KPI

Annual Report 2019

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Publisher: DFS Deutsche Flugsicherung GmbH
on behalf of German Harmonisation Initiative *A-CDM Germany*
Am DFS-Campus 10
D-63225 Langen
GERMANY

Contacts: Erik Sinz & Sebastian Barboff,
TWR/M Tower Management Services

Editorial Board: Sebastian Barboff
DFS Deutsche Flugsicherung GmbH
Am DFS-Campus 10
D-63225 Langen
GERMANY

Boris Breug
Flughafen München GmbH
D-85326 München-Flughafen
GERMANY

Stefan Hilger
Fraport AG
Frankfurt Airport Services Worldwide
D-60547 Frankfurt am Main
GERMANY

Nico Ruwe
Flughafen Stuttgart GmbH
Flughafenstraße 32
D-70629 Stuttgart
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-Schönefeld, 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 2019. 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 year 2019's higher traffic demand compared to 2018 has had less effect on the ATFM situation than predicted. This has been due to countermeasures implemented by the most important stakeholders as well as technical and operational changes initiated by ACDM@GER.

Because of the Covid-19 pandemic, the traffic demand in 2020 will not continue the preceding years' trend. ATFM performance indicators such as share of regulated flights, ATFM delay and CTOT stability will lose their significance compared to the two previous years.

At the time this report was finalized, aviation's focus lies on creating modified turnaround processes that respect the new conditions brought by the pandemic. It is very likely that seat load factors will be lower and the duration of the turnaround process will be higher, which raises the demands on the quality of planning data to allow all partners high efficiency in using their resources.

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 GmbH (DFS)
- Munich Airport (FMG)
- Frankfurt Airport (Fraport)
- Berlin Airports (FBB)
- Düsseldorf Airport (FDG)
- Stuttgart Airport (FSG)
- Hamburg Airport (FHG)

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.

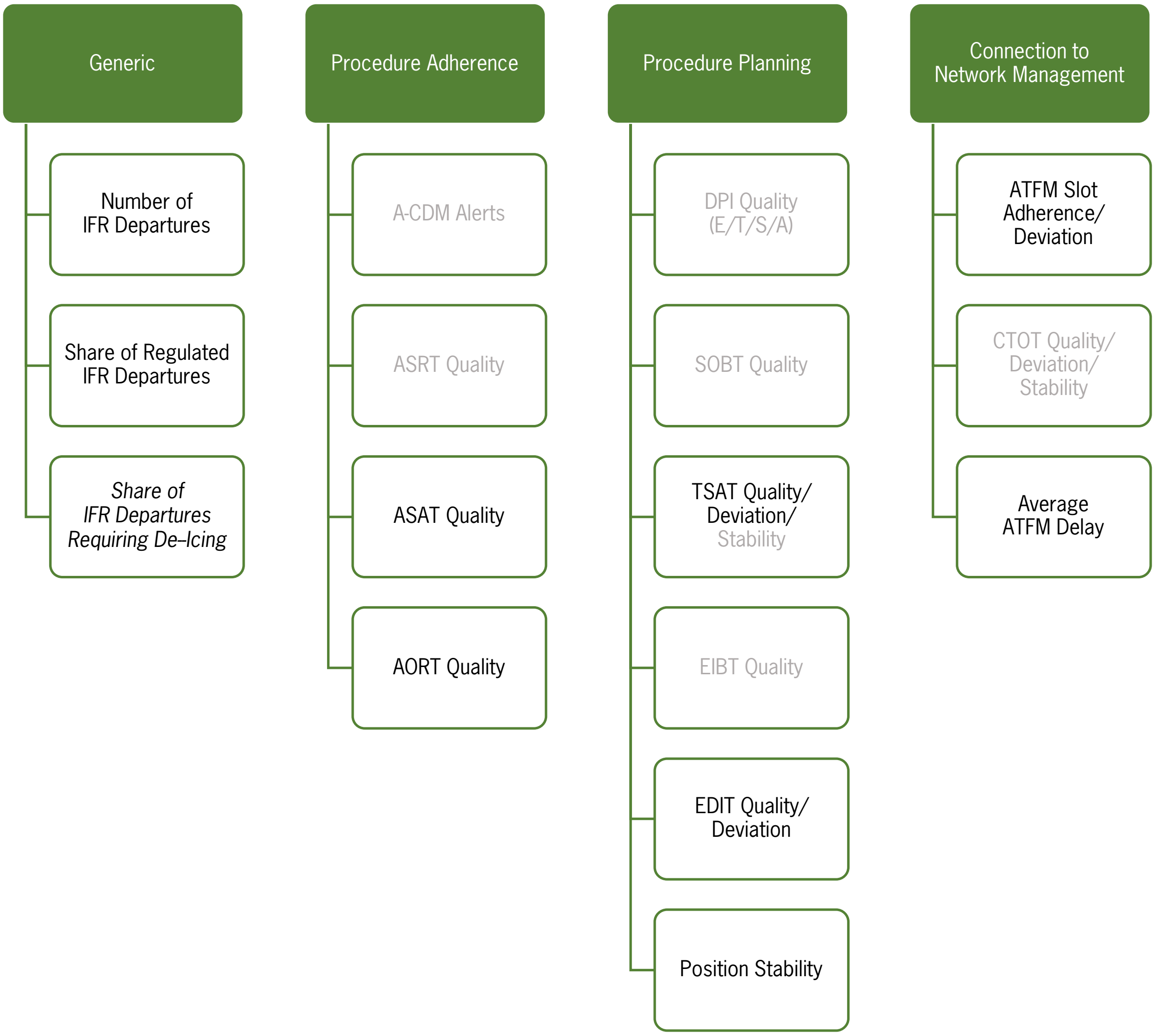
The common reporting that serves as basis for the KPIs contained within this report provide A-CDM airports with the opportunity of highlighting changes and developments, recognising potential for improvements, and developing harmonised A-CDM subprocesses.

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

Goal
Show the amount and trend of traffic

Charts

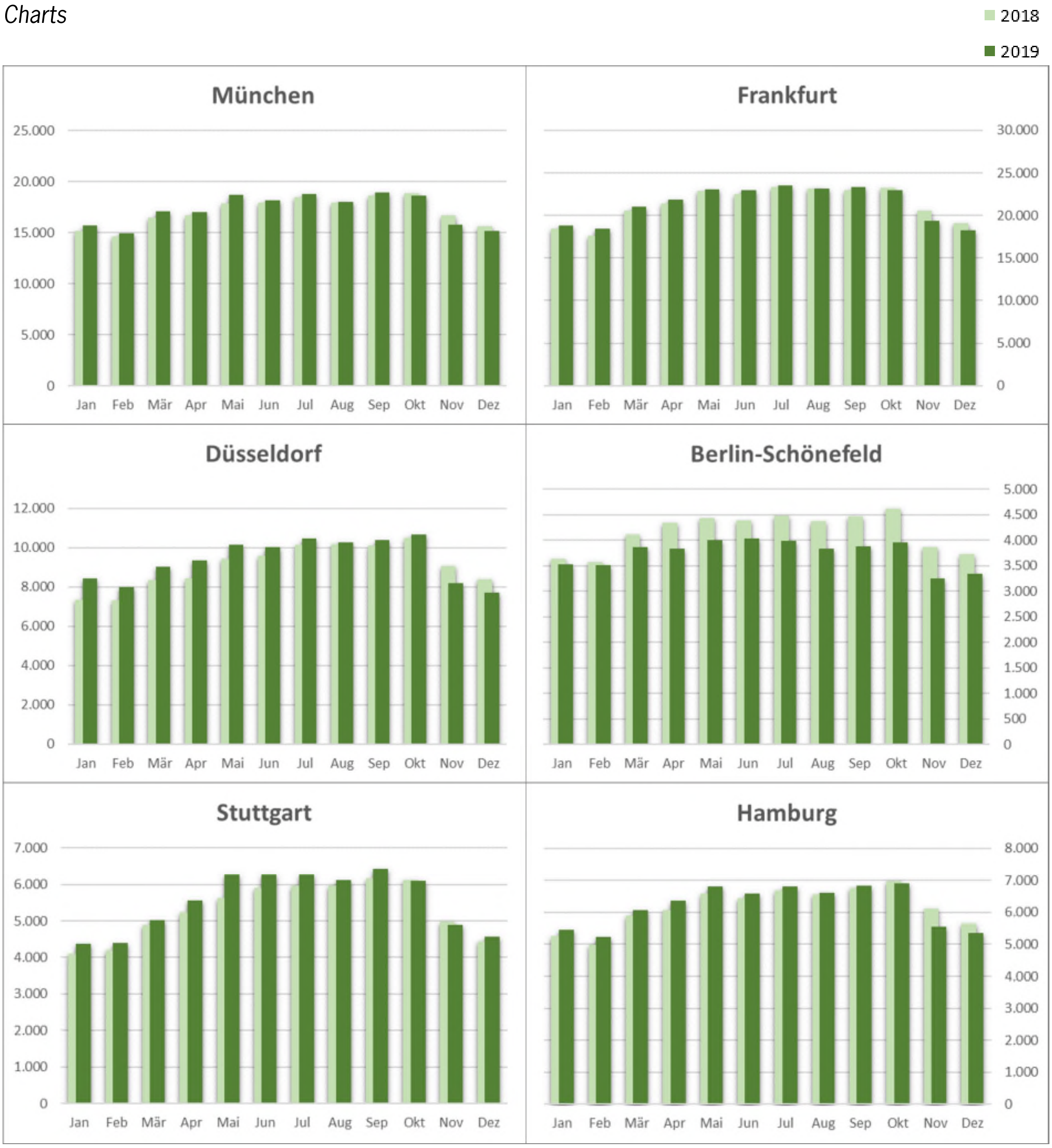


Fig. 1: Number of IFR departures 2019 (dark green) and 2018 (light green)

Conclusion
The six German A-CDM airports generated 66.5% of all IFR departures within Germany in 2019, down one tenth of a percentage point from the preceding year.

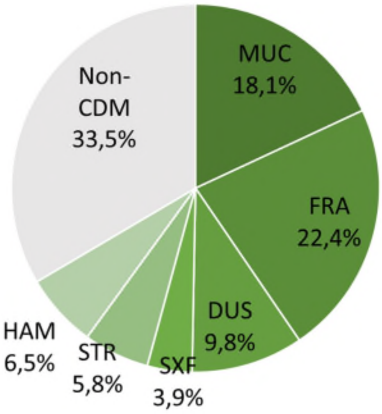


Fig. 2: Share of total departures originating from A-CDM airports in Germany 2019

Berlin-Schönefeld Airport experienced a significant reduction in demand in 2019. This was caused mainly by Easyjet shifting many of their flights to Berlin-Tegel, the city's other airport.

Starting summer 2019, Laudamotion based three additional aircraft at Stuttgart Airport. This resulted in continued demand growth there.

The other airports clearly show fewer flight movements towards the end of the year compared to 2018. This reflects both an increased use of larger aircraft and accompanying frequency reduction on some routes, as well as the overall economic outlook becoming less optimistic.

4.1.2 Share of Regulated IFR Departures

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

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 2018, and 2017 share (yellow)

Conclusion
The first half of 2019 showed an increased share of regulated departures at almost all airports. The second half, however, was significantly below the previous year's values.

This is due to the unusually high number of regulations during the demanding year 2018 which resulted in a larger share of regulated flights than during previous years. For the latter half of 2019, the number of regulated flights is closer to its usual share of total flights again.

Because of the high CTOT volatility observed in 2018 and the expected further increase in regulations for summer 2019, the German A-CDM airports for their part implemented measures aimed at optimizing the data exchange with the Network Manager. These measures appear to have measurably lowered volatility.

For the year 2020 the editors expect a lower ATM network load due to significantly reduced demand, so the impact of regulations on traffic flows will also continue to decrease.

4.1.3 Share of IFR Departures Requiring De-Icing

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

Goal
Show the monthly share of IFR departures whose turnaround process was prolonged by de-icing.

Charts

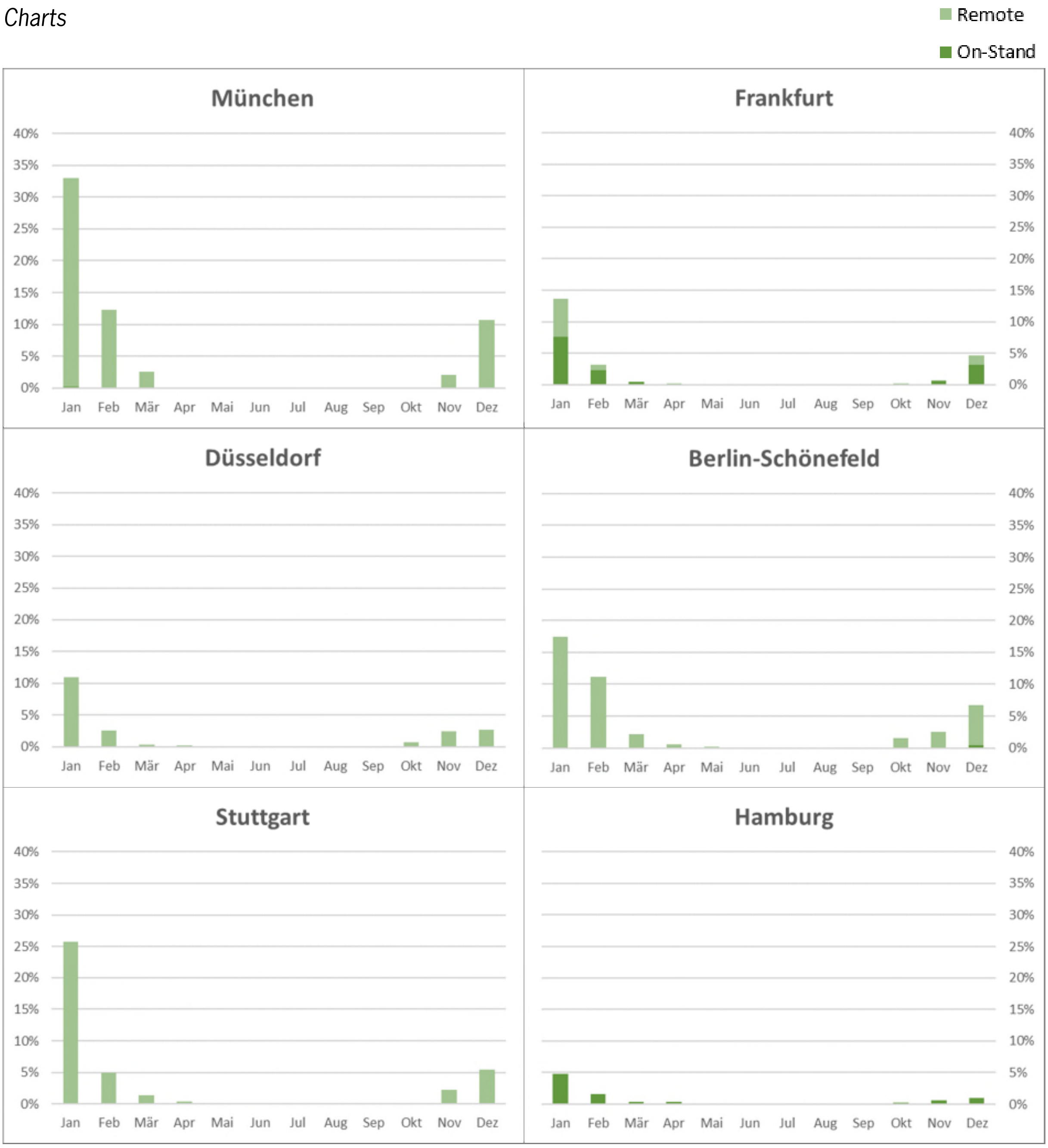


Fig. 4: Share of IFR departures 2019 requiring aircraft de-icing on stand (dark green) and remotely (light green)

This KPI provides context for further KPIs below (e.g. TSAT Quality). 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 flight 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 % per airport

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 in 2019 (dark green) and 2018 (light green)

Conclusion
Munich Airport showed a low ASAT quality in January 2019. This was caused by unstable sequencing during heavy de-icing operations. To counteract this effect, Munich has implemented measures intended to stabilize the sequencing process.

The continued traffic growth at Stuttgart Airport led to a further increase and stabilization in procedure adherence in 2019.

4.2.2 AORT Quality

Description
Share of IFR departures that asked for their off-block clearance (AORT) within the window of

1. ASAT + 5 min (start-up via radio)
2. TSAT ± 5 min (start-up via datalink)

in % per airport

Goal
Measure procedure adherence of the Flight Crew

Charts

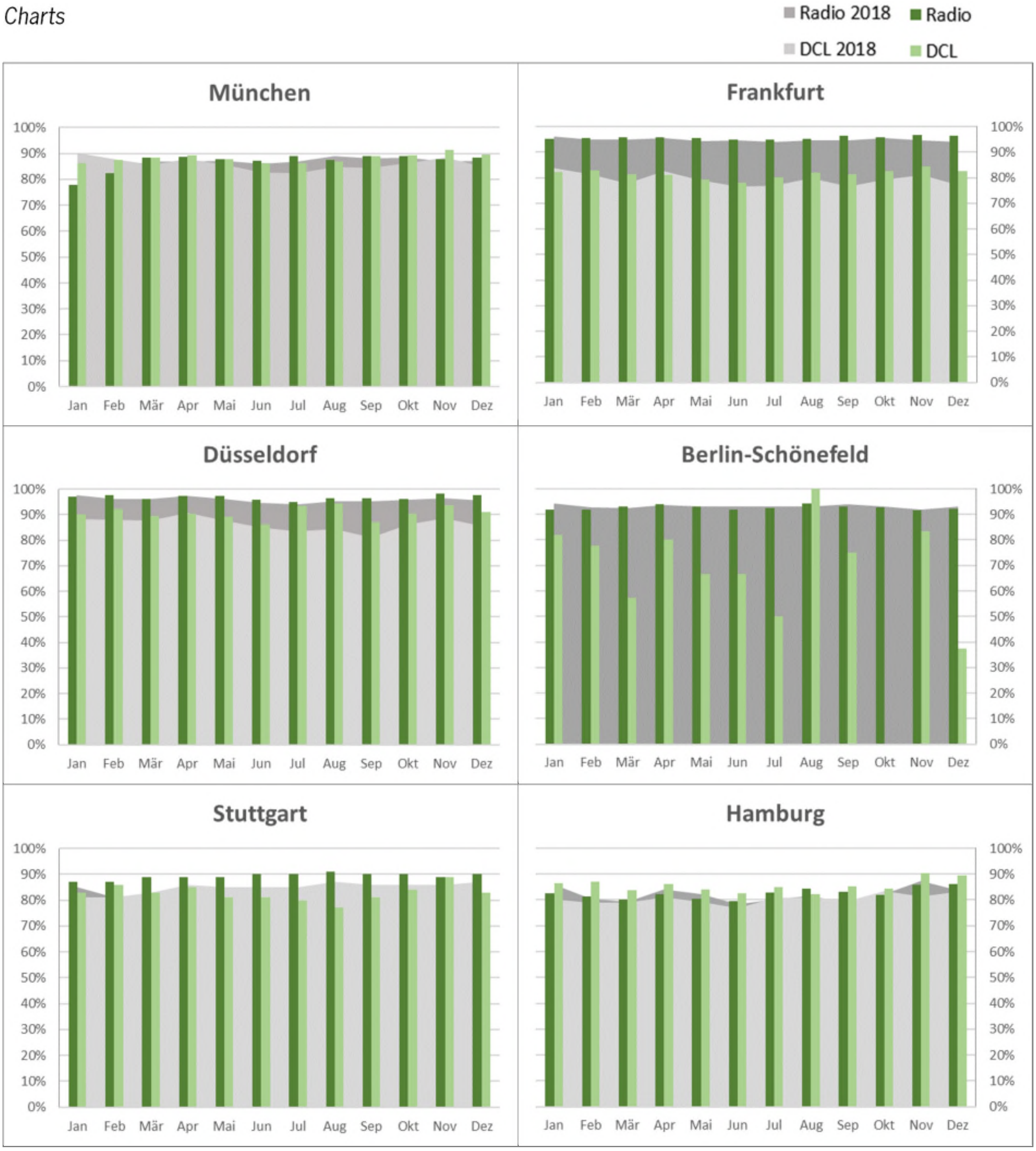


Fig. 6: Share of IFR departures 2019 with conformant AORT (green) compared to 2018 (grey)

Conclusion
If ASAT quality is poor, this is commonly also reflected in AORT quality. This causation can clearly be seen at Munich Airport in January and February 2019.

At Frankfurt, Düsseldorf and Stuttgart airports, AORT quality after start-up approval via datalink is significantly lower than after approval via radio. Datalink clearances are frequently given before ground handling is finished which might encourage lesser adherence to the TSAT window. Clearances via radio are usually only requested after ground handling is complete, so the off-block request will usually follow soon. Start-up request via radio that are made too early are usually rejected by Tower, so overall likelihood of a start-up request outside of the TSAT window is lower.

4.3 Procedure Planning

4.3.1 TSAT Quality and Deviation

TSAT Quality

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

Goal
Operational adherence to planning on the day of operations.

Charts

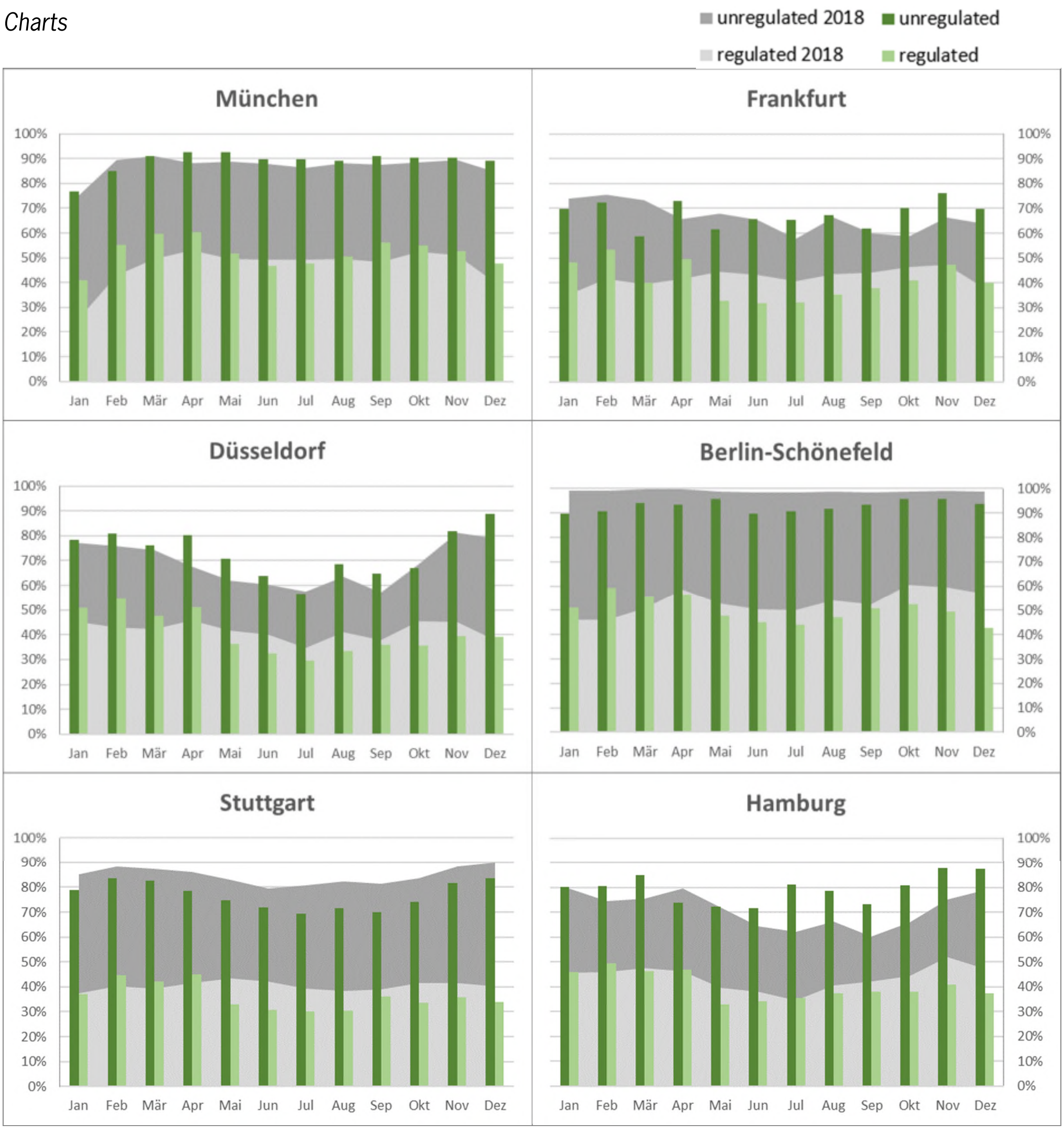


Fig. 7: Share of regulated and unregulated IFR departures 2019 (green) and 2018 (grey) where last TSAT = TOBT

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

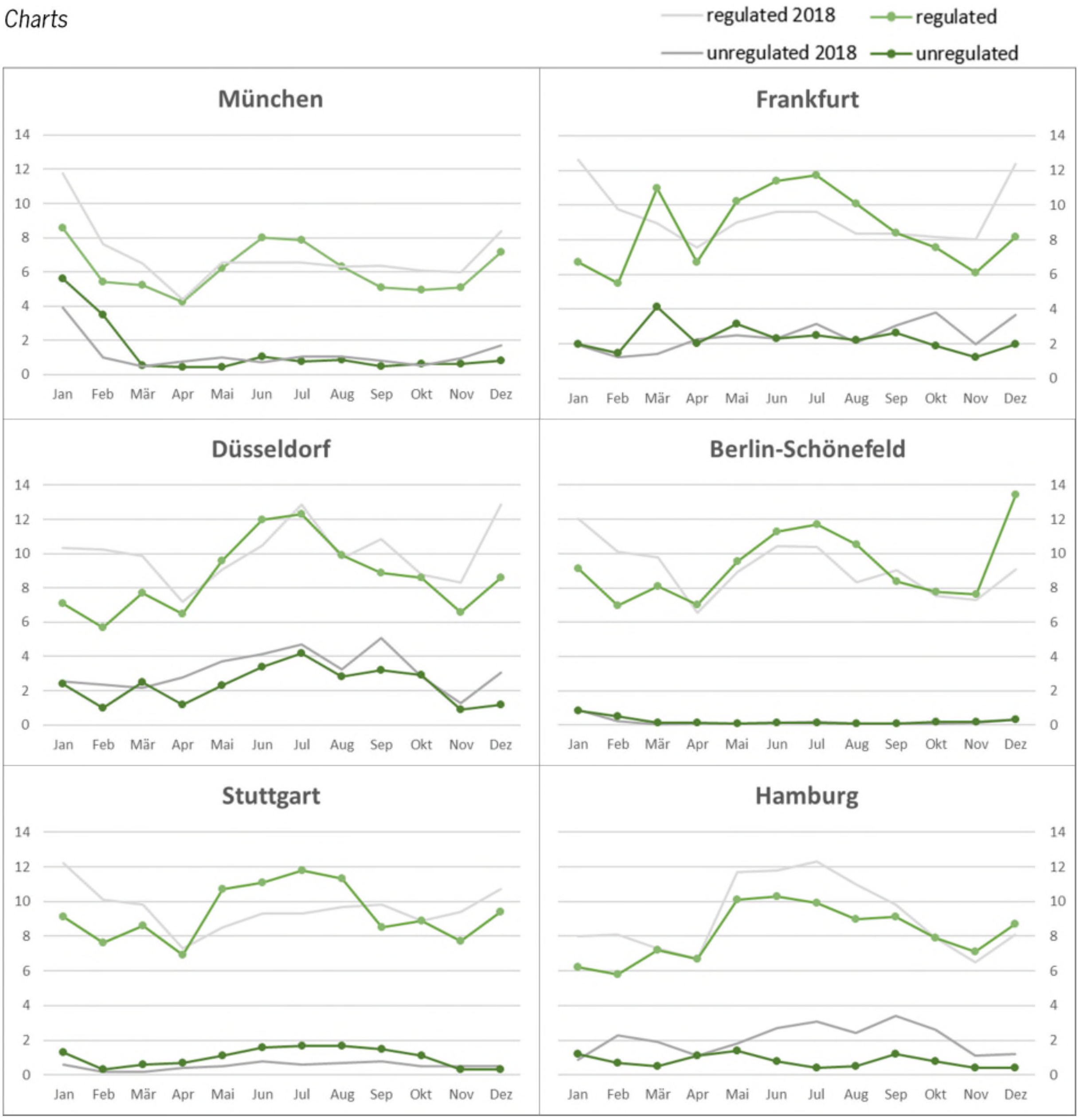


Fig. 8: Mean deviation of last TSAT and TOBT in minutes for 2019 (green) and 2018 (grey)

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.

Overall, the year 2019 shows a reduction in TSAT quality for regulated flights. Fewer flights were regulated, however a larger share of flights showed a difference between TOBT and TSAT, while especially during the summer months the two values also differed by a larger amount than a year before. This suggests that

CTOT quality for these flights was also lower than in 2018. CTOT quality is defined as the difference between the take-off time calculated by the local A-CDM process and the CTOT issued by the Network Manager.

At Stuttgart Airport, TSAT quality for non-regulated flights has decreased inversely proportional to the traffic demand. This suggests that the airport is approaching its capacity limit during peak periods.

Hamburg Airport shows an increased TSAT quality for both regulated and unregulated flights. This was aided by improved departure capacity planning and more favourable wind conditions than during 2018. Hamburg's runway configuration allows a very different flight capacity depending on wind direction.

4.3.2 EDIT Quality and Deviation

EDIT Quality

Description
Monthly share of IFR departures
1. with on-stand de-icing
2. with remote de-icing

whose EDIT was within ADIT ±3 min, in % per airport

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

Charts

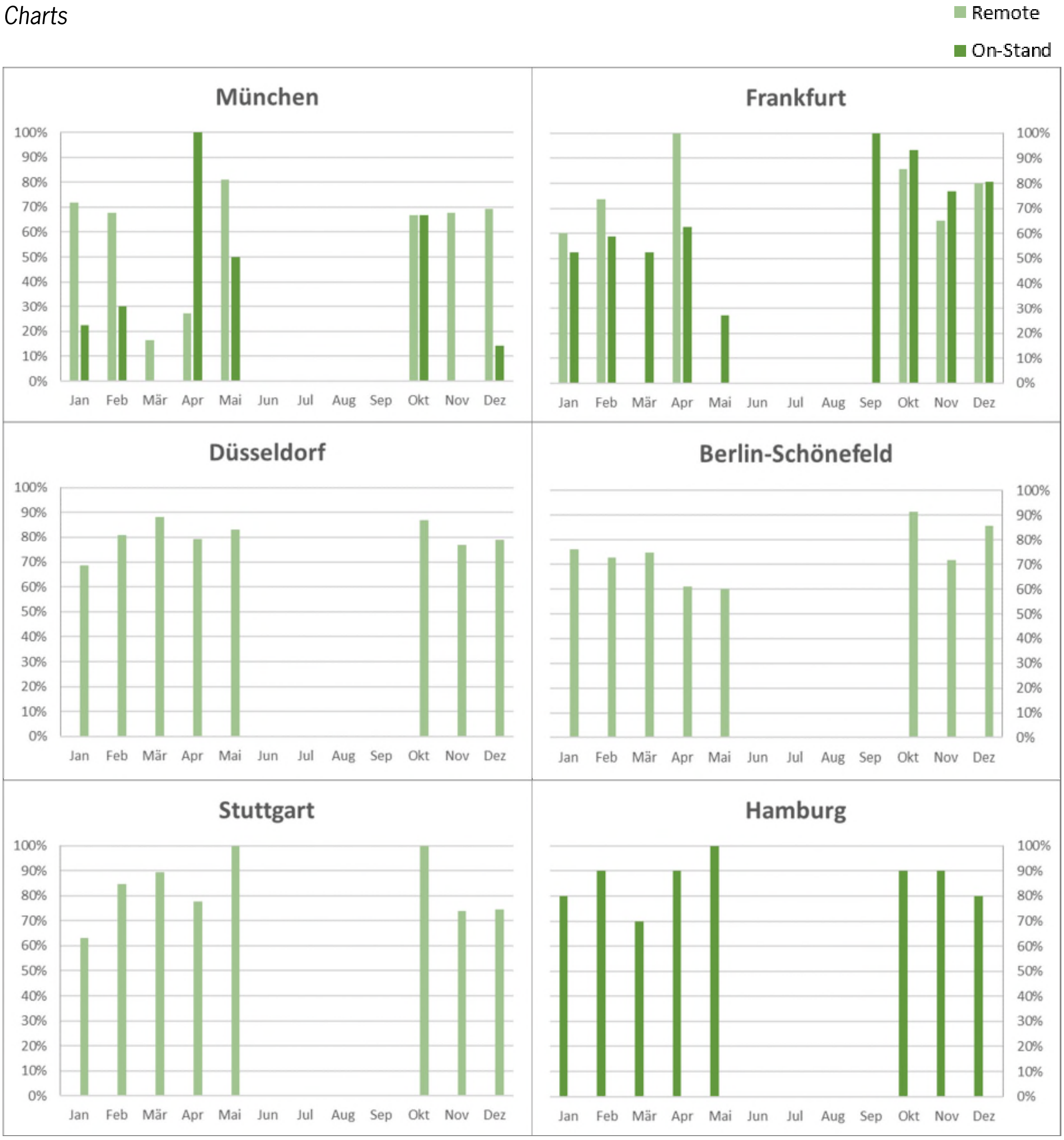


Fig. 9: Percentage of flights with remote (light green) and on-stand de-icing (dark green) where EDIT = ADIT±3 min

EDIT Deviation

Description

Monthly mean deviation of ADIT and EDIT for IFR departures

1. with on-stand de-icing
2. with remote de-icing

in minutes per de-iced flight and airport

Goal

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

Charts

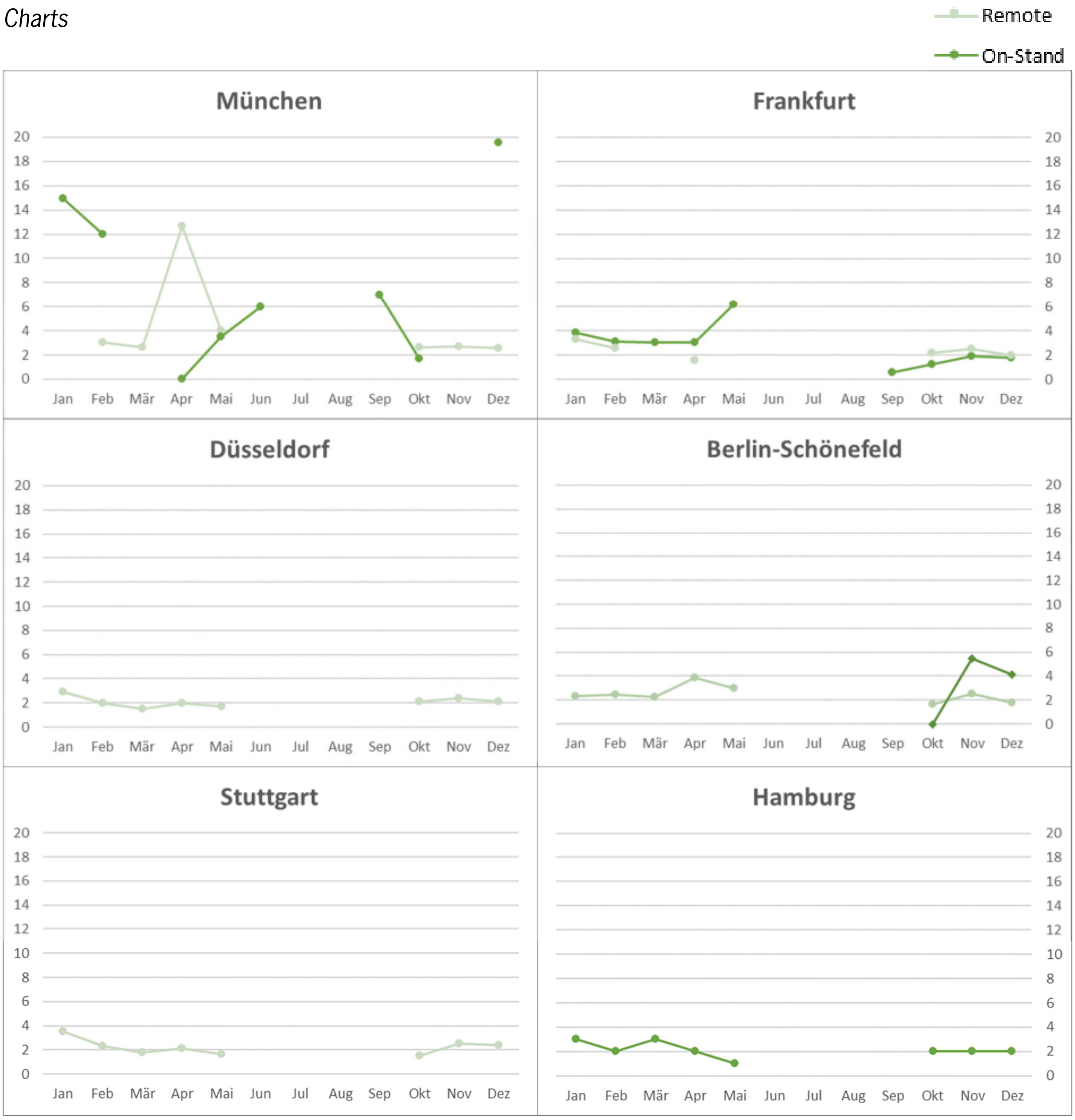


Fig. 10: Mean deviation in minutes of EDIT and ADIT for on-stand (dark green) and remote de-icing (light green)

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.

4.4 Connection to 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 % per airport

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. 11: Share of flights with ATOT before (dark green left), within (light green) and after (dark green right) STW

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

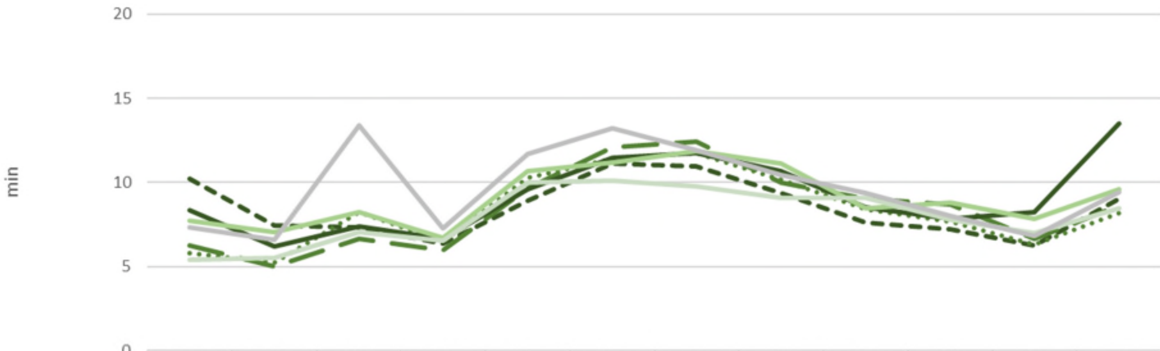
Conclusion
ATFM Slot Adherence at the German A-CDM airports is generally well above the European average and even slightly above its quality in previous years. Those flights that depart outside of their Slot Tolerance Window usually do so too early rather than too late. A cause of this could be that planned taxi-out times (EXOTs) are too high.
At Munich Airport, this effect is magnified by flights being sequenced according to the beginning of their Slot Tolerance Window (CTOT-5 min). If they then happen to taxi faster than planned, they will very likely arrive too early at the runway. Other airports sequence flights according to CTOT which gives a 5-minute buffer to compensate unexpectedly short taxi times.

4.4.2 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	10,2	7,4	7,3	6,4	8,9	11,1	10,9	9,4	7,6	7,2	6,3	9,0
FRA	5,8	5,2	8,3	6,5	10,3	11,4	11,8	10,2	8,4	7,7	6,3	8,2
DUS	6,3	5,0	6,6	6,0	9,7	12,1	12,4	10,0	9,0	8,7	6,6	8,6
SXF	8,3	6,2	7,4	6,7	9,6	11,4	11,7	10,7	8,5	7,8	8,2	13,5
STR	7,7	7,1	8,3	6,7	10,7	11,2	11,9	11,1	8,5	8,8	7,8	9,6
HAM	5,4	5,5	7,0	6,6	10,0	10,1	9,7	9,1	9,1	7,8	7,0	8,4
Non-CDM	7,3	6,6	13,4	7,3	11,7	13,2	11,9	10,5	9,4	8,0	6,8	9,4

Fig. 13: Average ATFM delay per airport

Conclusion
In line with experience from 2018, the first half of summer season 2019 again showed lower ATFM delay for the German A-CDM airports compared to non-CDM airports. The lower share of regulated flights from July 2019 coincides with an alignment of ATFM delay between the two airport types for reasons that could not be determined by the time this report was published.

5 Outlook

The year 2019's higher traffic demand compared to 2018 has had less effect on the ATFM situation than predicted. This has been due to countermeasures implemented by the most important stakeholders as well as technical and operational changes initiated by ACDM@GER.

As a consequence of the Covid-19 pandemic, the traffic demand in 2020 will not continue the preceding years' trend. How air traffic will develop after having collapsed to a fraction of its previous volume during the first half of 2020 could not be predicted at the time this report was finalized. It is very likely that monthly traffic volumes seen during January or February 2020 will not be reached again for the remainder of the year. ATFM performance indicators such as share of regulated flights, ATFM delay and CTOT stability will lose their significance compared to the two previous years.

After mitigation of the pandemic's effects, mid-term prognoses predict a gradual increase in traffic demand back to pre-pandemic levels and beyond. For this reason, further stability indicators will be added to this report to better show the effects of the overall ATFM situation on the Airport CDM process. In particular, this means indicators reflecting TSAT and CTOT stability.

Additional important inputs for the Airport CDM and ATFM process will be examined as well, such as prediction qualities of EIBT and TTOT.

Regarding ASRT quality, DFS still intends to release an updated version of its Tower Flight Plan Data Processing System that will allow a valid calculation of this indicator. The software update will successively be rolled out at all A-CDM airports. Once it is implemented, this indicator will then be added for the respective airport in this report.

List of Sources

KAPITEL	KPI	QUELLE
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
4.2.2	AORT Quality	Airports
4.3.1	TSAT Quality and Deviation	Airports
4.3.2	EDIT Quality and Deviation	Airports
4.4.1	ATFM Slot Adherence and Deviation	NM ATFCM Monthly Slot Adherence
4.4.2	CTOT Stability	Airports
4.4.3	Average ATFM Delay	NM ATFCM Monthly Summary per Airport