AF5 and AF6 Sensitivity Analysis

The economic impact of potential delays in implementation

Edition 1.0

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Authoring and approval – Control Page

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Executive Summary

CP1 IS PROGRESSING WELL AND ONLY SOME ELEMENTS ARE AT RISK

The latest SESAR Deployment Programme (SDP) Monitoring View report for 2023 reveals satisfactory implementation levels and a positive trend. 42% of CP1 Regulation is already implemented and an additional 43% on-going, totalling an amount of 85% of the entire CP1.

However, the Monitoring exercise also indicates that some Common Project 1 (CP1) functionalities may miss their target implementation dates. SDM experts have highlighted Family 5.6.1 (Flight Information Exchange) as particularly at risk. The dates for the ground element of ATM Functionality 6 (AF6 Initial Trajectory Information Sharing) are not guaranteed yet. Due to missing certainty a delay could still materialize.

CP1 EFFECTIVENESS IS UNDISPUTED (...)

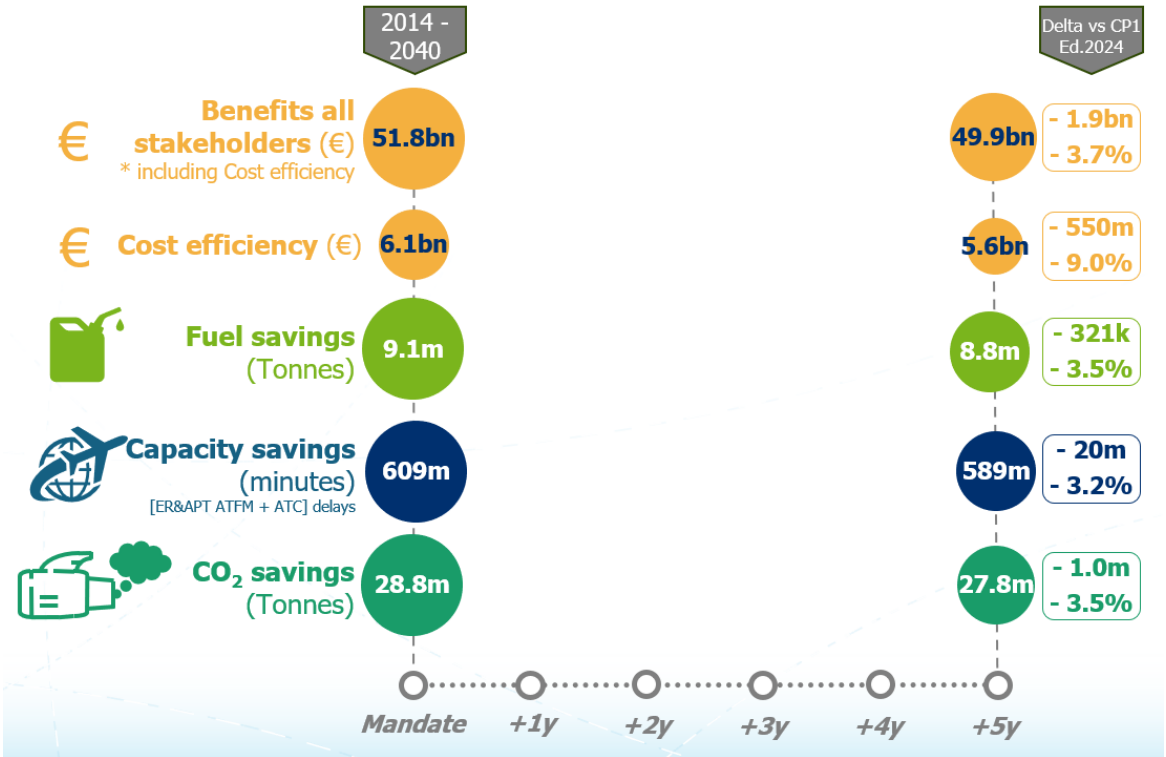
This report provides an economic assessment of the impacts of potential – theoretical - delays of these two identified elements of CP1. The assumptions for Family 5.6.1 are based on its current implementation status. The hypotheses for AF6 are more a worst-case scenario based on the limited plans and partial data available in the reporting information.

The analysis shows that CP1would remain highly effective even in case of theoretical delays. CP1 continues to deliver robust benefits notwithstanding potential delays in the implementation of Family 5.6.1 and AF6 ground part. Overall – even with a delay of 5 years for both AFs – the expected CP1 benefits would be reduced by 3.7% and 3.5% of the potential CO2 savings would be lost by 2040.

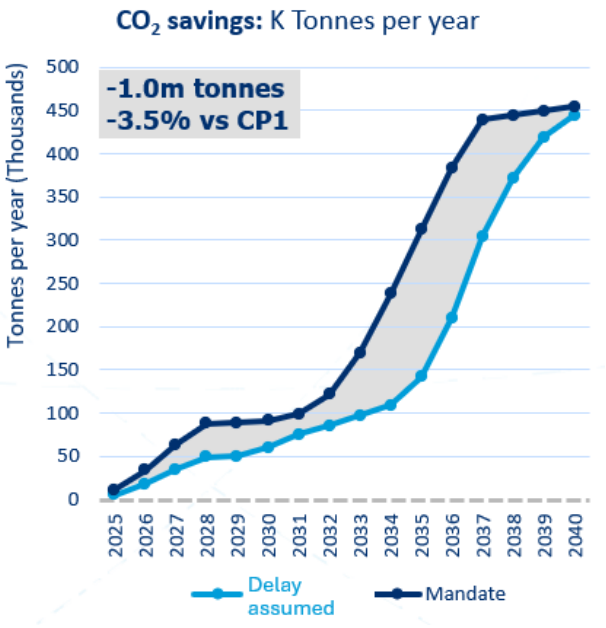
(...) HOWEVER, AT STAKEHOLDER LEVEL, SOME SAVINGS ARE UNRECOVERABLE.

At stakeholder level, potential delays in implementation come at the costs of losing operational improvements by 2040.

- Airspace Users would lose the possibility to save 321k tonnes of fuel.
- Airports would be penalised with additional 12k minutes of APT ATFM delay.
- Air Navigation Service Providers would lose the possibility to improve capacity by 20m minutes of En Route ATFM delays.



The graph shows the potential loss of environmental savings due to potential delays in the implementation of 5.6.1 and AF6 at the same time. Delays in deployment are associated with a lower ramp-up of operational benefits represented by the grey shaded area. An assumption of a 5-year delay is associated with losses of up to 1.0m of CO2 tonnes which is equivalent to the average emissions of 50k flights in 2023.



WE NEED TO REINFORCE ALL DEPLOYMENT ACTIONS (...)

There is still a degree of uncertainty about the deployment ramp-up for many stakeholders. The 5-year delays assumption are a pessimistic approach as some partners start already implementing and the percentage of completion gets closer to 100% every year.

This is even more visible in the case of AF6 (ground) where the readiness of the functionality has only recently been confirmed and not all partners reported plans in the Monitoring Exercise of 2023. However, the assumed 5-year delay is considered sufficiently long at this point as to cater for pessimistic outcomes.

Currently, SDM is partnering with stakeholders to build initiatives that intend to facilitate a faster deployment. E.g. FF-ICE Coordination Support Initiative and SDM Trajectory Information Sharing and Coordination Support Initiative

(...) BECAUSE OTHER KEY FUTURE ATM IMPROVEMENTS ARE RELYING ON CP1

Many of the future operational concepts bringing the needed operational improvements rely on the effective and timely implementation of CP1. Those functionalities are also necessary first step to deploy TBO; in order to solve the capacity crunch, to increase the efficiency of ATC and to cope with the Green Deal European Program.

This report's findings should provide a foundation for recognizing the advantages of fast-tracking the implementation of 5.6.1 and AF6.

Contents

1. Introduction

Problem statement

The Commission Implementing Regulation (EU) 2021/116 (Common Project 1 – CP1 Regulation) **[Ref] 1**, defines the dates when specific ATM functionalities (AFs) shall be implemented. Precisely for those studied in this report, Family 5.6.1 is mandated by end of 2025 and AF6 by end 2027. Today, the latest SESAR Deployment Programme (SDP) Monitoring View report **[Ref] 2** shows the risk that some of the mandated dates for ground elements might not be met.

To better understand the potential impact of potential delays in the implementation of the CP1, the SESAR Deployment Manager (SDM) has decided to produce this report helping to study the monetary impact of potential delays tin implementation.

Objective

The objective of this report is to conduct a comprehensive analysis of the economic impact resulting from potential postponements in the implementation of 5.6.1 and AF6 ground of the CP1 Regulation **[Ref] 1**. By examining different scenarios where deployment of 5.6.1 and AF6 ground are delayed, this document aims to provide insights to policymakers and stakeholders in the Air Traffic Management (ATM) sector. The results provided are linked to the latest CP1 CBA Ed. 2024 **[Ref] 3**.

This document builds on the latest AF5 **[Ref] 4** and AF6 **[Ref] 5** Business Cases and further elaborates with a specific view on the performance and CBA impacts of possible delays in the use of the above-mentioned AFs.

Structure of the report

This report starts by giving an overview of the scope and rationale for performing a sensitivity analysis. It continues by explaining the impact on the potential scenarios envisaged for 5.6.1 and AF6 (ground) and finalises by proposing recommendations.

2. Scope

To ensure the analysis remains relevant and provides clear insights into the Regulation's effectiveness, the scope of this report is confined to the CP1 Regulation. E.g. the knock-on effects that a potential delay of CP1 functionalities would have on other future deployment initiatives (e.g. TBO, SDOs, etc.) are not considered.

SDM experts' assessment suggests that – out of all the ATM functionalities and families within the CP1 Regulation – the two elements possibly at risk are the following:

- Family 5.6.1 – Flight Information Exchange, within AF5 – System Wide Information Management (SWIM).
- The three families **(6.1.2; 6.2.1 and 6.3.1)** in AF6 – Initial Trajectory Information Sharing – only for ground investments. AUs are expected to equip as per the 'implementing mandate' or in some cases even ahead of the date.

3. Methodology

The methodology applied in this Sensitivity Analysis to CP1 implementation delays is fully consistent with the latest CP1 CBA Ed. 2024 **[Ref] 3**. The main methodological notes are:

- Since this is not a CBA that will be used for an invest/do not invest decision and, no Net Present Value figures are presented. Only **undiscounted values** are provided.
- The delta losses due to potential postponements in the implementation of CP1 families are calculated considering the timeline 2025 to 2040. **Absolutes values** are expressed, therefore, **as of 2025** but when **percentage changes** are provided, they are measured against the totality of CP1 benefits **between 2014 and 2040**.
- The modelling considers that delays in the deployment (costs) postpone the associated operational improvements (benefits) by the same duration as the CP1 CBA Ed. 2024 **[Ref] 3**.
- The different delays considered are based mostly on SDM expert judgement driven mostly by the information provided in the latest SDP Monitoring View report **[Ref] 2**. All years referred to in this report should be read as 'End of Year'. E.g. 2027 means by the end of 2027.

4. Family 5.6.1

4.1. Delay assumptions

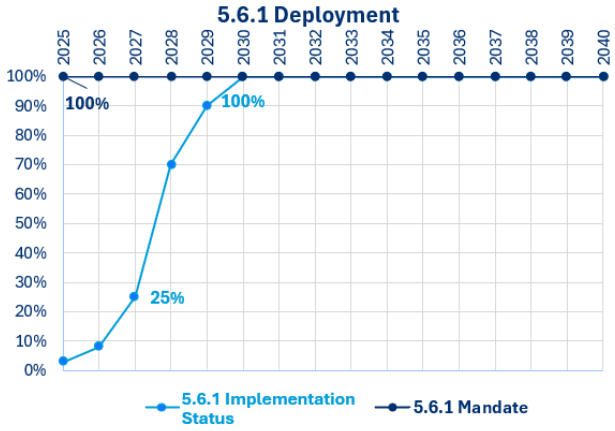
The deployment of Flight & Flow Information for a Collaborative Environment (FF-ICE) is mandated by CP1 with an implementation target date of the 31st of December 2025. The mandate applies to AUs, ANSPs and NM. Further details are provided in the SDP **[Ref] 2**.

FF-ICE is divided into 3 releases. Only FF-ICE Release 1 (FF-ICE/R1) is to be operational by the end of 2025. Releases 2 and 3 are still not defined and so this analysis focuses exclusively on R1.

Considering the points below and based on discussions with the relevant experts, **Figure 1** below summarises graphically the delay assumptions considered for the ground stakeholders. AU are mostly reporting full compliance with the mandate and only marginal delays into 2026.

- Analysis of the implementation gap described in the most recent SDP Monitoring View. See **Annex 1** for details.
- SDM and NM have recently created an FF-ICE Support Initiative which is expected to help ANSPs in accelerating their plans and make them compliant.

- ICAO Flight Plan 2012 (FPL2012) is to be ceased by the end of 2034 **[Ref] 7**. Therefore, FF-ICE should be ready well in advance to avoid costly transition periods where both systems run in parallel.

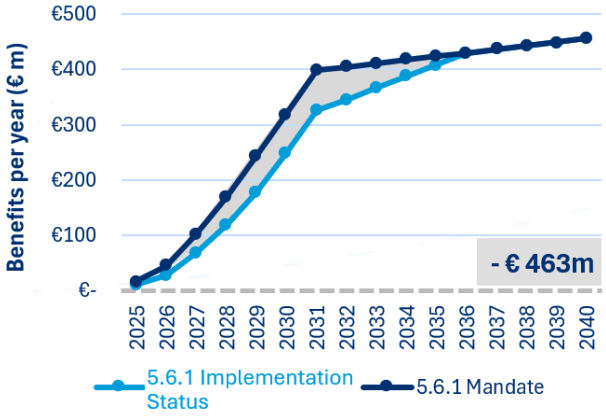


The original mandate requires that all stakeholders have deployed by end of 2025. The proposed assumption is that 25% of ground stakeholders would now be ready only 2 years after the mandate (i.e. 2027) and all of them would have deployed 5 years after the mandate (i.e. 2030).

Figure 1: Deployment assumptions for 5.6.1

4.2. Impacts

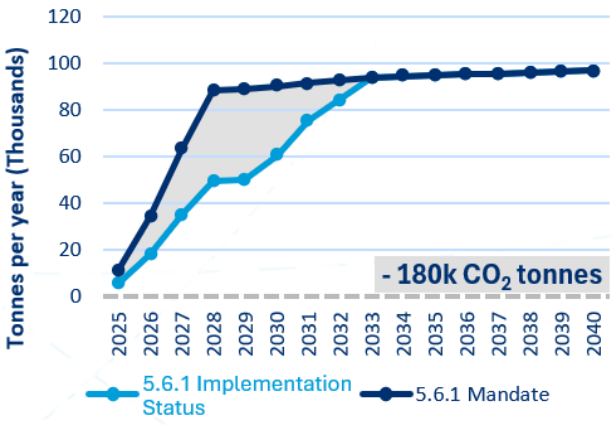
4.2.1. Monetary benefits



The potential loss of monetary benefits associated with a postponement of 5.6.1 is estimated at €463m.

Figure 2: 5.6.1 impact in monetary benefits

4.2.2. Environment



Delays in implementing 5.6.1 would be linked with losing the opportunity to save up to 180k tonnes of CO_2 .

Figure 3: 5.6.1 impact in CO_2

4.2.3. Flight efficiency

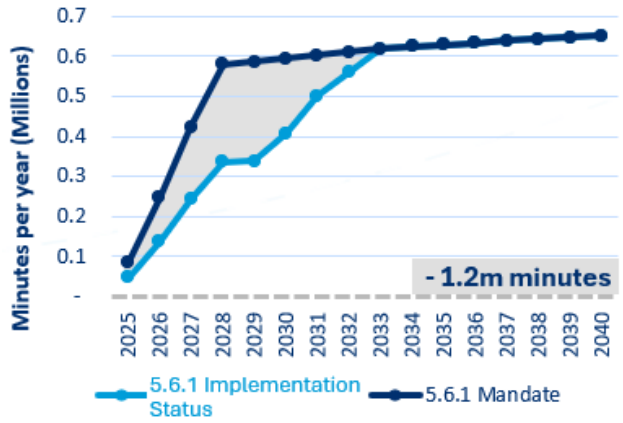


Figure 4: 5.6.1 impact in flight efficiency

Flight efficiency: postponements are linked with additional 1.2m minutes of flight time.

4.2.4. Delay

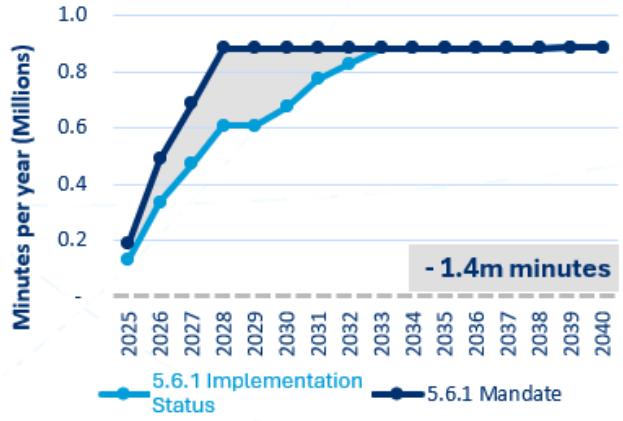


Figure 5: 5.6.1 impact in delay

The European Network could experience an increase of 1.4 million minutes of ATFM delay with a postponement of 5.6.1.

4.2.5. Fuel savings

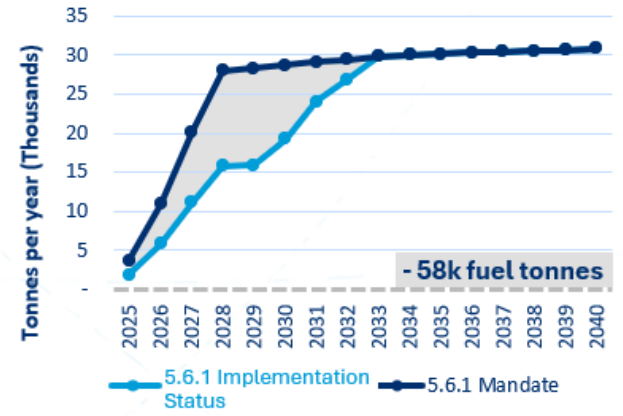


Figure 6: 5.6.1 impact in fuel savings

An additional amount of 58k tonnes of fuel would be consumed due to postponements of 5.6.1.

4.2.6. Cost efficiency

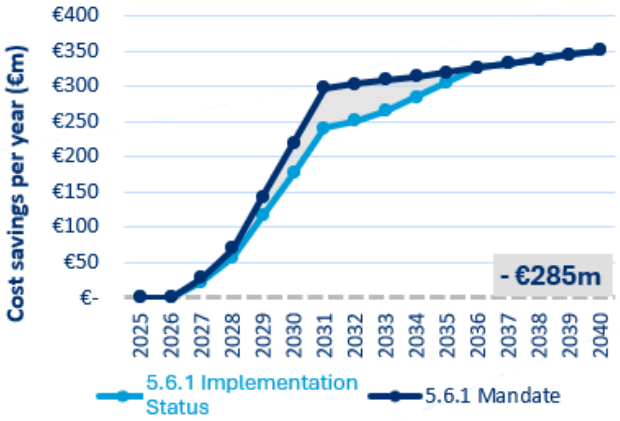


Figure 7: 5.6.1 impact in cost efficiency

Cost Efficiency: delays in implementation of 5.6.1 are linked to increased costs by €285m.

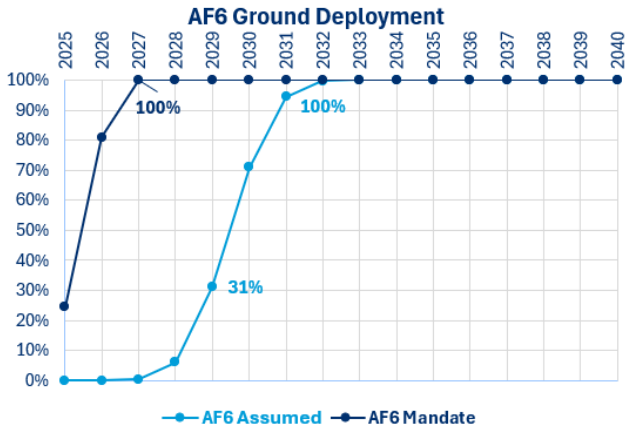
5. ATM Functionality 6

5.1. Delay assumptions

With EASA confirming AF6 readiness by the 'Industrialisation Target Date' **[Ref] 8**, CP1 requires its rollout by the end of 2027. Consequently, the latest SDP Monitoring View 2023 **[Ref] 2** still shows a large portion of– ground stakeholders – for which no dedicated deployment plans for AF6 have been identified. Having only partial data makes it difficult to make a solid projection of potential evolution and delays in AF6 ground implementation. AF6 progress is expected to speed up from the next monitoring cycle offering more information.

For this sensitivity analysis, a hypothetical delay scenario of 5 years is chosen to showcase the impact of a potential delay. A delay of 5 years are considered a worst-case scenario and such delay is currently not visible from the available data. For AF6 ground deployment, the projected ramp-up anticipates that 31% of stakeholders will deploy by 2029, with full compliance assumed by 2032. The justification for this ramp-up includes:

- Analysis of the implementation gap described in the most recent SDP Monitoring View. See **Annex 2** for details.
- SDM experts' initial assessment on current bid drafts for the next Connecting Europe Facility (CEF) 2024 call.
- According to the forward-fit mandate for Airspace Users, the assumption is reflecting the potential deliveries of new aircrafts. Early implementation and potential retrofits are not considered in the analysis to be consistent with CP1 CBA Ed. 2024. The analysis can be considered worst-case scenario.
- This report focuses on an EU-wide implementation, whereas already today first significant savings are generated in the MUAC airspace.

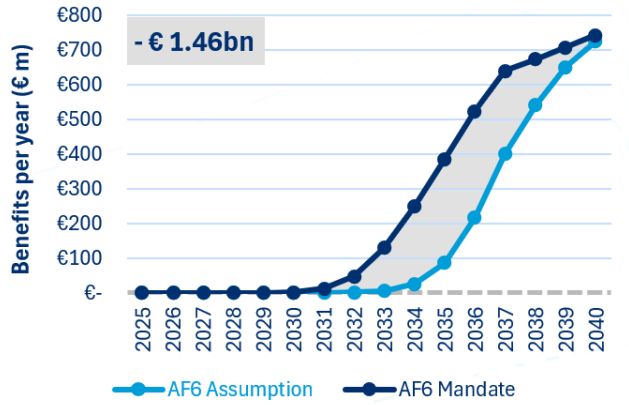


The CP1 envisaged that all stakeholders would deploy by end of 2027. Considering the lack of data at this early stage, it is assumed that 31% of the impacted stakeholders in the ground would deploy 2 years after the mandate date (i.e. 2029) and 100% of them 5 years after the mandate (i.e. 2032). The Airborne deployment is not considered to be postponed in the document.

Figure 8: Deployment assumptions for AF6

5.2. Impact

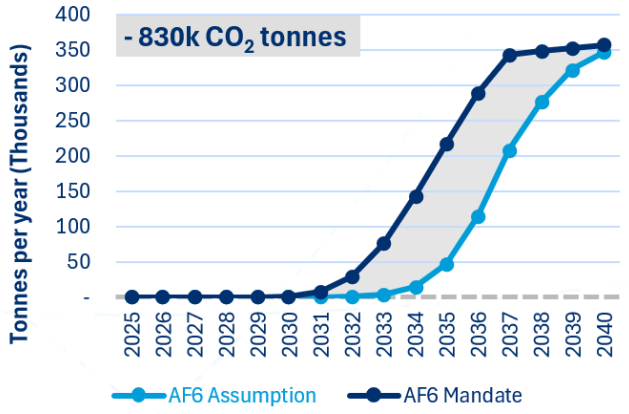
5.2.1. Monetary benefits



A postponement of AF6 ground would bring a loss of monetary benefits by €1.46bn.

Figure 9: AF6 ground impact in monetary benefits

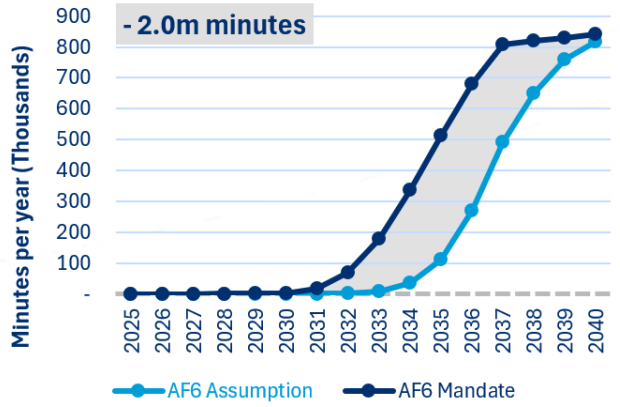
5.2.2. Environment



Delays in implementing AF6 ground would be linked with losing the opportunity to save up to 830k tonnes of CO_2.

Figure 10: AF6 ground impact in CO2

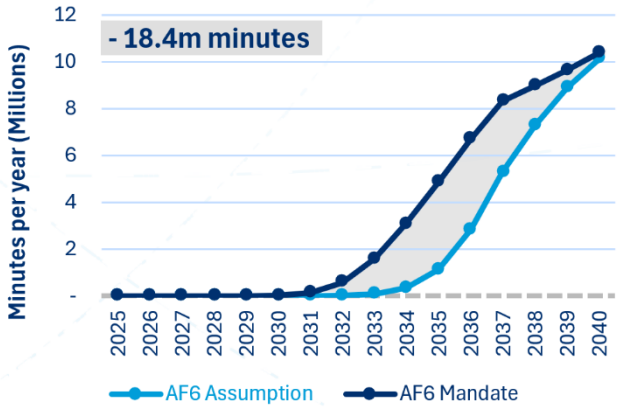
5.2.3. Flight efficiency



Delays of AF6 ground bring additional 2.0m minutes of flight time.

Figure 11: AF6 ground impact in flight efficiency

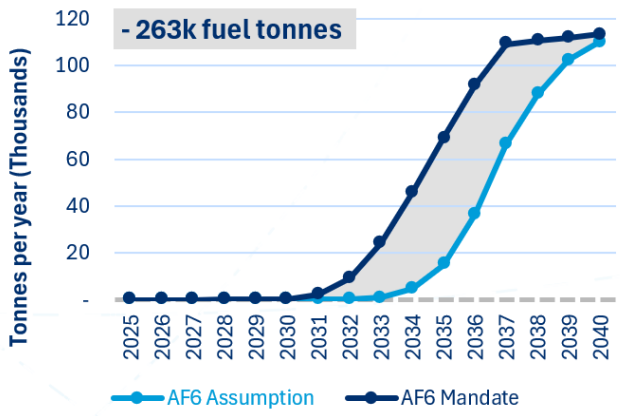
5.2.4. Delay



The European Network could miss the chance to reduce a total of 18.4 million minutes of ATFM delay.

Figure 12: AF6 ground impact in delay

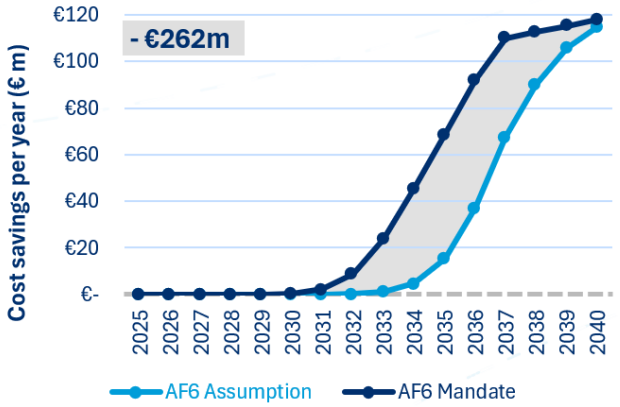
5.2.5. Fuel savings



An additional amount of 263k tonnes of fuel would be consumed due to postponements of AF6 ground.

Figure 13: AF6 ground impact in fuel savings

5.2.6. Cost efficiency



Delays in AF6 ground are coming with increased costs by €262m.

Figure 14: AF6 ground impact in cost efficiency

6. Conclusions and Recommendations

Conclusions

AF5 and AF6 functionalities are of high importance for the timely implementation of Common Project One, allowing future important savings on capacity, fuel and CO_2. It should be noted that these two functionalities are independent and early savings in the MUAC area show significant savings for initial AF6 functionalities. Every additional implementation in other airspace will allow additional savings.

This report assumes a theoretical delay of AF6 ground implementation because implementation data for AF6 will be available at the end of the next monitoring cycle (March 2025) and shows a combined view (AF5 + AF6).

Although this report shows that the impact of a possible delay in AF5/6 will not impede the overall CP1 CBA, it is still necessary to continue and deploy both ATM functionalities as soon as possible.

Therefore, those two ATM functionalities should remain at a high priority in the investment plans of the stakeholders. Those functionalities are also a vital first step to deploy TBO; in order to solve the foreseen capacity crunch, to increase the efficiency of ATC and to cope with the Green Deal European Program.

Ideas for further improvement

- This report should be updated during Q2 2025 when **newer and consolidated information out of the monitoring cycle 2024 becomes available.** At the time of writing of this report, the data for the monitoring cycle were only working drafts.

Ongoing and other possible mitigation measures by SDM:

- Setting-up of dedicated supporting initiatives for FF-ICE and Trajectory-Information and Coordination, in close cooperation with NM and other entities (i.e. EASA IF, ECTRL NDTECH, etc.)
- Setting-up and synchronising stakeholder projects in AF6 under the umbrella of CEF Call 2024.
- Continue to have risk management meetings with all stakeholders involved on national level after the outcome of the next monitoring cycle.

7. References

***[Ref] 1**: CP1 Regulation. Commission Implementing Regulation (EU) 2021/116 of 1 February 2021 on the establishment of the Common Project One supporting the implementation of the European Air Traffic Management Master Plan provided for in Regulation (EC) No 550/2004 of the European Parliament and of the Council, amending Commission Implementing Regulation (EU) No 409/2013 and repealing Commission Implementing Regulation (EU) No 716/2014 (Text with EEA relevance).

Available at: http://data.europa.eu/eli/reg_impl/2021/116/oj

***[Ref] 2**: SESAR Deployment Manager. SDP Monitoring View 2023. Edition 20th June 2024.*

Link: Monitoring View 2023 | SESAR DM (sesardeploymentmanager.eu) and https://www.sesardeploymentmanager.eu/news/sesar-deployment-manager-reports-significant-progress-in-cp1-implementation

***[Ref] 3**: Common Project 1 CBA. Update 2024. Deliverable 2.4.4. Ed. July 2024. Deliverable full ID: 2022-122-SESAR Deployment Manager FPA. SGA MOVE/E3/SUB/2022-122/SI2.875834.

***[Ref] 4**: AF5 Business Case. System Wide Information Management. Draft September 2024.

Unpublished work.

***[Ref] 5**: AF6 Business Case. Initial Trajectory Information Sharing. Draft September 2024.

Unpublished work.

***[Ref] 6**: EUROCONTROL.*

Link: https://www.eurocontrol.int/concept/flight-and-flow-information-collaborative-environment

***[Ref] 7**: ICAO 14th Air Navigation Conference. Montreal, Canada, 26 August to 6 September 2024. Working Paper on the CESSATION OF ICAO 2012 FLIGHT PLAN BY 2034.*

Link: wp_011_en.pdf (icao.int)

***[Ref] 8**: EASA. AF6 Industrialisation and Readiness. Final Report. 2024.*

Link: https://www.easa.europa.eu/en/newsroom-and-events/news/easa-publishes-final-report-industrialisation-initial-trajectory

***[Ref] 9**: 2024 CEF Transport calls for proposals.*

Link: https://cinea.ec.europa.eu/funding-opportunities/calls-proposals/2024-cef-transport-calls-proposals_en

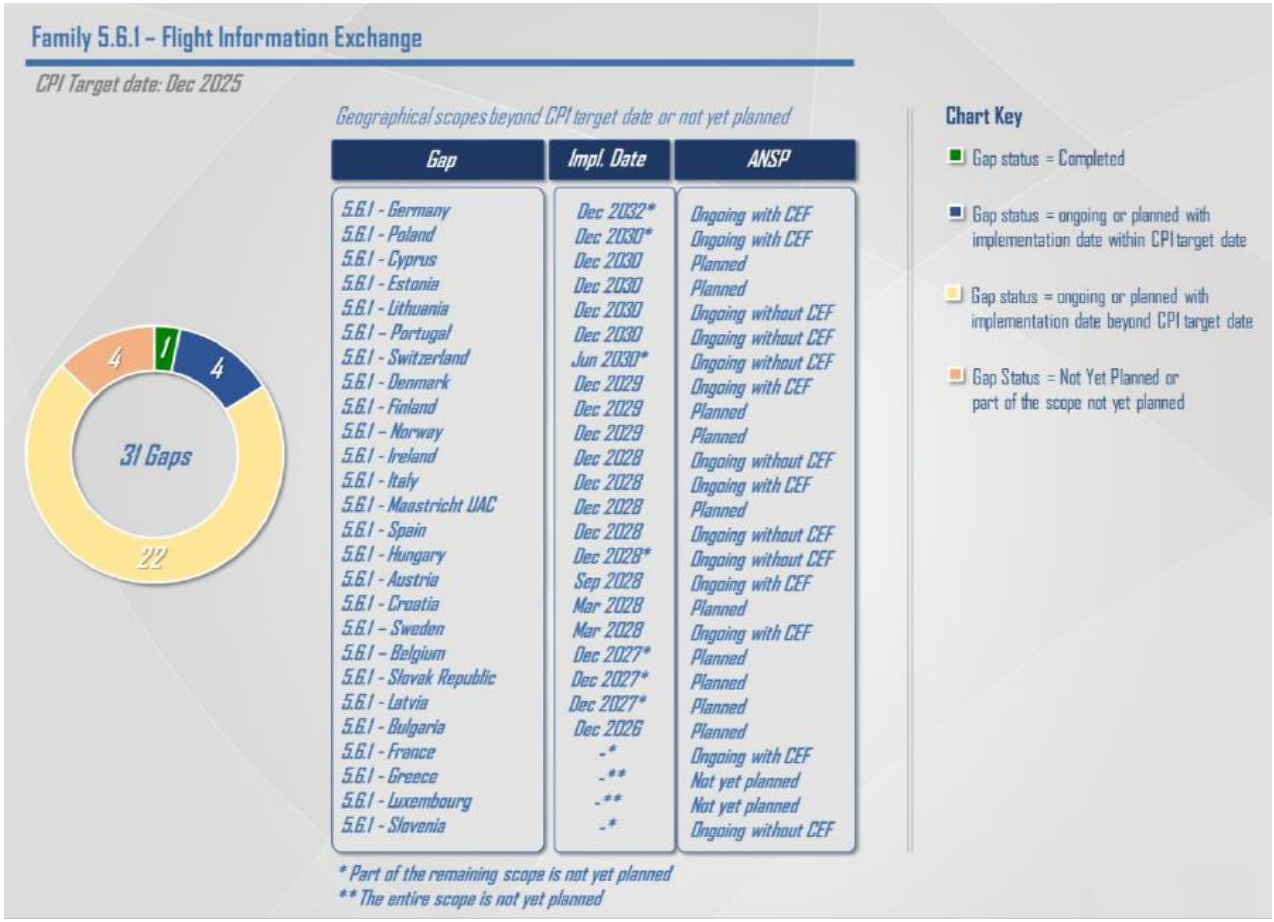
8. Acronyms

AF	ATM Functionality
ANSP	Air Navigation Services Provider
ATM	Air Traffic Management
AU	Airspace User
CP1:	Common Project 1
FF-ICE:	Flight & Flow Information for a Collaborative Environment (FF-ICE). ICAO DOC 9965 2012 & ICAO DOC 9854 2005
MUAC	Maastricht Upper Area Control Centre
NM	Network Manager
SESAR	Single European Sky ATM Research
SDM	SESAR Deployment Manager
SDP	SESAR Deployment Programme
SWIM	System Wide Information Management
TBO	Trajectory Based Operations

Annex

Annex 1: 5.6.1 implementation gap

The SDP 2023 shows the identified gaps in 5.6.1.



Annex 2: AF6 implementation gap

The SDP 2023 shows the identified gaps in AF6.