PRB | Performance review body of the single european sky

Performance Review Body Monitoring Report

Germany - 2022

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1 OVERVIEW

1.1 Contextual information

National performance plan adopted following Commission Decision (EU) 2023/177 of 14 December 2022

List of ACCs 4
Bremen ACC
Langen ACC
Karlsruhe UAC
Munich ACC

No of airports in the scope of the performance plan:
- **≥80'K** 7
- **<80'K** 8

Exchange rate (1 EUR=)
2017: 1 EUR
2022: 1 EUR

Share of Union-wide:
- **traffic (TSUs) 2022** 11.6%
- **en route costs 2022** 14.8%

Share en route / terminal costs 2022 76% / 24%

En route charging zone(s)
Germany

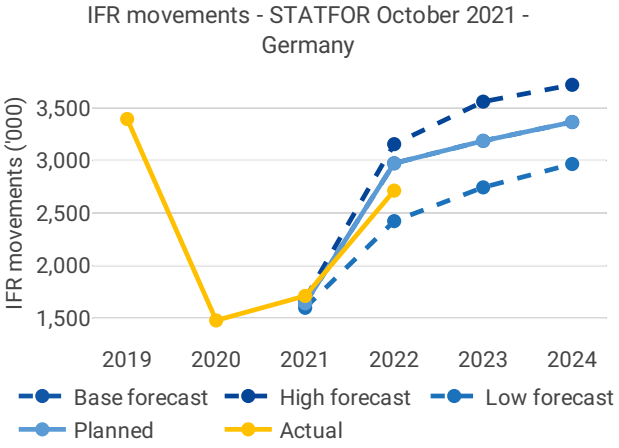
Terminal charging zone(s)
Germany

Main ANSP
- DFS

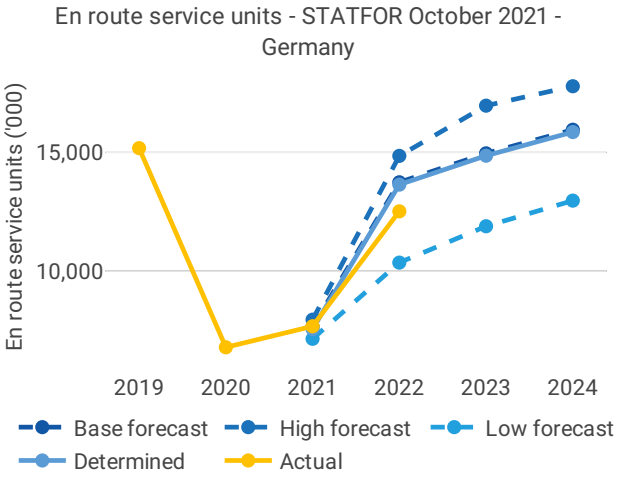
Other ANSPs
- MUAC

MET Providers
- Deutscher Wetterdienst (DWD)

1.2 Traffic (En route traffic zone)

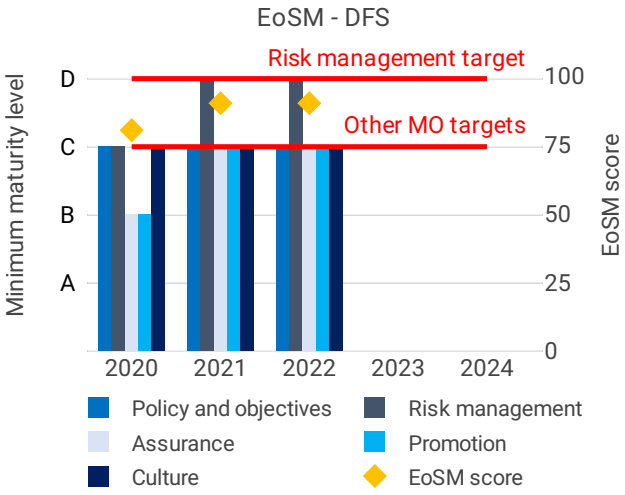


- Germany recorded 2,713K actual IFR movements in 2022, +58% compared to 2021 (1,712K).
- Actual 2022 IFR movements were -8.8% below the plan (2,973K).
- Actual 2022 IFR movements represent 80% of the actual 2019 level (3,394K).



- Germany recorded 12,519K actual en route service units in 2022, +63% compared to 2021 (7,679K).
- Actual 2022 service units were -8.2% below the plan (13,644K).
- Actual 2022 service units represent 83% of the actual 2019 level (15,180K).

1.3 Safety (Main ANSP)



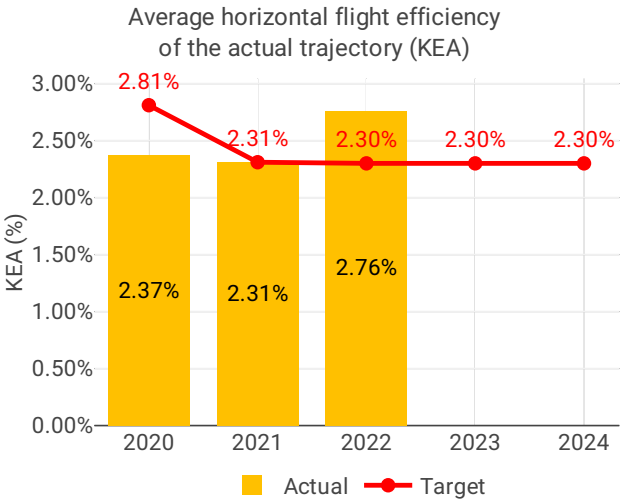
• DFS achieved the RP3 EoSM targets in 2021, earlier than planned and retained this level in 2022. DFS implemented harmonised measures to ensure continuous improvement of safety performance.

• Germany reported an increase in the rate of separation minima infringements and a comparable rate of runway incursion in 2022 relative to 2021. Both rates are below the Union-wide.

• The German NSA aims to improve the monitoring of safety occurrences. A procedure was implemented that was based on regular reviews and in-depth auditing of specific cases.

• DFS could improve its safety management by implementing automated safety data recording systems.

1.4 Environment (Member State)



• Germany achieved a KEA performance of 2.76% compared to its target of 2.30% and did not contribute positively towards achieving the Union-wide target.

• The NSA states that flight efficiency deteriorated after the pandemic, due to increased traffic and establishment of military corridors following Russia's war of aggression against Ukraine.

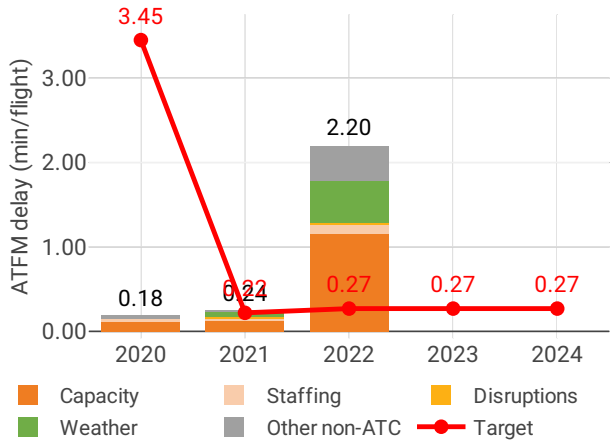
• Both KEP and SCR deteriorated in comparison with 2021.

• The share of CDO flights decreased by 21.60% compared to 2021.

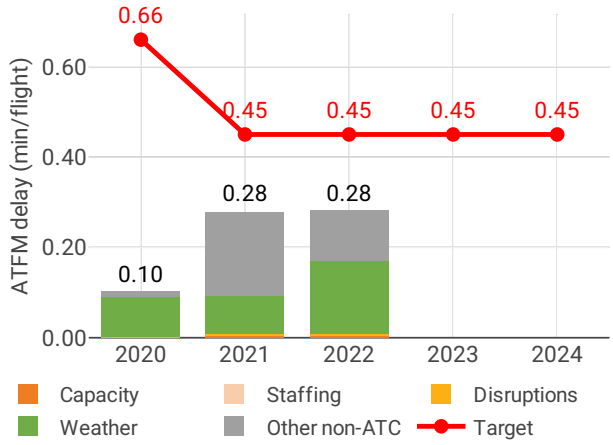
• During 2022, additional time in terminal airspace decreased from 1.14 to 1.08 min/flight, while additional taxi out time increased from 1.85 min/flight to 1.87 min/flight.

1.5 Capacity (Member State)

Average en route ATFM delay per flight by delay groups



Average arrival ATFM delay per flight by delay groups



• Germany registered 2.28 minutes of average en route ATFM delay per flight during 2022, which has been adjusted to 2.27 during the post-ops adjustment process.

• Average en route ATFM delay per flight was further adjusted to 2.20 minutes per flight due to the exceptional event related to Russia's war of aggression against Ukraine, still not achieving the local target value of 0.27.

• The average number of IFR movements was 20% below 2019 levels in Germany in 2022.

• The number of ATCOs in OPS is expected to increase significantly in Bremen and Karlsruhe ACCs and to increase only slightly in Langen and Munich. The number of ATCOs in OPS remained unchanged in Bremen ACC and in Karlsruhe UAC there was an increase but actual values in both ACCs remained below the plans in 2022. In Langen and Munich, there was an increase in the number of ATCOs in OPS, with the actual values being higher than the 2022 plans.

• The planned number of ATCOs in OPS in Karlsruhe remained below the level required to offer sufficient capacity.

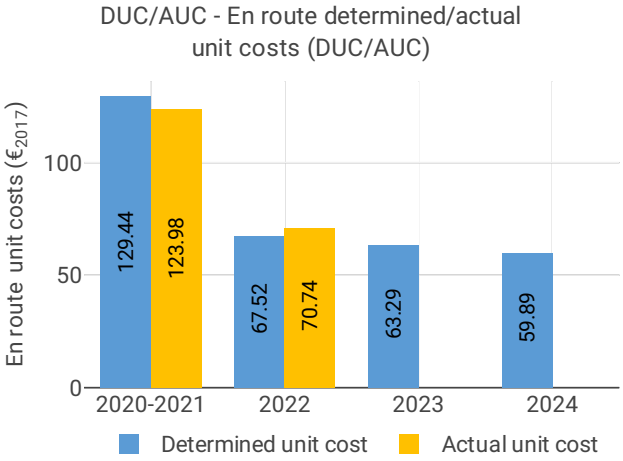
• Delays were highest between May and September, mostly driven by ATC Capacity and Weather.

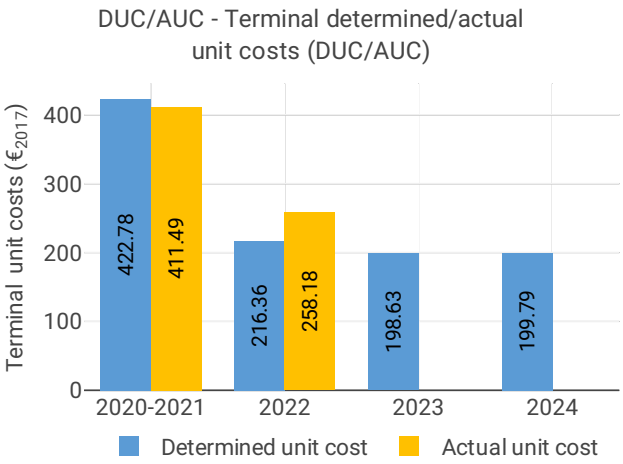
• The share of delayed flights with delays longer than 15 minutes in Germany increased by 14.57 p.p. compared to 2021 and was higher than 2019 values.

• The yearly total of sector opening hours in Langen ACC was 122,199 in 2022, showing a 29.1% increase compared to 2021. Sector opening hours are 7.7% below 2019 levels. The yearly total of sector opening hours in Munich ACC was 96,825 in 2022, showing an 82.9% increase compared to 2021. Sector opening hours are 0.4% below 2019 levels. The yearly total of sector opening hours in Karlsruhe ACC was 137,986 in 2022, showing a 37.2% increase compared to 2021. Sector opening hours are 4.7% below 2019 levels. The yearly total of sector opening hours in Bremen ACC was 83,630 in 2022, showing a 9.3% increase compared to 2021. Sector opening hours are 19.5% below 2019 levels.

• Langen ACC registered 8.36 IFR movements per one sector opening hour in 2022, being 17.2% below 2019 levels. Munich ACC registered 8.89 IFR movements per one sector opening hour in 2022, being 28.1% below 2019 levels. Karlsruhe ACC registered 11.92 IFR movements per one sector opening hour in 2022, being 5.7% below 2019 levels. Bremen ACC registered 5.28 IFR movements per one sector opening hour in 2022, being 16.6% below 2019 levels.

1.6 Cost-efficiency (En route/Terminal charging zone(s))





• The en route 2022 actual unit cost of Germany was 70.65 €2017, 4.6% higher than the determined unit cost (67.52 €2017). The terminal 2022 actual unit cost was 258.18 €2017, 19% higher than the determined unit cost (216.36 €2017).

• The en route 2022 actual service units (12,519K) were 8.2% lower than the determined service units (13,644K).

• In 2022, the en route actual total costs were 37 M€2017 lower (-4.0%) than determined. It was mainly attributable to the reduction in staff costs (-62 M€2017, or -9.0%) mainly due to less full-time equivalents than planned. However, the decrease was partially offset by the significant increase in cost of capital (+37 M€2017, or +198%).

• DFS spent 107 M€2017 in 2022 related to costs of investments, 6.5% more than determined (100 M€2017), driven by the substantial increase in cost of capital. The NSA explained that it is stemming from the negative development of commercial papers. At the same time the net book value of fixed assets decreased by -4.0%. The PRB invites the NSA to clarify the reasons and impact of these commercial papers and, if eligible, to present the costs in line with the Regulation.

• The en route actual unit cost incurred by users in 2022 was 79.70€, while the terminal actual unit cost incurred by users was 278.54€.

2 SAFETY - GERMANY

2.1 PRB monitoring

• DFS achieved the RP3 EoSM targets in 2021, earlier than planned and retained this level in 2022. DFS implemented harmonised measures to ensure continuous improvement of safety performance.

• Germany reported an increase in the rate of separation minima infringements and a comparable rate of runway incursion in 2022 relative to 2021. Both rates are below the Union-wide.

• The German NSA aims to improve the monitoring of safety occurrences. A procedure was implemented that was based on regular reviews and in-depth auditing of specific cases.

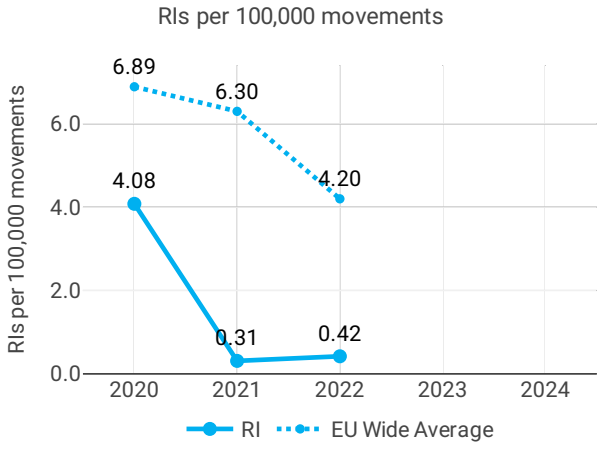
• DFS could improve its safety management by implementing automated safety data recording systems.

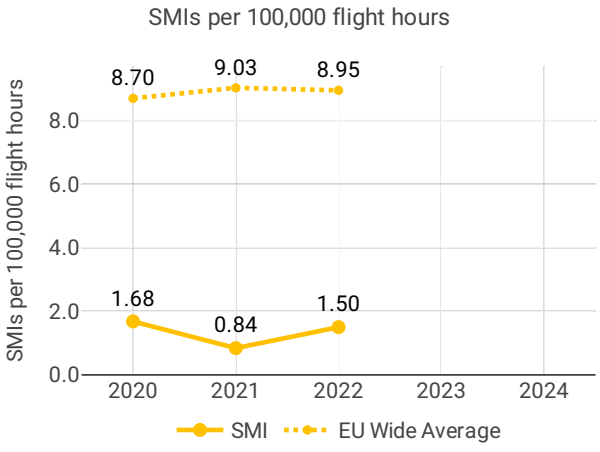
2.2 Effectiveness of Safety Management (EoSM) (KPI#1)

Focus on EoSM

All five EoSM components of the ANSP meet the RP3 target level. The level was maintained compared with 2021.

2.3 Occurrences - Rate of runway incursions (RIs) (PI#1) & Rate of separation minima infringements (SMIs) (PI#2)





3 ENVIRONMENT - GERMANY

3.1 PRB monitoring

• Germany achieved a KEA performance of 2.76% compared to its target of 2.30% and did not contribute positively towards achieving the Union-wide target.

• The NSA states that flight efficiency deteriorated after the pandemic, due to increased traffic and establishment of military corridors following Russia's war of aggression against Ukraine.

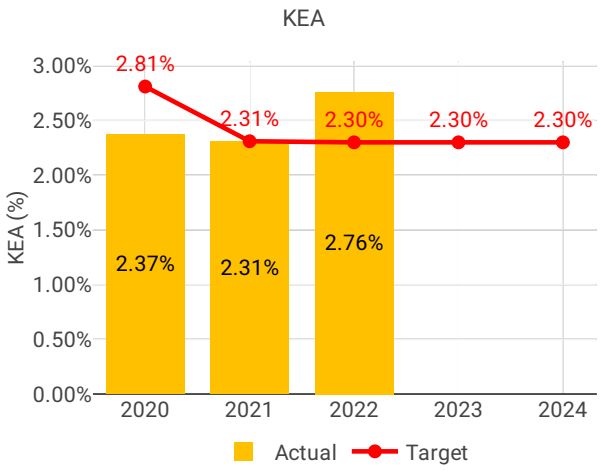
• Both KEP and SCR deteriorated in comparison with 2021.

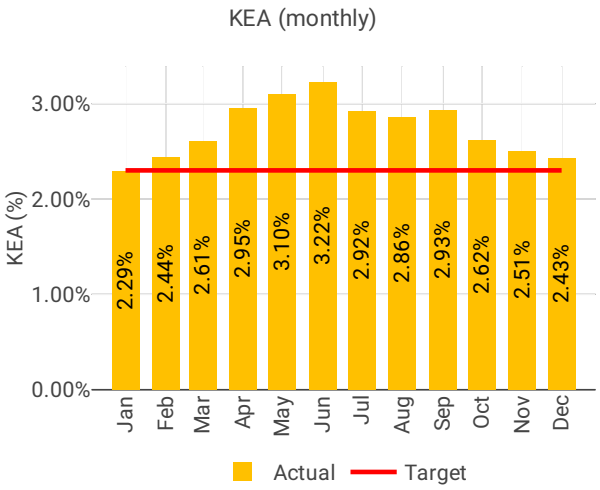
• The share of CDO flights decreased by 21.60% compared to 2021.

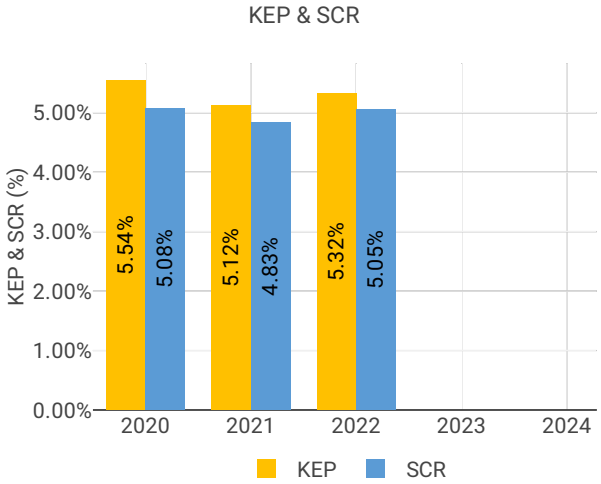
• During 2022, additional time in terminal airspace decreased from 1.14 to 1.08 min/flight, while additional taxi out time increased from 1.85 min/flight to 1.87 min/flight.

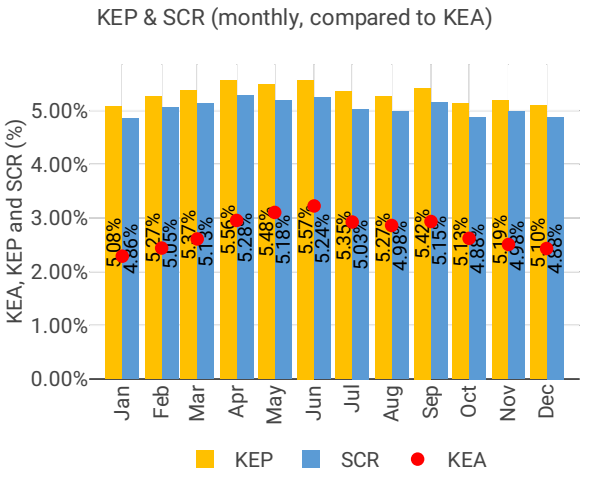
3.2 En route performance

3.2.1 Horizontal flight efficiency of the actual trajectory (KEA) (KPI#1), of the last filed flight plan (KEP) (PI#1) & shortest constrained route (SCR) (PI#2)



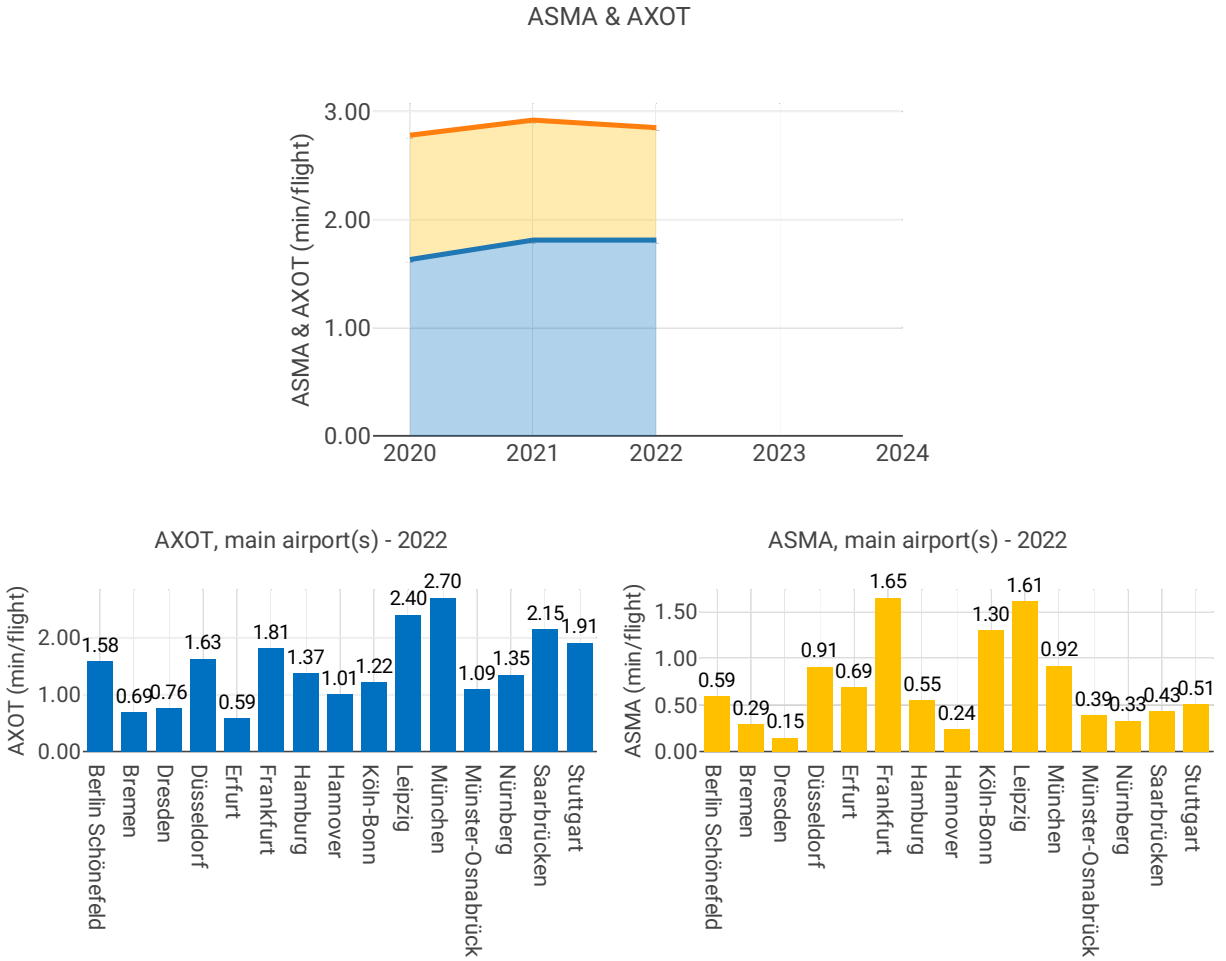






3.3 Terminal performance

3.3.1 Additional taxi-out time (AXOT) (PI#3) & Arrival Sequencing and Metering Area (ASMA) time (PI#4)



Focus on ASMA & AXOT

AXOT

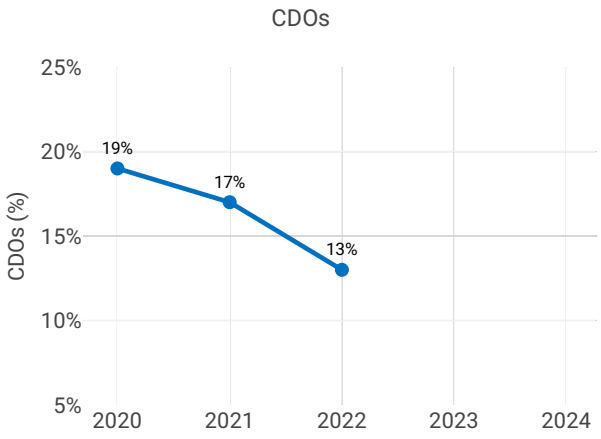
In global, the additional taxi-out times in 2022 at German airports was 7% higher than in 2021. Evolution at each airport is different but without any drastic changes at any of these airports. Only Munich (EDDM; 2019: 3.82 min/dep; 2020: 2.48 min/dep.; 2021: 3.12 min/dep.; 2022: 2.7 min/dep.), regardless of a slight decrease, exceeded the 2022 average additional taxi-out time for the SES monitored airports of 2.52 min/dep. According to the German monitoring report: This data is not collected by DFS. No initiatives were/are planned. Most of the movement/taxi-areas at german airports are outside of the responsibility of DFS. The NSA is monitoring the KPA Environment by regularly checking the current performance by using the existing dashboards. The German monitoring report takes the values from the SES DB (https://www.eurocontrol.int/prudata/dashboard/vis/2022/), which is the same as the data in the pre-filled monitoring templates and used across this report.

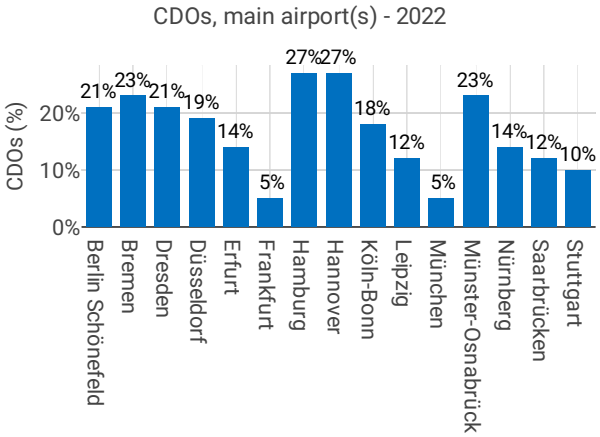
ASMA

The additional ASMA times evolved in 2022 in a different manner at each German airport, but in total, and driven mainly by the improvements in Berlin Brandenburg and Munich, these times were 3% lower than in 2021. In comparison with the 2022 SES average of 1.06 min/arr, only Franfurt (EDDF; 2019: 2.17 min/arr.; 2020: 1.73 min/arr.; 2021: 1.51 min/arr.; 2022: 1.65 min/arr.) and Cologne (EDDK; 2019: 1.15 min/arr.; 2020: 0.88 min/arr.; 2021: 1.27 min/arr.; 2022: 1.3 min/arr.) exceed that value. According to German monitoring report: ATM in TMAs is still focusing on noise abatement (departure) and capacity and traffic flow (approach). With traffic recovering after the COVID pandemic more tactical manouvering inside TMAs ocurred as forecasted. In addition projects to shorten TMA detours have been sucessfully implemented

(EDDL/MODRU; EDDS/TEDGO). The NSA is monitoring the KPA Environment by regularly checking the current performance by using the existing dashboards. The German monitoring report takes the values from the SES DB (https://www.eurocontrol.int/prudata/dashboard/vis/2022/), which is the same as the data in the pre-filled monitoring templates and used across this report.

3.3.2 Share of arrivals applying continuous descent operations (CDOs) (PI#5)





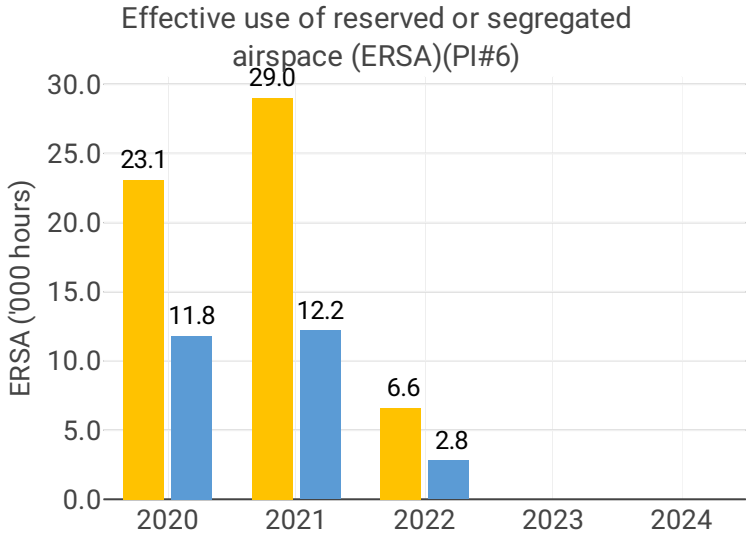
Focus CDOs

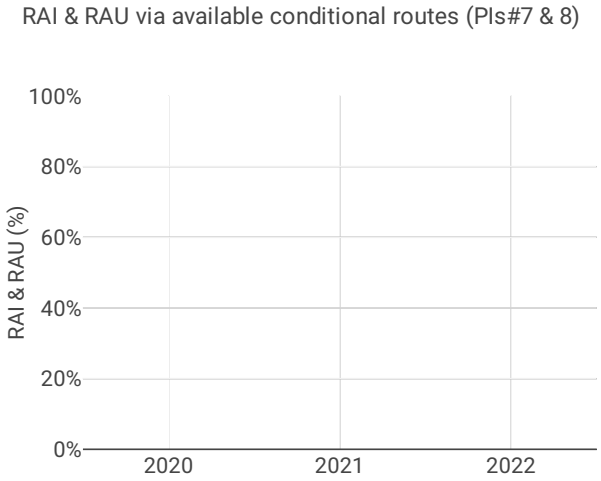
All German airports had shares of CDO flights below the RP3 overall value in 2022 (29.0%). Only Hamburg (EDDH), Bremen (EDDW), Münster-Osnabrück (EDDG) and Saarbrücken (EDDR) saw an improvement in the share of CDOs. Overall, the share of CDO decreased from 16.2% in 2021 to 12.7% in 2022.
The two airports with the highest traffic numbers, Frankfurt (EDDF) and Munich (EDDM), still have a very low share of CDO flights.
The share of CDO flights decreased with 5 or more percentage points for Cologne/Bonn (EDDK), Dusseldorf (EDDL), Munich (EDDM), Stuttgart (EDDS) and Erfurt (EDDE).
According to the German monitoring report: *After DFS had successfully implemented High-Transition-Operations to continuously approach Frankfurt from close to cruising levels a new project in the context of HERON is set up to design CDOs to EDDF from cruising level from various directions (out of adjacient FIRs/UIRs including MUAC) making use of the results from the former project.*
Besides DFS is taking every opportunity to apply published or tactical CDO procedures at airspace users individual needs whenever traffic allows.
The NSA is monitoring the KPA Environment by regularly checking the current performance by using the existing dashboards.
Source of above shown values: SES DB (https://www.eurocontrol.int/prudata/dashboard/vis/2022/)

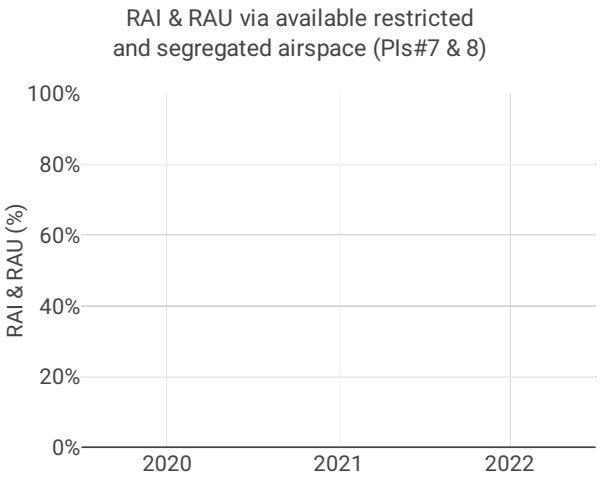
Airport level

	Additional taxi-out time (PI#3)					Additional ASMA time (PI#4)					Share of arrivals applying CDO (PI#5)				
Airport Name	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024
Berlin Schönefeld	1.29	1.90	1.58	NA	NA	0.40	0.93	0.59	NA	NA	29%	23%	21%	NA	NA
Berlin-Tegel	0.94	NA	NA	NA	NA	0.72	NA	NA	NA	NA	26%	NA	NA	NA	NA
Bremen	0.60	0.65	0.69	NA	NA	0.51	0.26	0.29	NA	NA	25%	16%	23%	NA	NA
Köln-Bonn	1.36	1.34	1.22	NA	NA	0.88	1.27	1.30	NA	NA	29%	25%	18%	NA	NA
Dresden	0.46	0.46	0.76	NA	NA	0.40	0.19	0.15	NA	NA	24%	22%	21%	NA	NA
Düsseldorf	1.37	1.33	1.63	NA	NA	1.25	0.59	0.91	NA	NA	27%	24%	19%	NA	NA
Erfurt	0.41	0.48	0.59	NA	NA	0.17	0.26	0.69	NA	NA	20%	22%	14%	NA	NA
Frankfurt	1.90	1.34	1.81	NA	NA	1.73	1.51	1.65	NA	NA	8%	7%	5%	NA	NA
Hamburg	0.91	1.12	1.37	NA	NA	0.60	0.45	0.55	NA	NA	33%	26%	27%	NA	NA
Hannover	1.03	0.73	1.01	NA	NA	0.65	0.13	0.24	NA	NA	33%	32%	27%	NA	NA
Leipzig	2.01	3.68	2.40	NA	NA	2.07	1.91	1.61	NA	NA	18%	15%	12%	NA	NA
Münster-Osnabrück	1.02	1.19	1.09	NA	NA	0.53	0.28	0.39	NA	NA	17%	19%	23%	NA	NA
München	2.48	3.12	2.70	NA	NA	1.12	1.20	0.92	NA	NA	11%	10%	5%	NA	NA
Nürnberg	0.63	0.92	1.35	NA	NA	0.43	0.32	0.33	NA	NA	21%	19%	14%	NA	NA
Saarbrücken	2.43	2.72	2.15	NA	NA	0.61	0.46	0.43	NA	NA	14%	11%	12%	NA	NA
Stuttgart	1.85	1.87	1.91	NA	NA	0.56	0.32	0.51	NA	NA	16%	16%	10%	NA	NA

3.4 Civil-Military dimension







Focus on Civil-Military dimension

Update on Military dimension of the plan

For obvious flight safety reasons, military activities must be segregated from civil flows which has an impact on both horizontal (HFE) and vertical flight efficiency (VFE).
Because ASM manageable areas form an integral part of the nominal system, military airspace reservations shall be considered as part of the performance baseline rather than a key factor degrading environmental KPIs.
As a result of implementation of the FUA concept the impact of military activities using Restricted Airspace on civil performance is highly minored when associated with an efficient ASM process:
- At strategic level (HLAPB) by designing areas in accordance with A-FUA concept (MVPA structures), especially for congested airspaces.
- At pre-tactical level (AMC), by managing these areas in a dynamic way, with an associated level 2 CDM process, validated by HLAPB.
- At tactical level (ACC/UAC in cooperation with TCS) by activating/deactivating areas as close as possible to actual use and allowing crossing or direct routes when possible (in accordance with TRA status), with an associated level 3 CDM process validated by HLAPB.

At each level, HLAPB, AMC or ACC/UAC, a key factor of efficiency is a trust-driven civil-military cooperation. As a counterpart, AOs and CFSPs must be reactive and take efficiently into account available or released airspaces. At last, ANSP have also to adapt the route network to create more DCTs within military areas.
Finally, local circumstances (e.g. constrained airspace, proximity of international hubs, etc….) as well as a large number of military missions that differ from one State to another must be taken into account.

Therefore, airspace needs (e.g. airspace requirements for the 5th generation fighters) and related ASM procedures of the States differ and standardized objectives cannot be defined.

Military - related measures implemented or planned to improve capacity

FABEC States are working on mid-term improvements regarding implementation of ASM level 1, 2, and 3 procedures. Some local initiatives regarding ASM/ATFCM convergence, like the traffic Light Scheme concept in France are promoted at FABEC level, as well as at ECAC level in the EUROCONTROL OEP framework. Another major improvement is the interconnection of the existing ASM tools (e.g. LARA, STANLY_ACOS) at FABEC Level, to enhance regional coordination among FABEC AMCs as well as with the NM.

Initiatives implemented or planned to improve PI#6

No data available

Initiatives implemented or planned to improve PI#7

No data available

Initiatives implemented or planned to improve PI#8

No data available

4 CAPACITY - GERMANY

4.1 PRB monitoring

• Germany registered 2.28 minutes of average en route ATFM delay per flight during 2022, which has been adjusted to 2.27 during the post-ops adjustment process.

• Average en route ATFM delay per flight was further adjusted to 2.20 minutes per flight due to the exceptional event related to Russia's war of aggression against Ukraine, still not achieving the local target value of 0.27.

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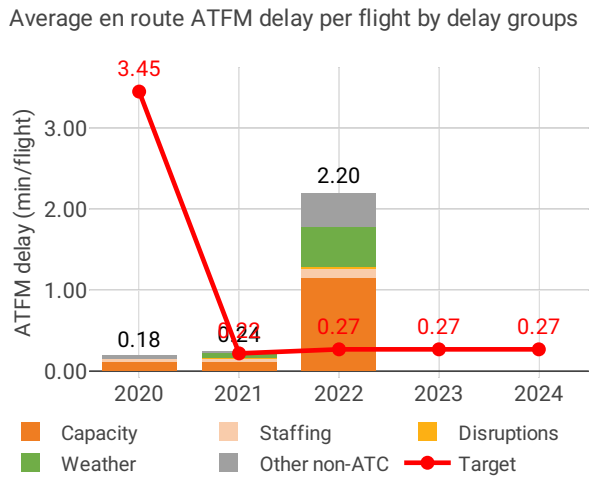
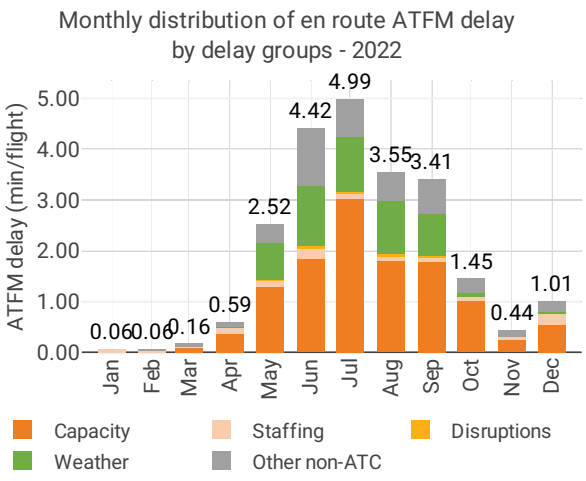
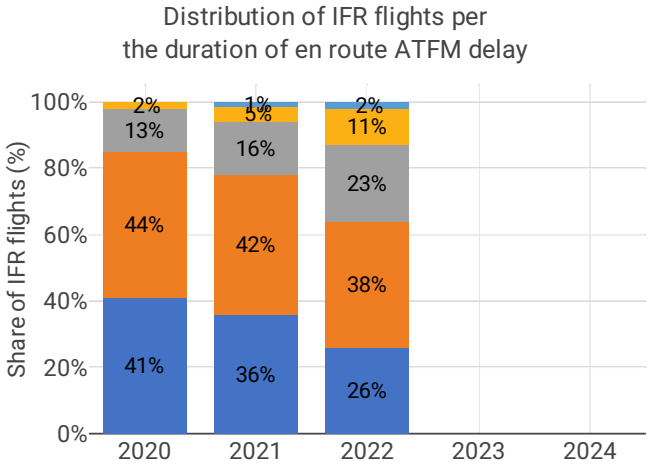
4.2 En route performance

4.2.1 En route ATFM delay (KPI#1)







Focus on en route ATFM delay

Summary of capacity performance

Germany did not achieve the required en route capacity performance in 2022. There were 2 516k flights in the airspace of Germany (handled by DFS & EUROCONTROL MUAC), with 5.7 million minutes of ATFM en route delay, including 483k minutes of ATFM delay re-attributed to the DFS (from other ANSPs) under the Network Manager's post operations delay attribution process.
Such delays originated from the eNM/S22 measures agreed with adjacent ANSPs to ameliorate expected capacity shortfalls primarily in Karlsruhe UAC, by on-loading adjacent ATC units.
Similarly, during 2022, the DFS re-attributed 503k minutes of en route ATFM delay to DSNA due to eNM/S22 measures associated with the capacity shortfall in Reims ACC.
An additional 180k minutes of ATFM delay due to 'exceptional events' were excluded after consultation with the European Commission and the Network Manager, giving a final value of 5,5 million minutes of en route ATFM delay.

NSA's assessment of capacity performance

In addition to the decisive influence of the pandemic in 2021, two other influencing factors were added in 2022 that were decisive for the course of business: the war in Ukraine and the significantly rising inflation rate, leading among other things to the resulting energy shortage.
Air traffic recorded significant growth rates compared to the previous year. However, problems with the operational handling of passenger processes, triggered by the various service providers at the airports, affected this positive development.
Overall, the recovery of the situation is reflected in the fact that the level of traffic development on average

in 2022 has been able to correspond to the strongest month of 2021 with 80 percent of the traffic of 2019. After traffic volumes had only reached half of pre-crisis levels in 2021, there was a significant recovery in 2022. On an annual average, the number of controlled flights in German airspace was 80 percent of the 2019 level.
Compared to the previous year, DFS conducted more than 60 percent more flights under instrument flight rules in 2022. In some air traffic control sectors, even more traffic was controlled than in the pre-Corona year 2019, up to 50 percent at peak times. Due to the Ukraine war, military flight operations also increased in the course of 2022. Overall, it was around 15 percent above the level of 2021.
The GER 2022 en route capacity target of 0,27 min/flight was not met. The actual value for 2022 was 2,27 min/flight which is 2,00 min/flight above the target. [Corrected to 2,20 after consideration of 'exceptional events'.]
The delay in 2022 was mainly caused by limited ATC capacity, Other Reasons (Code O due to activation of military corridors) and severe weather.
Reasons for this non-achievement are e.g. the strong traffic increase from April 2022 with traffic peaks far above the pre-crisis level, significantly higher airspace complexity with increased military presence and the establishment of military corridors because of the war in the Ukraine.
The capacity targets for 2022 were met in MUAC. More ATCO than anticipated have stopped working in OPS.

Monitoring process for capacity performance

DFS is in continuous exchange with the NM.
Data received from DFS was checked, consolidated and in terms of unclarities further information was requested. Besides this the NSA requested regularly during the past year information on the Capacity performance, remedial actions and their progress as well as on outlooks.
Value shown above is in line with the SES Dashboard (https://www.eurocontrol.int/prudata/dashboard/vis/2022/). It has to be considered that the ansperformance Dashboard (https://ansperformance.eu/data/) shows a better value of 2,11.

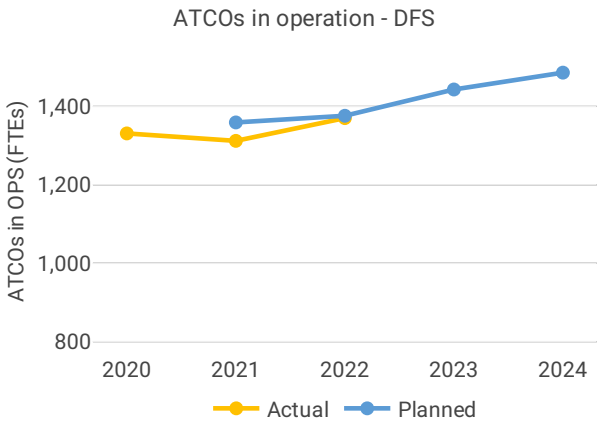
Capacity planning

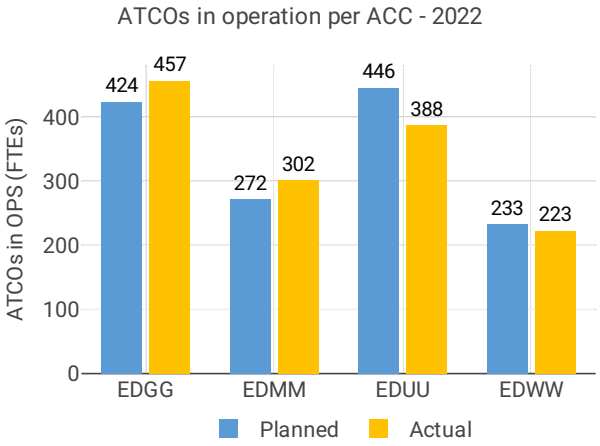
As stated in the national PP, the targets remain challenging for DFS. It is rather difficult to react on the strong traffic increase from April 2022 onwards with traffic peaks far above the pre-crisis level; significantly higher airspace complexity with increased military presence, and the establishment of military corridors because of the war in the Ukraine, while at the same time there are e.g. staffing measures having been slowed down during COVID with a negative effect on the staff situation (especially in Karlsruhe UAC Sector family South).
In addition, there were some unforeseen events or framework conditions that led to further bottlenecks such as: 4Flight Initiative with shifts of traffic from Reims ACC (due to the software problems with the 4Flight system, DSNA was not able to fully ramp up capacity again by summer 2022 as planned. Therefore, part of the traffic transfers from Reims ACC to Karlsruhe UAC had to be extended until the beginning of October); High traffic volatility and poor predictability (intensive work is being done with all system partners and with NM to improve flight plan adherence.).

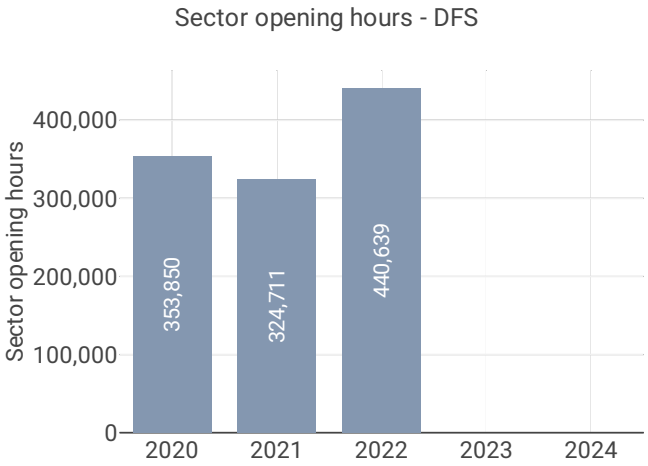
Application of Corrective Measures for Capacity (if applicable)

Strong traffic increase from April 2022 with traffic peaks far above the pre-crisis level (esp. in Karlsruhe UAC Sector family South); Staffing situation in some sector families (especially in Karlsruhe UAC Sector family South); 4Flight initiative with traffic shifts from Reims ACC; Significantly higher airspace complexity with increased military presence and the establishment of military corridors because of war in the Ukraine; High traffic volatility and poor predictability.[
As the given reasons for the capacity situation are various, the NSA was and will still be in regular contact with the ANSP to evaluate the situation in the course of the year, the outcome of the previous years remedial actions and the implementation of further remedial actions.Remedial measures to be taken by ANSP

4.2.2 Other indicators





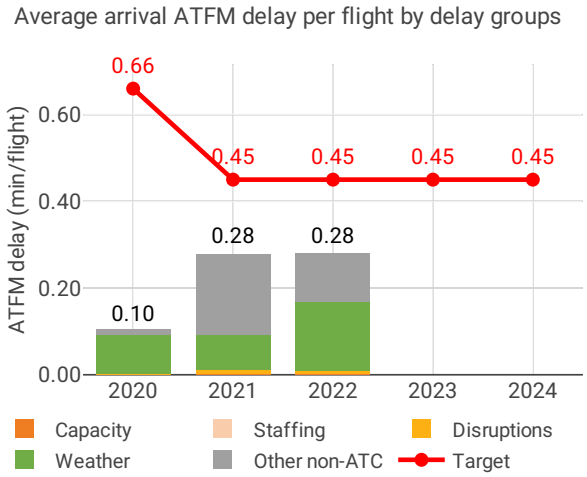


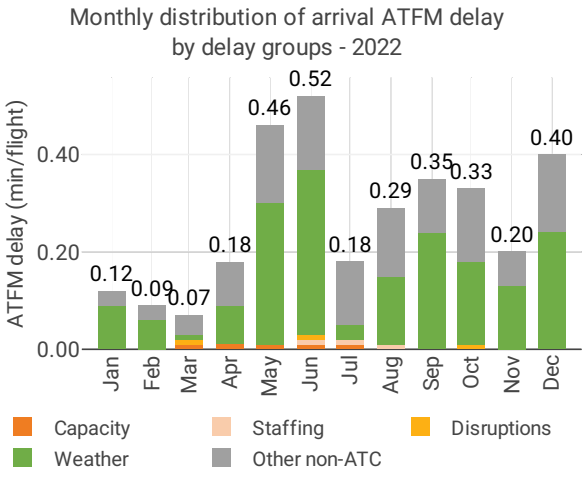
Focus on ATCOs in operations

The German NSA and ANSPs question if ATCO planning figures are legally required by the performance regulation to be included in the Performance Monitoring for RP3, as it is not a prescribed indicator. Furthermore, Germany questions whether this level of detail should be monitored by the EC, as plans are subject to change, creating unnecessary burdens within the SES performance scheme domain. Additionally, the planned evolution of ATCO numbers within an ANSP with multiple ACCs is socially sensitive.
Despite being a major driver for resolving current capacity and staffing issues, ATCO hiring and assignment cannot be considered a commitment due to the uncertainties associated with managing recruitment plans. The provided figures, even when reported annually, only offer a snapshot and do not guarantee a realistic view throughout the entire duration of RP3. Several factors contribute to the uncertainty of ATCO planning, including retirement rates, employee absences, maternity and parental leave, ATCO mobility issues, availability of suitable applicants, training success rates, and social agreements that impact ATCO availability per person and the total available Full-Time Equivalent (FTE) per ANSP. The demographic situation of ANSPs may also require hiring beyond traffic demand. Standardizing assumptions and disclosing information about ATCOs partially working in projects are necessary before reporting ATCO FTE.
For ANSPs with multiple national ACCs, ATCO hiring plans are managed at the ANSP level, but changes in traffic volumes, flows, and local human resources factors can influence assignments to different ACCs. It should be noted that social agreements, involving ANSPs, unions, Ministries of Finance, and Public Administration, will affect the figures related to the numbers of additional ATCOs to be recruited during RP3 and working conditions such as salaries, extra hours, and rostering.
For MUAC: More ATCO than anticipated have stopped working in OPS.

4.3 Terminal performance

4.3.1 Arrival ATFM delay (KPI#2)





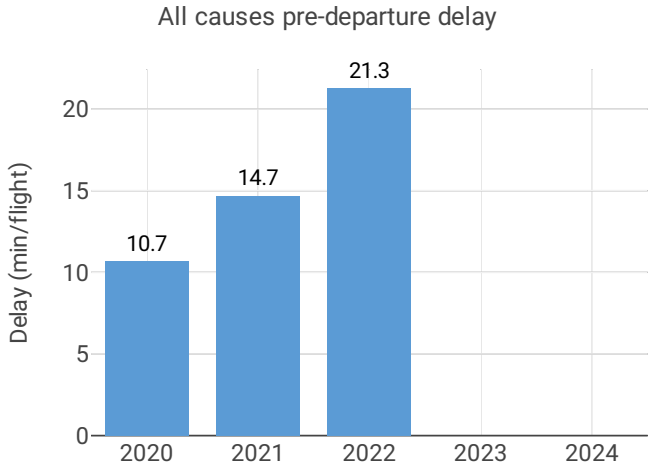
Focus on arrival ATFM delay

Germany identifies a total of 15 airports as subject to RP3 monitoring (Flight Operation at Berlin-Tegel were suspended on 08/11/2020 and the airport was finally decommissioned on 05/05/2021.)
However, in accordance with IR (EU) 2019/317 and the traffic figures, only 7 of those airports must be monitored for pre-departure delays.
The Airport Operator Data Flow, necessary for the monitoring of these pre-departure delays, is established for the 8 airports required. Nevertheless, the quality of the reporting does not allow for the calculation of the ATC pre-departure delay at Cologne (EDDK) and Frankfurt (EDDF), with more than 60% of the reported delay not allocated to any cause.
In 2022, traffic at the ensemble of German airports under monitoring was still 30% lower with respect to 2019, regardless of a 53% increase versus 2021.
Average arrival ATFM delays in 2022 was 0.28 min/arr, same as in 2021.
ATFM slot adherence has improved (2022: 97.6%; 2021: 97.3%).

The most important delays at German airports in 2022 were observed at Cologne (EDDK: 2020: 0.03 min/arr.; 2021: 0.80 min/arr.; 2021: 1.31 min/arr.). 80% of these delays at Cologne were attributed to Aerodrome Capacity issues and distributed all over the year.
Frankfurt (EDDF: 2019: 0.69 min/arr.; 2020: 0.19 min/arr.; 2021: 0.19 min/arr.; 2022: 0.38 min/arr.) and Munich (EDDM: 2019: 0.25 min/arr.; 2020: 0.08 min/arr.; 2021: 0.13 min/arr.; 2022 0.22 min/arr.) showed delays mainly due to weather.
Leipzig (EDDP: 2020: 0.14 min/arr.; 2021: 0.31 min/arr.; 2022: 0.2 min/arr.) improved slightly and Erfurt showed some delays concentrated in one day in November, and associated with non-ATC disruptions.
The rest of German airports registered very low or nearly zero arrival ATFM delays in 2022.3. Arrival ATFM Delay – National TargetThe national target on arrival ATFM delay in 2022 was met.

All German airports showed adherence above 94% and the national average was 97.6%, a slight improvement with respect to 2021 (97.3%). With regard to the 2.4% of flights that did not adhere, 1.5% was early and 0.9% was late.
According to the German monitoring report *there are no initiatives planned by DFS in this area.*

4.3.2 Other terminal performance indicators (PI#1-3)



Airport level

	Avg arrival ATFM delay (KPI#2)				Slot adherence (PI#1)			
Airport name	2020	2021	2022	2023	2020	2021	2022	2023
Berlin Schönefeld	NA	0.94	0.04	NA	97.7%	98.3%	99.3%	NA%
Berlin-Tegel	0.05	NA	NA	NA	94.2%	NA	NA	NA
Bremen	0.01	0.02	0.01	NA	94.9%	92.5%	95.6%	NA%
Dresden	NA	0.00	0.06	NA	99.7%	98.8%	98.8%	NA%
Düsseldorf	0.26	0.03	0.12	NA	95.8%	98.2%	98.0%	NA%
Erfurt	NA	NA	0.22	NA	96.0%	97.4%	98.4%	NA%
Frankfurt	0.19	0.19	0.38	NA	92.3%	96.4%	96.4%	NA%
Hamburg	0.03	0.01	0.05	NA	97.5%	97.6%	97.8%	NA%
Hannover	NA	0.07	0.03	NA	95.9%	94.4%	94.2%	NA%
Köln-Bonn	0.03	0.80	1.31	NA	97.2%	97.0%	97.8%	NA%
Leipzig	0.14	0.31	0.20	NA	98.9%	96.9%	99.0%	NA%
München	0.08	0.13	0.22	NA	94.3%	96.9%	97.6%	NA%
Münster-Osnabrück	NA	NA	NA	NA	97.1%	97.1%	96.8%	NA%
Nürnberg	NA	0.01	NA	NA	97.6%	97.7%	98.2%	NA%
Saarbrücken	NA	0.00	NA	NA	98.4%	98.7%	97.2%	NA%
Stuttgart	NA	0.02	0.08	NA	98.9%	98.9%	98.9%	NA%

	ATC pre departure delay (PI#2)				All causes pre departure delay (PI#3)			
Airport name	2020	2021	2022	2023	2020	2021	2022	2023
Berlin Schönefeld	0.04	0.32	0.27	NA	8.2	12.3	20.1	NA
Berlin-Tegel	NA	NA	NA	NA	6.7	NA	NA	NA
Bremen	0.01	0.10	0.14	NA	3.4	4.9	11.1	NA
Dresden	0.00	0.00	0.00	NA	7.9	9.0	12.0	NA
Düsseldorf	0.11	0.03	0.10	NA	8.2	11.6	20.6	NA
Erfurt	0.00	0.00	0.00	NA	4.8	7.8	14.4	NA
Frankfurt	0.28	0.14	0.18	NA	16.5	20.4	27.9	NA
Hamburg	0.08	0.12	0.34	NA	7.4	10.2	19.0	NA
Hannover	0.01	0.08	0.26	NA	11.6	16.1	20.8	NA
Köln-Bonn	NA	NA	NA	NA	10.8	16.7	25.7	NA
Leipzig	0.16	0.12	0.12	NA	15.2	21.9	19.2	NA
München	0.01	0.07	0.02	NA	7.3	9.0	16.7	NA
Münster-Osnabrück	0.00	NA	0.01	NA	8.6	9.9	10.6	NA
Nürnberg	0.03	NA	0.17	NA	13.4	15.9	22.7	NA
Saarbrücken	0.00	0.00	0.02	NA	3.3	6.3	14.4	NA
Stuttgart	0.05	0.01	0.05	NA	6.9	9.0	13.7	NA

Focus on performance indicators at airport level

ATFM slot adherence

The share of unidentified delay reported by 2 of the 7 German airports subject to monitoring of this indicator in 2021 (Tegel is closed) has been above 40% for more than 2 months in the year, preventing the calculation of this indicator.
In order to improve the situation EUROCONTROL contacts regularly the airports to check on the status of

the reporting and provide support in the final correct implementation of the APDF. EUROCONTROL is also part of an ACI sub-group (APN) that includes several airports and informs them regularly on data provision issues.
It should be noted that in 2022 three more airports were able to provide enough data quality for the calculation of the indicator (EDDH, EDDM, EDDS).
Hamburg (EDDH: 2022: 0.37 min/dep) and Berlin Brandenburg (EDDB: 2022: 0.27 min/dep) showed the highest values in Germany for this indicator. At the rest of airports these delays are very low.
According to the German monitoring report there are no initiatives planned by DFS in this area.

ATC pre-departure delay

The total (all causes) delay in the actual off block time at German airports in 2022 increased significantly at all airports. The highest pre-departure delays were observed at Frankfurt (EDDF: 2022: 27.93 min/dep) and Cologne (EDDK: 2022: 25.75 min/dep), resulting in the highest and third highest among the SES monitored airports in 2022.The worst delays per flight at these airports were observed in Summer.
According to the German monitoring report there are no initiatives planned by DFS in this area. The German monitoring report also mentions: All cause departure delay is very generic and ATFM delay is only a small contributor. Departure delay can be generated by ATFM en-route delay (not only local airport, but the complete Network) but also reactionary and turnaround delay, technical issues with the aircraft, airport operations, problems with passengers and or luggage, etc. In other words, it is not always possible to address a specific reason as this delay is quite generic.

All causes pre-departure delay

No data available: airport operator data flow not established, or more than two months of missing / non-validated data

5 COST-EFFIENCY - GERMANY

5.1 PRB monitoring

• The en route 2022 actual unit cost of Germany was 70.65 €2017, 4.6% higher than the determined unit cost (67.52 €2017). The terminal 2022 actual unit cost was 258.18 €2017, 19% higher than the determined unit cost (216.36 €2017).

• The en route 2022 actual service units (12,519K) were 8.2% lower than the determined service units (13,644K).

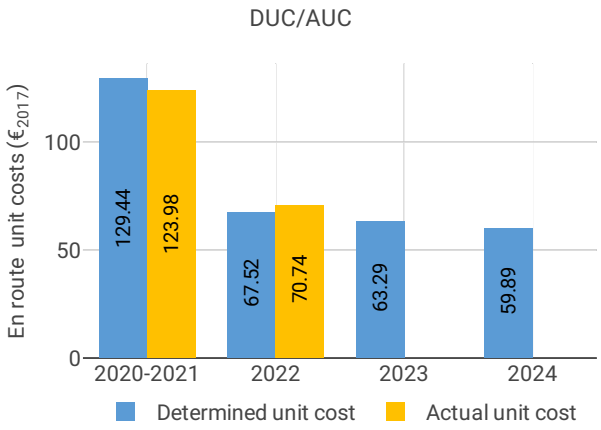
• In 2022, the en route actual total costs were 37 M€2017 lower (-4.0%) than determined. It was mainly attributable to the reduction in staff costs (-62 M€2017, or -9.0%) mainly due to less full-time equivalents than planned. However, the decrease was partially offset by the significant increase in cost of capital (+37 M€2017, or +198%).

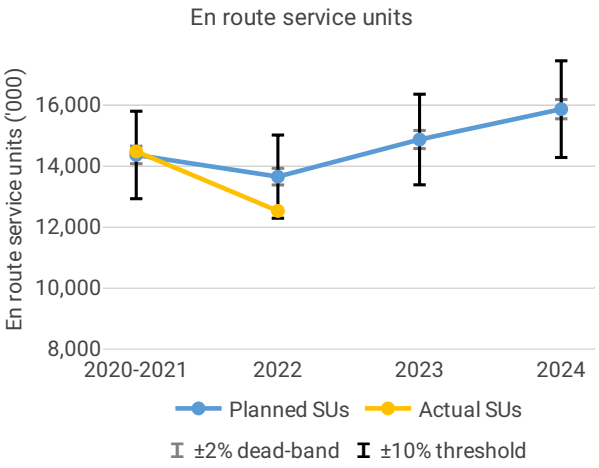
• DFS spent 107 M€2017 in 2022 related to costs of investments, 6.5% more than determined (100 M€2017), driven by the substantial increase in cost of capital. The NSA explained that it is stemming from the negative development of commercial papers. At the same time the net book value of fixed assets decreased by -4.0%. The PRB invites the NSA to clarify the reasons and impact of these commercial papers and, if eligible, to present the costs in line with the Regulation.

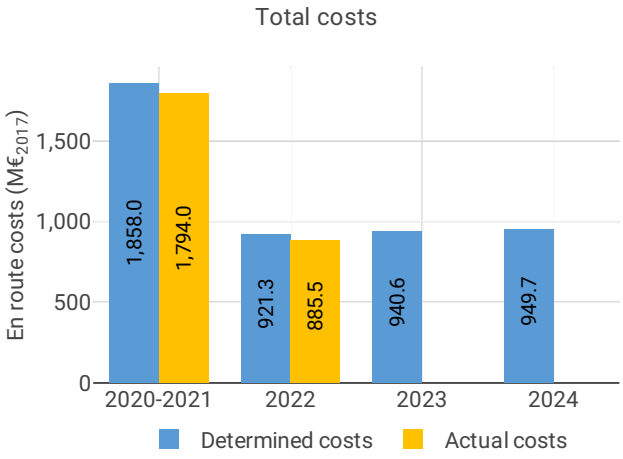
• The en route actual unit cost incurred by users in 2022 was 79.70€, while the terminal actual unit cost incurred by users was 278.54€.

5.2 En route charging zone

5.2.1 Unit cost (KPI#1)

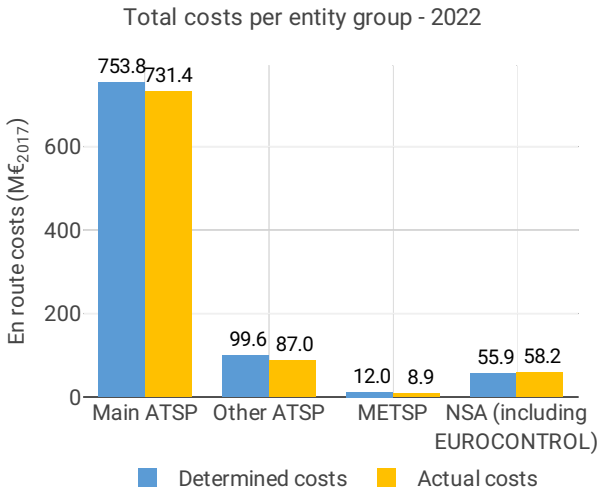


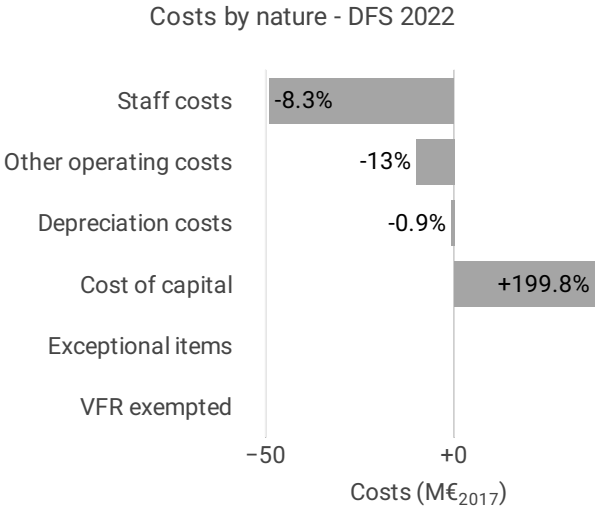




Actual and determined data

Total costs - nominal (M€)	2020-2021	2022	2023	2024
Actual costs	1,877	1,000	NA	NA
Determined costs	1,935	977	1,010	1,034
Difference costs	-59	23	NA	NA
Inflation assumptions	**2020-2021**	**2022**	**2023**	**2024**
Determined inflation rate	NA	1.1%	1.5%	1.7%
Determined inflation index	NA	107.2	108.8	110.6
Actual inflation rate	NA	8.7%	NA	NA
Actual inflation index	NA	116.4	NA	NA
Difference inflation index (p.p.)	NA	+9.1	NA	NA





Focus on unit cost

AUC vs. DUC

In 2022, the en route AUC was +4.6% (or +3.12 €2017) higher than the planned DUC. This results from the combination of significantly lower than planned TSUs (-8.2%) and lower than planned en route costs in

real terms (-4.0%, or -36.9 M€2017). It should be noted that actual inflation index in 2022 was +9.1 p.p. higher than planned.

En route service units

The difference between actual and planned TSUs (-8.2%) falls outside the ±2% dead band, but does not exceed the ±10% threshold foreseen in the traffic risk sharing mechanism. The resulting loss of en route revenues is therefore shared between the ANSP and the airspace users, with the ANSP (DFS) bearing a loss of -26.7 M€2017.

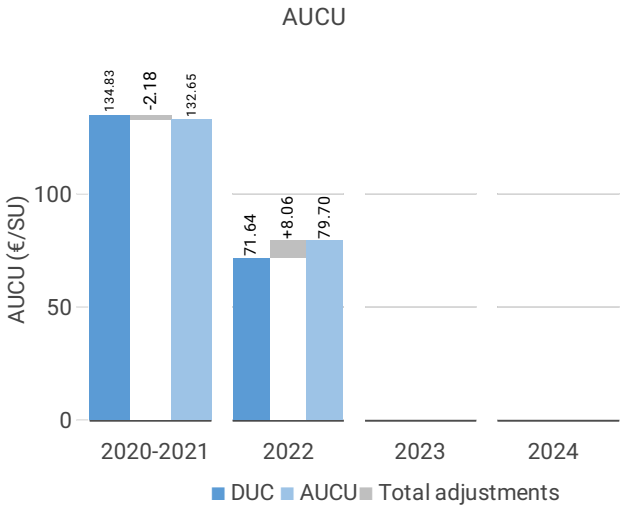
En route costs by entity

Actual real en route costs are -4.0% (-36.9 M€2017) lower than planned. This is the result of lower costs for the main ANSP, DFS (-3.0%, or -22.4 M€2017), the other ANSP (MUAC (Germany), -12.6%, or -12.6 M€2017) and the MET service provider (-25.9%, or -3.1 M€2017) and higher costs for the NSA/EUROCONTROL (+2.2%, or +1.2 M€2017).

En route costs for the main ANSP at charging zone level

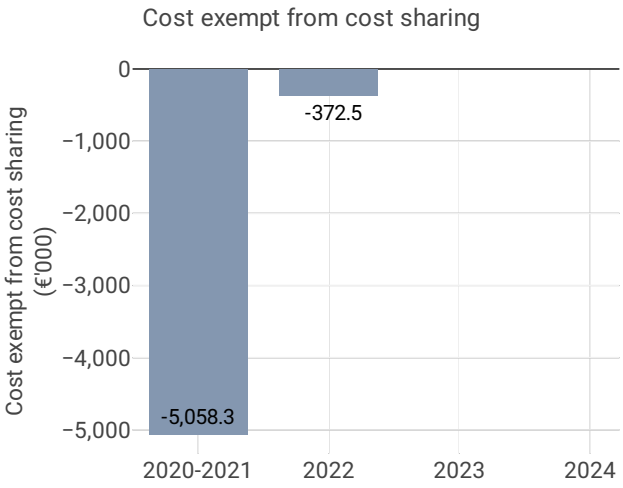
Lower than planned en route costs in real terms for DFS in 2022 (-3.0%, or -22.4 M€2017) result from:
- Significantly lower staff costs (-8.3%), due to two opposite effects, from one side lower staff (FTE's) compared to the planned while increasing costs for special payments in order to maintain capacity as part of the COVID-19 agreements,
- Significantly lower other operating costs (-13.0%), reflecting lower costs in projects like "Transmission paths", "Data Center", the construction of a new building at the DFS Campus Munich and lower costs relating to facility management and infrastructure.
- Slightly lower depreciation (-0.9%). None lower costs driver information has been provided.
- Significantly higher cost of capital (+199.8%), *"caused by the negative development of the commercial papers."*

5.2.2 Actual unit cost incurred by the users (AUCU) (PI#1)



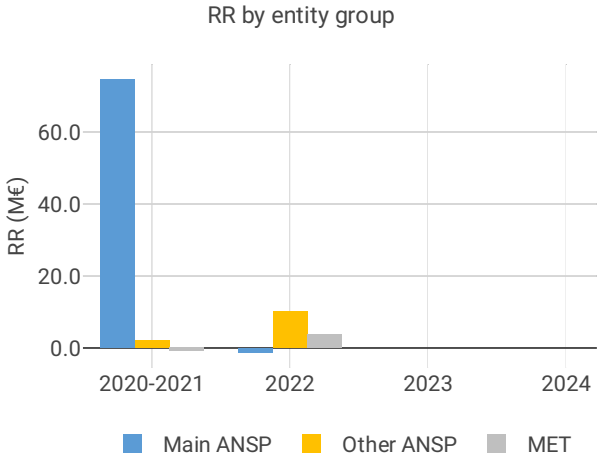
AUCU components (€/SU) – 2022

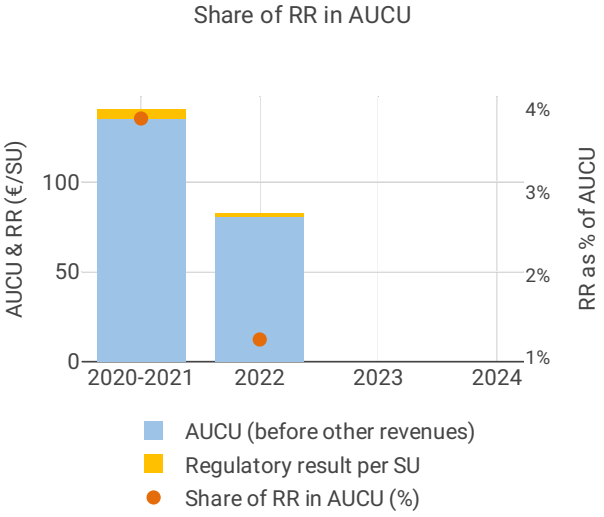
Components of the AUCU in 2022	€/SU
DUC	**71.64**
Inflation adjustment	5.66
Cost exempt from cost-sharing	-0.03
Traffic risk sharing adjustment	3.17
Traffic adj. (costs not TRS)	0.45
Finantial incentives	0.00
Modulation of charges	0.00
Cross-financing	0.00
Other revenues	-1.19
Application of lower unit rate	0.00
Total adjustments	8.06
AUCU	**79.70**
AUCU vs. DUC	**+11.3%**

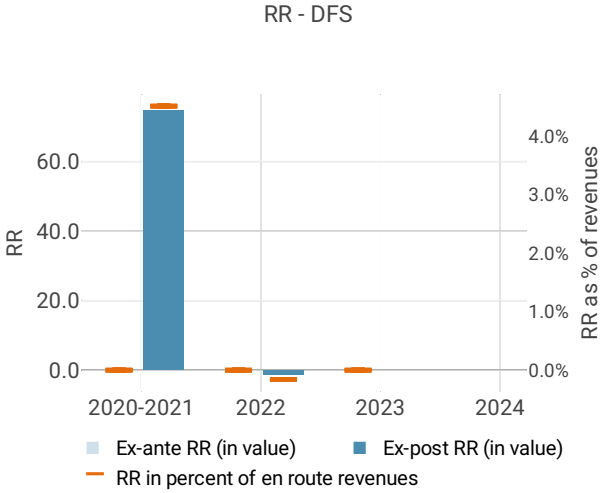


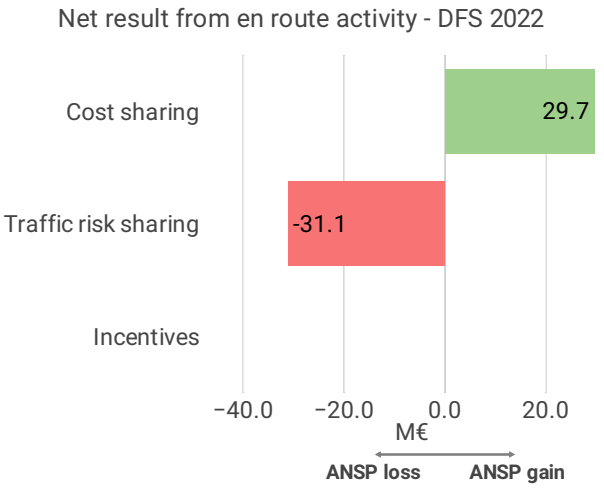
Cost exempt from cost sharing by item - 2022	€'000	€/SU
New and existing investments	-970.6	-0.08
Competent authorities and qualified entities costs	-2,408.7	-0.19
Eurocontrol costs	4,767.8	0.38
Pension costs	-1,675.8	-0.13
Interest on loans	0.0	0.00
Changes in law	-85.2	-0.01
Total cost exempt from cost risk sharing	**-372.5**	**-0.03**

5.2.3 Regulatory result (RR)









Focus on regulatory result

DFS net gain on activity in the Germany en route charging zone in the year 2022

DFS reported a net loss of -1.3M€, as a combination of a gain of +29.7 M€ arising from the cost sharing mechanism, with a loss of -31.1 M€ arising from the traffic risk sharing mechanism.

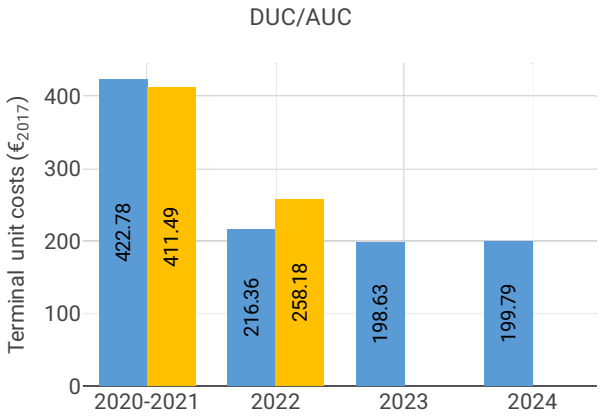
DFS overall regulatory results (RR) for the en route activity

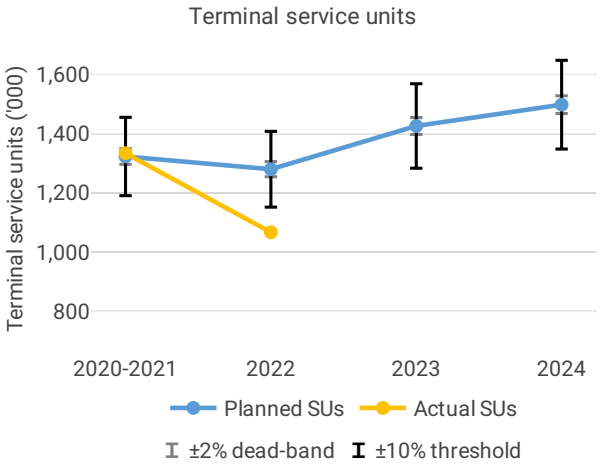
Ex-post, the overall RR corresponds to the net loss from the en route activity mentioned above (-1.3 M€), as the RoE for DFS has been set to zero throughout RP3. The ex-post RR corresponds to -0.2% of the en route revenues). The resulting ex-post rate of return on equity is -0.2%, compared to 0% planned in the PP.

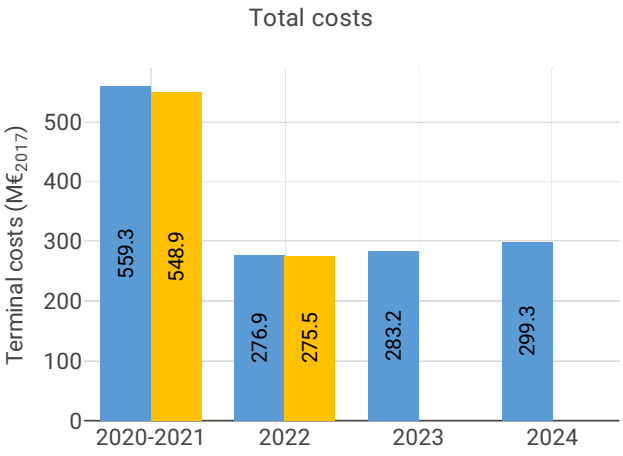
Note 1: The proportion of financing trough equity for 2022A should be corrected to reflect the actual share, in spite of the specific composition of the asset base and the significantly higher than planned cost of capital reported to be due to *"the negative development of the commercial papers".* For the purpose of the analysis, it has been set at the level of the 2022D presented in the revised draft performance plan.

5.3 Terminal charging zone

5.3.1 Unit cost (KPI#1)

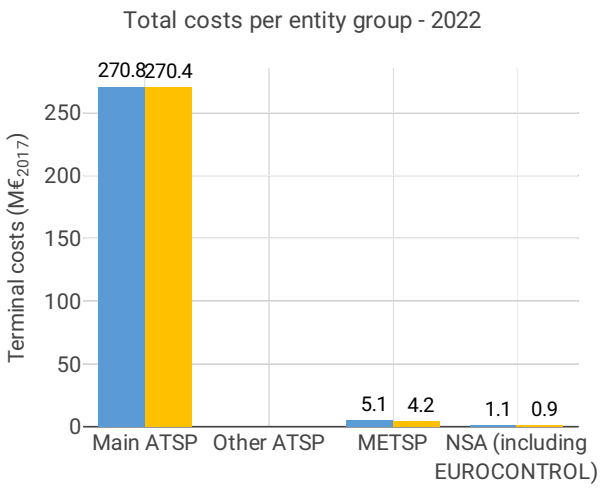


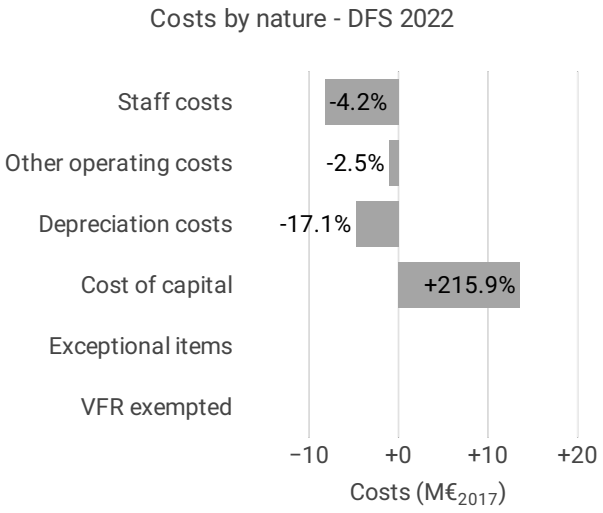




Actual and determined data

Total costs - nominal (M€)	2020-2021	2022	2023	2024
Actual costs	576	313	NA	NA
Determined costs	584	294	305	327
Difference costs	-8	19	NA	NA
Inflation assumptions	**2020-2021**	**2022**	**2023**	**2024**
Determined inflation rate	NA	1.1%	1.5%	1.7%
Determined inflation index	NA	107.2	108.8	110.6
Actual inflation rate	NA	8.7%	NA	NA
Actual inflation index	NA	116.4	NA	NA
Difference inflation index (p.p.)	NA	+9.1	NA	NA





Focus on unit cost

AUC vs. DUC

In 2022, the terminal AUC was +19.3% (or +41.82 €2017) higher than the planned DUC. This results from the combination of significantly lower than planned TNSUs (-16.6%) and slightly lower than planned terminal costs in real terms (-0.5%, or -1.5 M€2017). It should be noted that actual inflation index in 2022 was +9.1 p.p. higher than planned.

Terminal service units

The difference between actual and planned TNSUs (-16.6%) falls outside the ±10% threshold foreseen in the traffic risk sharing mechanism. The resulting loss of terminal revenues is therefore shared between the ANSP and the airspace users, with the ANSP (DFS) bearing a loss of -10.9 M€2017.

Terminal costs by entity

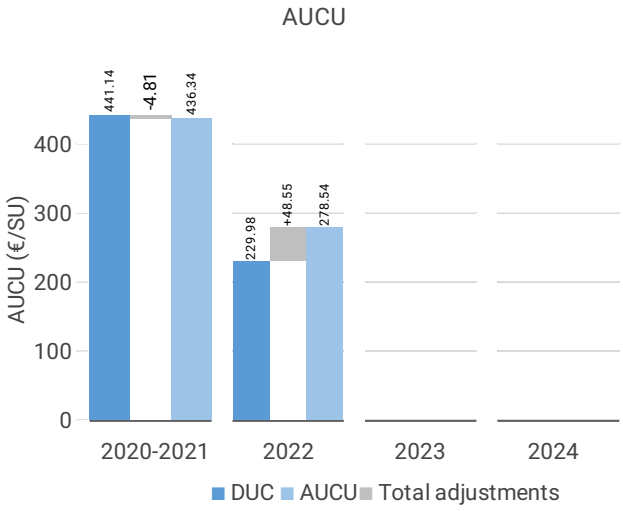
Actual real terminal costs are -0.5% (-1.5 M€2017) lower than planned. This is the result of lower costs for the MET service provider (-16.3%, or -0.8 M€2017), the main ANSP, DFS (-0.2%, or -0.4 M€2017) and the NSA (-19.3%, or -0.2 M€2017).

Terminal costs for the main ANSP at charging zone level

Slightly lower than planned terminal costs in real terms for DFS in 2022 (-0.2%, or -0.4 M€2017) result from:

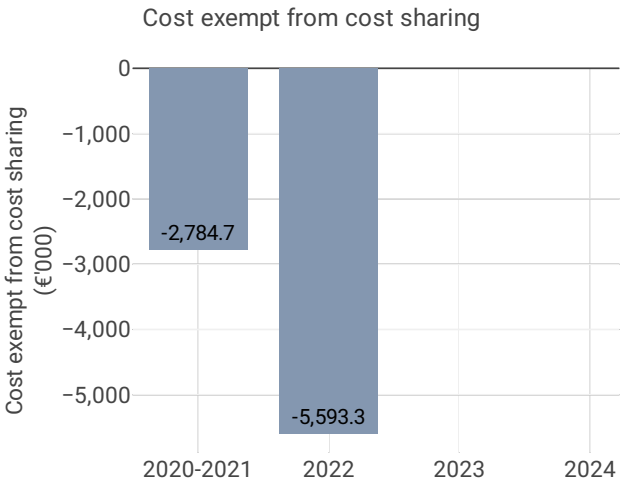
- Lower staff costs (-4.2%),mainly as a result of the inflation index impact (+9.1 p.p.) since in nominal terms staff costs are higher than planned (+3.9%) due to special payments in order to maintain capacity as part of the COVID-19 agreements.
- Lower other operating costs (-2.5%), as a result of to the inflation index impact (+9.1 p.p.) since in nominal terms operating cots are higher than planned (+5.8%) due to external personnel for programming work, travel expenses, bike leasing, inflation impacting the increase of costs services.
- Significantly lower depreciation (-17.1%), mainly due to the implementation of the TANGe (Tower Air Traffic Service - ATS next generation)/RTC project.
- Significantly higher cost of capital (+215.9%), *"caused by the negative performance of the commercial papers."*

5.3.2 Actual unit cost incurred by the users (AUCU) (PI#1)



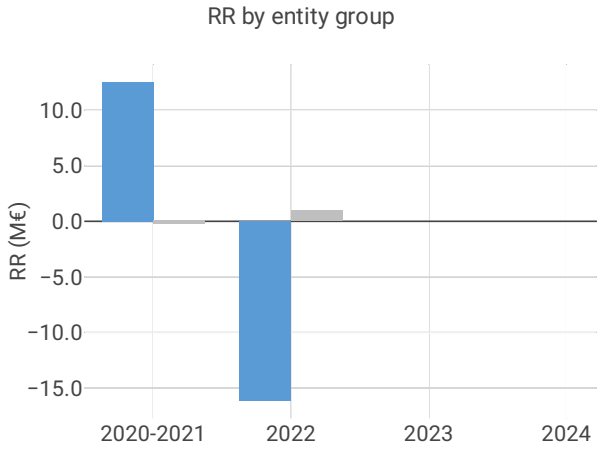
AUCU components (€/SU) – 2022

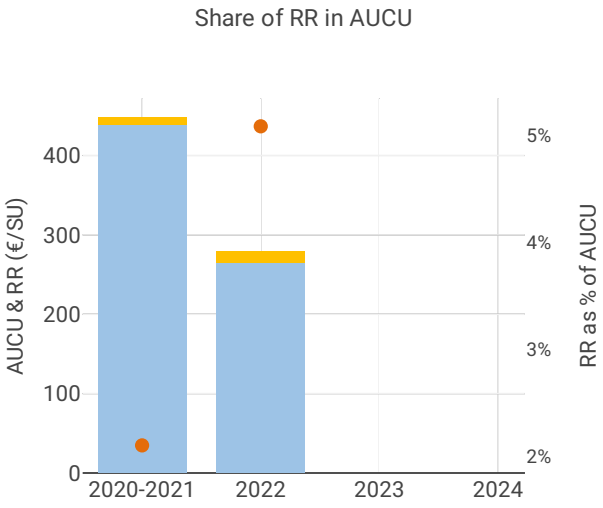
Components of the AUCU in 2022	€/SU
DUC	**229.98**
Inflation adjustment	20.63
Cost exempt from cost-sharing	-5.24
Traffic risk sharing adjustment	33.02
Traffic adj. (costs not TRS)	1.01
Finantial incentives	0.00
Modulation of charges	0.00
Cross-financing	0.00
Other revenues	-0.87
Application of lower unit rate	0.00
Total adjustments	48.55
AUCU	**278.54**
AUCU vs. DUC	**+21.1%**

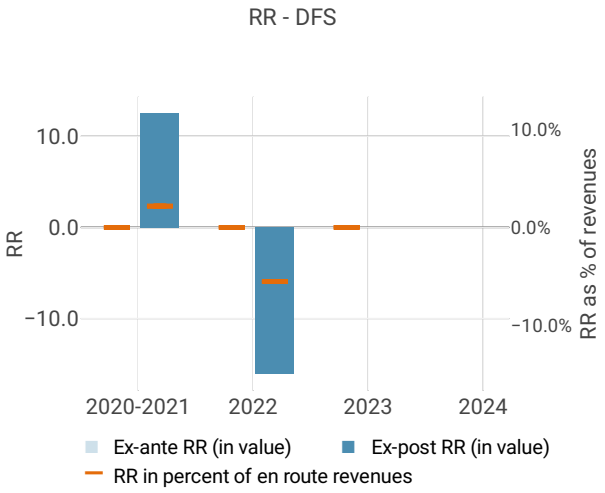


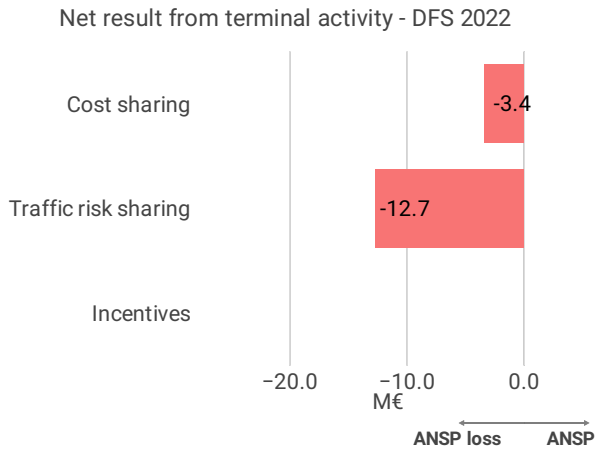
Cost exempt from cost sharing by item - 2022	€'000	€/SU
New and existing investments	-4,751.7	-4.45
Competent authorities and qualified entities costs	-209.5	-0.20
Eurocontrol costs	0.0	0.00
Pension costs	-601.6	-0.56
Interest on loans	0.0	0.00
Changes in law	-30.6	-0.03
Total cost exempt from cost risk sharing	**-5,593.3**	**-5.24**

5.3.3 Regulatory result (RR)









Focus on regulatory result

DFS net gain on activity in the Germany terminal charging zone in the year 2022

DFS reported a net loss of -16.1 M€, as a combination of a loss of -3.4 M€ arising from the cost sharing mechanism, with a loss of -12.7 M€ arising from the traffic risk sharing mechanism.

DFS overall regulatory results (RR) for the terminal activity

Ex-post, the overall RR taking into account the net loss from the terminal activity mentioned above (-16.1 M€) amounts to -16.1 M€ (-5.5% of the terminal revenues), as the RoE for DFS has been set to zero. The resulting ex-post rate of return on equity is -8.6%.

Note 1: The proportion of financing trough equity for 2022A should be corrected to reflect the actual share, in spite of the specific composition of the asset base and the significantly higher than planned cost of capital reported to be due to *"the negative development of the commercial papers"*. For the purpose of the analysis, it has been set at the level of the 2022D presented in the revised draft performance plan.