



TECHNICAL NOTE ON EN ROUTE CAPACITY

*DOCUMENTATION OF PRC TRIAL WITH
ANSPS TO IMPROVE TRANSPARENCY IN
ATFCM OPERATIONS*

*Technical note
prepared by the
EUROCONTROL
Performance Review
Unit (PRU) and
commissioned by the
Performance Review
Commission (PRC)*



Background

This report has been commissioned by the Performance Review Commission (PRC).

The PRC was established in 1998 by the Permanent Commission of EUROCONTROL, in accordance with the ECAC Institutional Strategy (1997). One objective of this strategy is *“to introduce a strong, transparent and independent performance review and target setting system to facilitate more effective management of the European ATM system, encourage mutual accountability for system performance...”*

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1 Background:

The Performance Review Commission (PRC) is a Commission established by the Permanent Commission (of EUROCONTROL) to provide advice in order to ensure the effective management of the European air traffic management system through a strong, transparent and independent performance review and target setting system.

Through independent measurement, assessment and review of the performance of Pan-European Air Navigation Services system, the PRC strives to identify future improvements and make recommendations as appropriate.

The PRC does not intend to criticise either stakeholders or stakeholders' actions. The PRC focuses purely, on supporting stakeholders to improve Network operations. The PRC, wherever possible, uses factual data that is available within the system, to present an objective perspective on how operations currently are, and on areas where improvements are possible.

One of the areas where the PRC has identified room for improvement is the attribution of Air Traffic Management (ATFM) delays.

The PRC would like to inform readers that this report has been produced without prejudice to the current regulatory system applied within the Single European Sky.

1.1 Attribution of ATFM delays

The PRC considers that the current ATFM delay attribution process could be significantly improved to facilitate the identification, and subsequent mitigation / resolution, of capacity constraints.

The first step to improve the ATFM process involves providing robust, objective and consistent information in a transparent manner; improving transparency will assist stakeholders to identify and address capacity issues.

1.2 The importance of transparency

Air traffic management involves stakeholders with both overlapping and diverging interests. Although, the relationship, between airspace users and air navigation service providers, is primarily a user – provider relationship, it is also very much a symbiotic one.

Airspace users, and ultimately their customers, pay for the service that they receive from ANSPs, either through a cost-recovery basis, or through an agreed framework based on defined levels of service or 'targets' in various key performance areas including cost effectiveness and capacity.

The Covid-19 pandemic has brought into focus that ATM is an essential service that must be available even when traffic levels are unable to sustain the cost of operations. Furthermore, airspace users frequently pay, not only for the service that they receive now, but also, for the service that they will receive, in the future. To plan for future traffic, existing airspace users fund capacity enhancements, which, potentially, they may not actually avail of in the future, and which may create disruptions to existing capacity during implementation.

Providing an objective and transparent view of how capacity is planned, implemented, and deployed, assures airspace users that they are being treated fairly and receiving value for the costs, and investments, that they are paying for.

1.3 Benefits of transparency

Greater transparency will provide airspace users with accurate information on the causes for capacity constraints that they encountered. It will allow them to decide, whether or not, to factor such constraints into operational planning: for example, if a constraint shows a recurring pattern, or is likely to recur, the airspace user may decide to adapt operations accordingly, by increasing buffers or by re-routing to ensure reliable service.

ANSPs also benefit from increased transparency in the capacity process. Identifying the underlying causes for the capacity shortfall, enables effective mitigation / resolution of the problems. Aggregating or Incorrectly attributing capacity constraints gives a misleading picture of the causes and potential mitigations.

ANSPs, unable to achieve the required level of service, can clearly identify the issues creating the capacity constraints and focus efforts on addressing those issues. For ANSPs that satisfy capacity requirements, greater transparency will identify where future improvements can come from when traffic demand increases. In both cases, the ANSPs will be able to focus on areas where they have an influence.

When an ANSP is unable to handle traffic demand, even when deploying all existing capacity, greater transparency will identify and justify the need for capacity enhancement measures such as airspace re-design. Typically, such measures involve significant costs and time before they can be fully realised.

ANSP investments and capacity planning are scrutinised by the national authorities. Greater transparency on the capacity process will enable authorities to review the causes of capacity constraints and proposed solutions / mitigations for existing and future traffic demand. The authority will be in a better position to consider and eventually approve ANSP plans.

Stakeholder consultation, including airspace users, about national (performance) plans will benefit from improved transparency since the airspace users will see the link between operational constraints and proposed solutions and can assess the justification for associated costs. Although airspace users are rarely likely to welcome increased charges, they will be more palatable if they can be directly, and transparently, traced back to the need to mitigate / solve operational constraints.

The Network Manager operates a post-operations delay attribution process that, if activated on stakeholder request, can re-attribute delay causes or delay reference locations, including third parties, up to three months after the event.

However, the source data, used to populate performance graphics, including NM interactive reporting, and inform decision-makers, is based upon the original attributions.

It would be much more effective to improve the quality of data at source whenever possible, especially in cases where there is no issue about attributing delays to third parties.

1.4 Historic attribution of ATFM delays

For several years, the PRC has highlighted that the existing ATFCM process could be improved to provide greater transparency to stakeholders, in particular in the way in which ATFM delays are attributed.

The current ATFCM process gives guidelines that should be followed when the flow management position (FMP) of an ANSP is requesting ATFM regulations to be applied as a result of one, or more, capacity constraints. The guidelines are subject to interpretation and, as highlighted in previous PRC analysis, result in considerable inconsistencies in the reporting of ATFM delays.

For a given situation, (despite the guidelines provided by NM) one ANSP may attribute ATFM delays to ATC Capacity, whereas a second ANSP facing an identical situation may attribute the delays to ATC

staffing. Moreover, an ANSP may decide to classify ATFM delays either to ATC staffing or ATC capacity, depending on when exactly the absence of ATC staff was notified. In all of these cases, the airspace will have the exact same capacity shortfall, requiring the exact same ATFM regulations and ATFM delays. However, the airspace users will not have a clear picture as to the actual cause of the capacity constraint.

Responsibility for attributing delays remains solely with the ANSP requesting the regulation. Inconsistent attribution of delays results in misleading information being used in performance reporting and ultimately being fed to the decision makers. There is a risk that strategic national / network decisions could be based on incorrect data.

The PRC has previously proposed a strengthening of the ATFCM process, by developing strict procedures for attributing ATFM delay causes, instead of the current guidelines that lead to inconsistencies and opacity in monitoring capacity performance. (PRR 2017, PRR 2018, PRR 2020)

In PC/49 (June 2018), the Provisional Council of EUROCONTROL adopted the following recommendation stemming from the PRC proposals:

The Provisional Council requested the Director General and the Member States to strengthen the ATFCM process by developing and adopting strict procedures for attributing ATFM delay causes, through the NM/NMB, instead of the current guidelines that lead to inconsistencies and opacity in monitoring capacity performance.

In 2019 and 2021 the Provisional Council reaffirmed that steps should be taken to ensure implementation of the 2018 recommendation. Unfortunately, despite the repeated PC recommendations, the PRC have noted no changes to the ATFCM process to date.

1.5 Adverse weather

In PRR 2020, the PRC reported.

“The virtual elimination of all delays categories including adverse weather shows how capacity constraints stemming from weather are generally aggravated by other capacity constraints e.g. sector capacity and staffing availability.”

In the executive summary of the Performance Review Body Monitoring Report 2020, the Performance Review Body (PRB) made a very similar statement.

“With reduced traffic, weather related delays disappeared suggesting that weather does not directly cause delays on its own. It is the combination of lack of capacity to deal with difficult weather situations and higher traffic demand that causes delays.”

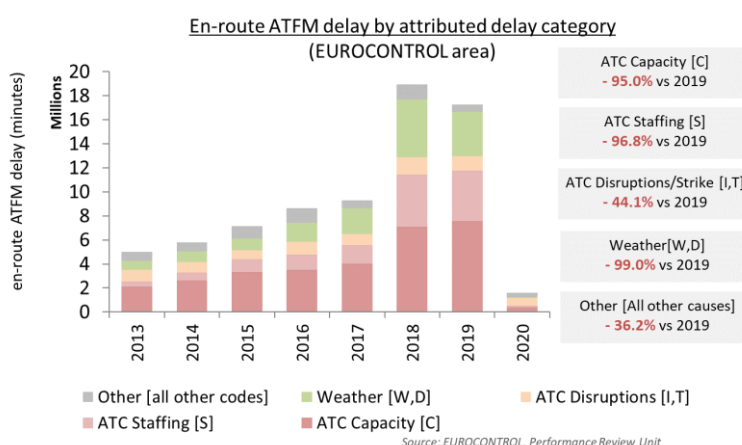


Figure 1: Attributed delay causes 2013 - 2020

The PRC received considerable support for its analysis, in discussions with ANSPs, though a few ANSPs challenged it - albeit without providing substantive evidence to support their challenges. The PRC proposal to improve transparency is expected to provide further evidence to allow the issue to be discussed objectively.



Currently an ANSP can only attribute an ATFM regulation to a single delay cause, which cannot be changed while the regulation is being applied (an issue highlighted by several ANSPs in discussions with the PRC). Therefore, attributing ATFM delays to ‘adverse weather’ or any other cause can obscure the other reasons for the capacity constraint, some of which may be more significant than the impact of adverse weather.

Even if only one reason / code (code) is permitted it is possible to improve the situation, by prioritising the order in which delay codes are used – e.g., prioritising ANSP-internal causes first; or, by increasing the range of regulation codes that can be used so that multiple capacity constraints can be reflected in a single code.

Strengthening the ATFM attribution process will lead to better quality information on the causes of capacity constraints and will therefore improve the transparency about capacity constraints and their potential solutions / mitigations.

1.6 PRC initiative – two new codes

The PRC, working directly with ANSPs, made proposals for the introduction of two new additional codes to improve transparency. The first new code “J” will introduce a third category between ATC Capacity ‘C’ and ATC Staffing ‘S’; the second new code “K” will involve adverse weather ‘W’.

ANSPs repeatedly stated that they are obliged to control the deployment of staff, and therefore the sector openings, in order to control the costs to airspace users. Staff and sector planning are integral parts of the ANSP capacity planning and should be recognised as such, in discussions about capacity constraints. To recognise this fact, while increasing transparency in the process, two new codes are proposed and described below.

Additional code for ATC staffing/capacity “J” → when during the planned operation of a collapsed sector, available capacity was insufficient to meet traffic demand.

Additional code for weather “K” → when during the planned operation of a collapsed sector, adverse weather has further decreased capacity – leading to, or amplifying, a capacity shortfall.

Currently, if sectors A and B are operated independently giving a potential capacity of 60 (2 x 30) (left-hand side of figure 2) and demand in either sector is greater than the declared capacity (30) to the extent that an ATFM regulation is required, the ATFM delay is attributed to ATC capacity ‘C’.

If the ANSP, because of a lack of staff, operates the two sectors as a single collapsed sector (right-hand side) the available capacity is reduced (45). If demand requires an ATFM regulation, the guidelines permit the ANSP to attribute the delay to ATC capacity ‘C’, or ATC staffing – depending on when the absence of staff was notified. (If the absence was notified the day before, it can be attributed as ATC capacity; if the absence occurred on the day of operations, it can be attributed as ATC staffing.)

Similarly, if adverse weather reduces sector capacity by 20% the potential available capacity of the independent sectors would be 48 (2 x 24). Demand, and regulations, above 48 would see delays attributed to Weather ‘W’.

If the sectors were collapsed, because of staffing unavailability, planned or unplanned, the available capacity would be 36. Demand and regulations above 36 would see delays attributed to Weather ‘W’.

The PRC proposals would see no change whatsoever when the sectors are operated independently (left-hand side of Figure 2). When the sectors are operated as a single collapsed sector according to staff / sector planning (right-hand side of Figure 2):

- Demand above declared capacity of collapsed sector (46+) – FMP uses new additional code “J”;
- During adverse weather – FMP uses new weather code “K”. (In specific cases where sectors cannot operate independently during adverse weather, then delays would be attributed to ‘W’ as at present – since additional staffing would not alleviate constraint.)

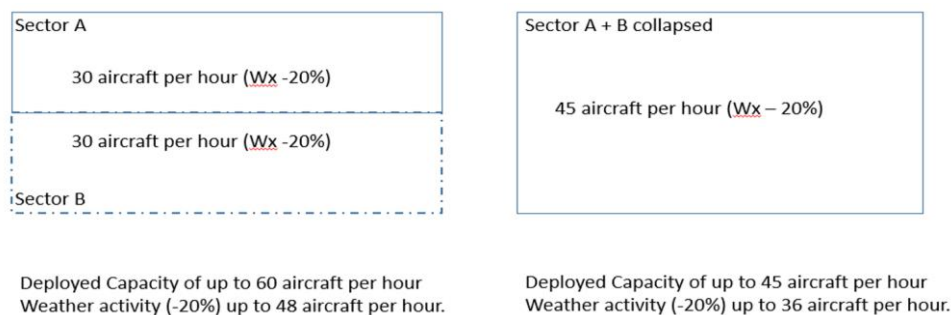


Figure 2: Generic independent and collapsed sectors

When sectors are operated as a single collapsed sector due to unplanned absence of staff, the FMP continue to use ATC staffing code ‘S’.

The PRC proposes that this simple change in ATFM delay classification will significantly improve transparency, whilst also improving consistency in how delays are reported by different ANSPs.

The introduction of the new codes should mean that ANSPs’ efforts to control costs by optimising sector openings, in accordance with agreed performance targets, will become more transparent. Discussions about the interaction between the need for capacity, and the costs of providing it, can also become more evidence based.

1.7 ANSP consultation

The PRC wrote to 39 ANSPs in Q4 2021 explaining the PRC proposal and rationale, requesting comment and feedback. More than half of the ANSPs responded.

All of the ANSPs who replied expressed a willingness to improve transparency. The vast majority of replies also expressed support for the specific proposals for two additional ATFM codes, to enhance the description of capacity constraints.

The PRC held further bilateral discussions with a limited number of ANSPs: Austro Control; DFS, DSNA; ENAIRE; EUROCONTROL (both MUAC & Network Manager); LVNL; and Nav Portugal. The PRC received support from each of these ANSPs for the proposed additional codes.

Key messages from various ANSPs in the consultations included:

- although ANSPs have lots of data about their specific problems, the information is not known to other stakeholders;
- ANSPs could benefit from knowing about the real issues at a neighbouring ANSP and how they are trying to solve them;
- “If the problem could have been solved by more staff, then staffing is an issue”;
- the additional transparency that could be brought by introduction of the new codes may be limited, especially if in some cases most delay may be re-allocated to the new codes;
- changes to ATFM coding requires harmonised implementation;
- the introduction of two additional codes goes a long way towards addressing well-known problems.

Following the ANSP consultation, the PRC decided to arrange trials to test the effectiveness and feasibility of implementing two additional ATFM codes.

2 Trials - methodology

Five ANSPs (Austro Control, DFS, LVNL, MUAC & NATS), together with the Network Manager, volunteered to work with the PRC to perform trials over the summer period 2022.

While the ANSPs would implement regulations as normal, using the current ATFCM guidelines, they would also perform post-operations analysis, to test the feasibility and effectiveness of the additional codes to improve transparency.

The PRC invited the ANSPs to review the attribution of delays on a limited number of days, in accordance with the proposals quoted above in this document. The ANSPs and the PRC would make a comparison between the original delay code attribution and the version using the new delay codes.

The Network Manager was also informed of the ANSP results, including the selection of days / regulations chosen by the ANSP for review. This would allow the Network Manager to perform a similar analysis using the existing NM post-operations delay attribution process.

The results of the trials are presented below.

2.1 Austro Control:

Austro Control reviewed 19 different regulations originally attributed to ATC Capacity 'C' and adverse Weather 'W'.

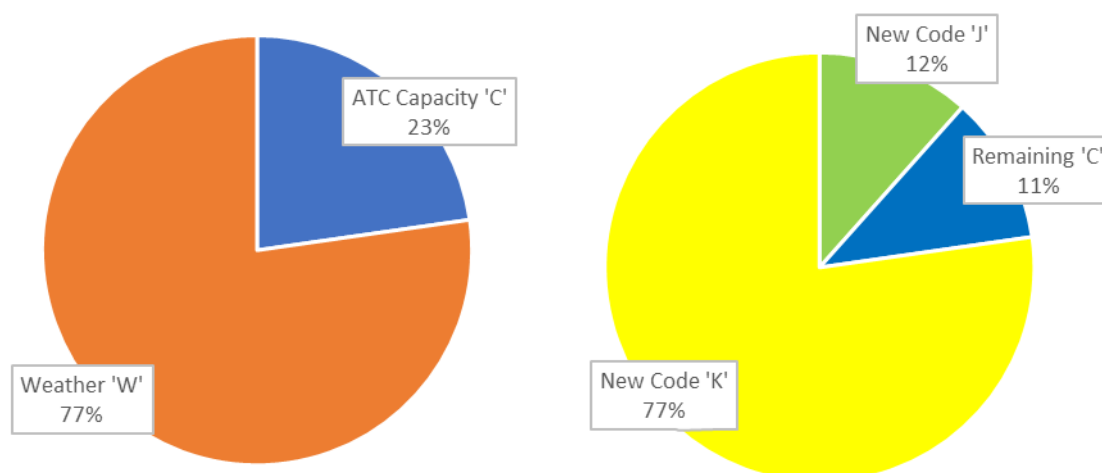


Figure 3: Vienna ACC review - Original attribution on left, revised attribution on right.

Austro Control reported “It is clear that the regulation code ‘K’ would be the better reason for all collapsed sectors with reason ‘Weather’ and ‘J’ for such ‘ATC Capacity’ regulations.”

There were two regulations in collapsed sectors attributed to ATC capacity where Austro Control decided to keep the attribution as originally designated, with the following explanation:

“NE13 regulations: Whenever we had to implement such regulations this summer, the real cause were regulations of other ANSPs until late in the night, which pushed traffic in our NE Sectors at a time, where we normally never have capacity issues. To plan additional staff for such unforeseen situations would be a waste of staff resources, as this effect does not happen all the other nights.”

2.2 DFS

The DFS reviewed ATFM delays on six specific days during July & August 2022: 10, 15, 29 July and 05, 13, 26 August. The DFS reviewed the ATFM delays attributed to ATC Capacity 'C' and adverse weather 'W' on those specific days in four ACCs: Karlsruhe UAC, Bremen ACC, Langen ACC and Munich ACC.

Karlsruhe UAC:

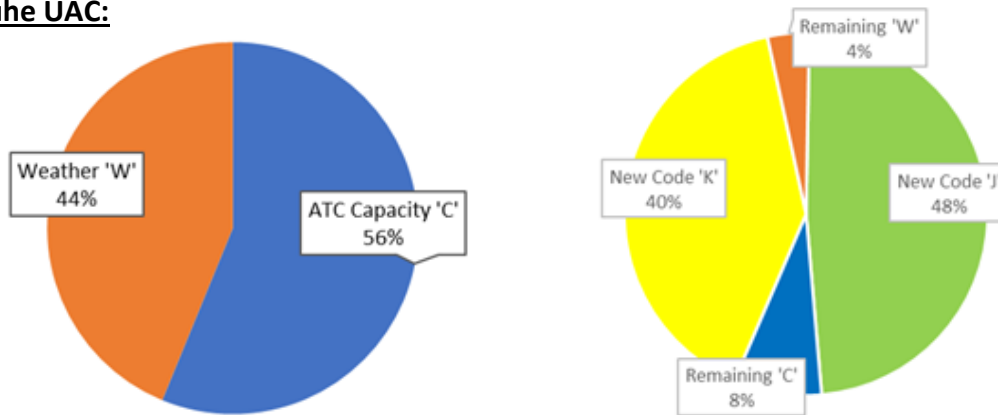


Figure 4: Karlsruhe UAC review - Original attribution on left, revised attribution on right.

Bremen ACC:

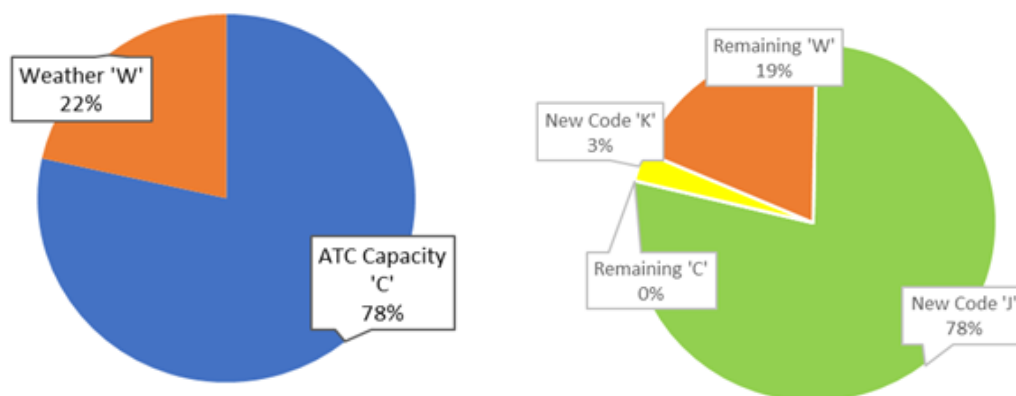


Figure 5: Bremen ACC review - Original attribution on left, revised attribution on right.

Langen ACC:

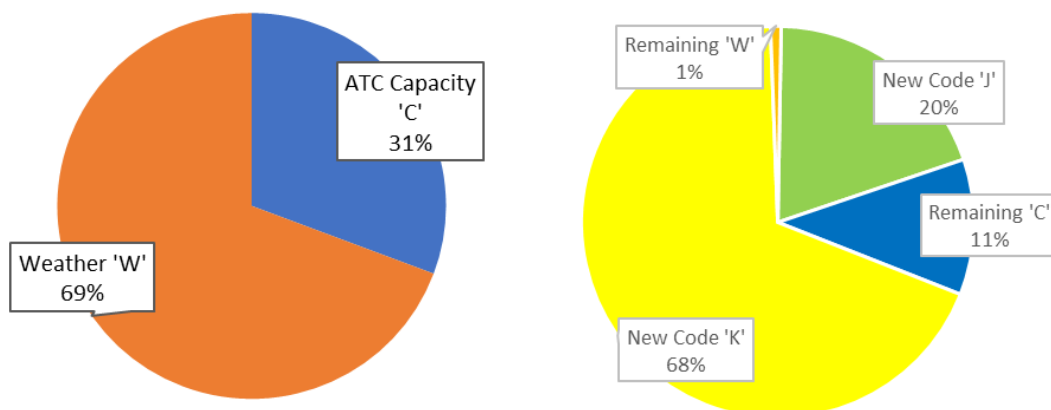


Figure 6: Langen ACC review - Original attribution on left, revised attribution on right.

Munich ACC:

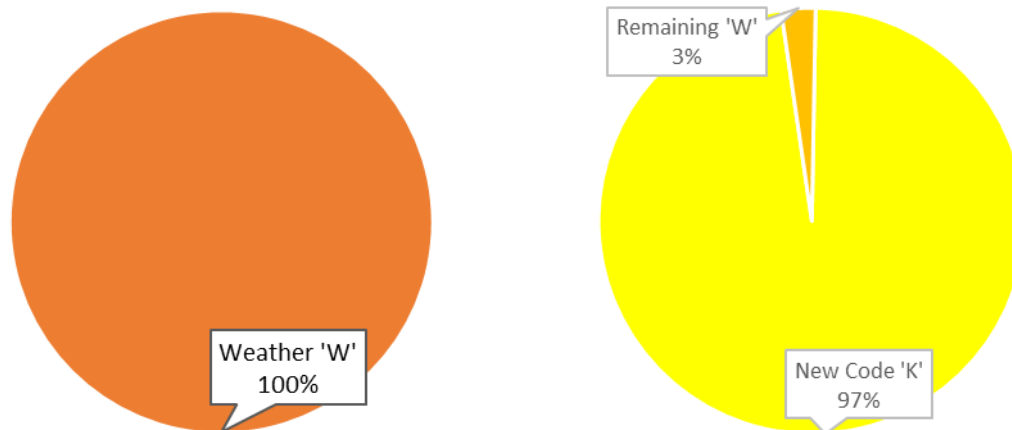


Figure 7: Munich ACC review - Original attribution on left, revised attribution on right.

DFS Overall:

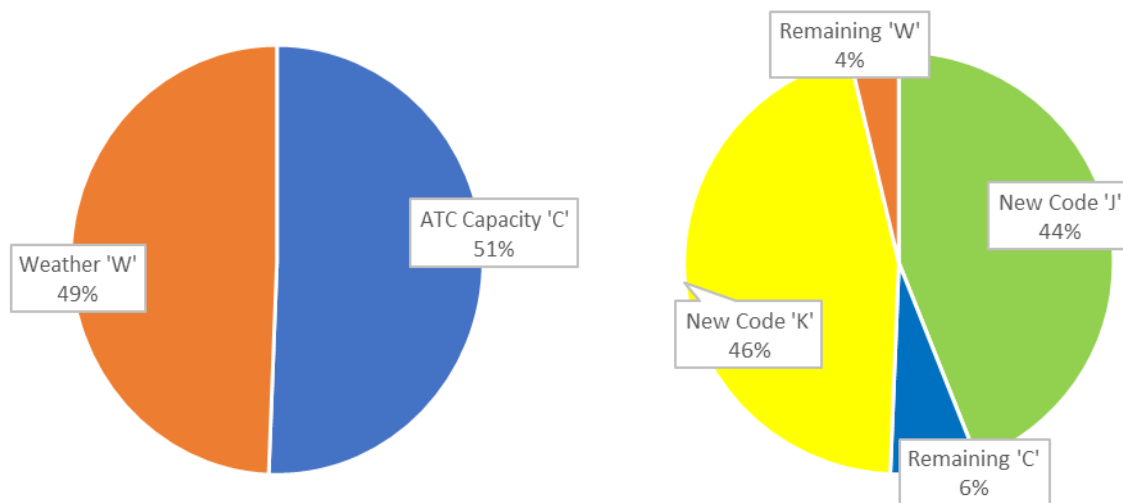


Figure 8: DFS overall review - Original attribution on left, revised attribution on right.

With the proposed coding approach, the majority (circa 90%) of Capacity and Weather-related delays would be re-assigned to the new delay codes.

This result was not unexpected by DFS as they noted that maximum configuration is rarely provided in the sector families concerned.

2.3 NATS:

NATS reviewed ATFM delays over the entire period of July and August. They analysed 229 individual ATFM regulations across the UK: Prestwick ACC, London AC and London TC.

NATS provided comprehensive information regarding ATFM delays attributed to ATC Capacity “C” and Weather “W”.

London AC:

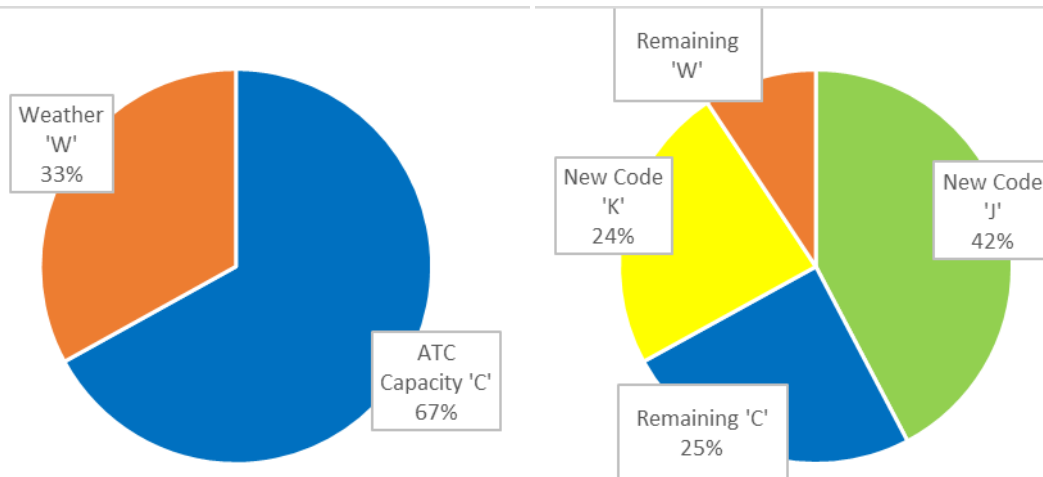


Figure 9: London AC review - Original attribution on left, revised attribution on right.

London TC:

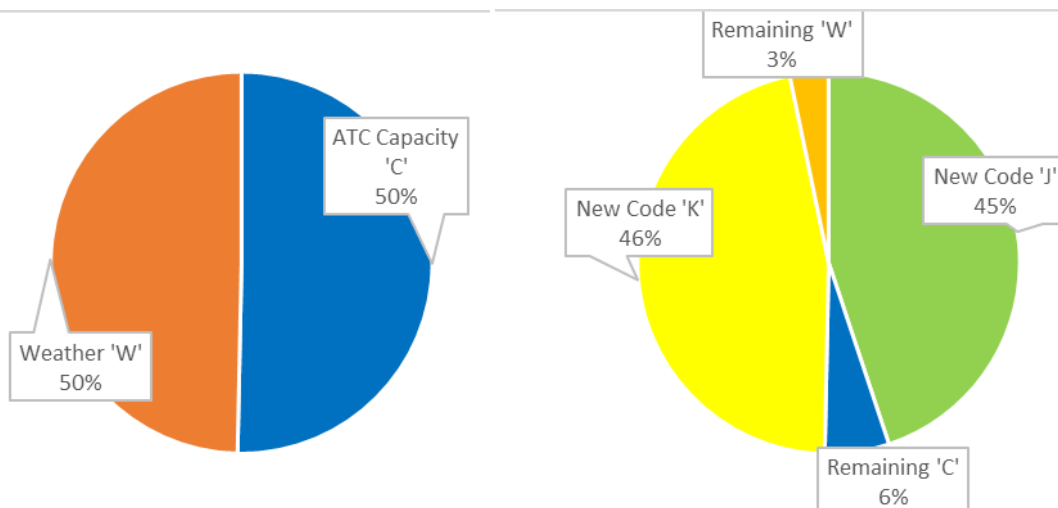


Figure 10: London TC review - Original attribution on left, revised attribution on right.

Prestwick ACC:

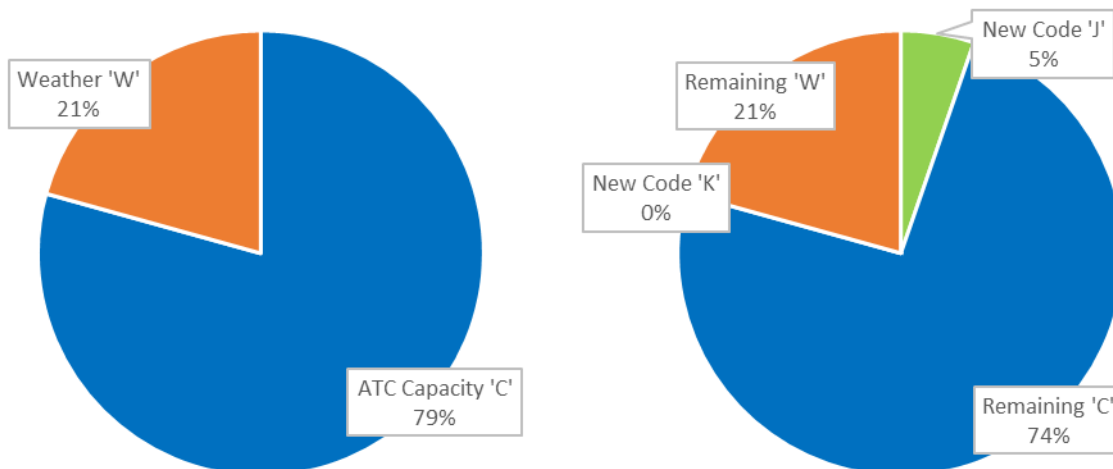


Figure 11: Prestwick ACC review - Original attribution on left, revised attribution on right.

NATS Overall:

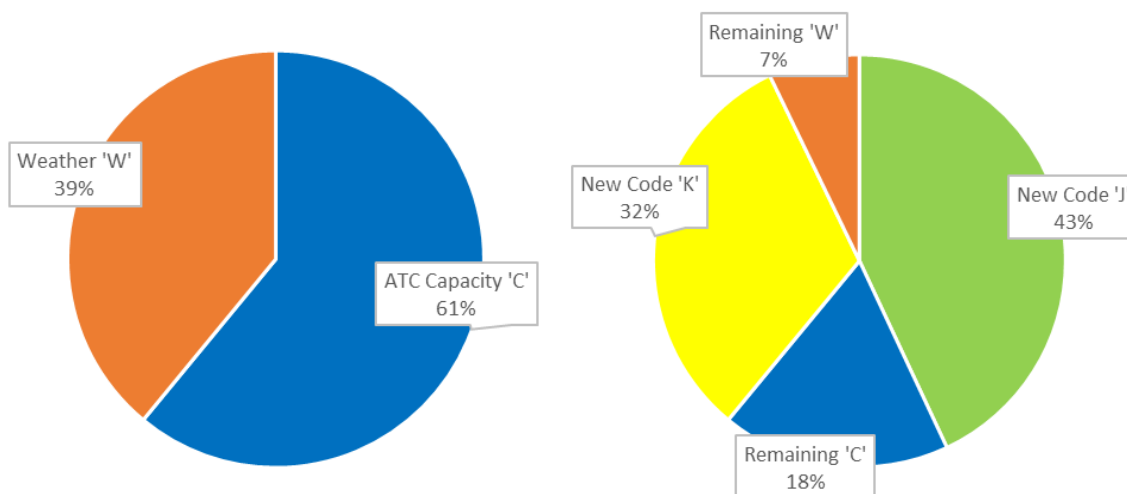


Figure 12: NATS overall review - Original attribution on left, revised attribution on right.

In the UK, during July and August, the trial findings are that more than 70% of delays originally attributed to ATC capacity would be rebooked as “J” – [ATC capacity affected by staffing]; more than 80% of delays originally attributed to Weather would be rebooked as “K” – [Weather affected by staffing].

2.4 Maastricht UAC:

Maastricht UAC provided analysis regarding 64 regulations, all originally attributed to adverse weather 'W', over the following periods: Week 25 (20 – 26th June), Week 33 (15 – 21st August) and Week 36 (5-11th September).

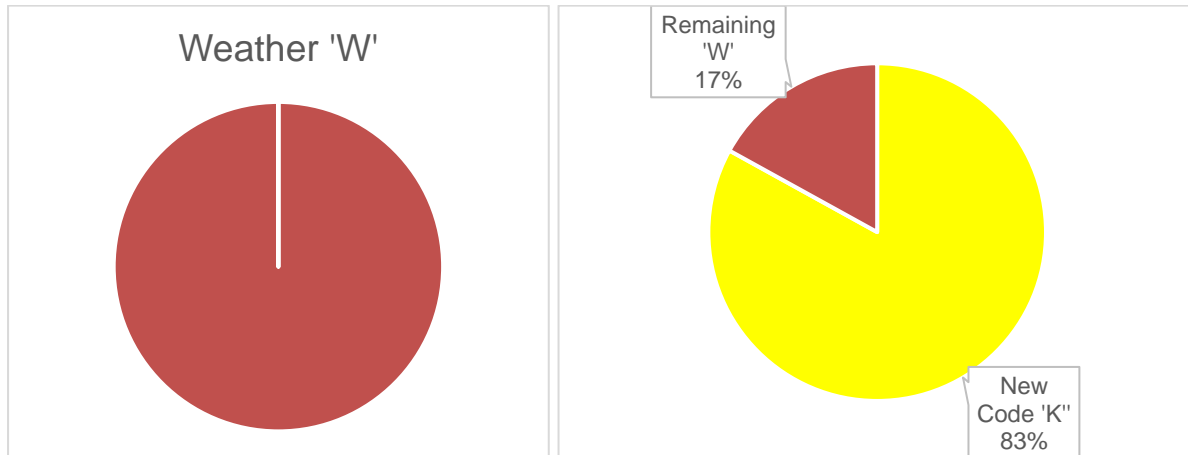


Figure 13: Maastricht UAC review - Original attribution on left, revised attribution on right.

MUAC have determined that more than 80% of the reviewed ATFM delays, originally attributed to adverse weather, should be re-booked as “K” – [Weather affected by staffing].



2.5 LVNL:

LVNL informed the PRC that they experienced very few ATFM delays during the period July – August 2022. They evaluated 10 regulations attributed to ATC capacity (9) and adverse Weather (1).

Delay location	ATC Capacity "C"	New code "J"	ATC Staffing "S"	Adverse weather "W"	New code "K"	Total ATFM delay
EHARTIP	379	0	0	140	0	519
EHRIVER	436	0	0	0	0	436
EHSECT3R	0	0	0	0	0	0
EHSECT2	0	0	0	0	0	0
Total	815	0	0	140	0	955

EHARTIP is an IAF. No split possible

EHRIVER is an IAF. No split possible

All ten regulations were attributed to specific points (initial approach fixes) rather than ATC sectors making it impossible to identify if sector splitting was possible.

2.6 Summary of findings from the trial

The PRC are most grateful for the cooperation and efforts from the ANSPs that volunteered to take part in this trial.

From the data received from the ANSPs, it is evident that complementing the ATFCM regulation reasons for ATC capacity and adverse Weather with two additional reasons / codes, to reflect when the capacity constraints were affected by staffing, provides a very different perspective.

The new delay codes bring transparency between combined capacity delay (J-code) and elemental capacity delay (C-code)

The findings were not as expected for some stakeholders indicating that they could provide valuable additional insight into the operational situation.

One ANSP reported that the results were as expected.

No ANSP reported any difficulties in identifying situations where operating additional sectors could have provided additional capacity.

One ANSP decided to retain the original attribution even though it was acknowledged that the (albeit unusual) situation was affected by staffing – already determining that mitigation would be a waste of resources.

3 PRC synopsis:

ANSPs have to consider applying ATFM regulations to limit the flow of traffic into specific sectors so that the maximum capacity of the sector – and the safe workload of the ATCOs – is not exceeded.

Similarly, adverse weather will always cause ANSPs to consider whether, or not, to reduce available capacity in specific sectors for reasons of safety and ATC workload.

The ANSPs must effectively manage the staffing situation – ensuring sufficient capacity (and staff) available to handle traffic demand according to a certain level of capacity performance while keeping an eye on the associated costs.

ANSPs must consider the limitations of traffic forecasts together with the potential for disruptions (adverse weather, network disruptions, military activity etc.), and associated constraints on capacity, when determining the appropriate level of staffing and capacity to be deployed.

Increasing transparency on when staffing availability affected capacity constraints allows ANSPs to review staffing planning, including rostering practices, and their resilience in handling unusual (and not-so-unusual) situations.

Introducing additional regulation reasons: “ATC capacity affected by staffing”, “Weather affected by staffing” & respective regulation codes “J” & “K” into the permissible ATFM regulation reasons and codes:

- provides better clarity and establishes the principle of improving transparency in ATFCM and in identifying capacity constraints;
- allows flow management personnel to immediately and accurately describe clear situations when capacity constraints, normally attributed simply as ATC capacity or adverse Weather, are affected by staffing availability;
- improves the quality of capacity information presented to high-level decision makers for strategic and political consideration;
- introduces additional reasons and codes that can be used in post-operations analyses such as performed by the Network Manager;
- enables National Supervisory Authorities, and other stakeholders, to have greater visibility on the capacity issues, faced by the ANSPs, and potential mitigations / solutions to address them.

4 Further information

The PRC notes the recent publication, by EUROCONTROL, of [“Think Paper #19”](#)¹ regarding ATCO Mobility and Capacity Shortfalls, and the [response to this paper](#)² published by Air Traffic Controllers European Unions Coordination (ATCEUC).

¹<https://www.eurocontrol.int/publication/eurocontrol-think-paper-19-atc-mobility-and-capacity-shortfalls>

² <http://www.atceuc.org/documents/pdf/an-answer-to-eurocontrol-think-paper-19.258.html>