*1,435 minutes*
07 February	*Lyon*	*Radar failure*	*1,269 minutes*
19 & 21 February	*Gran Canaria*	*ILS check*	*4,837 minutes*
01-29 February	*Lanzarote & Fuerteventura*	*ATC industrial action*	*12,749 minutes*
01-31 March	*Lanzarote & Fuerteventura*	*ATC industrial action*	*15,291 minutes*
09 March	*Frankfurt/Main*	*Lack of parking positions resulting in two days of Industrial Action*	*1,940 minutes*
15-19 March	*Naples*	*Radar maintenance*	*11,386 minutes*
18-31 March	*Eindhoven*	*Communication system failure*	*1,893 minutes*
01-30 April	*Lanzarote & Fuerteventura*	*ATC industrial action*	*1,154 minutes*
12 April	*Gran Canaria*	*Drone intrusion*	*1,136 minutes*
15 April	*Amsterdam/Schiphol*	*Intervention on ATM system*	*1,558 minutes*
25 April	*France*	*ATC industrial action*	*4,577 minutes*
01-08 May	*Antalya*	*ASMGCS failure*	*24,729 minutes*
28 May	*Tel Aviv/Ben Gurion*	*Radar failure*	*1,380 minutes*
08-31 May	*Pisa*	*Radar maintenance*	*3,517 minutes*
23-31 May	*France*	*ATC industrial action*	*18,550 minutes*
28 May	*Frankfurt*	*Disposal of WW2 ordnance*	*2,293 minutes*
06-28 June	*Pisa*	*Radar failure and maintenance*	*7,161 minutes*
01-30 June	*France*	*ATC industrial action*	*5,054 minutes*
14-27 June	*Paris/Orly*	*ILS25 unavailability*	*1,671 minutes*
18 June	*Barcelona*	*ILS calibration*	*1,903 minutes*
25 June	*Geneva*	*Capacity reduction due to flooding of the ops room*	*3,597 minutes*
26 June	*Paris/Le Bourget*	*ILS calibration*	*2,287 minutes*
05 July	*Venice*	*ATC industrial action*	*1,984 minutes*
20 July	*Venice*	*IT issues*	*3,228 minutes*
25 July	*Naples*	*IT issues*	*4,644 minutes*
05 August	*Athens*	*Radar issue*	*1,979 minutes*
10 August	*Lisbon*	*CPDLC issue*	*1,127 minutes*
24 August	*Manchester*	*FDPS failure*	*1,052 minutes*

11 September	*Antalya*	*Electrical failure*	*2,944 minutes*
04 October	*Frankfurt*	*Datalink issue*	*1,773 minutes*
13 October	*Athens*	*Radar issue*	*1,169 minutes*
19 October	*Amsterdam/Schiphol*	*Communication system failure*	*1,582 minutes*
29 October	*Malaga*	*Communication system failure*	*2,220 minutes*
01-05 November	*Porto*	*Frequency issues*	*6,024 minutes*
18 November	*London/Heathrow*	*IT issue in British Airways*	*1,447 minutes*
29 November	*Italy*	*ATC industrial action*	*2,688 minutes*
01-31 December	*Strasbourg*	*Transfer of airspace below FL195 from Reims ACC to Basel and Strasbourg Approach sectors*	*1,391 minutes*
04-06 December	*France*	*ATC industrial action*	*7,311 minutes*
12-16 December	*Edinburgh*	*New EFPS equipment*	*3,665 minutes*
15 December	*Milano/Malpensa*	*ATC industrial action*	*776 minutes*

Table 8 Unplanned airport Events/Disruptions 2024

6.4 NM ACTIONS

6.4.1 PRE-TACTICAL SUPPORT (AIRPORT BRIEFINGS)

The NM Airport Unit and the Airport Function holds a weekly briefing targeted to airport operators, ANSPs and airlines, with the aim of sharing the results of post-operations analysis and the foreseen matters that might impact them and the network during the following weeks. These briefings cover the following topics: an outlook of the operations the week before and week ahead, the weekly pre-tactical DCB hotspots, traffic demand forecast, post-ops flight evolution, punctuality and ground delay, passenger demand, events, and weather information. The NM Airport Unit and the Airport Function release a written pack containing extended information weekly published in the Airport Corner.

Once the summer season is over, the frequency of the live-presentations decreases to bi-weekly meetings with a view to organise extraordinary live briefings when circumstances require so. However, the written pack continues to be issued weekly via the Airport Corner.

During the ski season, the Airport Weekly Briefing addressed the airports known for being the gateways to the ski resorts and that might impact the network.

6.4.2 TACTICAL SUPPORT (AIRPORT FUNCTION)

The Airport Function of the NM is now a permanent position within the NMOC, providing services to capacity-challenged regional and hub airports, supporting resolution of demand-capacity balancing issues and facilitating operational exchange between an airport operations centre (APOC) and the NMOC. The Airport Function closely monitors Night Curfews (closures or night quotas) and endeavours to prevent the need for diversions wherever possible.

6.4.3 OTHER SUPPORT ACTIVITIES

During 2024, NM continued the close and effective collaboration with airports for their integration into the Network. Actions and elements are recorded in the 2024 Network Operation Plan but also resulting from situations identified in the Rolling Network Operation plan have been regularly taken in collaboration with the Airports. The range of support in this context varied from the information publication and event management to more long-term support and targeted solutions tailored to the local needs.

Additionally, NM continued to further develop the Passenger Demand Support Service with main focus to improve the reporting schema on the passenger demand during Airport Briefings and NDOP meetings. The idea was to effectively replace the price ratio indicator with a more concrete solution detecting potential overdemand of the passenger volumes in reference to terminal capacities. On top of that, NM B2B Service has been enhanced including the predictions, which are available for an automated acquisition.

NM also responded to the request from regional airports and respective ANSPs to start working on a cost-effective solution supporting safe ground operations in all weather conditions. As such the Surface Movement Awareness System (SMAS) concept has been developed while being consulted with EUROCAE, EASA and all the operational stakeholders. Further works are expected to validate and standardize the solution.

The landing and take-off emission estimator tool has been further re-adapted to meet the operational needs of the concerned stakeholders such as airport operators, and air navigation service providers. The tool responds to a growing demand and supports our stakeholders in monitoring and management of the operations based on the environmental metrics covering ground but also extends to wider area around the airport with the aim to depict CO2, NOx, and the volumes of fuel burned.

NM remained active in training development and delivery while maintaining an agile form of communicating on the most relevant developments and proceedings via the EUROCONTROL Aviation Learning Centre's portfolio of services.

7 FLIGHT EFFICIENCY

This chapter summarises progress on implementing the actions of the 2008 joint IATA/CANSO/EUROCONTROL Flight Efficiency Plan and responds to the requirements of the SES performance scheme.

The NM flight efficiency targets and objectives for 2024 included in the Network Performance Plan (NPP) 2020-2024, in the Network Operations Plan (NOP) 2024-2029 and in the ERNIP Part 2 – ARN Version 2024-2030 are listed below:

Route extension – airspace design (DES)

Target:

- The NM objective is to reach a further reduction of 0.25pp from the 2019 reference value (an average of 0.05pp per year in RP3)

Route extension – last filed flight plan (KEP)

Target:

- achieve a KEP target of 3.73% for the NM area in 2024.

Route extension – actual trajectory (KEA)

Target:

- achieve a KEA target of 2.4% for both SES and NM areas in 2024.

Flight efficiency indicators are monitored for pure airspace design and for flight planning. The trend evolution of those indicators since the beginning of 2022 is shown on Figure 38.

The continued implementation of Free Route Airspace and the expansion of cross-border Free Route Airspace had a positive effect on the airspace design route extension indicator. The same applies for the last filed flight plan and the actual trajectory indicators as the airspace design changes compensated to a large extent the impact of the Ukrainian crisis and the avoidance routes that had to be operated as a result of that. These positive effects have been also enabled by the Flight Efficiency Implementation Network Strategic Project that accelerated the close cooperation between NM, the airspace users and the computer flight plan service providers. This evolution continues to demonstrate the necessity to continue the cooperative approach towards airspace design and enhanced flight planning.

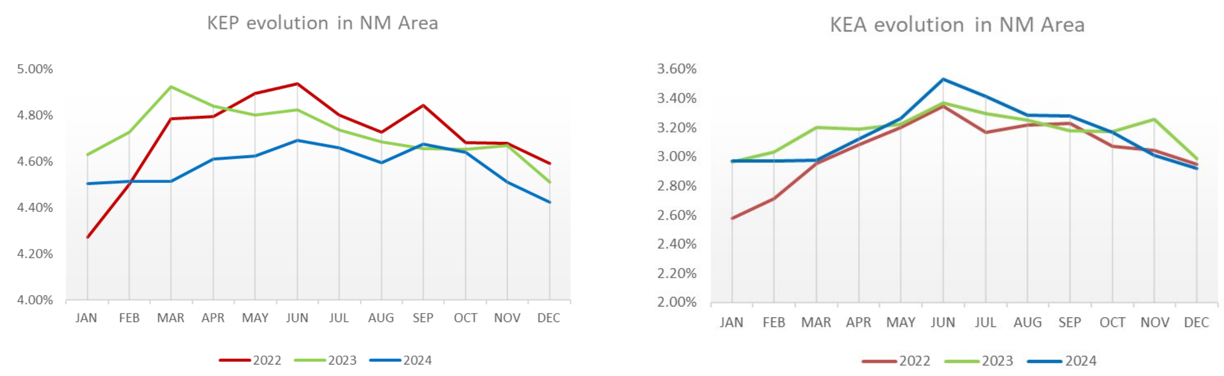


Figure 38: KEA and KEP evolutions per month 2022-2024

A number of events in 2024 affected the network and had direct consequences on the flight efficiency evolution:

- Flights avoided the entire Ukrainian, Belarus and Russian airspace moving to neighbouring countries (Türkiye, Bulgaria, Romania, Poland, Slovakia, Hungary, Lithuania, Latvia, Estonia, etc.); adjacent ACCs/ UACs were on-loaded by Far Eastern traffic avoiding the Ukraine airspace leading to increased route extensions.
- Avoidance of Belarus as a result of the EU sanctions.
- Strong economic recovery, especially in South and East Europe, has resulted in increased demand for travel, particularly for leisure and tourism. This has led to higher than expected flight numbers across Europe, especially in Southern and Eastern regions.
- Flights avoided Syrian, Iraqi and Iranian airspace due to the security situation; traffic between Europe, Middle East and Asia re-routed via Afghanistan, Turkmenistan and/or Saudi Arabia, Egypt with additional impacts on the flows from the Ukrainian crisis situation.
- Impacts of Israeli crisis led to a volatile situation in terms of airspace and routes availability in the region throughout the year. Increased number of overflights in the South Caucasus States was one result of the mentioned geopolitical event.
- During the summer the network operated with constrained airspaces in central Europe (4-Flight system implementation in Paris ACC, Olympic games). This led to a Southeast bound flows shift to the west, with notable increases in Italy, Switzerland and western Balkan States
- Arrival trajectories in the terminal area of the Istanbul airport that sit outside of the 40 nautical mile circle.
- A significant increase in military activity.

7.1 AIRSPACE DESIGN

As part of the Flight Efficiency Plan, States and ANSPs cooperated closely with NM to develop and implement enhanced airspace design solutions. More than 100 airspace improvement packages were co-ordinated at network level and implemented during 2024. As a result, the route extension due to airspace design (RTE-DES) continued its downward trend throughout the year, reaching its lowest ever average level in 2024, at 1.64%, further decreasing by 0.15 pp than in 2023, which is better than the targets in the Network Performance Plan (0,25 pp decrease per year in RP3).

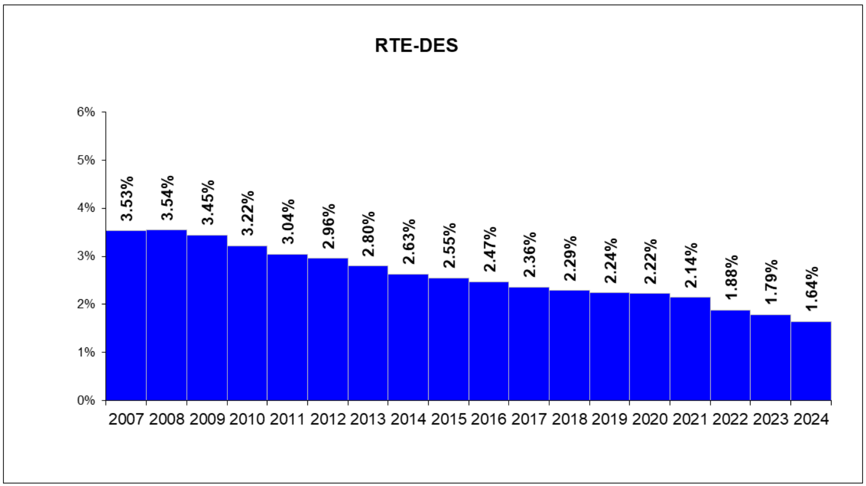


Figure 39 : yearly evolution of the airspace design indicator (RTE-DES)

The average route extension due to airspace design decreased from 1.79% in 2023 to 1.64% in 2024 *(Figure 39)*.

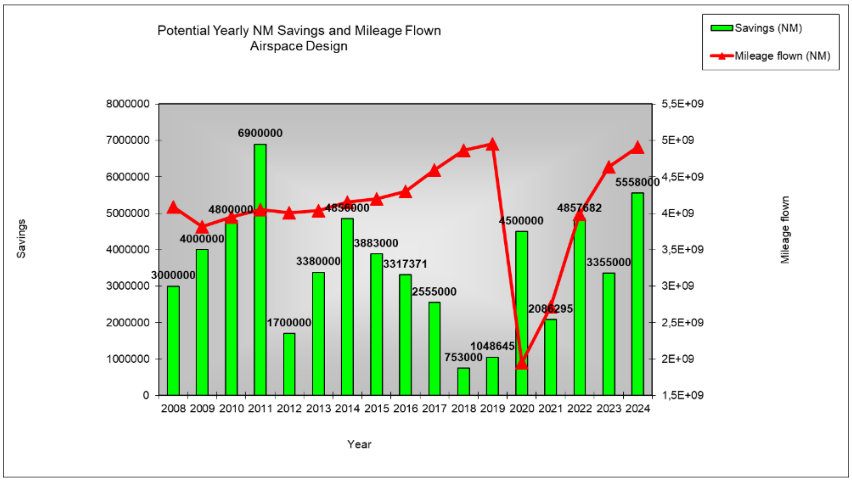


Figure 40: Potential yearly savings/ losses in nautical miles due to airspace design

This represents a potential saving in 2024 of 5.558.000 nautical miles *(Figure 40)*, approximately 32.000 tonnes of fuel, reduced emissions of 102.000 tonnes of CO_2, or ~23 M€ fuel savings

7.2 AIRSPACES CHANGES VS FLIGHT PLANNING

The flight planning indicator (KEP) measures the length of the flight planned trajectory compared to the great circle (route extension). It reflects inefficiencies in the use of the airspace (due to RAD restrictions, CDR availability, inefficient flight-planning, no fly areas etc.), but also user preferences for cheaper rather than shorter routes.

While KEP improved significantly in 2024 (4.59%) over 2023 (4.72%), KEA remained flat overall, reflecting the constraints in the network during summer (KEA was worse than 2023 during June-September months and better or flat the rest of the year). *(Figure 41)* for the NM area. The achieved 2024 KEP of 4.59% remains above the KEP 2024 target of 3.73% for the NM area.

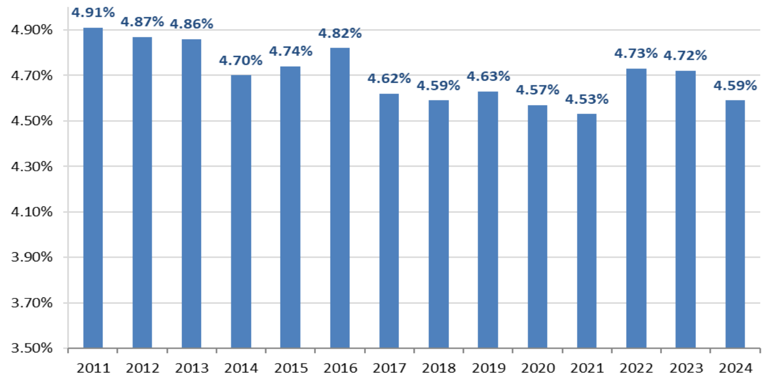


Figure 41: Yearly evolution of flight-planning indicator (KEP)

Figure 42 shows the annual miles flight planned in the period 2020-2024 and the marginal change between years.

The average flight-planned distance in 2024 increased by 10 nautical miles compared to 2023. With the traffic recovery, the flight plan route extension decreased in 2024 by 53.8 million nautical miles over 2023. The extra planned distance is mainly due to the various network situations, in particular, the impact of the war in Ukraine that materialised in 2023 figures. At the same time, the average city pair distance increased in 2024 by 1.5% as more long and medium haul flights were operated. The cumulative effect of both could not be eliminated by the significant improvement made in airspace design. The 53.8 million nautical increase represents 32.2 kilotons more fuel burn (101.8 kilotons of CO2.)

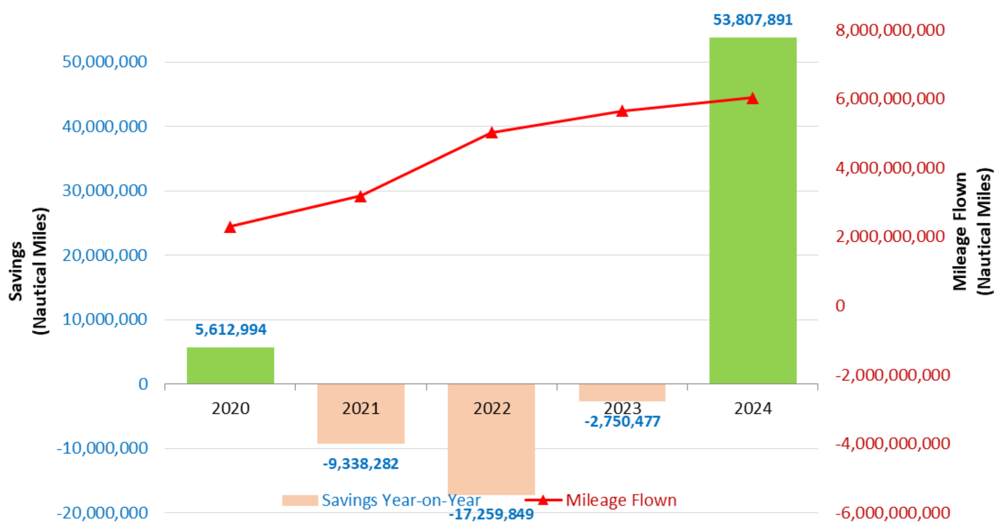
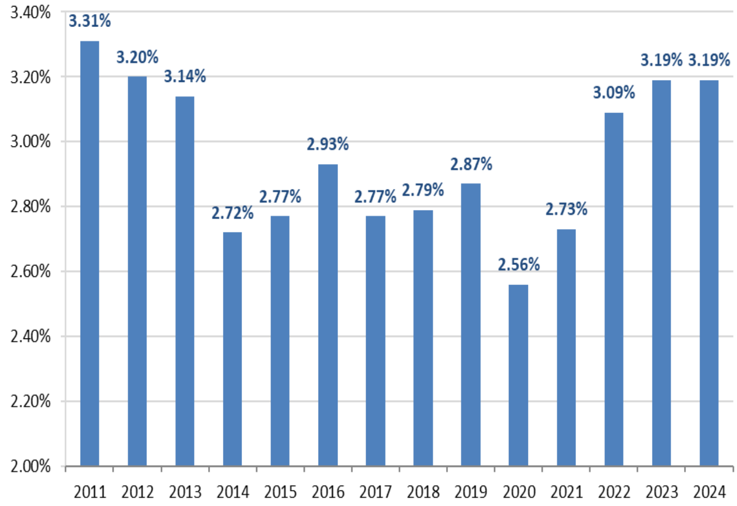


Figure 42 Yearly savings/ losses in nautical miles (NM) due to improved flight planning efficiency

7.3 ACTUAL TRAJECTORY



The actual trajectory indicator (KEA) remains unchanged 3.19% in 2024 in the NM area *(Figure 43)*, above the KEA 2024 target of 2.4% set for both the NM and SES areas. KEA increased by 0.10pp in 2023 mainly due to the war in Ukraine.

Figure 43: Yearly evolution of the actual trajectory indicator (KEA)

Figure 44 shows the annual miles actually flown in the period 2020-2024 and the marginal change between years.

The average distance flown in 2024 increased by 9 nautical miles compared to 2023. With the traffic recovery, the actual route extension increased in 2023 by 2.59 million more nautical miles over 2023. The extra distance is mainly due to the various network situations, in particular, the impact of the war in Ukraine that materialised in 2023 figures. At the same time, the average city pair distance increased in 2023 by 1.6% as more long and medium haul flights were operated. The cumulative effect of both could not be eliminated by the significant improvement made in airspace design. The extra 2.59 million nautical represents 15.5 kilotons more fuel burn (49 kilotons of CO2).

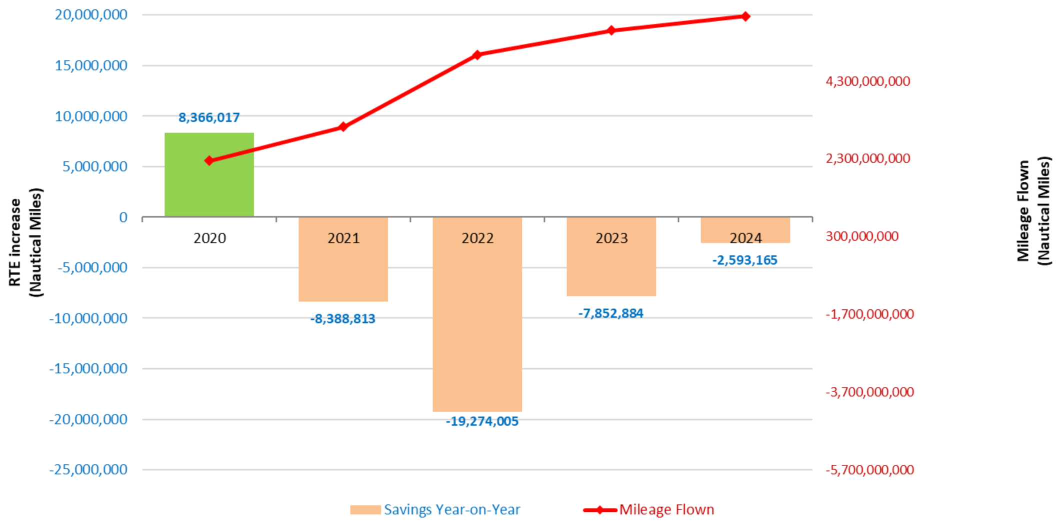


Figure 44 Yearly savings in nautical miles (NM) due to improved flight efficiency

7.4 CONDITIONAL ROUTES (CDR)

CDR availability is an important element when considering ASM in the network operations context. Figure 45 shows the ECAC map of published CDR1 for the last AIRAC of the year 2024 as they are stored in CACD.

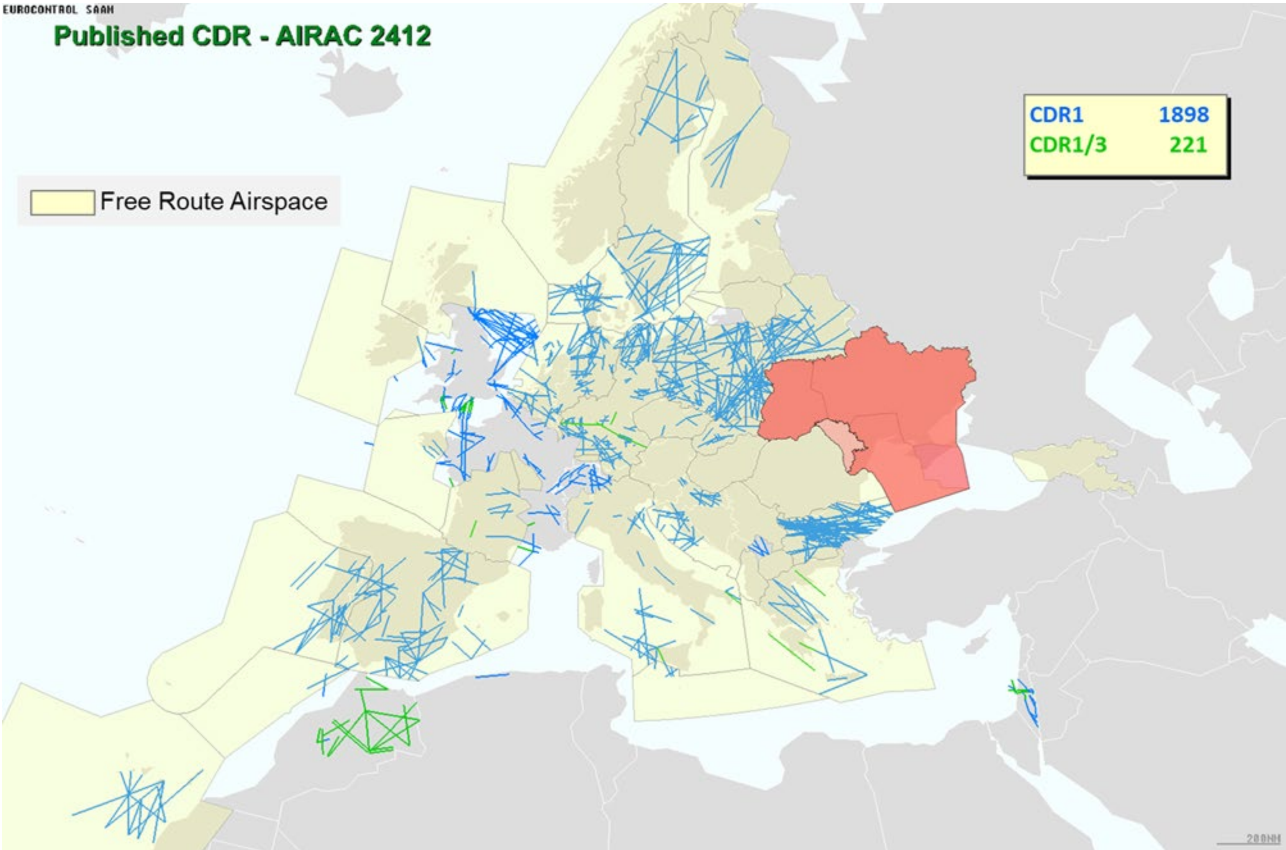


Figure 45 ECAC map of published CDR1 and CDR1/3 for AIRAC 2412 (28 November 2024)

Figure 46 shows little changes in absolute figures for CDR numbers of segments in 2024 compared to past five years. This is due mainly to transition to Single CDR as part of the continuous network improvement process (covered by ERNIP part 2). Implementation of the Single CDR Category which happened in most of ECAC states is already noticeable since CDR2 and CDR1/2 became either CDR1 or ATS routes. The process is practically finalised at the end of 2022.

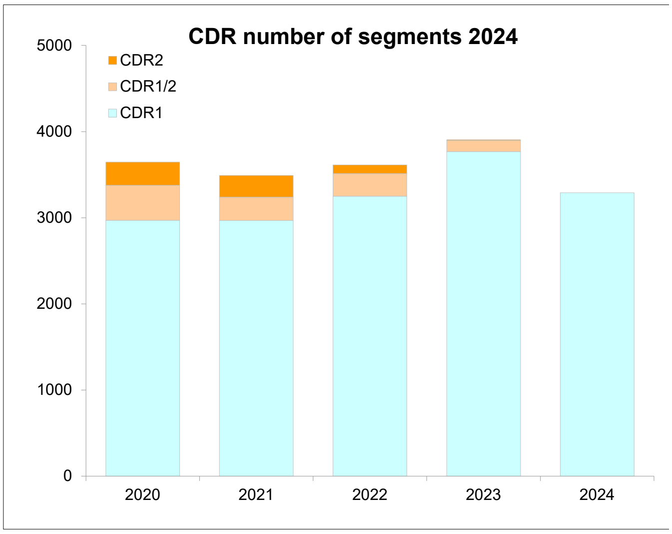


Figure 46 Evolution of CDR number 2020 - 2024

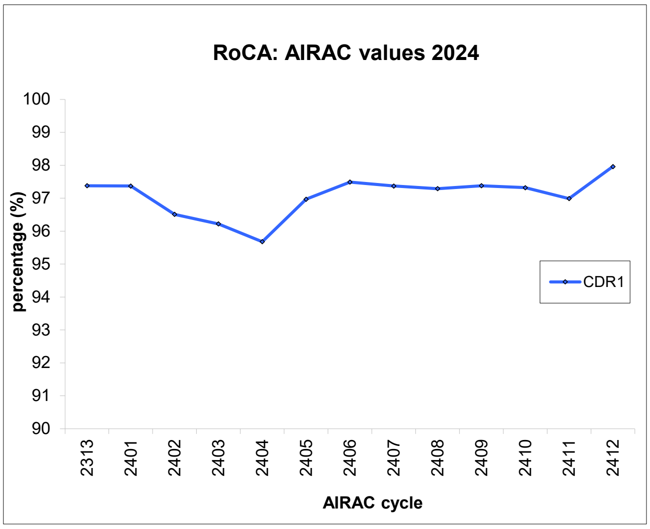


Figure 47 Rate of CDR availability (RoCA) in 2024

Figure 47 shows RoCA for CDR1. RoCA for CDR1 has high values (95.7% to 98%) over the entire year.

The Rate of Aircraft Interested RAI (*Figure 48*)- flights planning the available CDRs is relatively low (22.16% yearly average) with small variations between 20.0% to 23.9% during summer.

The Rate of Aircraft Interested RAU (*Figure 49*) - has an average of 34.5% with values between 32.0% and 36.3%.

Both indicators RAI and RAU have low values as a result of reduced potential of CDR to offer better routing solutions with the expansion of FRA airspace, most of them being contained in lower airspace below FRA.

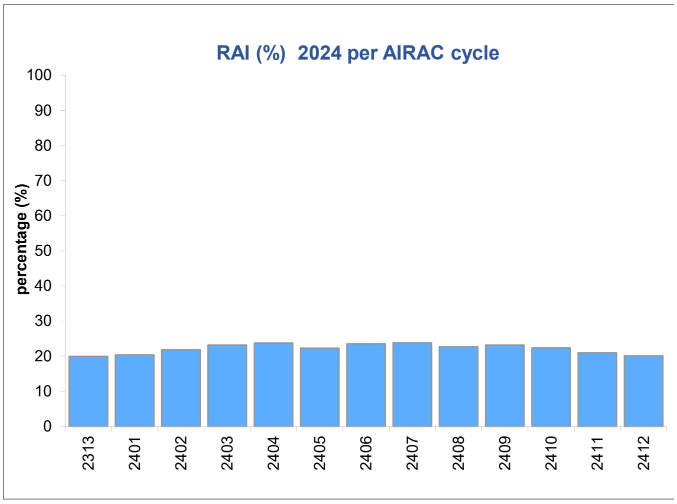


Figure 48 RAI (%) 2024 per AIRAC cycle.

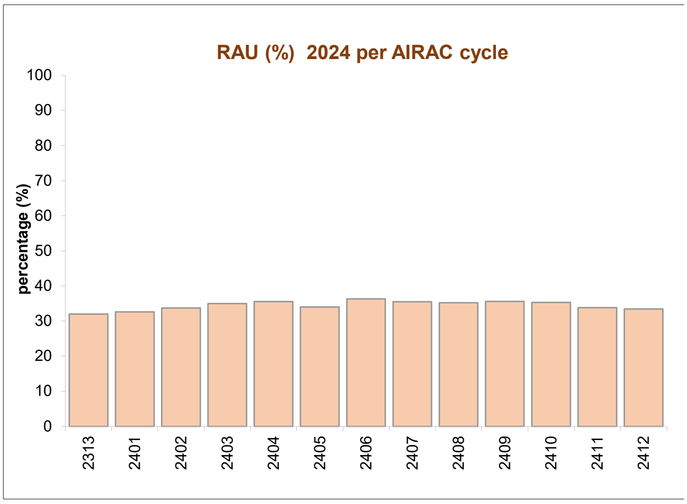


Figure 49 RAU (%) 2024 per AIRAC cycle

This fact is clearly illustrated in the above charts of RAI and RAU evolution over the past five years. They show the trend to use less the CDR even when planned since there are today more and better options either in FRA or the significant number of available DCTs. While in 2020 and 2021 due to the favorable environment for air operations with fewer RAD restrictions the actual CDR utilisation for actual traffic increased significantly, the situation of 2022 to 2024 when traffic increased close to 2019 level reversed the trend.

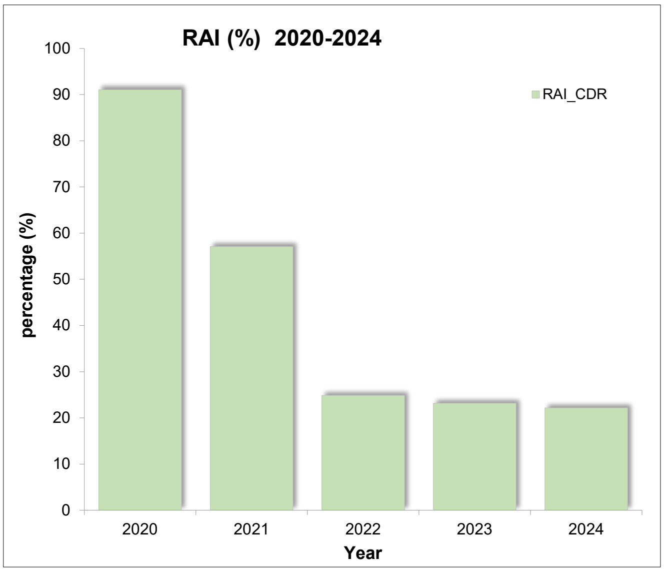


Figure 50 Five year RAI evolution

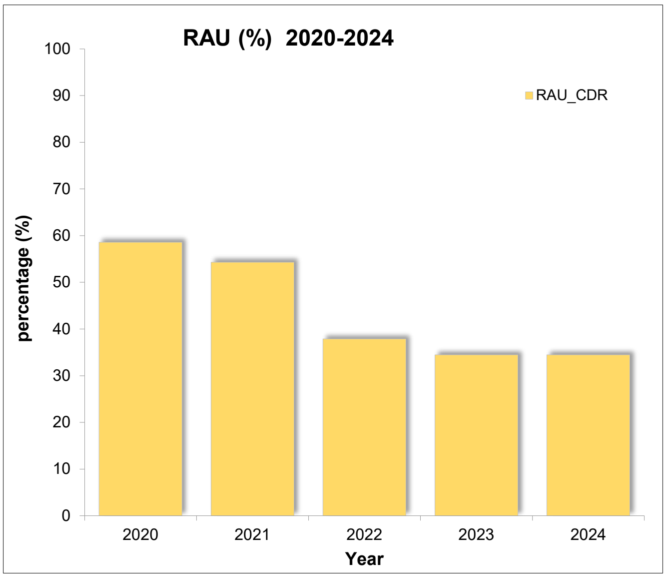


Figure 51 Five year RAU evolution

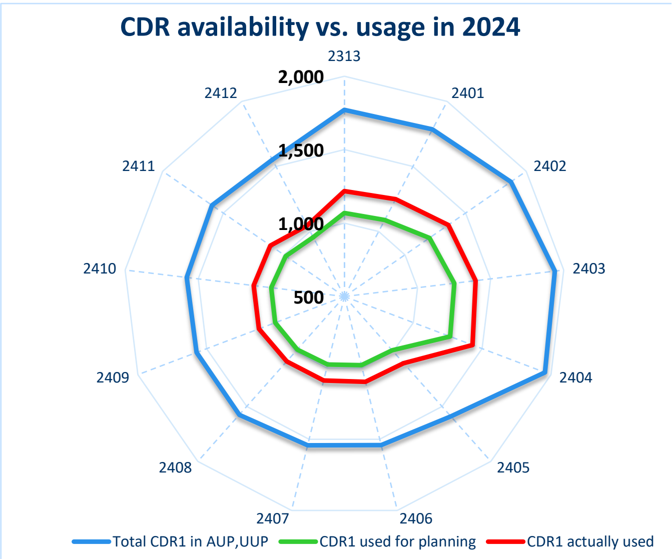


Figure 52 CDR availability vs. usage in 2024

Figure *52* shows the number of CDRs available for flight planning (blue line), the number of those actually used in flight plans (green line) and the number of those that were actually flown (red line). The values indicate that in 2024 63% of available CDRs are used, while in 2023 the utilisation was 67%.

CDRs used and planned versus CDRs available maintained an almost constant difference in 2024 – the gap between availability and utilisation was 93% to 96%. There is a room for improvement with regards to airspace users utilization of available CDR routes in flight planning and execution. Many airlines have defined company routes in such a way that if the flight planning system cannot create an automated, optimized route, the route used shuold be always available, regardless of AUP/UUP, and therefore does not include CDRs.

On some city pairs this behavior results in lost route savings of up to 40 NM.

RESTRICTED/SEGREGATED AIRSPACE (RSA)

The Free Route Airspace expansion means that flights can plan and fly far more trajectories than in a fixed route network adapted to changing environment. As a consequence, managing the access to areas with restrictions cannot simply be done by opening and closing CDRs. The airspace management process should be based on timely notification of airspace status by RSA availability. To reflect and assess this aspect of ASM, specific RSA KPIs have been established similar to CDR FUA KPI. Consequently, a comprehensive process for monitoring and analysis is in place and the results are illustrated in this section. *Figure 49* shows the ECAC map of published RSAs for the last AIRAC of the year 2024 as they are stored in CACD.

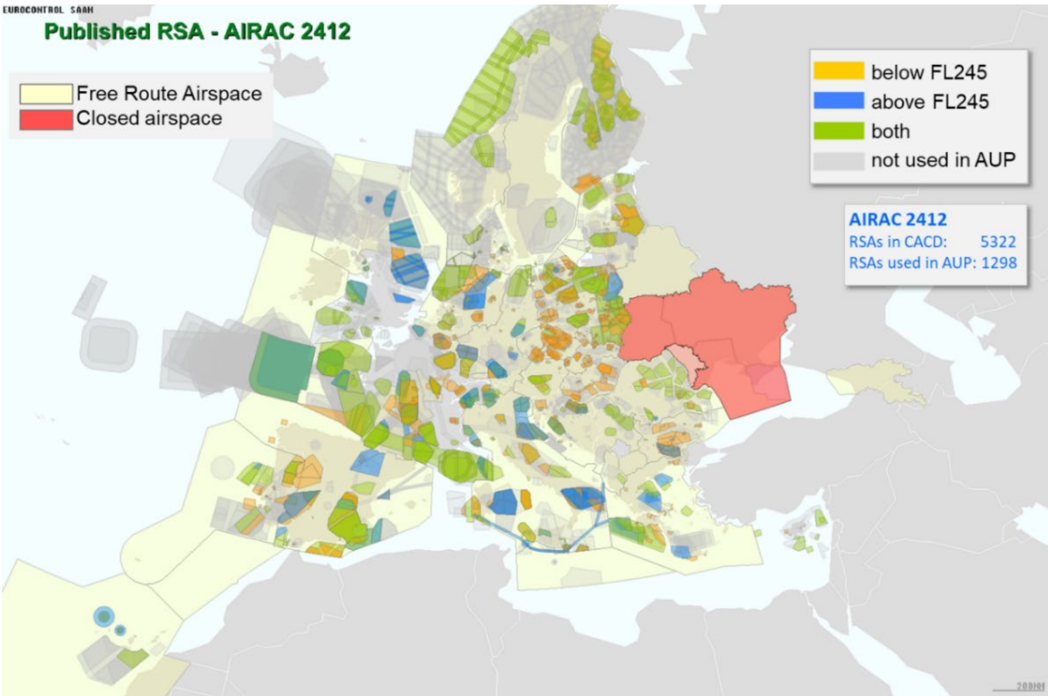


Figure 53: Map of the RSAs from NM database (CACD) for AIRAC 2412

The evolution of the published RSAs in 2024 is shown in *Figure 54* 23.0% of the RSAs have established one or more Flight Buffer Zones (FBZ).

From the total number of RSAs existing in CACD only 63% were used in 2024 for the daily airspace reservation by AUP/UUP process, see Figure 55.

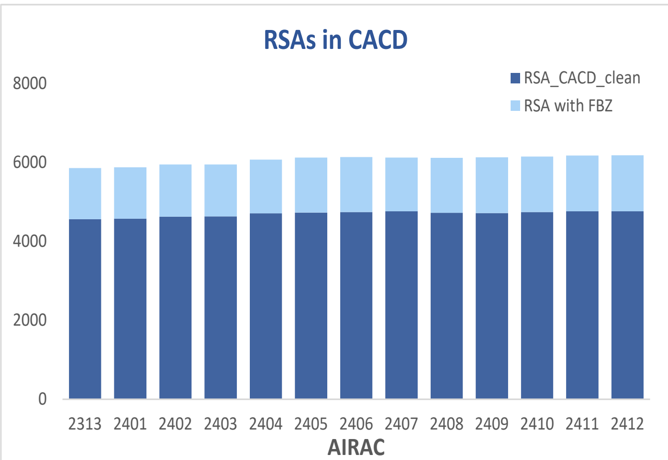


Figure 54 Number of RSAs in CACD by AIRAC cycle for year 2024

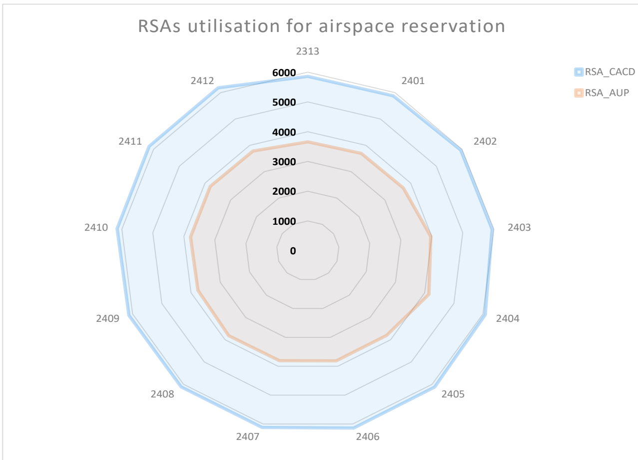


Figure 55 Number of RSAs used in airspace reservations vs. total RSAs in CACD

The evolution of the number of flights using the available RSAs over the year 2024 is represented in Figure 56, together with the traffic average values for each AIRAC cycle.

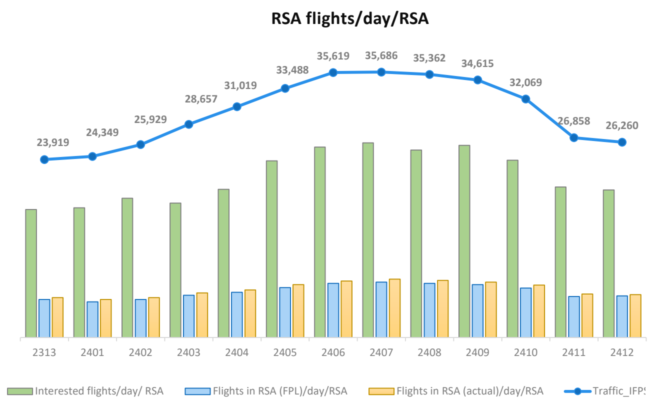


Figure 56 Number of interested flights, flights planning via RSA (ARFL) and actual flights (AU)

Availability of the airspace utilises a similar indicator to CDR RoCA, called Rate of Airspace Availability (RoAA). The Rate of aircraft interested (RAI) and Rate of Actual Use of RSA (RAU) have the same meaning as for CDRs only referring to RSAs instead. ASM indicators for RSAs are defined in ERNIP part 3, Section 7.

Figure 57 shows the evolution of these indicators by AIRAC cycle in 2024.

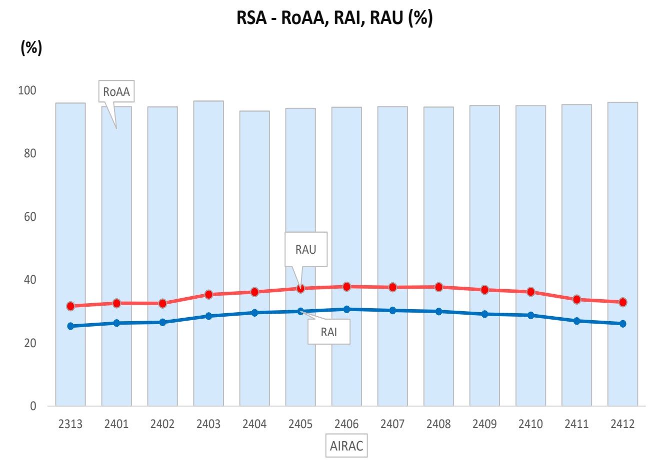


Figure 57 ASM KPI for RSAs – RoAA, RAI, RAU

RAU follows the RAI trend at 30-40% higher values, due to ATC civil-military coordination either by relaxed FUA restrictions or by tactical coordination allowing some flights to cross active areas under certain conditions and agreements.

ERSA indicator stands for Effective RSA booking. It was introduced for RP3 reporting by the Implementing Regulation (EU) 2019/317. The values calculated are the ratio between the actual booking time at the end of the day of operation and the initial booking at the beginning of the day (the last AUP/UUP from D-1). This indicator gives an indication of the effectiveness of rolling UUP process, ultimately the dynamics of ASM during the day.

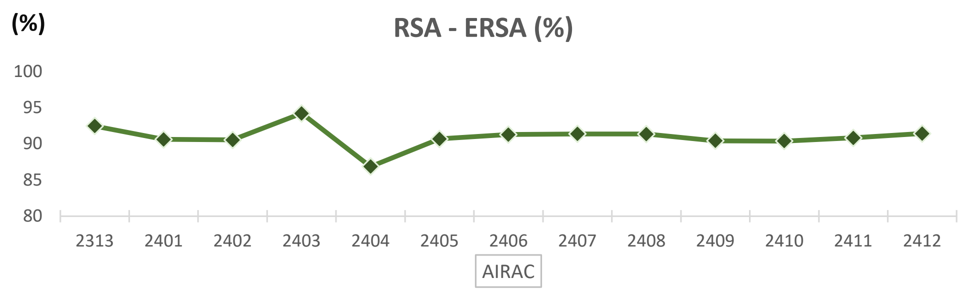


Figure 58: ASM KPI for RSAs – ERSA

ERSA values for 2024 are between 86.7% to 94.2% (*Figure 58*). Those values have been calculated for manageable RSA, since for NAM RSA the values were confirmed measured of 100%

7.5 FREE ROUTE AIRSPACE

The Free Route Airspace is a specified airspace within which users may freely plan a route between a defined entry point and a defined exit point, with the possibility to route via intermediate (published or unpublished) significant points, without reference to the ATS route network, subject to airspace availability. Within this airspace, flights remain subject to air traffic control.

The Free Route Airspace gives airspace users the freedom to plan a route in European airspace.

Operating a FRA environment offers improved traffic predictability due to more stable trajectories. At the same time, it enhances the use of conflict detection tools. The FRA concept leads to a better spread of conflicts compared with the concentration of conflicts generated by the former fixed ATS route network.

Free Route Airspace implementation within the European network started on 07th May 2009 by Portugal within the airspace of Lisboa FIR and is continuing in accordance with ERNIP.

The ACCs listed below have implemented Free Route Airspace by the end of 2024.

H24 Free Route Airspace implementation	**FRA Portugal (Lisboa ACC)**
	BOREALIS FRA (Oslo, Stavanger, Bodo, Tampere, Tallinn, Riga, Kobenhavn, Malmo, Stockholm, Shannon, Prestwick ACCs and some sectors of Swanwick ACC)
	BALTIC FRA (Warszawa and Vilnius ACCs)
	SEE FRA (Budapest, Sofia, Bucuresti, Bratislava and Chisinau ACCs)
	SECSI FRA (Beograd, Zagreb, Wien, Ljubljana, Sarajevo, Tirana and Skopje ACCs)
	FRA-IT (Roma, Padova, Brindisi and Milano ACCs)
	FRA Malta (Malta ACC)
	FRASC (Tbilisi and Yerevan ACCs)
	DFS FRA (Karlsruhe UAC)
	UKRNESFRA (Kyiv, Lviv and Dnipro ACCs)
	FRAM (Maastricht UAC)
	HISPAFRA (Canarias, Madrid and Barcelona ACCs)
	FRACH (Geneva and Zurich ACCs)
	UKODSFRA (Odesa ACC)
	HELLAS FRA (Athinai and Makedonia ACCs)
	LFFRASE (Marseille ACC)
	LFFRAE (Reims ACC)
Non-H24 Free Route Airspace implementation	DFS FRA (Bremen and Munchen ACCs)
	NICFRA (Nicosia ACC)
	FRA Morocco (Agadir ACC and Casablanca ACC)

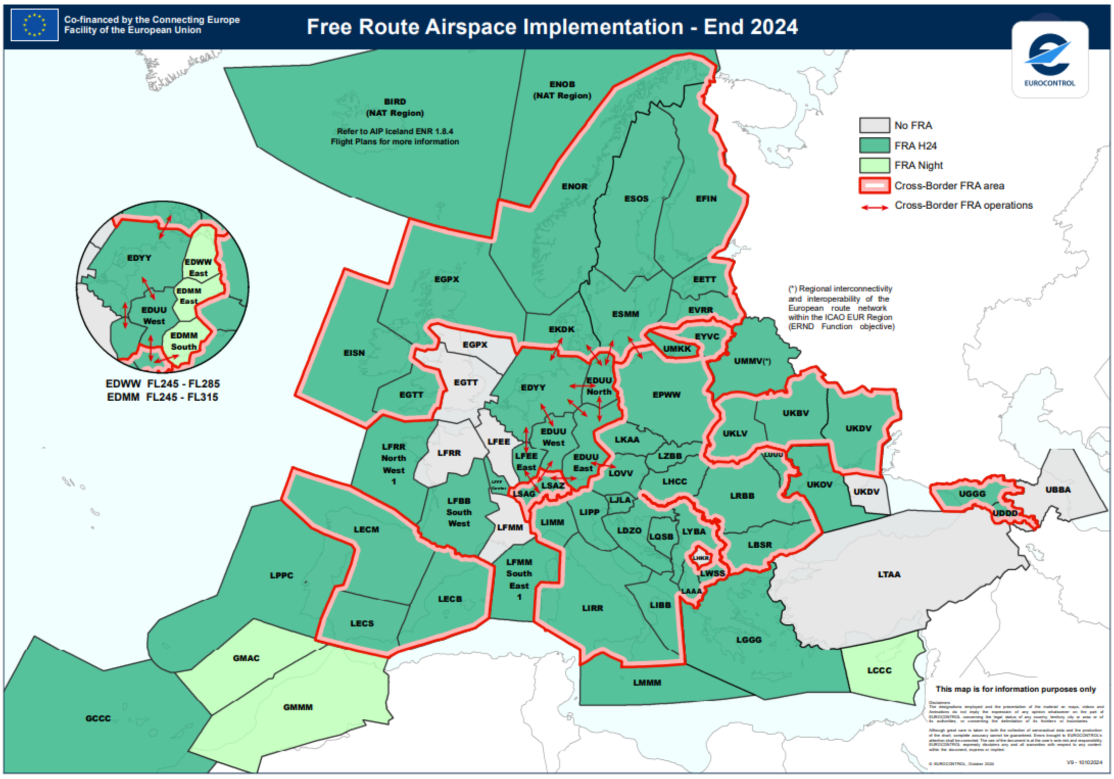
Table 9 Free Route Airspace Implementations

NM is closely associated to the FRA implementation through airspace design, airspace validations, definition of network airspace utilisation rules and availability, overall network interconnectivity and interoperability, simulations, and NM systems upgrades.

During 2024 the following implementations were completed:

- Improvement of flight planning options across the interface between London ACC (Clacton and North Sea sectors) and Maastricht UAC.
- Implementation of South East FRA Cell (LFFRASE step 1) – H24 FRA above FL195 in South Marseille ACC area.
- Implementation of East FRA Cell (LFFRAE) – H24 FRA above FL195 in Reims ACC area, including cross-border FRA operations H24 with FRA Switzerland and night cross-border FRA operations with Maastricht UAC.
- Improvement of FRAIT with the lowering of the FRA limit from FL305 to FL195, as well as allowing cross-border FRA operations between FRA-IT and SECSI FRA.
- Cross-border FRA operations between SECSI FRA and SEE FRA (between Vienna CTA and Praha CTA/Bratislava CTA/Budapest CTA).
- Cross-border FRA operations between BALTIC FRA and SEE FRA (FRACZECH).
- Implementation of Night Free Route Airspace FL195 - FL460 within the AoR of Casablanca ACC for overflights.
- Cross-border FRA operations for ARR/DEP EK/ES between FAB DK-SE and Baltic FAB.

The map below shows the European Free Route Airspace deployment status at the end 2024.



7.6 ROUTE AVAILABILITY DOCUMENT (RAD)

The Route Availability Document (RAD) is a tool that addresses how the European network airspace may be used. According to the Commission Regulation (EU) No 255/2010 the RAD is a common reference document containing the policies, procedures and description for route and traffic orientation.

The Network Manager Implementing Rule (Commission Implementing Regulation (EU) 2019/123) makes a clear reference that the European Route Network Improvement

Plan shall include route network and free route airspace utilisation rules and availability.

The airspace design and airspace utilisation aspects were brought closer by the established multi-disciplinary EUROCONTROL NM RAD Team guided by the Operational Stakeholders RAD Management Group.

The actions performed by the NM RAD Team have facilitated a pragmatic refinement of the RAD during 2024, with full cooperation of Operational Stakeholders, aiming to overcome weaknesses in airspace design and ATM system functionality and to ensure application of the remaining airspace utilisation rules and availability only where and when required.

RMG/RNDSG/NETOPS/NDOP/NMB supported the proposals for amendment to ERNIP Part 1 and Part 4 related to further improvements in RAD content, which are:

- Creation of Chapter 4 in ERNIP Part 4 defining in detail the agreed standardized RAD Grammar.
- Creation of Chapter 5 in ERNIP Part 4 containing the RAD Data Content definition for each RAD Annex.
- Clarification of the use of Flight Level (FL) and Requested Flight Level (RFL) in the RAD supported by examples
- Definition of a Rolling RAD document, containing all the RAD data for a certain AIRAC.
- Definition of RAD Significant Dates and change of the timeline for RAD Data Provision and Publication in order to allow more time to NRCs and align the process with the AIP data provision.
    - The RAD cut-off date (AIRAC publication date - 42 day before the RAD/AIRAC effective date), i.e. the latest date for traffic flow rules and/or flight planning facilitation options to reach the NM RAD Team.
    - b) The RAD publication date (AIRAC latest reception date - 28 day before the RAD/AIRAC effective date), i.e. the date at which the NM RAD Team sends out the RAD.
    - c) The RAD effective date (AIRAC effective date), i.e. the date at which the RAD takes effect.
    - d) The RAD switch date (AIRAC last day)

The major RAD evolutions and developments in 2023 focusing particularly at network level and covering the entire NM area of responsibility were as follows:

- NM RAD Team supported the National RAD Coordinators in the work of converting the Traffic Flow Rules and Flight Planning Facilitation Option to the new RAD Grammar, in order to reduce their workload and ensure a smooth transition.
- Development and deployment of a new RAD Application as part of the iNM Wave 0.
- Further improvements and simplification in the RAD Application to manage the Annex for Special Events and Crises.
- Proposals for structural airspace changes to eliminate the need for RAD TFRs.
- Definition of requirements and gradually implement an enhanced pre-validation process supported by automation to allow better validation and flight planning.
- Gradual improvement in RAD utilization definition, adaptation of the expressions in the RAD and harmonisation in entire RAD.
- Continuation of harmonisation of terminology and definitions of TFRs and flight planning facilitation options.

- Continuation of improvements in RAD availability (publication) to users. New Rolling RAD document allows for a better and more consolidated overview of the RAD changes.
- Continuation of rationalisation of TFRs expression.
- Termination of the pdf RAD publication. This has been replaced by a consolidated excel version containing all the RAD Data.
- Continuation of improvements in coordination of RAD airspace data reference versus airspace changes.
- Adaptation of RAD Documentation.

In 2023 Technical changes have been implemented to introduce improvements for a more efficient management of Dynamic RAD. Due to the necessary changes required for local systems, a transition period until the end of 2024 was agreed among the different partners. The stakeholders agreed as well to continue with live trials on selected RADs by volunteers ANSPs using the initial solutions used to validate the Dynamic RAD concept, still compatible with the technical changes introduced. Gradually ANSPs started to apply the dynamic RAD concepts, while Aos/CFSPs are continuing the update of their system. Possibility to use different solutions will grant a smooth operational evolution in 2025.

7.7 FLIGHT EFFICIENCY PLAN

As part of Flight Efficiency Plan, intensive work has been undertaken by States and ANSPs in close cooperation with NM to develop and implement enhanced airspace design solutions, airspace improvement.

These improvement measures reduced significantly the actual losses recorded as a result of number of events which had direct consequences on the flight efficiency evolution. The list below provides an overview of the major enhancements implemented in 2024:

- **Albania**

(1) ATM system improvements Tirana ACC.

- **Austria**

(1) Airspace organisation in Wien ACC

- **Austria/Czech Republic/Slovak Republic/Hungary**

(1) Cross-border FRA operations between SECSI FRA and SEE FRA (between Vienna CTA and Praha CTA/Bratislava CTA/Budapest CTA).

- **Belgium**

(1) EBCI Procedures.

- **Croatia**

(1) Removal of conventional routes.

- **Denmark**

(1) VOR stations closure Denmark - Phase 1 and Phase 2

(2) RNAV 1 Helicopter Routes.

(3) Areas over the High Seas.

(4) Division flight level change in EKDK and FIR sector split.

(5) New TRAs.

- **France**

(1) VOR/NDB stations rationalization France - Phase 2.

(2) Free Route Airspace France SE step1 - Marseille ACC.

(3) Free Route Airspace France E - Reims ACC.

(4) Cognac Fighter School Airspace Improvement - Phase 1.

(5) D54 reorganization.

(6) Paris ACC re-organisation - Phase 3a.

(7) Paris ACC re-organisation - Phase 3b.

(8) Reims - Strasbourg - Bale interface.

(9) ZENA military areas - Phase 1.

- **Germany**

(1) AIP publication adaptation.

(2) New PBN STARS Frankfurt (EDDF).

(3) CB FRA operations Germany - MUAC - Phase.

(4) 5LNC replacement by Germany.

(5) PBN procedures at Heringsdorf (EDAH) Airport.

(6) PBN procedures at Kassel-Calden (EDVK) Airport.

(7) PBN procedures at Friedrichshafen (EDNY) Airport.

- **Greece**

(1) Extension of IRAKLION TMA.

(2) PBN SIDs/STARs Athens TMA.

(3) Implementation of new 5LNC point SIRIO - New FRA(I) points SIRIO, PERIM, EKTOS.

- **Italy**

(1) FRA vertical limits improvement.

(2) NC sector transferred from Brindisi to Rome ACC.

(3) Removal of conventional routes with France.

(4) Cross-border FRA operations between FRAIT and SECSI FRA.

- **Lithuania**

(1) Lithuania Airspace reconfiguration project - Step 2.

(2) LT-PL interface for Vilnius and Kaunas flights reorganisation.

- **Lithuania/Czech Republic/Poland/Sweden**

(1) Cross-border FRA operations between BALTIC FRA and SEE FRA (FRACZECH).

- **Montenegro**

(1) Removal of conventional routes.

- **Morocco**

(2) Improvement of available capacity.

(3) FRA Morocco (MORFRA) - Casablanca FRA area, Step 1a.

(4) Radar approach Fes (GMFF) airport.

(5) New TMA Nador (GMMW) airport.

(6) New TMA Tetouan (GMTN) airport.

(7) Single CDR Category (SCC) - Morocco.

(8) New sectorisation project in GMMMCTA.

(9) PBN RNP procedures in GMTN.

(10) RAD promulgation in ENR 1.10.

- **Norway**

(1) AMC-areas Northern Norway.

(1) MØRE TMA airspace re-organization.

(2) Low level Helicopter routes Norway.

- **Poland**

(1) New TMA Rzeszów entry/exit points and new SIDs/STARs procedures connected to new points.

(2) FAB DK-SE - Baltic FAB Cross Border FRA.

- **Portugal**

(1) STAR redesignation.

(2) Lisboa TMA Point Merge System.

(3) New SID and STAR structure in Cascais.

(4) FRA AIP Publication.

- **Republic of North Macedonia**

(1) TMA extension.

- **Republic of Serbia**

(1) Conventional routes – removal.

(2) IFP implementation at LYUZ - Phase 1.

(3) Consolidation of Beograd ACC sectorisation.

(4) IFP implementation at LYUZ - Phase 2.

- **Romania**

(1) Implementation of new 5LNC point: EFJAS.

- **Slovak Republic**

(1) Conventional routes - removal.

- **Spain**

(1) SUR sector split - Sevilla ACC.

- **Switzerland**

(1) Introduction of Minimum Obstacle Clearance Altitudes (MOCA) in AIP Switzerland ENR 3.

(2) Modification of Area Designators.

- **Türkiye**

(1) New ATS route in Istanbul FIR.

(2) Çukurova Regional Airport (LTDB).

- **United Kingdom**

(1) Edinburgh Airport RNAV.

(2) Gatwick RNAV Substitution - Part 2.

(3) Heathrow RNAV Substitution - Part 2.

(4) London Healthcare Bridge (Trial).

(5) PINs - King’s College Hospital, London.

(6) PINs - Royal Sussex County Hospital, Brighton.

(7) PINs - William Harvey Hospital, Ashford.

(8) PINs - Wiltshire Air Ambulance, Outmarsh.

(9) RAF Fairford RPAS Operations (High Altitude).

(10) RNP Procedures - Redhill Aerodrome.

(11) Shetland Space Centre Satellite Vertical Launch Safety Area.

(12) Special Use Airspace for RPAS Diversion (Trial).

(13) Flight Planning Improvements London AC / Maastricht UAC.

(14) Amendment of UK Danger Area IDs.

(15) Future Combat Airspace (Permanent).

- **United Kingdom & MUAC:**

(1) Operational Service Enhancements (OSEP) Project- OD8.

- **United Kingdom & Ireland:**

(1) Operational Service Enhancements Project- OD10 Swanwick ACC Lakes Sectors

References

[1] *EUROCONTROL Air Navigation Inter-site Acronym List (AIRIAL)* *http://www.eurocontrol.int/airial/definitionListInit.do?skipLogon=true&glossaryUid=AIRIAL*

[2] *Reporting Assumptions and Descriptions Document* *https://www.eurocontrol.int/publication/reporting-assumptions-and-descriptions*

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