KPI

Annual Report 2025

ACDM GERMANY

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Content

1 Management Summary

Introduction

This report covers a set of general Key Performance Indicators (KPIs) that were deemed by the Editorial Board to be comparable among the A-CDM airports Munich, Frankfurt, Düsseldorf, Berlin, Stuttgart, and Hamburg.

The KPIs contained within this report serve to continuously monitor the A-CDM process and usually portray only individual parts of the overall process.

The KPIs allow a measurement of A-CDM effects and steering of the process. They are the basis for local reporting at the individual airports. The KPIs were defined using input from EUROCONTROL's A-CDM Implementation Manual, experiences of the local German Airport CDM airports, as well as local and future necessities.

The report is intended to provide a general overview of KPI trends at the A-CDM airports, as well as serve as basis for decisions regarding adjustments to or steering of the A-CDM process.

This report describes the experiences, measurements and results of the calendar year 2025. It utilises regular evaluations and measurements on a monthly basis, the conclusions that are drawn address points that were mutually agreed by *ACDM Germany* which are reflected in the KPI Concept.

Summary of Results and Tendencies

The majority of German A-CDM airports recorded moderate increases in air traffic movements from spring 2025 onwards. Frankfurt and Munich experienced somewhat higher growth rates of 3 to 5 percent compared with the other airports covered in this report. Despite this modest positive traffic development, traffic volumes at all German A-CDM airports remained significantly below the 2019 levels recorded before the COVID-19 pandemic. Compared with other European countries and with overall air traffic development across Europe, where 2025 traffic volumes clearly exceeded 2019 levels, traffic growth in Germany remained considerably weaker.

In contrast to the overall traffic growth observed across Europe, the proportion of regulated flights declined overall. Particularly during the summer months, the number of regulated flights remained well above the levels recorded during the heavily congested years of 2018 and 2019. Nevertheless, the downward trend in airspace flow management measures was noticeable and was also reflected at the German A-CDM airports, with the exception of Stuttgart Airport.

This development appears to have been supported in particular by the positive effects of stabilization measures aimed at improving resource availability at air navigation service providers and airports. However, the ongoing war between Russia and Ukraine continued to place additional pressure on certain airspace sectors due to traffic flows being rerouted around the conflict area. Capacity constraints in the Balearic region and other parts of Europe also contributed to the fact that the proportion of regulated flights remained significantly above the levels recorded during the traffic-intensive pre-pandemic years of 2018 and 2019.

A slight improvement was also observed in the volatility of CTOT updates in 2025 compared with the previous year. However, during the summer months of 2025, CTOT volatility remained substantially higher than in the pre-pandemic years of 2018 and 2019, and a significant number of departures continued to be affected by 20 or more CTOT updates. As a result, airport planning processes throughout 2025 continued to be adversely affected by elevated CTOT volatility, creating ongoing challenges for airport resource planning.

At the German A-CDM airports, further improvements and more stable airport processes also contributed to reducing the impact of airports on the overall network. On the one hand, the measures initiated and implemented during the previous two years to stabilize the turnaround process proved effective. On the other hand, the moderate increase in traffic volumes at German airports supported this positive development.

As a result, most German A-CDM airports achieved measurable improvements in overall performance, punctuality, and TOBT performance in 2025 compared with the previous two years. Owing to the strong focus placed on TOBT quality, all six A-CDM airports achieved TOBT performance levels that in some cases significantly exceeded the pre-crisis benchmark recorded in 2019.

The existing local reporting systems and the performance monitoring of the A-CDM process proved to be an important prerequisite for the post-pandemic recovery. They enabled stakeholders to identify that accurate target time predictions, which are essential for the efficient allocation of resources, had been negatively affected because traffic volumes and resource availability were not always in balance.

As a consequence, a number of targeted projects have been launched and implemented since 2023 with the aim of progressively improving the predictability of the turnaround process. Examples include the introduction of Ground Coordination in Munich, the implementation of Turnaround Management in Frankfurt, targeted communication initiatives, documentation and training programmes for ground handling agents, the introduction of automatically triggered TOBT updates based on boarding commencement by Lufthansa in Frankfurt and Munich, and the integration of stand camera images into Frankfurt Airport's CSA tool.

The effectiveness of these measures is clearly reflected in the performance indicator trends presented in this report.

2 German Harmonisation Initiative A-CDM Germany

2.1 European A-CDM Concept

Airport Collaborative Decision Making (A-CDM) is the operational approach (idea/concept/process) to achieving an optimal turnaround process at airports. A-CDM covers the period from EOBT -3 h until take-off. It is a continuous process beginning with processing of the ATC flight plan, via landing of the inbound flight, the turnaround process on the ground, to departure.

By exchanging estimated landing and take-off times between the A-CDM airports and Network Management Operations Centre (NMOC), airports can be further integrated into the European ATM Network EATMN.

A-CDM improves operational collaboration between the partners:

- Airport Operator,
- Aircraft Operators,
- Handling Agencies,
- Ground Handling Agencies,
- Air Navigation Service Provider, and
- European Air Traffic Flow Management (NMOC).

A-CDM in Germany is based upon the European A-CDM spirit, the Community Specification of A-CDM, as well as recommendations by the German Harmonisation Initiative *A-CDM Germany*.

A-CDM aims to optimise utilisation of available capacity and operational resources at airports and within European airspace through high-quality target times and efficiency increases in the individual steps of the turnaround process.

2.2 German Harmonisation Initiative for A-CDM

European A-CDM fundamentally relies on Community Specification EN 303212. However, development of A-CDM in Germany has shown a need of harmonisation to a level of detail that is beyond the Specification's scope.
The A-CDM partners recognised this need and founded the German Harmonisation Initiative *A-CDM Germany*. Collaboration within the Initiative is determined by a Letter of Intent that was signed by all partners.

Partners within *A-CDM Germany* are currently:

- Deutsche Flugsicherung (DFS)
- Munich Airport (FMG)
- Frankfurt Airport (Fraport)
- Berlin Airport (FBB)
- Düsseldorf Airport (FDG)
- Stuttgart Airport (FSG)
- Hamburg Airport (FHG)
- Leipzig/Halle Airport (FLHG)

Leipzig/Halle Airport has commenced an Airport CDM project and is therefore already a member of *A-CDM Germany*, however implementation is currently paused. Therefore, Leipzig/Halle is not shown in the following chapters.

A-CDM Germany's goals are, among others:

- Exchange of information and best practices between the various A-CDM airports,
- Common understanding of A-CDM in Germany and common representation towards international partners (Eurocontrol, EU, ICAO, IATA)
- Harmonisation in the interest of partners and customers ("one face to the customer")
- Best Practices developed within *A-CDM Germany* can be provided to other European A-CDM projects and working groups to advance harmonisation.

Creation and coordination of harmonised procedures and documentations are achieved within *A-CDM Germany's* working groups and regular harmonisation meetings.

3 Purpose of the Report

This document shows A-CDM KPIs that are generally comparable across A-CDM airports in Germany. KPIs fit for inclusion in this report were selected by a working group with participation of all A-CDM airports as well as DFS. The group also defined required data to be gathered and calculation rules.

This report is not intended to replace local KPIs, nor does it pre-empt local KPI reporting routines. It is designed as a baseline to which local KPI concepts and reports can add additional indicators or even measure the same KPIs using different criteria.

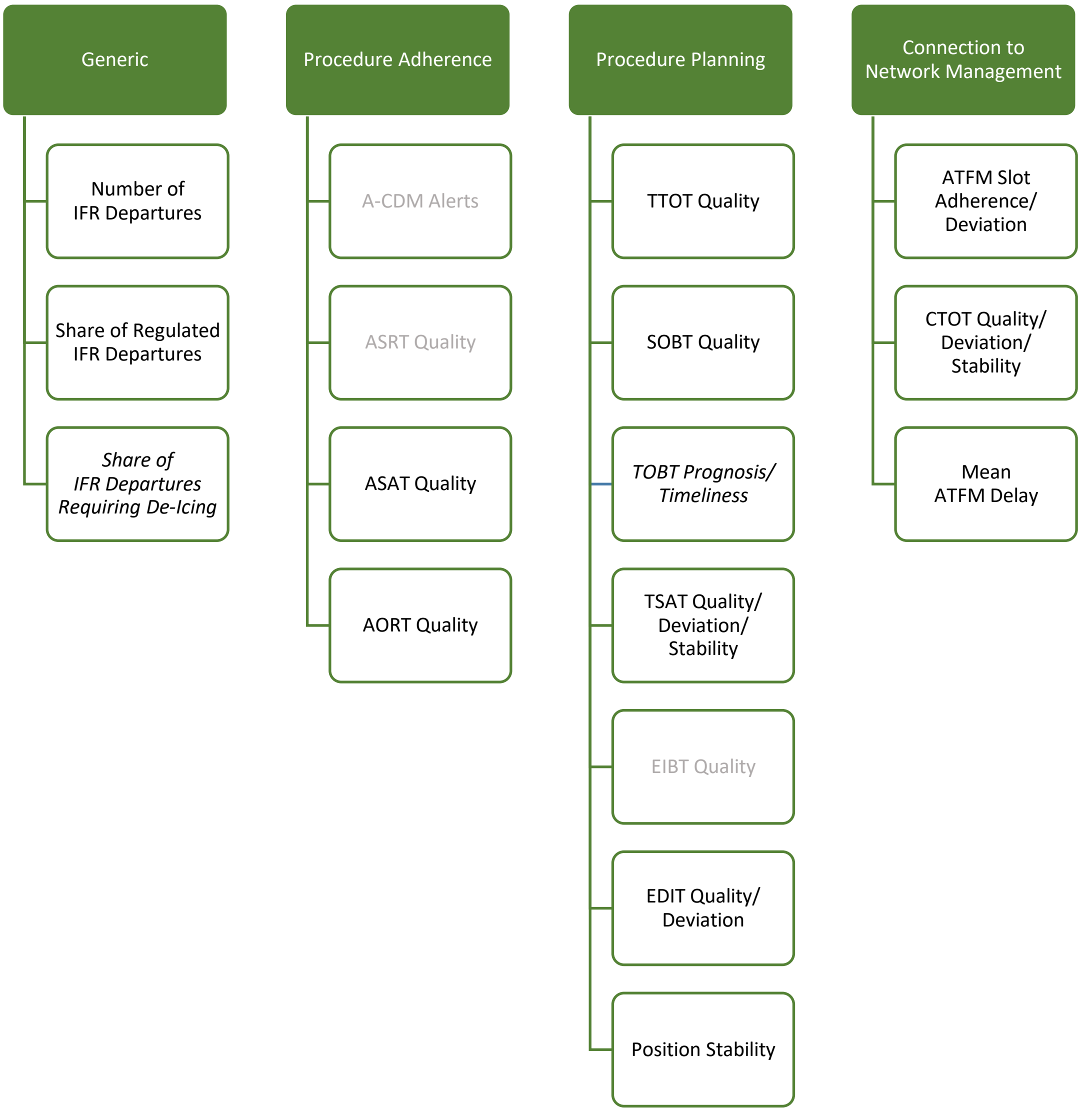
The common reporting that serves as basis for the KPIs contained within this report provide A-CDM airports with the opportunity of highlighting changes and developments, recognising potential for improvements, and developing harmonised A-CDM subprocesses.

Further details regarding the A-CDM process and its specifics at the individual airports are described within the local A-CDM procedure descriptions and publications.

4 Results

In order to achieve the local operational and network benefits associated with A-CDM, the quality of target times and process adherence are essential. For this reason, commonly available indicators from the following categories were selected:

- Generic Traffic Numbers
- Procedure Adherence of A-CDM Partners
- Procedure Planning
- Connection to Network Management



The KPIs coloured in light grey are not yet part of this report as the necessary historic data is not yet available at all German A-CDM airports. As soon as this changes, they will be included in a subsequent Annual KPI Report.

4.1 Generic

4.1.1 Number of IFR Departures

Description
Number of IFR departures within the calendar year as well as the previous calendar year and 2019 reference values

Goal
Show the amount and trend of traffic

Charts

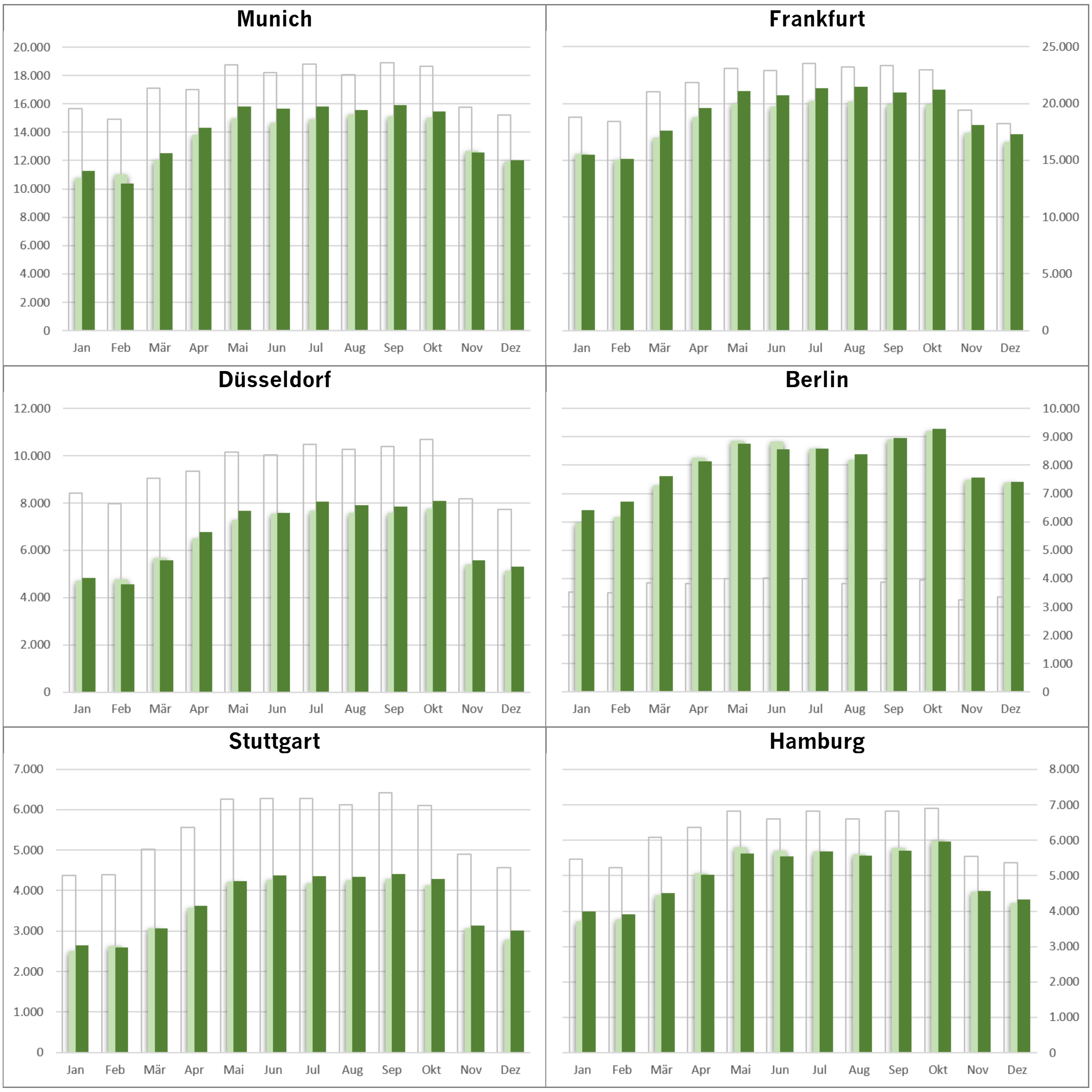


Fig. 1: Number of IFR departures, previous year (light green) and 2019 (white)

Conclusion
In 2025, the combined share of total departures in Germany handled by the six German A-CDM airports amounted to 71.1%, remaining at the same level as in the previous year.

With the exception of Berlin and Hamburg airports, the German A-CDM airports recorded slight increases in air traffic movements from spring 2025 onwards. Frankfurt and Munich experienced somewhat stronger growth of 3 to 5%, while Düsseldorf and Stuttgart recorded average growth rates of 2 to 3% in terms of flight movements.

Despite the moderately positive traffic development at these four airports, traffic volumes at all German A-CDM airports remained significantly below the levels recorded in 2019, prior to the COVID-19 pandemic. Compared with other European countries, where many airports exceeded their 2019 traffic volumes during 2025, overall traffic growth at German airports remained considerably weaker.

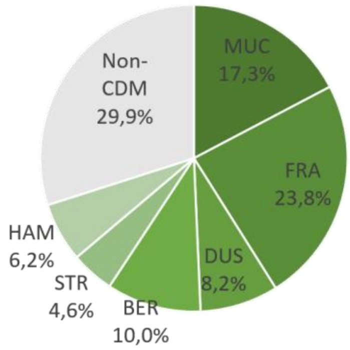


Fig. 2: Share of total departures originating from A-CDM airports in Germany

4.1.2 Share of Regulated IFR Departures

Description
Share of IFR departures with ATFM slot (CTOT), in %

Goal
Illustrate the monthly share of IFR departures that were subject to an air traffic flow measure by NMOC.

Charts

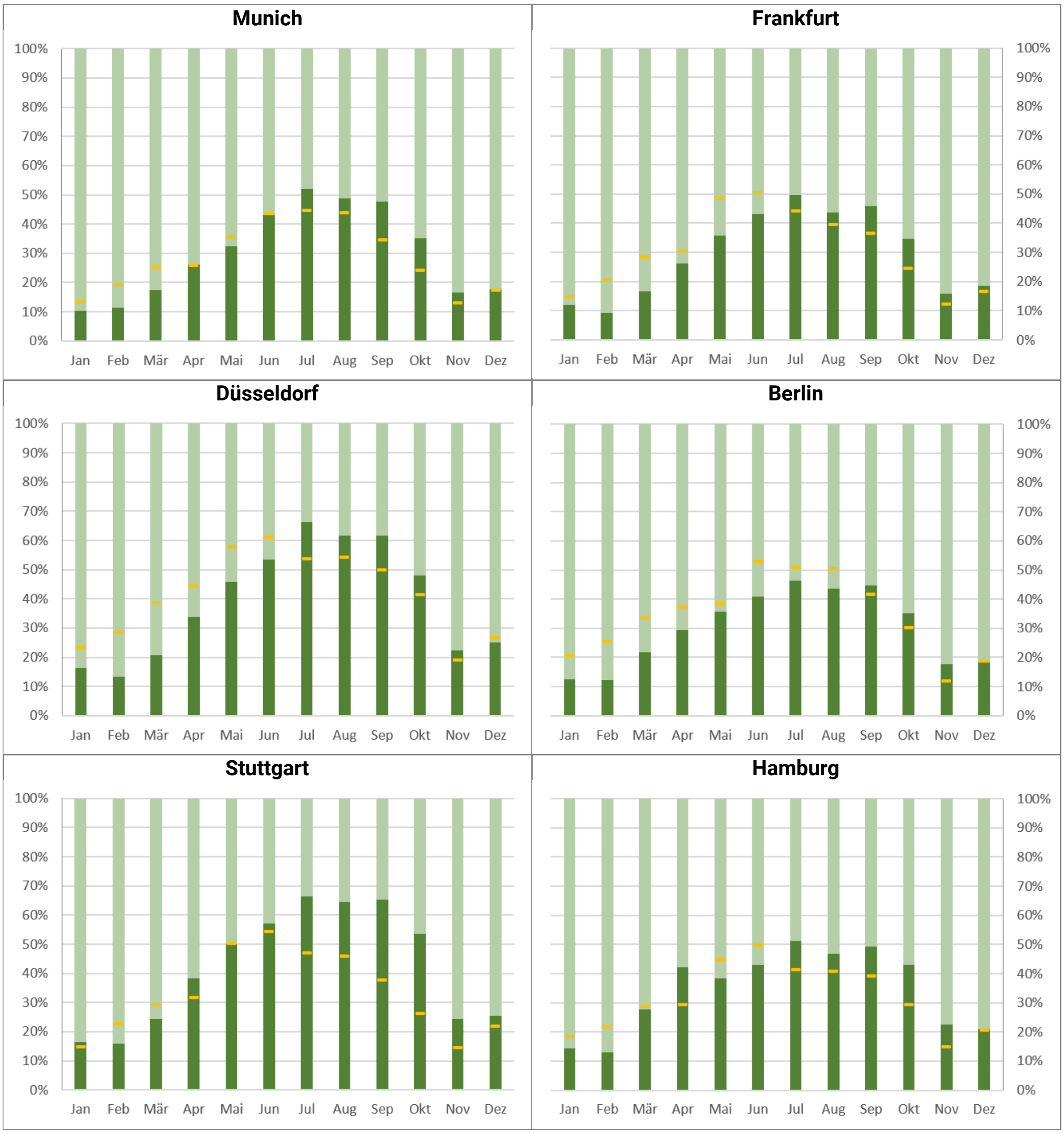


Fig. 3: Share of unregulated (light green) and regulated (dark green) IFR departures, and 2019 share (yellow)

Conclusion

Even though pre-pandemic flight movement levels had still not been reached in Germany by 2025, air traffic growth across Europe continued steadily, resulting in overall European traffic volumes, both in terms of flights and passengers, exceeding 2019 levels once again.

In contrast to this increase in flight movements across Europe, the overall proportion of regulated flights declined. While the number of regulated flights during the summer months remained significantly above the levels recorded in the highly congested years of 2018 and 2019, the downward trend in airspace flow management measures was nevertheless clearly noticeable. This trend was also observed at the German A-CDM airports, with the exception of Stuttgart Airport.

In particular, the positive effects of stabilization measures aimed at improving resource availability at air navigation service providers and airports appear to have contributed to this development. However, the ongoing war between Russia and Ukraine, which continues to place additional pressure on certain airspace sectors due to traffic flows being rerouted around the conflict area, together with capacity constraints in the Balearic region and other parts of Europe, meant that regulation volumes still remained significantly above the levels recorded during the high-traffic years prior to the COVID-19 pandemic.

Consistent with the general decline in regulation volumes, a slight reduction in the number of CTOT updates was also observed, resulting in a modest overall improvement in CTOT volatility (see Section 4.4.2). Nevertheless, this should not obscure the fact that the number of CTOT updates affecting individual flights remains at a very high level and continues to pose significant challenges for resource planning at heavily affected airports, particularly Frankfurt.

4.1.3 Share of IFR Departures Requiring De-Icing

Description
Share of IFR departures that required aircraft de-icing, in %

Goal
This KPI serves only as context information for other KPIs, e.g. TSAT Quality.

Charts

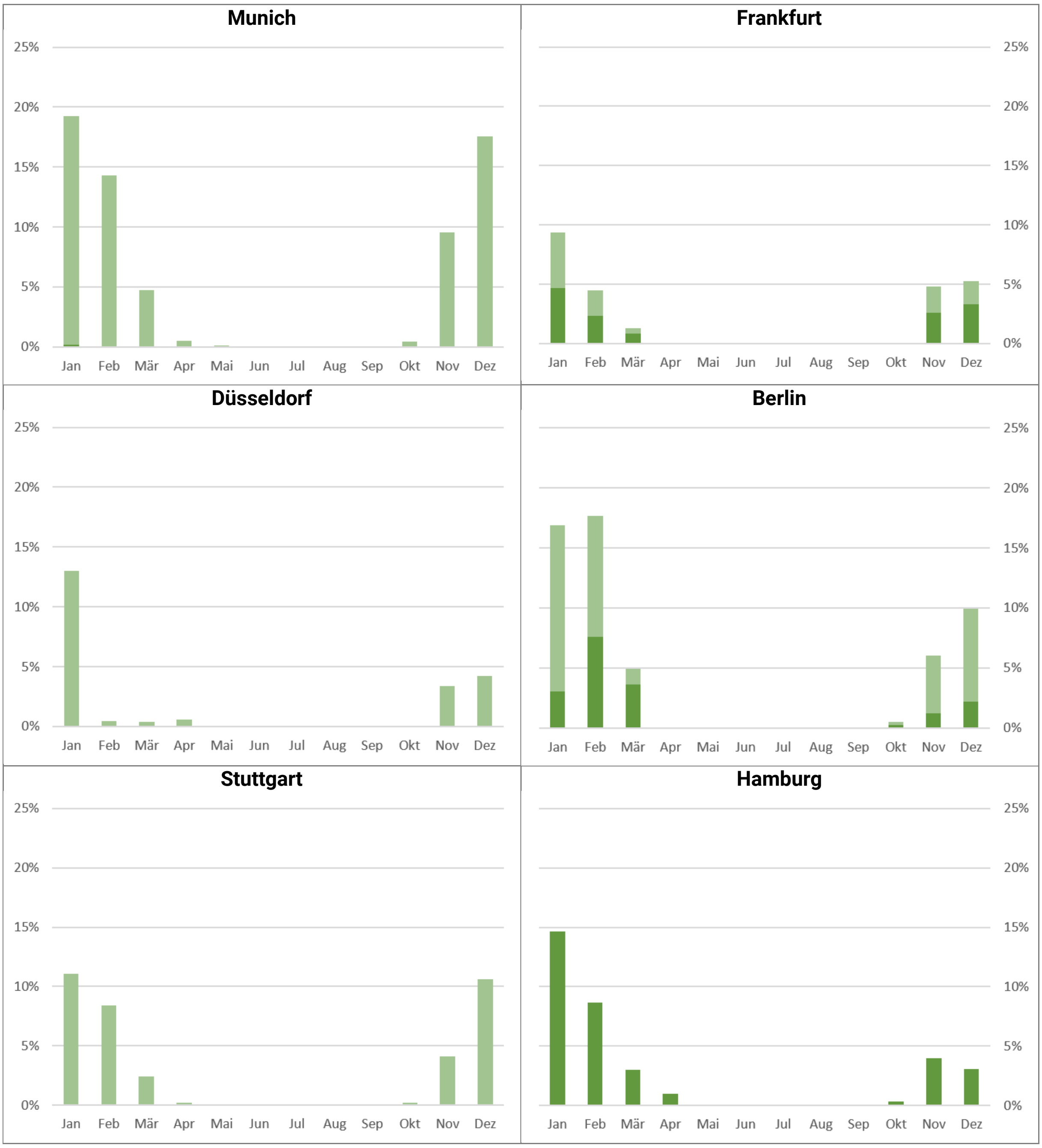


Fig. 4: Share of IFR departures requiring aircraft de-icing on stand (dark green) and remotely (light green)

Most airports only do remote de-icing, i.e. on designated de-icing areas. In this case, de-icing takes place after TSAT.
In the case of on-stand de-icing the flights are de-iced on their parking stands, i.e. after TOBT but before TSAT. Planned de-icing begin and duration are included in the TSAT calculation.

4.2 Procedure Adherence

4.2.1 ASAT Quality

Description
Share of IFR departures that received start-up approval (ASAT) within TSAT ± 5 min via radio, in %

Goal
Measure procedure adherence of Air Traffic Control (Tower)

Charts

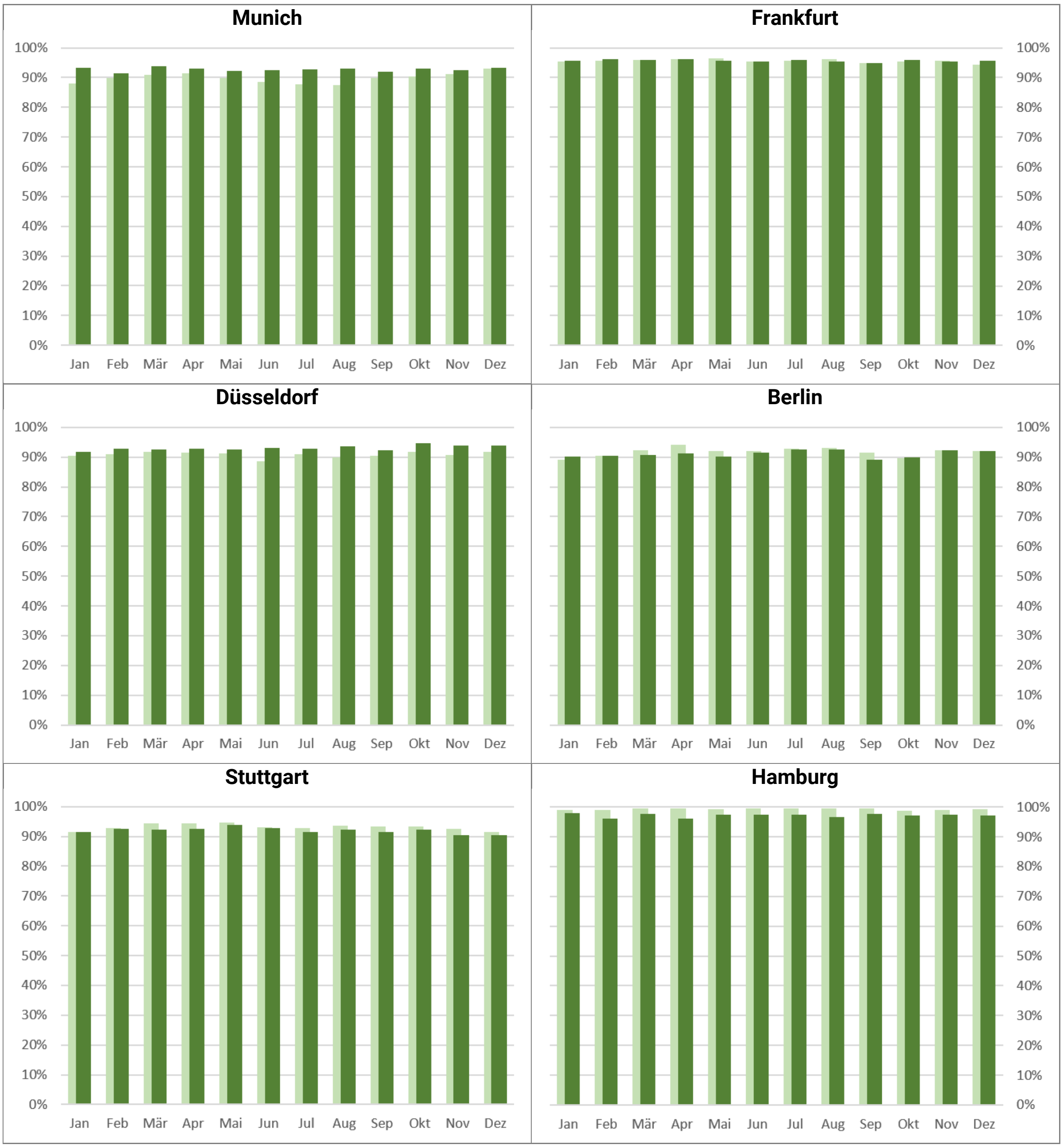


Fig. 5: Share of IFR departures that received start-up approval within TSAT ± 5 min via radio, compared to the previous year (light green)

Conclusion
A general improvement in ASAT quality was observed at the major airports of Munich and Düsseldorf in 2025 compared with 2024. This development can be attributed to greater process stability resulting from improvements in the availability of ground handling personnel and resources. At the other airports, performance remained largely unchanged.

This positive trend has contributed to all German A-CDM airports achieving a quality level of 90% or higher for the first time since the initial publication of this report in 2018.

4.2.2 AORT Quality

Description
Share of IFR departures that asked for their off-block clearance (AORT) within the window of ASAT + 5 min (start-up via radio) or TSAT ± 5 min (start-up via datalink), in %

Goal
Measure procedure adherence of the Flight Crew

Charts

Fig. 6: Share of IFR departures with conformant AORT (green) compared to the previous year (grey), radio in darker shade, datalink in lighter shade

Conclusion
AORT quality is shown only for flights' final off-block requests that resulted in off-block clearance. Denied off-block requests, for instance after exceeding ASAT time tolerance, are not considered.

At Frankfurt, Düsseldorf and Stuttgart Airports, it can be observed that AORT quality is higher when using radio procedures than when using DCL (Data Link Clearance). DCL clearances are often requested before the completion of ground handling activities, which may result in less reliable compliance with the TSAT window. By contrast, when using radio communication, start-up clearance is typically requested only after ground handling has been completed, leading to a more timely Off-Block Request.

In addition, start-up requests submitted prematurely via radio are generally rejected by Air Traffic Control, thereby reducing the likelihood of an Off-Block Request being made outside the TSAT window. As a result, radio-based procedures tend to support better adherence to the TSAT window and contribute to higher AORT quality.

4.3 Procedure Planning

4.3.1 TTOT Quality

Description
Progression of the difference between current E/TOBT + current EXOT to ATOT (in minutes), in 5-minute intervals from 120 minutes prior ATOT.

Goal
Determination of TTOT prediction quality as reported to the Network Manager for unregulated flights.

Charts

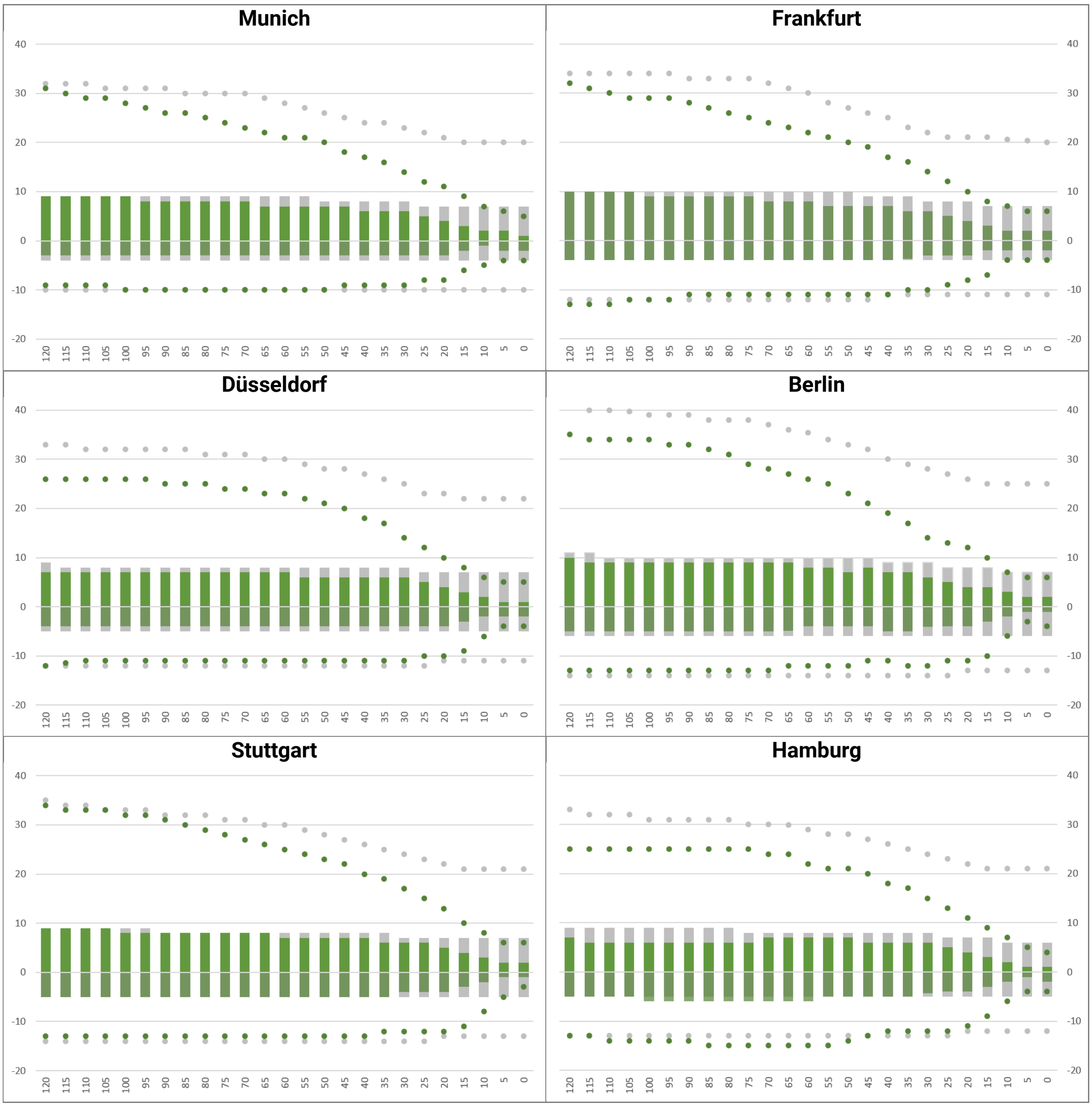


Fig. 7: Median (columns) and 90th percentile (dots) differences between E/TTOT and ATOT in minutes with a given lead time in minutes prior ATOT, split by flights with E/TTOT < ATOT (positive Y values) and E/TTOT > ATOT (negative Y values). ETOT in grey, TTOT in green.

Conclusion

Generally, every flight has a predicted take-off time based upon the ATC FPL's EOBT (ETOT). A-CDM airports additionally provide a prediction based upon the locally updated TOBT and the current departure capacity (TTOT). Both values are available to the Network Manager.

The above charts show that predictions based on local A-CDM data have a lower deviation from actual take-off times than those based on ATC FPLs only. From 90 to 50 minutes before departure, this improved quality is most pronounced because both TOBT and TSAT process are factored in at this stage.

Improved take-off predictions allow a more accurate traffic prognosis for the purpose of Air Traffic Flow Management and a more efficient use of airspace capacity.

4.3.2 SOBT Quality

Description
Monthly share of flights whose first EOBT provided in an ATC flight plan is equal to the SOBT agreed with the Airport Coordinator, in %

Goal
Difference between seasonal planning vs. first planning on the day of operations

Charts

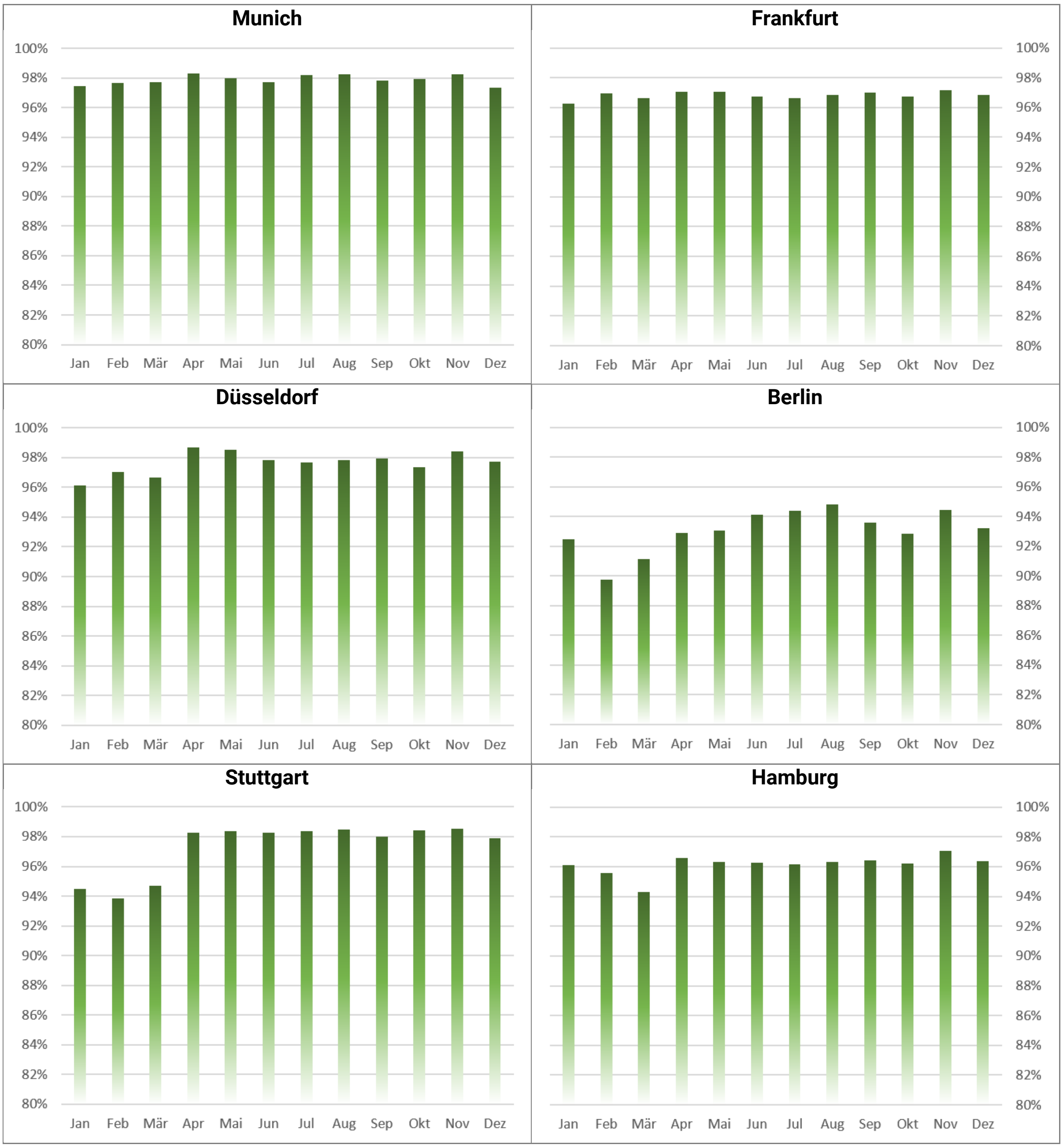


Fig. 8: Monthly share of IFR departures where first EOBT = SOBT

Conclusion

A high SOBT quality shows reliability of the strategic planning processes (seasonal planning) compared to the actual flight intention as expressed by the ATC flight plan. Significant differences between flight planning and slot coordination are being monitored and investigated by the German Airport Coordinator's Slot Performance Monitoring. The development of SOBT quality showed a positive trend at all A-CDM airports compared with the previous year 2024. This improvement can be attributed to the stabilization of airport processes and the associated enhancement of overall airport performance.

4.3.3 TOBT Prognosis and Timeliness

TOBT Prognosis

Description
Difference of TOBT and its input time. A score of 100% is granted if the difference is at least 10 minutes. Lower differences result in a linear score reduction which reaches 0% if the difference is 5 minutes or less.

Goal
Scoring the amount of foresight that goes into TOBT updates

Charts

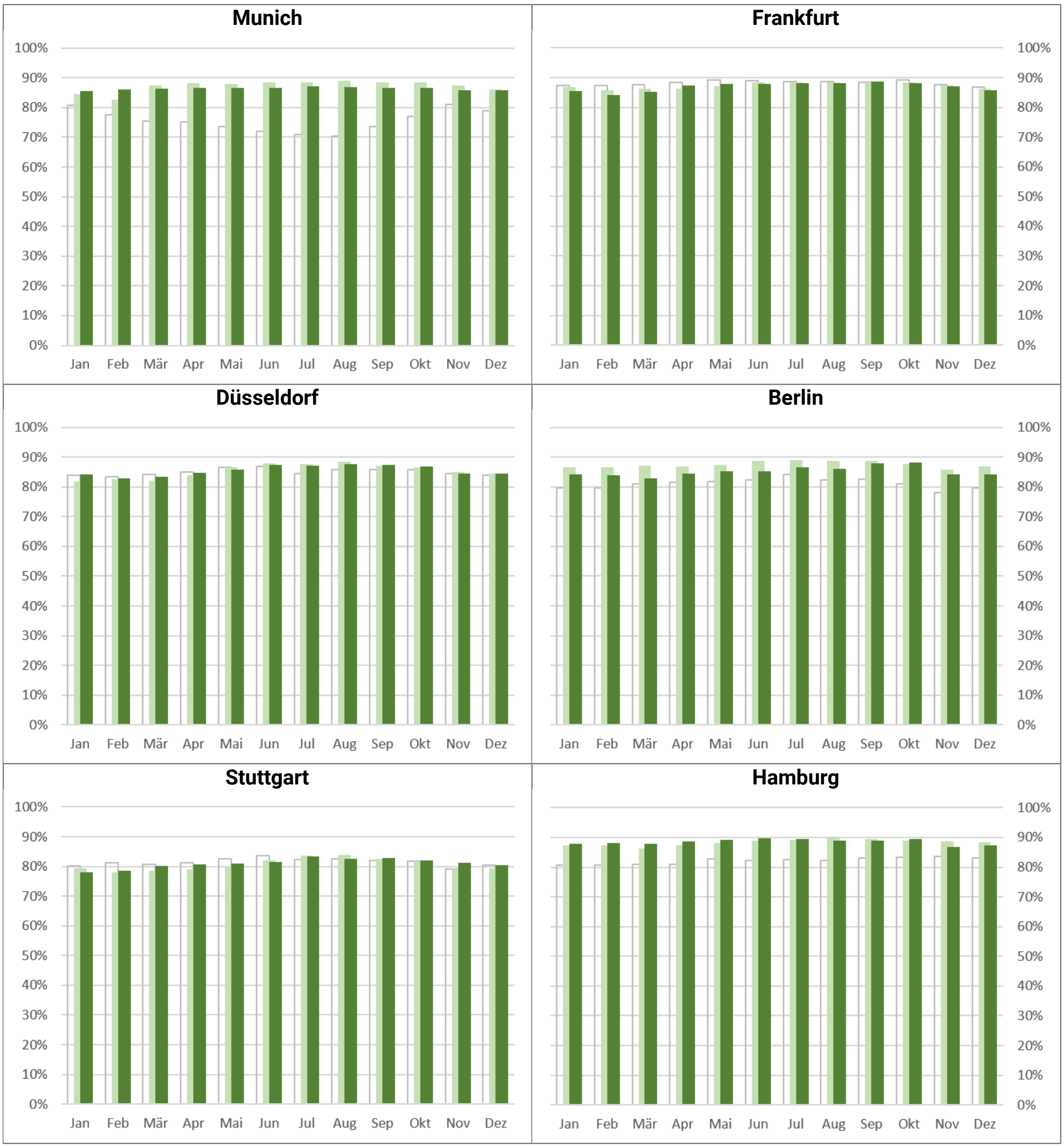


Fig. 9: Average Prognosis score of all TOBT updates per month compared to the same month in the previous year (light green) and 2019 (white).

TOBT Timeliness

Description
Difference of current TOBT and input time of a new TOBT. A score of 100% is granted if the difference is at least 10 minutes. Lower differences result in a linear score reduction which reaches 0% if the difference is 5 minutes or less.

Goal
Scoring how close to the existing TOBT an update is provided

Charts

Fig. 10: Average Timeliness score of all TOBT updates per month compared to the same month in the previous year (light green) and 2019 (white).

Conclusion

The timeliness of TOBT updates has a positive impact on the planning and deployment of resources at the airport and across the network. It is therefore encouraging that, in 2025, all airports recorded improvements in the timeliness of TOBT updates during most months of the year. This positive trend has been apparent since 2024 and can be attributed to the implementation of various measures to stabilise turnaround processes, which have since taken effect. These include increases in staffing levels, the introduction of Ground Coordination in Munich, and the introduction of Turnaround Management in Frankfurt. Further measures directly supporting the quality of TOBT maintenance – such as improved communication, the TOBT animated film published by A-CDM Germany, training for ground handlers, the introduction of automatically triggered TOBT updates based on the start of boarding by Lufthansa in Frankfurt and Munich, and the display of stand camera images in Frankfurt Airport's CSA tool – have also contributed to the continuous improvements in TOBT maintenance reflected in this indicator. As a result of the strong focus on TOBT quality, all six A-CDM airports achieved TOBT performance in 2025 that was, in some cases, significantly above the pre-crisis level recorded in 2019.

At Hamburg Airport, the improvements in TOBT timeliness achieved in 2023 and 2024 were sustained and further enhanced in 2025. This development – and thus the difference compared with the lower quality levels recorded in 2019 – is attributable to the early automatic TOBT updates introduced in 2023, which continue until the inbound flight's Actual In-Block Time (AIBT). These automatic updates are made only until a TOBT has been provided by the party responsible for TOBT. The early TOBT updates are included in the calculation of the indicator and therefore have a positive effect on the indicator value for Hamburg.

4.3.4 TSAT Quality, Deviation and Stability

TSAT Quality

Description
Monthly share of last TSATs that were equal to TOBT, in %

Goal
Operational adherence to planning on the day of operations.

Charts

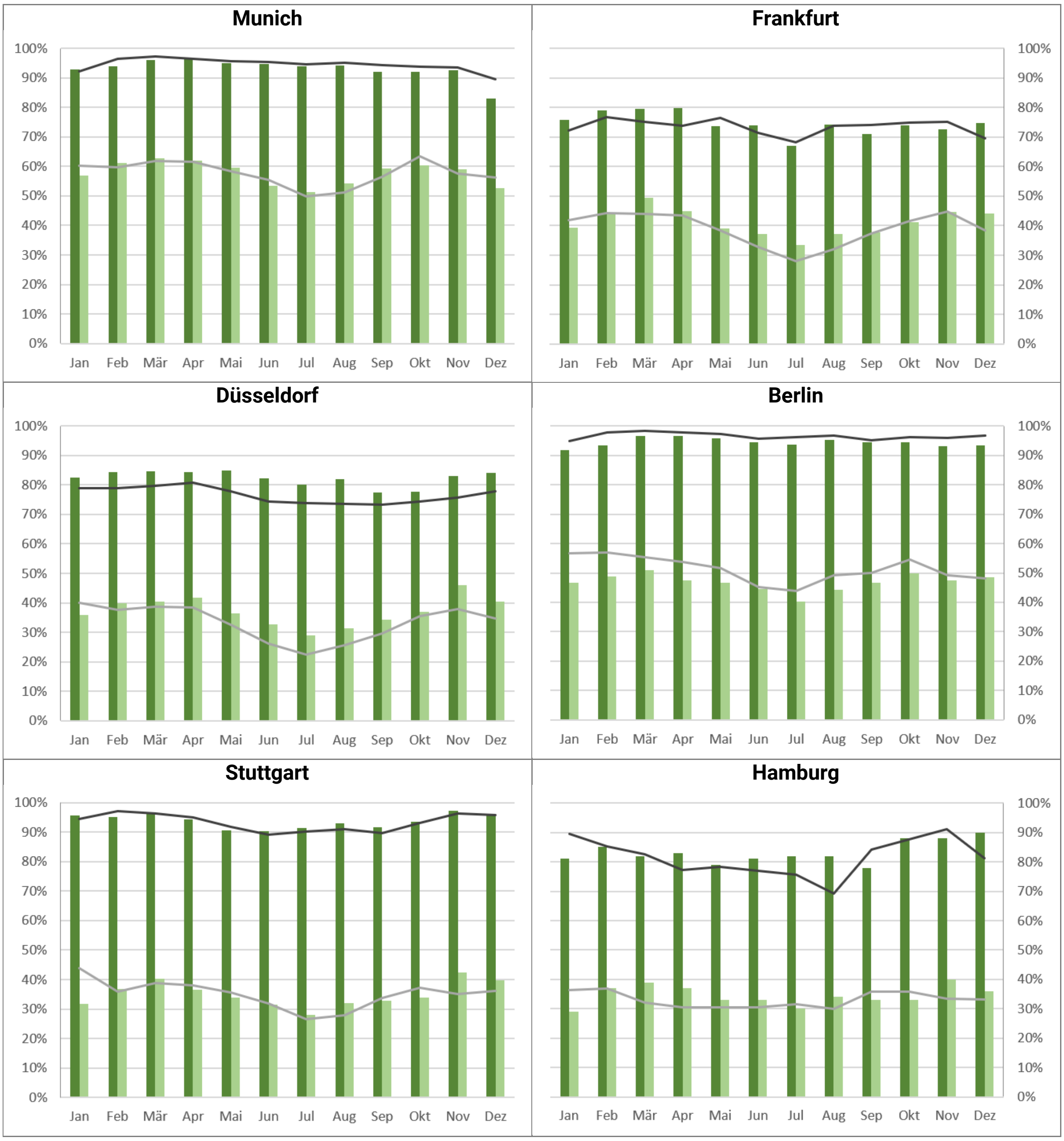


Fig. 11: Share of regulated and unregulated IFR departures (green) vs. previous year (grey) where last TSAT = TOBT. Non-regulated flights in darker shade, regulated lighter.

TSAT Deviation

Description
Monthly mean deviation of TOBT and last TSAT, in minutes

Goal
Show mean deviation of planning on day of operations versus actual operations

Charts

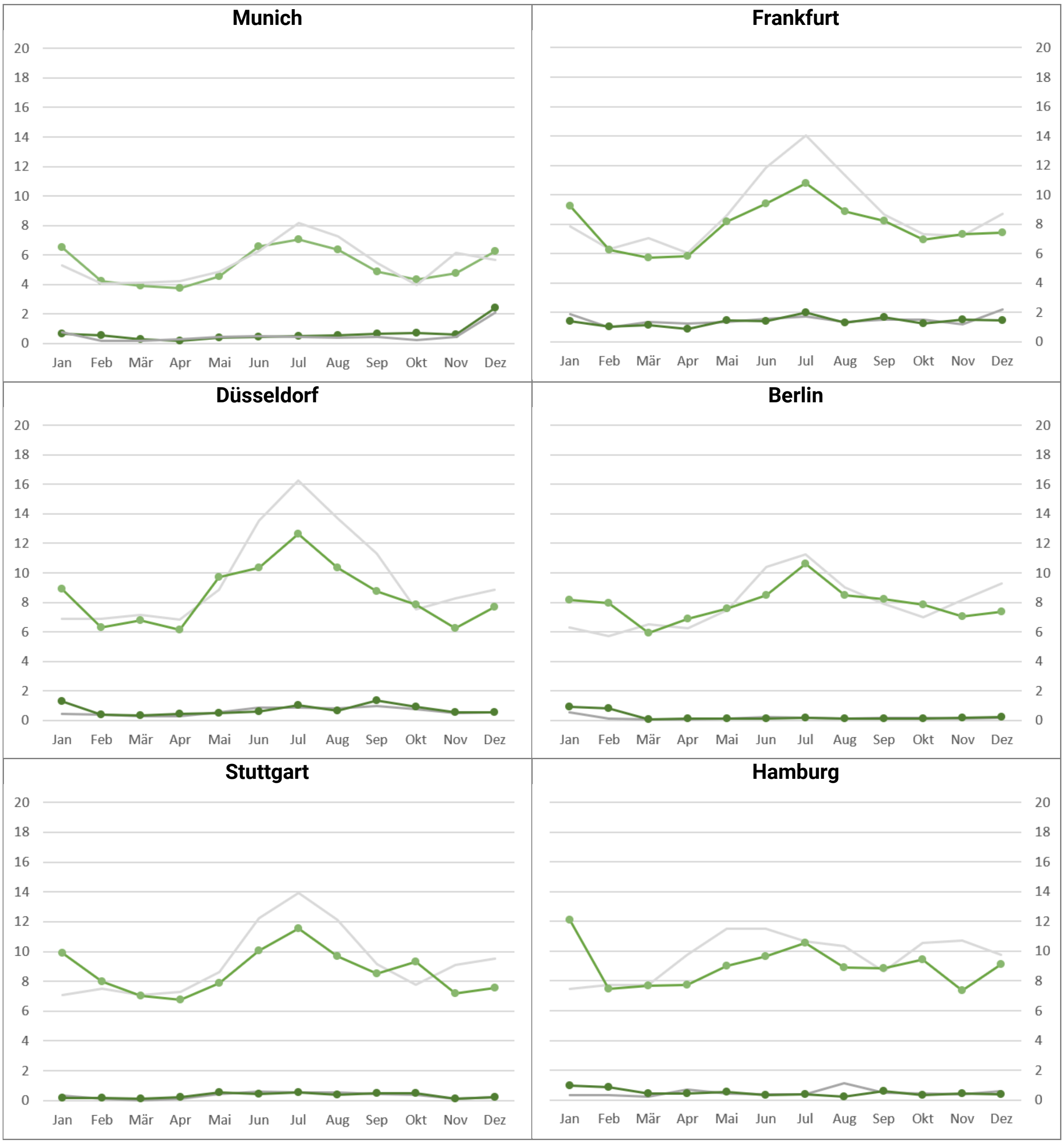


Fig. 12: Mean deviation of last TSAT and TOBT in minutes (green) vs. previous year (grey). Non-regulated flights in darker shade, regulated lighter.

TSAT Stability

Description

Number of TSAT changes from first publication (TOBT – 40 min) for non-regulated and regulated flights

Goal

Measuring TSAT stability

Charts

Fig. 13: Mean number of TSAT changes per regulated (light green) and non-regulated (dark green) flight and month without first TSAT, including deletions

Conclusion
For unregulated flights, a low TSAT quality shows that local capacity constraints have caused delays. For regulated flights, TSAT generally follows CTOT and therefore correlates more with ATFM delay.

Noticeable TSAT delays for unregulated flights occurred throughout the year at Frankfurt Airport and, to a lesser extent, at Düsseldorf Airport, with a more pronounced effect during the summer months. At Frankfurt, runway capacity is at times constrained depending on the runway operating direction (runway direction 25), while at Düsseldorf the periods during which dual-runway operations are permitted do not always coincide with the peak traffic periods of the day.

In general, regulated flights exhibited lower TSAT stability than unregulated flights because of the high number of CTOT updates. In Figure 13, lower TSAT stability is represented by a higher bar and therefore a higher average number of TSAT changes.

At Frankfurt Airport, which has the highest traffic load and is heavily affected by ATFM regulations, and at times at Munich Airport, which is also subject to extensive regulation, the opposite pattern was observed: TSAT stability for unregulated flights was periodically lower than for regulated flights. This is because CTOT updates destabilise the highly utilised pre-departure sequence as a whole. Since regulated flights are generally assigned a higher priority in the sequence than unregulated flights, the latter have to be rescheduled more frequently in response to the numerous CTOT updates affecting regulated flights.

4.3.5 EDIT Quality and Deviation

EDIT Quality

Description
Monthly share of IFR departures with on-stand de-icing or remote de-icing whose EDIT was within ADIT ±3 min, in %

Goal
Verify the reliability of estimated de-icing duration as input parameter for A-CDM

Charts

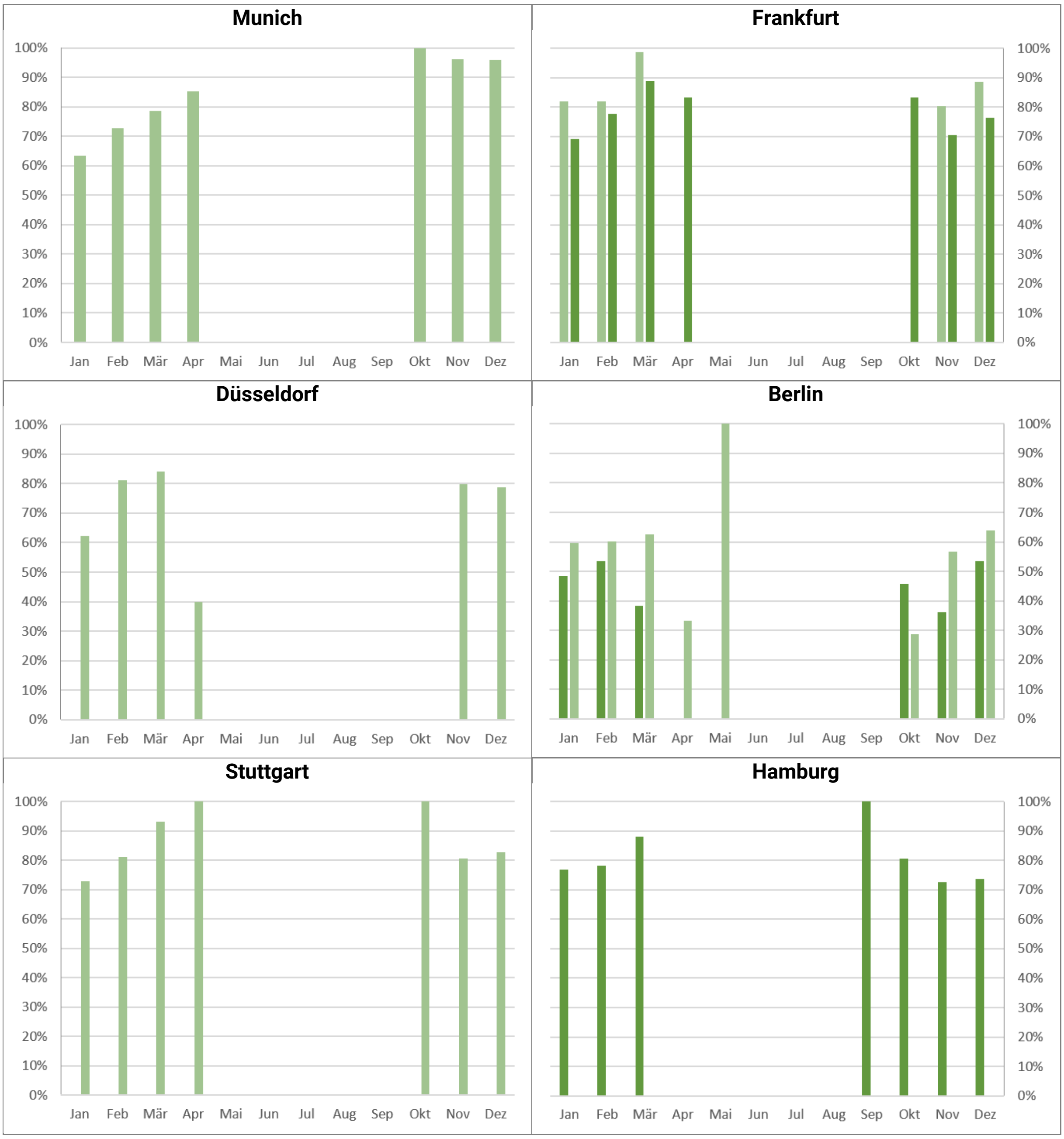


Fig. 14: Percentage of flights with on-stand (dark green) and remote de-icing (light green) where EDIT = ADIT±3 min

EDIT Deviation

Description
Monthly mean deviation of ADIT and EDIT for IFR departures with on-stand de-icing or remote de-icing in minutes per de-iced flight and airport, in minutes

Goal
Verify the accuracy of estimated de-icing duration as input parameter for A-CDM

Charts

Fig. 151: Mean deviation in minutes of EDIT and ADIT for on-stand (dark green) and remote de-icing (light green)

Conclusion
EDIT quality for remote de-icing is generally higher as the process itself is less prone to disturbances and, therefore, easier to plan. On-stand de-icing performance depends on the location of the parking stand and activities on neighbouring areas which makes accurate EDIT predictions more difficult.

4.3.6 Position Stability

Description
Share of IFR arrivals for whom no position change had to be effected from ALDT-10 min until AIBT, in %

Goal
Determine the number of short-term position changes at the airport in relation to ELDT and ALDT. Indicates the reliability of positioning information for process planning.

Charts

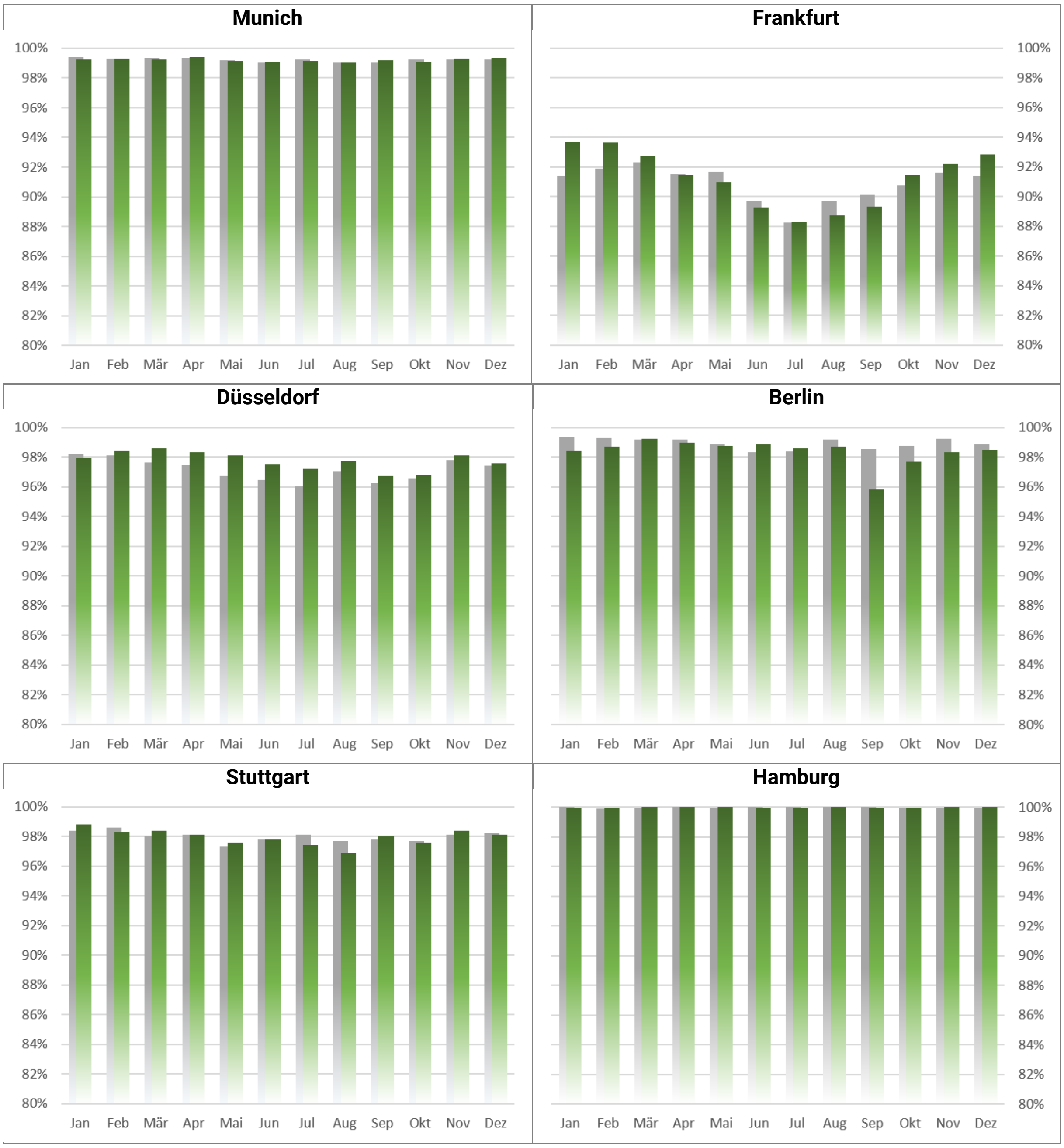


Fig. 16: Share of flights where no short-term position change was necessary, compared to previous year (grey)

Conclusion

At Frankfurt Airport, where traffic volumes are high and stand availability is constrained, position stability during the summer months was again lower than in winter, as in previous years. Limited stand and gate capacity meant that, at times during the summer, gate and stand planners could no longer reliably predict when parking positions would actually become available again. Consequently, arriving flights had to be reassigned to different parking positions more frequently at short notice.

At some airports, the slightly higher position stability recorded in certain months compared with the previous year – despite increased traffic volumes – indicates that critical subprocesses within the turnaround process were carried out more consistently and in line with schedule.

4.4 Network Management

4.4.1 ATFM Slot Adherence and Deviation

ATFM Slot Adherence

Description
Share of flights adhering or not adhering to Slot Tolerance Window prescribed by NM, in %

Goal
Measure procedure adherence of regulated flights. Nominally, ATOT should be within the Slot Tolerance Window (STW, usually CTOT -5/+10 min but may be extended in special conditions). Adjustment of the CTOT to the local TTOT within the A-CDM process improves ATFM slot adherence, pre-departure sequence and procedure adherence.
“Early” flights have an ATOT before STW begin, “late” flights have their ATOT after STW end.

Charts

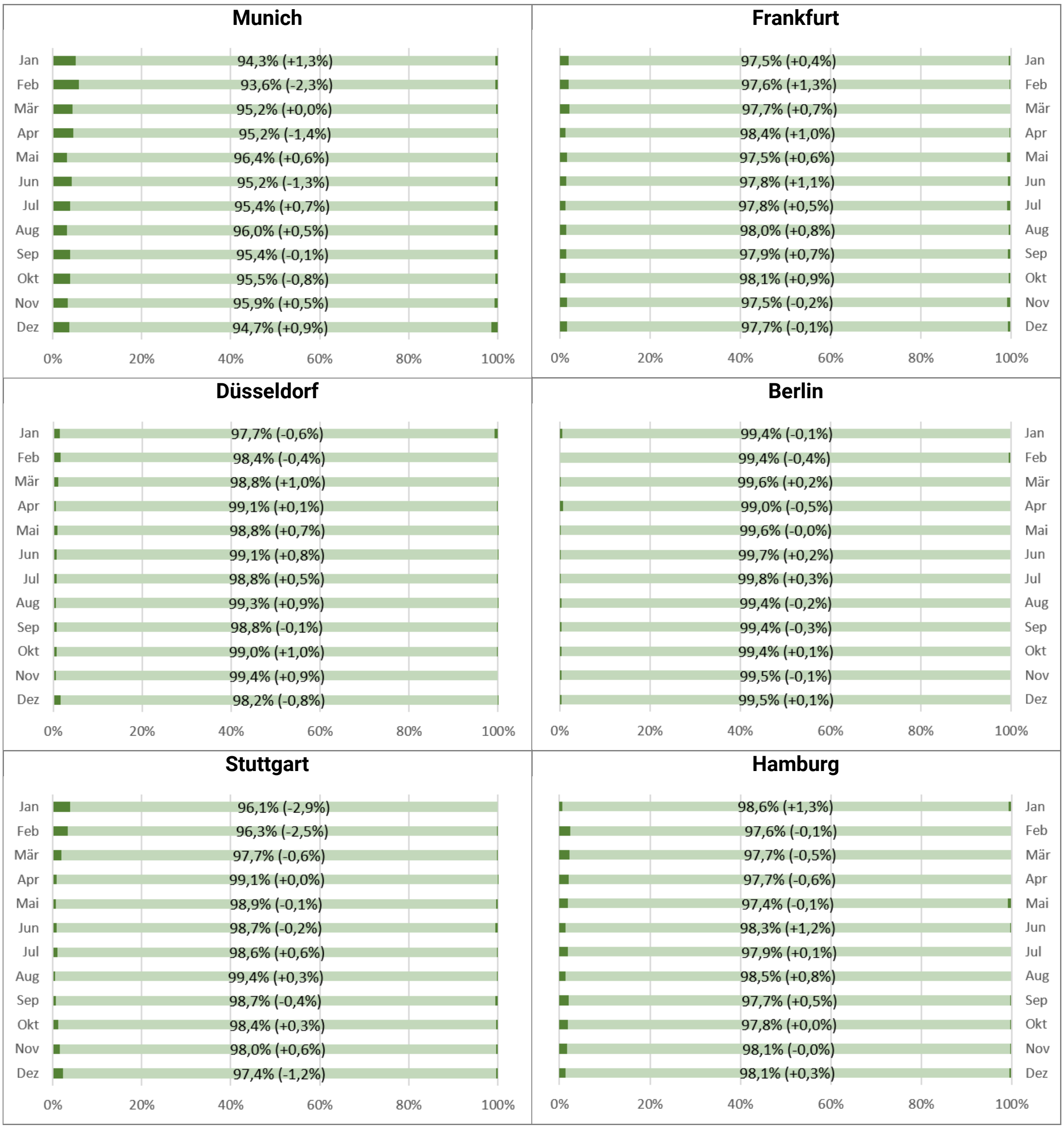


Fig. 17: Share of flights with ATOT before (dark green left), within (light green) and after (dark green right) STW, in brackets the difference to previous year's value

ATFM Slot Deviation

Description
Mean Deviation from the STW prescribed by NM, in minutes

Goal
Measure the level of slot deviations for regulated flights. This measurement counts only flights whose ATOT was outside of the Slot Tolerance Window and measures the time in minutes between ATOT and the nearest STW limit. “Early” flights have an ATOT before STW begin, “late” flights have their ATOT after STW end.

Charts

Fig. 18: Mean deviation in minutes of ATOT and STW for early (light green) and late (dark green) departures

Conclusion
Although the proportion of regulated flights declined slightly in 2025, particularly during the summer months, compared with the previous year, all six A-CDM airports achieved ATFM slot adherence in 2025 that was at least equal to, and in some cases better than, the level recorded in 2024. This result was supported by the trend towards more stable turnaround processes and the associated improvement in TOBT adherence, as well as by the only modest increase in ground-movement traffic, which remained below the levels recorded during the high-traffic pre-pandemic years. It also demonstrates the benefits of the A-CDM process, which helps align CTOTs more closely with local operational conditions and thereby improves adherence to them.

At Munich Airport, a large proportion of flights that do not adhere to their slots depart early. However, as the slot-deviation indicator shows, these departures are not significantly early. This is because regulated flights are sequenced at the runway for CTOT minus five minutes, increasing the likelihood that they will depart shortly before the start of the Slot Tolerance Window.

It is also notable that, in some months, the average ATFM slot deviation for departures taking off before their CTOT was considerably higher at Stuttgart and Hamburg airports. This is attributable to the overall high level of CTOT adherence, meaning that a small number of individual flights with large deviations have a substantial influence on this KPI. Possible causes include failures in data transmission to the Network Manager and, in some cases, exceptionally late adjustments to regulations, resulting in CTOT updates after off-block that could no longer be taken into account operationally.

4.4.2 CTOT Quality, Deviation and Stability

CTOT Quality

Description
Monthly percentage of IFR departures with CTOT = TTOT+≤5 min/+≤15 min/+>15 min at First CTOT, First TSAT Issue and AOBT

Goal
Measure suitability of network CTOT to the local A-CDM process over the progress of a turnaround

Charts

Fig. 19: Share of regulated IFR departures per month where CTOT is a maximum of 5 (dark green), 15 (green) or more than 15 minutes (light green) later than TTOT. First CTOT left, First TSAT Issue centre, AOBT right.

CTOT Deviation

Description
Mean monthly deviation CTOT-TTOT at First CTOT, First TSAT Issue and AOBT, in minutes

Goal
Measure suitability of network CTOT to the local A-CDM process over the progress of a turnaround

Charts

Fig. 20: Mean deviation CTOT-TTOT of regulated IFR departures at First CTOT (light green), First TSAT Issue (green) and AOBT (dark green)

CTOT Stability

Description
Number of CTOT updates per IFR departure with CTOT

Goal
Measure CTOT stability

Charts

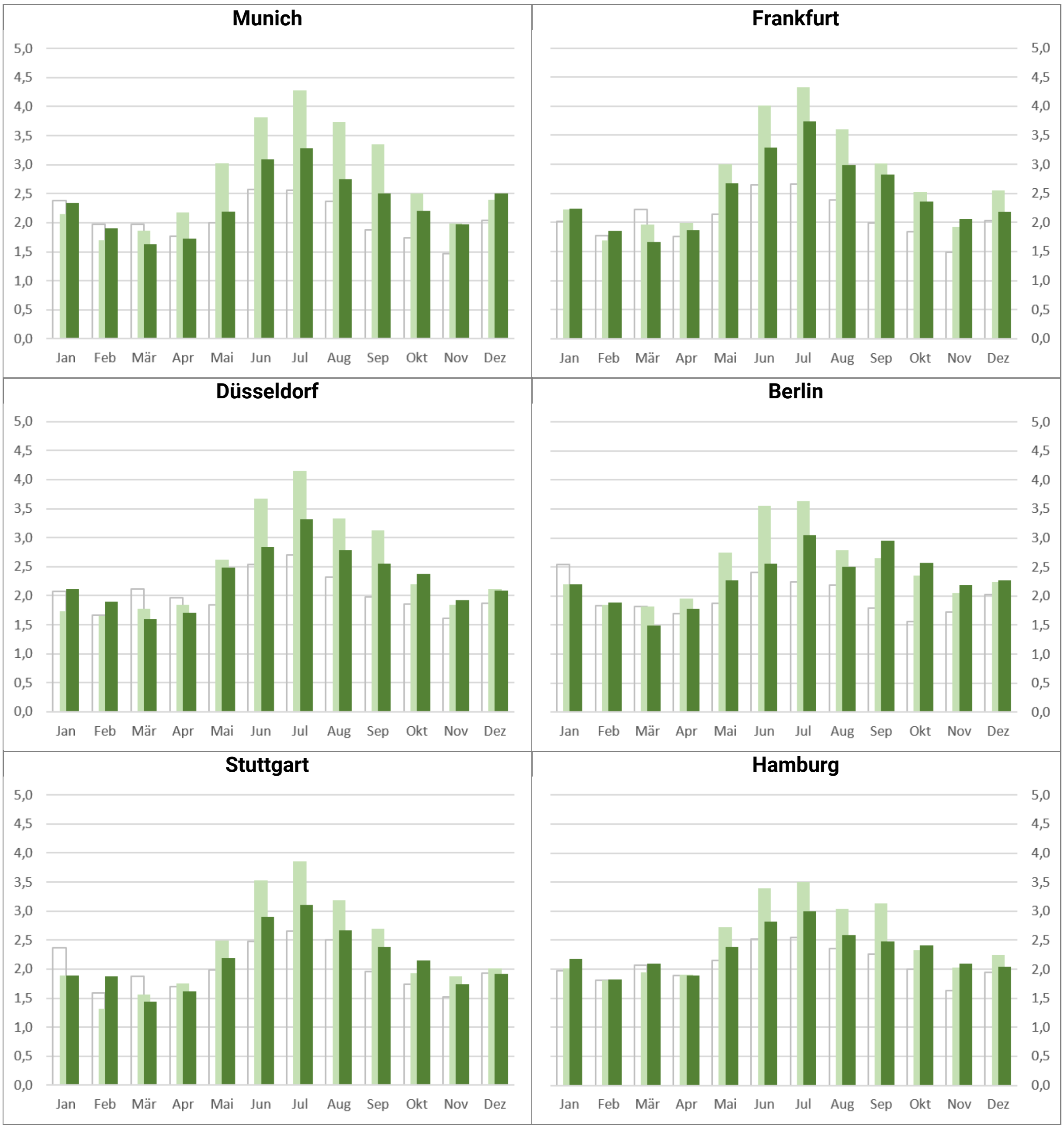


Fig. 21: Mean number of CTOT updates (without first CTOT) per flight and month, compared to previous year (light green) and 2019 (white)

Conclusion

The indicators CTOT Quality and Deviation clearly show how well the network CTOTs match the earliest possible local departure times reported by A-CDM airports. At most airports, it can be observed that there is generally an improvement in the assigned CTOTs during the A-CDM process. The initially assigned CTOTs often have a higher delay than the subsequent CTOT updates, as the Network Manager's optimization algorithm tries over time to find a CTOT that fits as closely as possible to the departure time calculated based on the TOBT. Early TOBT updates therefore increase the likelihood of keeping CTOT delays as low as possible.

At Munich Airport throughout the year, and at Düsseldorf and Stuttgart airports in individual months, CTOT quality and deviation at AOBT were slightly worse than at First TSAT Issue. At Munich Airport, one contributing factor is that, as already noted in Section 4.4.1, regulated flights are sequenced at the runway for CTOT minus five minutes. Consequently, the last TTOT transmitted before AOBT may be five minutes earlier than a previously transmitted TTOT derived from the TOBT to which the CTOT had been optimised. This can increase the deviation between the final TTOT and the CTOT at AOBT.
By contrast, late TOBT updates occur more frequently at Düsseldorf and Stuttgart airports, which can have a consequential effect on CTOT quality. The closer a TOBT update is submitted to the actual completion of ground handling, the less time the Network Manager's systems have to provide a CTOT that reflects the revised operational situation.

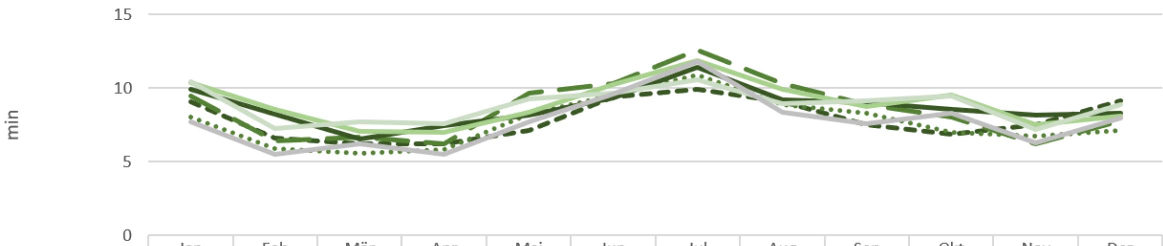
CTOT stability improved in most cases compared with the previous year, 2024. However, during the summer months it remained significantly lower than in 2019.
A high number of departures also continued to be affected by 20 or more CTOT updates. This significantly complicated airport planning processes in 2025. The high volatility affecting individual flights also had an adverse impact on unregulated departures whenever it was no longer possible to predict or plan when ground-handling resources allocated to a flight until AOBT would become available for other turnarounds.

4.4.3 Average ATFM Delay

Description
Average ATFM delay per regulated departure, in minutes

Goal
Measure the average ATFM delay for regulated departures

Chart



	Jan	Feb	Mär	Apr	Mai	Jun	Jul	Aug	Sep	Okt	Nov	Dez
MUC	9,1	6,6	6,2	6,2	7,1	9,4	9,9	9,1	7,5	6,9	7,5	9,1
FRA	8,0	5,9	5,5	5,8	8,2	9,5	10,9	8,8	8,3	7,0	6,7	7,1
DUS	9,5	6,4	6,7	6,2	9,7	10,3	12,6	10,3	8,9	8,0	6,2	7,8
BER	9,9	8,2	6,6	7,4	8,2	9,3	11,4	9,2	9,0	8,5	8,2	8,3
STR	10,4	8,6	7,1	7,0	8,4	10,2	11,9	9,9	8,8	9,5	7,5	8,1
HAM	10,4	7,2	7,7	7,6	9,2	9,6	10,6	9,0	9,1	9,4	7,2	8,9
Non-CDM	7,7	5,5	6,2	5,5	7,7	9,6	11,8	8,4	7,6	8,3	6,2	8,0

Fig. 22: Average ATFM delay per airport in minutes

Conclusion
During the winter season, there were significantly fewer regulations overall, making the summer season more statistically relevant. During this period, it becomes apparent that the advantage previously enjoyed by A-CDM airports in CTOT allocation—which in recent years was still reflected in lower ATFM delay per flight compared with non-CDM airports—continues to diminish. The causes and interdependencies underlying this development need to be understood and will therefore be investigated jointly with the Network Manager. A-CDM Germany will raise this issue for discussion at the forthcoming meetings of the European A-CDM Harmonisation Initiative.

5 Outlook

After the severely constrained staffing and ground-handling resources in 2022 and 2023 following the COVID-19 pandemic had placed considerable pressure on airports and impaired the predictability and stability of ground processes—and consequently the A-CDM process and the associated quality of target times for the European air traffic network—the positive trend seen in 2024 continued throughout 2025. The measures initiated and implemented in previous years to stabilise the turnaround process are now taking effect, supported by only moderate growth in traffic volumes.

As a result, in 2025 most German A-CDM airports achieved substantial improvements not only in overall performance and punctuality, but also in TOBT performance since the post-pandemic recovery began, with TOBT quality significantly exceeding the pre-crisis level recorded in 2019.

It also became clear that the continuing growth in traffic volumes across Europe and the network effects that remain more pronounced than before the crisis—in the form of higher regulation volumes and high CTOT volatility—are having an increasingly limited impact on the predictability of the turnaround process and on the timely and accurate updating of TOBTs. This improved resilience demonstrates that the measures initiated and implemented at the airports in previous years are taking effect.

The fact that the continued increase in traffic volumes did not lead to higher regulation volumes in European airspace even during summer 2025, and that network impacts actually declined, provides confidence that the network will also be able to accommodate the air traffic growth expected in Europe in 2026 without renewed deterioration in performance. The joint efforts of airports, air navigation service providers and the Network Manager appear to be paying off.

A-CDM Germany will continue to expand local reporting and performance monitoring of the A-CDM process so that it can also demonstrate in future how forecast traffic developments interact with the measures already initiated, some of which are already at an advanced stage at several German airports—for example, automated timestamp capture using computer vision and the development of AI-based turnaround forecasts to predict the completion of ground handling.

List of Abbreviations

	DESCRIPTION
ADIT	Actual De-Icing Time
AORT	Actual Off-Block Request Time
ASAT	Actual Start-Up Approval Time
ASRT	Actual Start-Up Request Time
ATC	Air Traffic Control
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATOT	Actual Take-Off Time
CTOT	Calculated Take-Off Time
DCL	Datalink Clearance
EDIT	Estimated De-Icing Time
FPL	ATC Flight Plan
IFR	Instrument Flight Rules
NM	Network Manager
NMOC	Network Manager Operations Centre
SOBT	Scheduled Off-Block Time
STW	Slot Tolerance Window
TOBT	Target Off-Block Time
TSAT	Target Start-Up Approval Time

List of Sources

CHAPTER	KPI	SOURCE
4.1.1	Number of IFR Departures	NM ATFCM Monthly Summary per Airport
	Share A-CDM	DFS
4.1.2	Share of Regulated IFR Departures	NM ATFCM Monthly Summary per Airport
4.1.3	Share of IFR Departures Requiring De-Icing	Airports
4.2.1	ASAT Quality	Airports, DFS
4.2.2	AORT Quality	Airports
4.3.1	TTOT Quality	DFS
4.3.2	SOBT Quality	DFS
4.3.3	TOBT Prognosis and Timeliness	DFS
4.3.4	TSAT Quality, Deviation and Stability	DFS
4.3.5	EDIT Quality and Deviation	Airports
4.3.6	Position Stability	Airports
4.4.1	ATFM Slot Adherence and Deviation	NM ATFCM Monthly Slot Adherence, DFS
4.4.2	CTOT Quality, Deviation and Stability	DFS
4.4.3	Mean ATFM Delay	NM ATFCM Monthly Summary per Airport