ACI EUROPE

AIRPORTS COUNCIL INTERNATIONAL

AIRPORT OPERATIONS PLAN
A GUIDEBOOK

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CONTENTS

INTRODUCTION

Airports, due to the dynamic nature of air transport, encounter a variety of operational challenges that can impact their efficiency, safety, and passenger experience. In this context, the Airport Operations Centre (APOC)[1] and Airport Operations Plan (AOP) play a critical role in the overall proactive management and efficiency of airport operations. An **AOP is relevant for ALL airports**, as the goal to contribute to a more efficient aviation ecosystem by improving operations, safety, and passenger experience is a common goal of all airports, regardless of their size. Like Airport Collaborative Decision-Making (A-CDM) and APOCs, the concept of the AOP was developed by SESAR (Single European Sky ATM Research) and its implementation has been made mandatory for 31 European airports under Common Project 1 Regulation[2] (a full list of CP1 airports is available in Annex F).

The AOP is a consolidated rolling airport operational plan[3] containing all the necessary data, contextual information, scenarios and KPIs required to enable decision-making in a collaborative manner. More specifically, the benefits that are enabled by the AOP and its core processes can be summarised as follows:

1. **Enhanced Efficiency:** A well-defined AOP helps streamline airport activities, ensuring that resources are used efficiently. This is crucial for smaller airports that may have more limited staff and equipment.
2. **Cost Management:** Effective planning can help any airport to manage their costs more effectively by identifying cost-saving opportunities and optimising resource allocation. Typically, the earlier decisions are taken, the less expensive they tend to be – with more options generally available.
3. **Predictability:** An operations plan helps to provide early and useful information such as flight cancellation or departure and arrival times, to inform passengers, airlines, and other stakeholders before and during their intended travel.
4 **Operational Resilience:** An operations plan helps any airport prepare for – and respond to – disruptions, such as adverse weather conditions or unexpected increases in traffic, ensuring smoother operations and faster recovery to normal operations.
5. **Community and Economic Benefits:** By improving operational efficiency, airports can enhance their service quality, making them more attractive to airlines and passengers. This can lead to increased traffic, boosting local tourism and economic development.
6. **Sustainability:** Greater efficiency, predictability, and resilience can all lead to lower energy consumption and resource usage, supporting an airport's carbon neutrality goals and a more sustainable use of the planet's resources.
7. **Enhancing Passenger Experience:** An AOP can extend airport processes and data into landside operations: ultimately helping to integrate passenger experience management into core airport operations such as monitoring and managing security queues and wait times.

This AOP Guidebook aims at providing a structured approach to develop and implement an AOP. To this end, this Guidebook will explore how an AOP can support airport operations with key data elements, KPIs, and core processes, as well as how sharing relevant information with the Network Manager (NM) improves overall network capacity and resilience for the benefit of all airspace users and passengers.

[1] The AOP underpins the workings of an APOC which is described in the ACI EUROPE APOC Guidebook.
[2] Commission Implementing Regulation (EU) 2021/116 on establishment of Common Project One.
[3] A rolling plan means a plan centred on the present moment in the operational day, referred to as Day Zero or D-0, with defined before and after time periods.

2. WHAT IS AN AOP?

An Airport Operations Plan (AOP) is a consolidated rolling airport operational plan containing all the necessary data, contextual information, scenarios and KPIs required to enable decision-making in a collaborative manner.

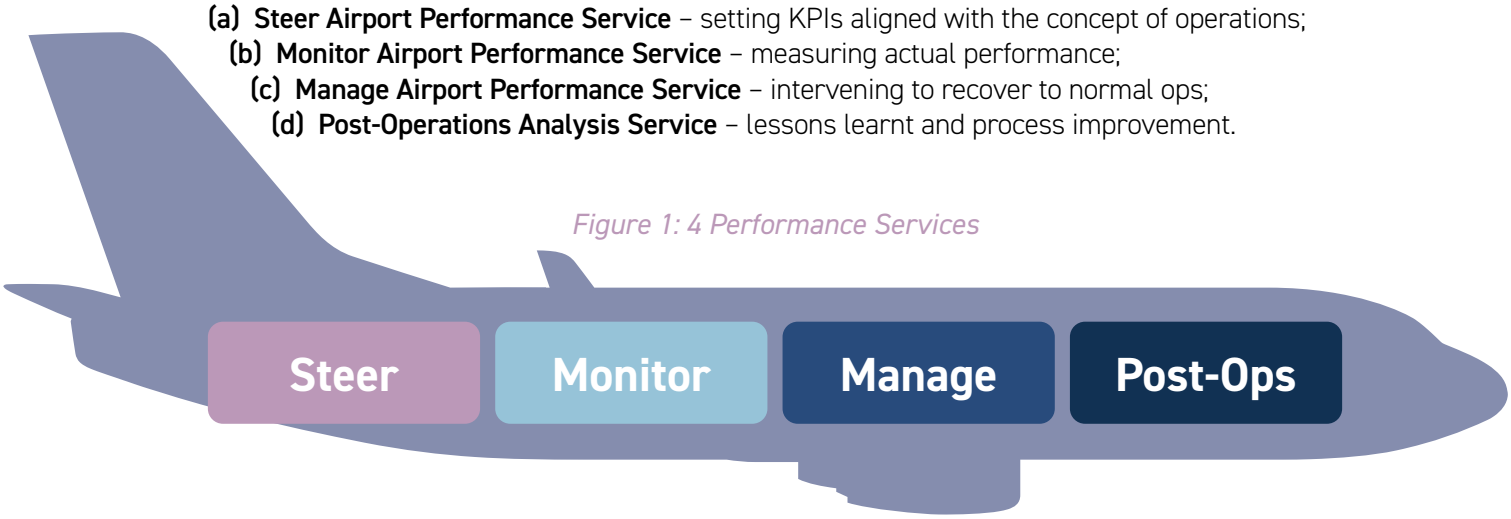
Punctual flights are a common interest between passengers, airlines, ground handlers, airports, and air traffic control. To that end, the earlier that planning information is shared and updated where needed, the better it is for everyone.

As stated in the previous chapter, an Airport Operations Plan (AOP) is a consolidated rolling airport operational plan containing all the necessary data, contextual information, scenarios and KPIs required to enable decision-making in a collaborative manner. An AOP is designed to proactively address the challenges and complexities of airport management, ensuring the safety, efficiency, and security of the airport for passengers, airlines, and other stakeholders, with an aim to further improve passenger experience. A mature AOP should also consider the environmental impact in order to reduce noise, fuel burn, and emissions as much as possible.

To maintain the integrity of the rolling plan, the following four operational performance services are designed to improve the overall operational efficiency by continually balancing demand with capacity. This will increase the resilience of the airport and of the network to disruptions such as adverse weather conditions, closure of a runway, and security alerts:

(a) Steer Airport Performance Service – setting KPIs aligned with the concept of operations;
(b) Monitor Airport Performance Service – measuring actual performance;
(c) Manage Airport Performance Service – intervening to recover to normal ops;
(d) Post-Operations Analysis Service – lessons learnt and process improvement.

Figure 1: 4 Performance Services



The Steer Airport Performance Service develops the performance standard (i.e., goals, targets, rules, thresholds, trade-off criteria and priorities) for airport operations and **sets an overall strategic direction.**

The Monitor Airport Performance Service maintains surveillance over airport operations, airport performance (against KPIs), supervising airport related information and any information that can impact the airport performance, providing observations, forecasts, alerts and warnings against predefined thresholds.

The Manage Airport Performance Service assesses the overall impact of warnings / alerts on upcoming airport operations and **supports decision making activities** (what-if, proposing solutions).

The Post-Operations Analysis Service provides:
- A facility to **understand the airport performance** against the performance plan and identify the root causes of deviations,
- A facility to **assess the relevance of the performance plan**,
- A **foundation for the development of new operational scenarios**.

3. WHO USES AN AOP?

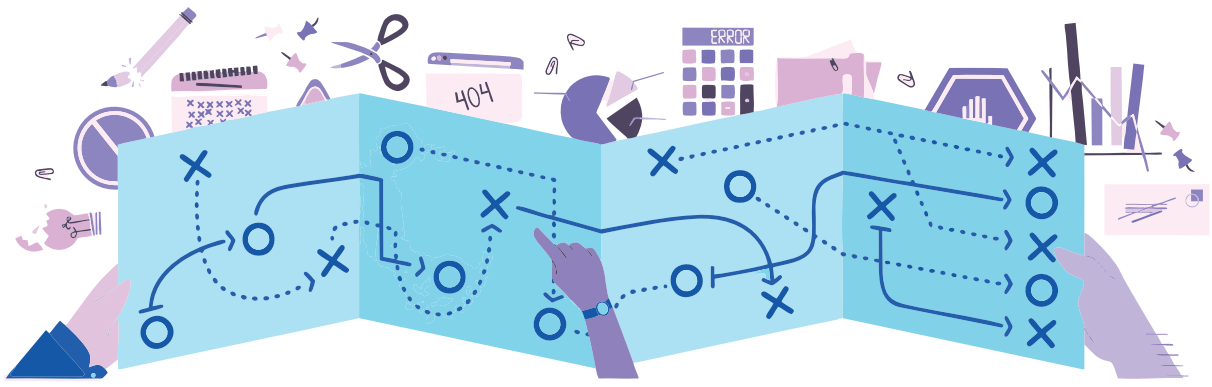
In short, everyone!

In fact, the AOP is relevant for **all airports regardless of their size or type of operations**, enabling the goal of improving operations and passenger experience.

To maintain the rolling plan and to make sure that it contains one version of the truth for all airport stakeholders, the AOP needs to be used as the principal source of information for all airport operations and for Post-Operations Analysis. To achieve this, the landside and airside airport operational stakeholders must feed into the AOP their most relevant information.

Typically, the stakeholders recommended to contribute to the AOP in this way are as follows:
(a) airport operators;
(b) aircraft operators;
(c) ground handlers;
(d) de-icing companies;
(e) Air Navigation Service Providers (ANSPs);
(f) network operations;
(g) MET service providers;
(h) support services such as police, customs, and immigration.

This is not an exhaustive list: airports can choose to add other stakeholders as appropriate for their local airport operations.



4. THE AIRPORT PERFORMANCE SERVICES

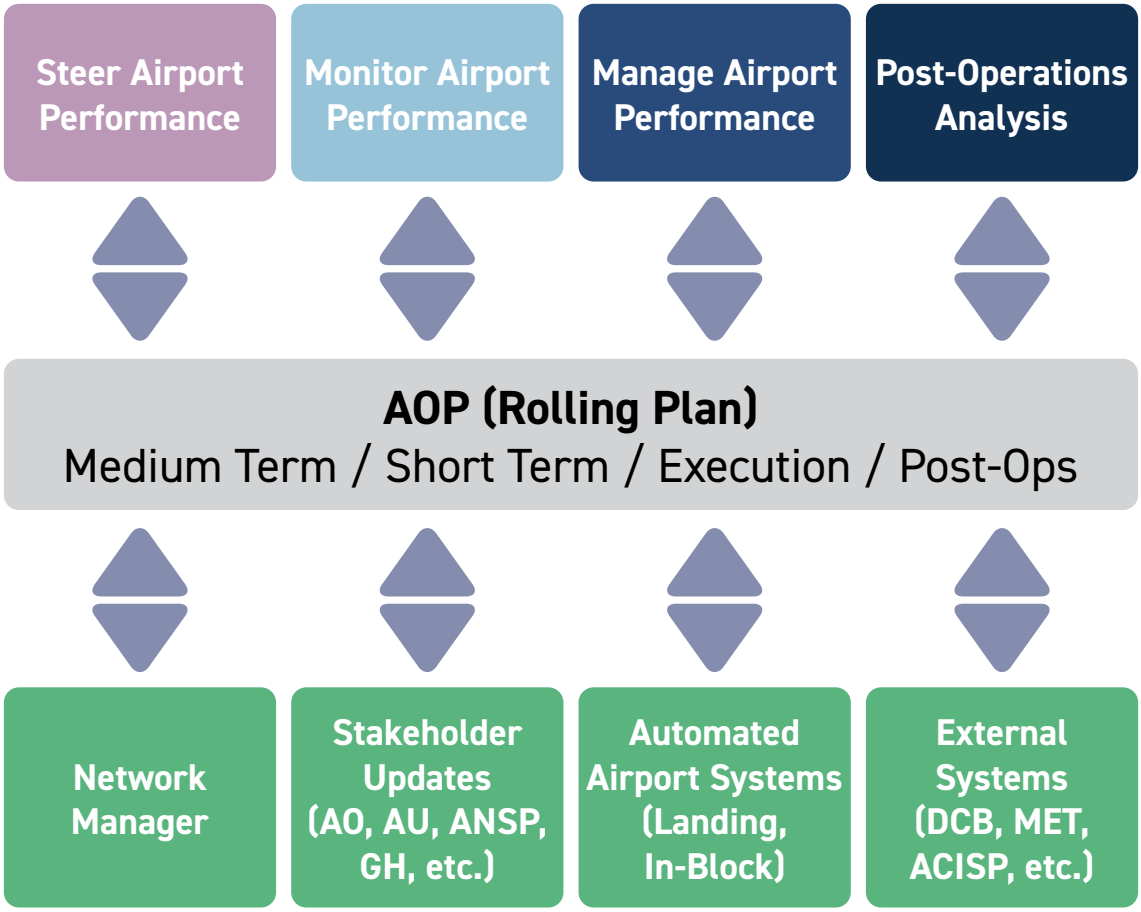
The AOP is set-up, managed, and operated based on four underlying performance services. These processes systemise the AOP and airport operations to give a framework for the efficient running of an airport. Basic principles and data principles together with data sharing standards are built into the processes. At a basic core level, all airports deploying an AOP will be using industry standards: giving operational commonality across Europe while leaving room for flexibility – which is good for all the airport users and their customers.

The performance services are called:

1. **Steer Performance Service**
2. **Monitor Performance Service**
3. **Manage Performance Service**
4. **Perform Post-Ops Analysis Service**

The following graphic helps to illustrate how the performance services fit with the AOP and the operational stakeholders.

Figure 2: How the performance services fit with the AOP and the operational stakeholders



See Annex E for definitions of included acronyms.

Type	The 4 Airport Performance Services
Steer	• This service **develops the performance standard** for airport operations (i.e. goals, targets, rules, thresholds, trade-off criteria and priorities) and sets an overall strategic direction. • Airport stakeholders develop a mutually agreed performance standard in a collaborative manner, based on the regional and/or national performance scheme(s) and Post-Operations Analysis reports. • The Steer Airport Performance Service is mainly performed in the long-term and medium-term planning phases and the post-operations phase. *An example of a KPI set in the Steer service is the departure and arrival punctuality targets. The punctality KPI is often used by the travelling public to judge overall airport performance. It may drive other considerations such as how long aircraft should wait for transfer passengers before departing. A Post-Ops Analysis report could reveal the main drivers of punctuality. A list of KPIs that can be considered is given in Annex B and C.*
Monitor	• This service **maintains surveillance over airport operations, airport performance** (against KPIs), airport surroundings (e.g. weather monitoring), supervising airport-related information and any information that can impact the airport performance, **providing observations, forecasts, alerts, and warnings against predefined thresholds.** • It is performed from the medium-term planning phase through to the execution phase. • This surveillance is based on the performance standard set by the Steer Airport Performance Service. • The Monitor Airport Performance Service compares any new information created or updated in the AOP with the plan and raises warnings or alerts if a deviation is detected. • The Monitor Airport Performance Service also provides the airport stakeholders with a common situational awareness of the airport operations processes and performance in real time. *The monitoring of airport operations is often carried out with the aid of a graphical presentation on a performance dashboard. Perhaps this is displayed on a video wall in an APOC (refer to the ACI EUROPE APOC Guidebook) or could also be displayed in a mobile app. For example, overall departure punctuality could be shown as a percentage figure together with a green-orange-red indicator to show the current state against pre-determined KPIs. This could also be used to show predicted values for the rest of the day.*

Manage	• Depending on the magnitude of the deviation and the severity of the impact on the airport processes and on airport performance, **the Manage Airport Performance Service triggers the relevant collaborative decision-making processes** which aim to mitigate any performance challenges most effectively. • In general, in adverse conditions, these processes take place in the Airport Operations Centre (APOC)[4], where the representatives of airport stakeholders can use simulation and decision support tools. • Local decisions are driven by the need to maintain an optimal performance level and to recover from a disruption as quickly and efficiently as possible. **These processes result in an update of the AOP, made by the relevant airport stakeholders.** *An example of managing airport operations could be when a storm over the airfield causes departures to be suspended. This would affect the departure punctuality and could result in many recovery actions depending on the severity, such as cancelling flights and/or consolidating the flight schedule.*

Post-Ops	• The AOP records any planned and actual data used in the airport processes during the planning and execution phases and needs to be synchronised between ANSPs and Airport Operators (AOs). This information is then used to produce Post-Operations Analysis reports. These reports allow the airport stakeholders to:
	  • Fully understand the actual airport performance against the airport performance KPIs
	  • Identify the root causes of any deviation
	  • Analyse actions and decisions made during the planning and execution phases
	  • Identify areas of potential improvements (procedures, tools, training, etc.)
	  • Communicate and engage with stakeholders (common goals)
	
	An example of such Post-Operations Analysis could be looking at the relationship between opening additional security lanes and passenger waiting time in order to determine the optimal time of day to add more security capacity.

The four performance services, which are operational processes rather than IT services, can be equated to the Plan-Do-Check-Act (Adjust) management principle. See Annex A for a more in-depth look at these Performance Services and where to find more information.

[4] For the ACI EUROPE APOC Guidebook, see hyperlink in Annex G (References).

5. KPIs, DATA PARAMETERS AND UNLOCKING NETWORK CAPACITY

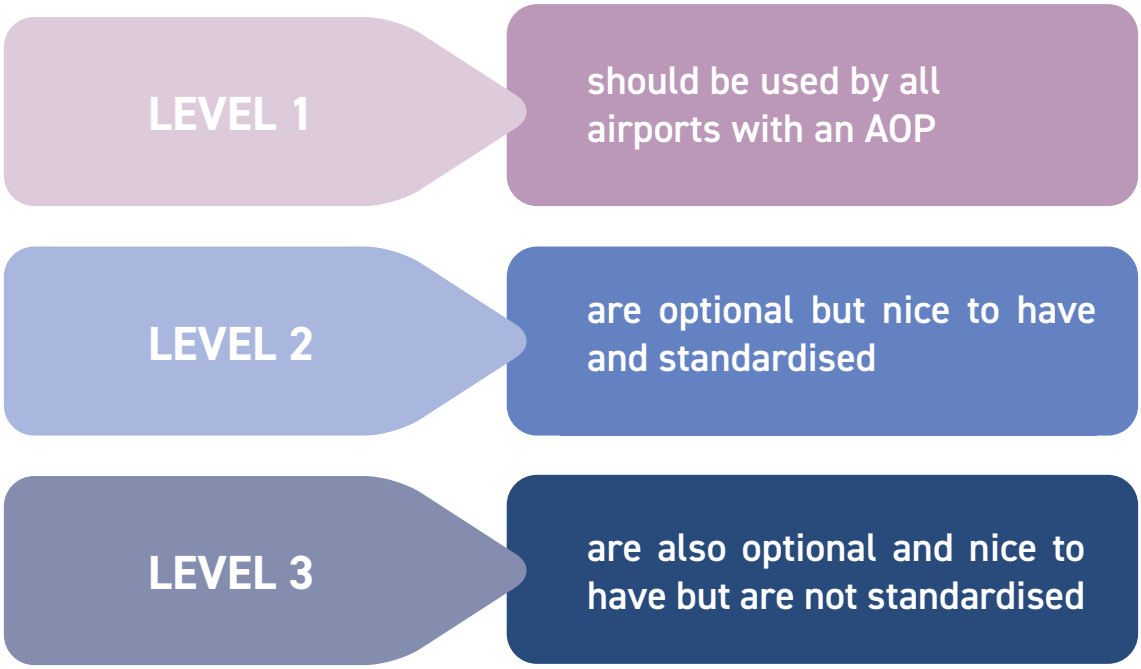
As already mentioned in the previous sections, the Airport Operations Plan (AOP) is about one version of the truth that holds all the relevant operational data in which all stakeholders have an interest. Some of that data can then be shared with the Network Manager (NM) to better inform the Network Operations Plan (NOP) and vice versa from the NOP to the AOP – reducing delays, unlocking capacity, and enabling resilience.

Linking the airport with the Network is a key function of the AOP. Key data and other (contextual) information are exchanged between the AOP and the NOP (AOP-NOP) to identify bottlenecks at the local and network level as early as possible and in a timely manner. Through this, actions can be taken earlier to resolve demand capacity imbalances in the network to find the optimum solution for when traffic demand exceeds capacity.

In order to facilitate the airports that are implementing AOP for Common Project 1 Regulation (CP1), ACI EUROPE and the Network Manager agreed to a comprehensive list of data levels and related KPIs, containing all the information needed for an AOP-NOP exchange.

For each KPI, it must be determined whether it will be applicable for an airport on an individual basis. The following AOP data levels have been identified and agreed between the NM and ACI EUROPE:

Figure 3: 3 Levels of KPIs



Notes:

- Level 1 KPIs are for all airports that need, or have the desire to have, an AOP. These are also KPIs that most airports already have (albeit with a somewhat different definition) and are therefore not difficult to implement.

- Airports that would like to make additional commitments regarding performance management should go through the KPIs labelled 'Level 2' and evaluate which KPIs may be appropriate for their operation. Once the selection has been made, it should adhere to the standardisation elements that can be found in the KPI and Data List in Annex C.

- Level 3 KPIs are nice to have but are not standardised. Some of them are contextual information for which it is difficult to determine KPIs. The Level 3 KPIs are just an example of what could be used: each airport should define their own KPIs that are useful to their specific operational needs.

- The AOP data level and KPI list is provided in a Microsoft Excel sheet[5] . Each level is split into 2 columns:
  > "Y" (Yes): this KPI should be shared with the NOP (Network Manager),
  > "N" (No): sharing with the NOP is optional.

Annex C lists the data parameters identified for data sharing with the NOP for CP1 for which an exchange format and method has been predefined. The concept of the three data levels forms a framework for expanding the data sharing scope in the future.

The following are key recommendations for AOP data and data sharing with the NOP, including future considerations for sharing data either with the NOP and/or directly between airports, as the AOP concept continues to evolve:

- As some **airport configuration constraints** are integrated into the NOP, it is necessary to integrate them within the AOP. Examples of airport constraints are:
  > Infrastructure maintenance, (part) closure or reduced functionality of terminal buildings, reduced baggage handling capacity, shortage of personnel at security or ground handling, shortage of equipment (e.g. airport buses), environmental constraints (e.g. noise regulations), airspace constraints, weather conditions. Furthermore, external landside elements may also play a role, such as car parking and rail connections: this is by no means an exhaustive list.

- Like airport capacity, it is necessary to provide a **traffic demand forecast** in the AOP, to enable the identification of bottlenecks. Traffic demand refers to both aircraft movements and passenger flows. Some examples to consider are: number of flights, schedule times (arrival/turnaround/departure), aircraft type/size and number of seats, type of flight (e.g. passenger/cargo), type of traveller (e.g. business or tourist), seasonal effects, events in the region, staffing requirements, and more. Additionally, airline strategies – such as decisions by airlines regarding routes, frequencies and type of aircraft used – can significantly influence traffic demand at an airport.

[5] Refer to Annex B and C for more detailed information.

For further information and guidance on airport capacity and traffic demand, please refer to the Airport Corner (EUROCONTROL) available in Annex G - References.

- For airports with an AOP, the Network Manager shares the **arrival demand with the AOP** and establishes a **collaborative decision-making process** at local Air Traffic Flow Management (ATFM) level. This is typically done via the **FMP** (**Flow Management Position**: a position within local/regional ATC)[6].

- AOP/NOP integration is about providing data to the Network Operations Plan (NOP) as well as providing useful data from the NOP to the airport.

- The AOP is connected to the NOP via **System Wide Information Management (SWIM) service(s)**[7] and makes all the network-relevant data available to the network. AOP/NOP B2B services are all SWIM compliant, which is a future proof connection.

- AOP-NOP exchange for an airport is defined by an Interface Control Document (ICD). It is a technical document that specifies the exchange elements and exchange process for that airport.

Refer to Annexes B and C for further details of the KPIs and data levels.

[6] For more information, see Flow Management Position (FMP) | Skybrary Aviation Safety.
[7] For more information about SWIM, refer to Annex G (References).

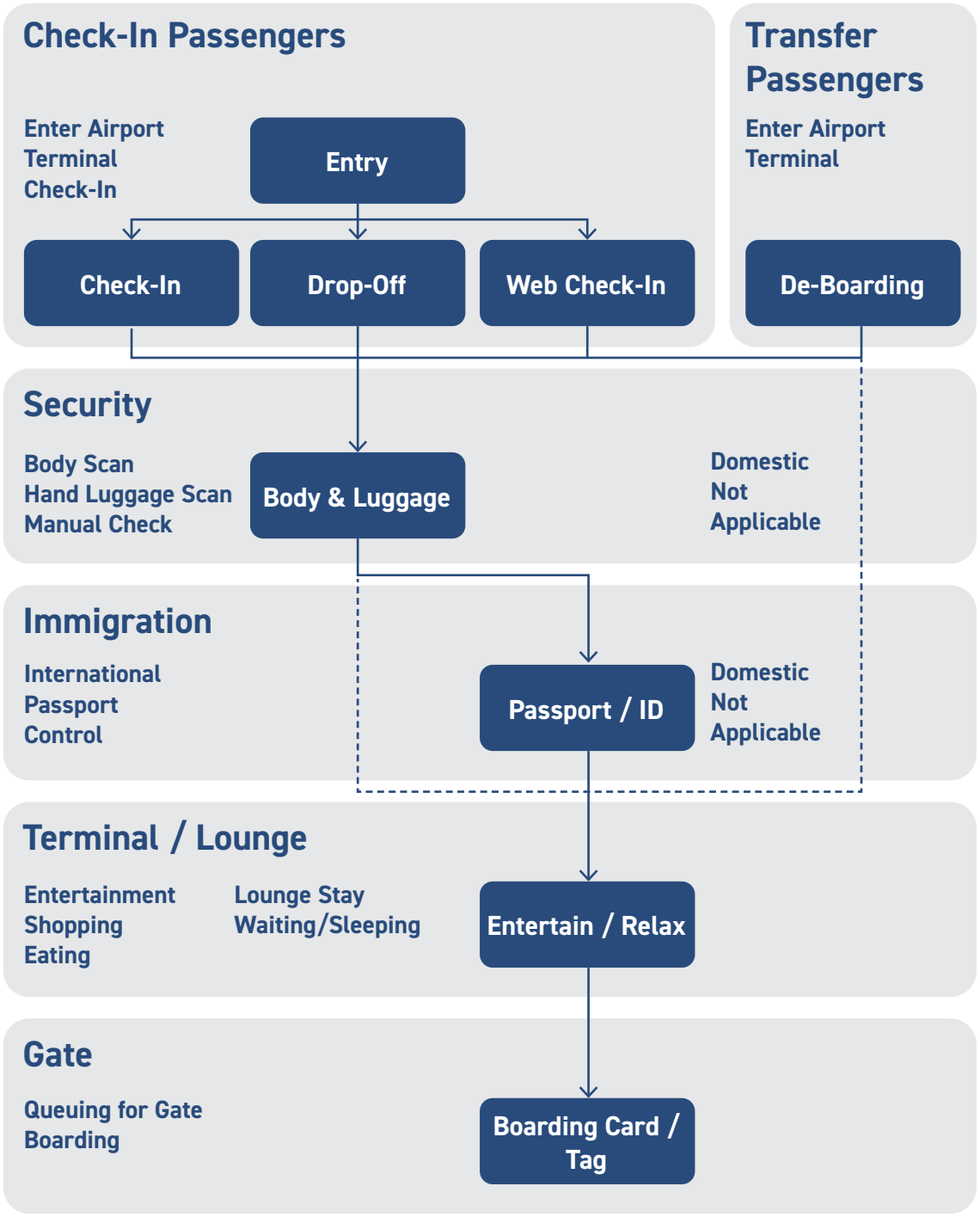
6. LANDSIDE PROCESSES

The AOP also recommends including data and management related to landside processes. A typical departure process is determined by two flows of passengers:

- Departure passengers
- Transfer Passengers

The departure process is visualised below:

Figure 4: Nominal departure passenger process



The main passenger information that is relevant for the AOP which could affect the Target Off Block Time (TOBT)[8] is:

- Checked-in passengers
- Security screened passengers
- Passengers that have passed immigration
- Passengers transferring to another flight
- Passengers that have boarded the flight

Comparing these items to the expected values for any given flight – such as comparing the number of checked and secured passengers compared to the number of boarded passengers – can be a reason to adjust the TOBT or to offload passenger baggage, where applicable.

A similar nominal **arrival passenger process** could be created and integrated in an AOP. This would be useful for Border Control and Baggage Handling service to manage demand versus capacity.

[8] Target Off Block Time (TOBT) is the time that the Aircraft Operator or Ground Handler estimates that an aircraft will be ready, all doors closed, boarding bridge removed, push back vehicle available and ready to start-up/ push back immediately upon reception of the clearance from the ATC Tower (ref. A-CDM manual EUROCONTROL-SPEC-198 dated 30 January 2025).

7. AOP IMPLEMENTATION GUIDANCE

7.1. Principles and purpose

To generate an Airport Operations Plan of satisfactory quality, aside from increasing the scope of the data used, one should plan to:

- Share AOP-NOP information with all stakeholders (one common view)
- Improve the forecasting and prediction of timestamps
- Monitor and manage airport performance against pre-defined parameters (KPIs)
- Use Demand Capacity Balancing (DCB) tool(s)
- Use operational Scenarios ('Playbook')[9]
- Use simulation and decision support tools
- Update the AOP continuously (as this is a rolling plan) with the latest and most accurate data/information
- Collect relevant data for Post-Operations analysis, share the results with all stakeholders and use lessons learnt to improve the AOP's predictability and overall quality
- Use the building blocks and actions based on experience and lessons learnt featured within this AOP Guidebook

7.2. Guidance / Roadmap

In order to develop an AOP for your airport and ultimately provide and operate the four performance services listed in Section 4, the following table provides a roadmap and basic questions to help define the AOP and its concept of operations.

The four performance services may overlap in the different timeframes (strategic, pre-tactical, tactical, and post-ops). Below is an example of what an AOP implementation roadmap may look like:

	ITEM	ACTIONS & CONSIDERATIONS[10]
1	**Engagement with all local stakeholders** • **Internal** • **External**	• Define stakeholder engagement and organisational structure • Take on board all stakeholders (actors) from day 1; keep them posted on progress • Allow stakeholders to actively participate in the project • Gain agreement on the AOP being the principal source of information for airside and landside stakeholders and information shared
2	**Project organisation**	• Define the scope and deliverables • Set the timeline • Gain funding and other resources

[9] A Scenario Playbook describes different situations (scenarios) at an airport and contains workflows and procedures. It explains how the business operates and the role each person plays. Although no scenario will unfold the same, the advantage is that people will recognise similar situations in real-time operations and will have a better idea about the impact and know what their role is.

[10] For sample questions related to the implementation roadmap, refer to Annex D (Sample Questions).

3	**A-CDM principles**	• Take note that A-CDM is a prerequisite for AOP[11]
4	**Airport performance**	• Set up the four performance services listed in Section 4: Steer Airport Performance, Monitor Airport Performance, Manage Airport Performance and Post-Operations Analysis • Note that airport capacity and traffic demand are for all areas of the operation, not just runways • Use the KPI list agreed between ACI EUROPE and the NM as a baseline • Consult airport stakeholders for their perspectives on what constitutes a good and bad operational day • Define airport performance indicators, which can be as simple as green-orange-red. There must be a good definition of the triggers: with orange and red a Demand Capacity Balancing (DCB) process must be activated, and appropriate measures taken to achieve recovery from disruption
5	**Use of data and contextual information**	• Determine what data and contextual information is required for the AOP • Establish who has the best information in each phase, agree on best source(s) • Determine where and how data will be stored and how backup will be ensured • Determine what triggers/alerts must be in place: these will help to inform the necessary KPIs to monitor
6	**Airport capacity and traffic demand**	• Determine (hourly) airport capacity for flights, passengers, and baggage as early as possible • Determine (hourly) traffic demand for both aircraft and passenger processes • Airport capacity and traffic demand starts with seasonal planning and needs to be updated as soon as new information becomes available
7	**Capacity assessment (bottlenecks)**	• Plot airport capacity (all resources) versus traffic demand (flights, passengers) on a timeline which gives insights in potential bottlenecks • Do this for arrivals, turnaround (ground handling), and departures • Assess the impact of over-demand

[11] If you are a non-CDM airport, there may be other solutions to provide basic information to the NM e.g. via the ECRA tool. See Chapter 9.3 and Annex G (References) for more info.

8	**Mitigate performance impact with the DCB process**	• For each over-demand scenario, determine potential mitigation measures (either reducing demand or increasing capacity), and who must act. Matching traffic demand against airport capacity is the function of a Demand Capacity Balancing process carried out by an operational team, with or without the aid of a Demand Capacity Balancing tool: often referred to as DCB • Implement a trigger mechanism: what cases require action, and which stakeholders take further action and/or lead the recovery? • There needs to be a DCB process in which the situation (performance risk) will be assessed and should result in appropriate measures resulting in traffic demand matching airport capacity, so the airport performance stays within the pre-defined parameters • Taking measures in a timely manner is essential as it will improve predictability and lower mitigation costs
9	**AOP dashboard**	• Use an AOP dashboard for local stakeholders to provide a common view • A good AOP dashboard should contain key information not only about present airport status, but also what can be expected in (near) future: airport configuration, number of flights & passengers, (potential) bottlenecks, alerts, significant events and trends, mitigation measures, airport performance information, and more • Airport status: a simple yet powerful way of communicating airport performance is to use green-orange-red indicators. Stakeholders need to first agree locally on the definition of each colour
10	**Information sharing**	• Ensure the data/information used in the AOP is correct, as users need to trust what they see • Feed the AOP with local and network updates and update the AOP accordingly • Share AOP data with local stakeholders • Share AOP data with the network (AOP-NOP exchange) • To exchange information with the NM, an Interface Control Document (ICD) needs to be set up[12]

[12] Basis for validation.

11	**DCB process (changes)**	• Modifications to the DCB process should be implemented whenever there is a risk that airport performance may fall outside defined performance targets • Decide what will be the trigger to start this process and how it works
12	**AOP updates**	• If the outcome of the DCB process influences the AOP, it should be updated accordingly
13	**AOP execution**	• On D-1, publish the operational plan for the next day • On D-0, the focus should be to execute the plan agreed the previous day • If the (AOP) plan was robust the day before (D-1) and a good scenario chosen, in most cases only tactical adjustments need to be made • If circumstances change drastically, the DCB process should be (re)started and an updated AOP published afterwards • Mitigation measures taken tactically (rather than pre-tactically) will typically be more difficult to achieve and more costly
14	**Airport performance monitoring and management**	• Assign roles to actively monitor airport performance on both D-1 and D-0 • Decide on which stakeholders will act on each alert or warning • Initiate actions for the Manage Airport Performance process if performance cannot be met as planned • Start a (new) DCB process as necessary • Monitor the effect of recovery measures
15	**Post-Operations Analysis**	• Collect both numerical and anecdotal data • Identify the root causes for airport performance degradation: Post-Operations Analysis will help to identify these • Perform data analysis and create subsequent reports • Use the insights gained from Post-Operations reports to make informed decisions about where to invest resources and how to improve the AOP process
16	**Communications**	• Be transparent in communications and the sharing of data • Celebrate successes and share insights from Post-Operations Analysis, as well as future plans for any data collected

General recommendations

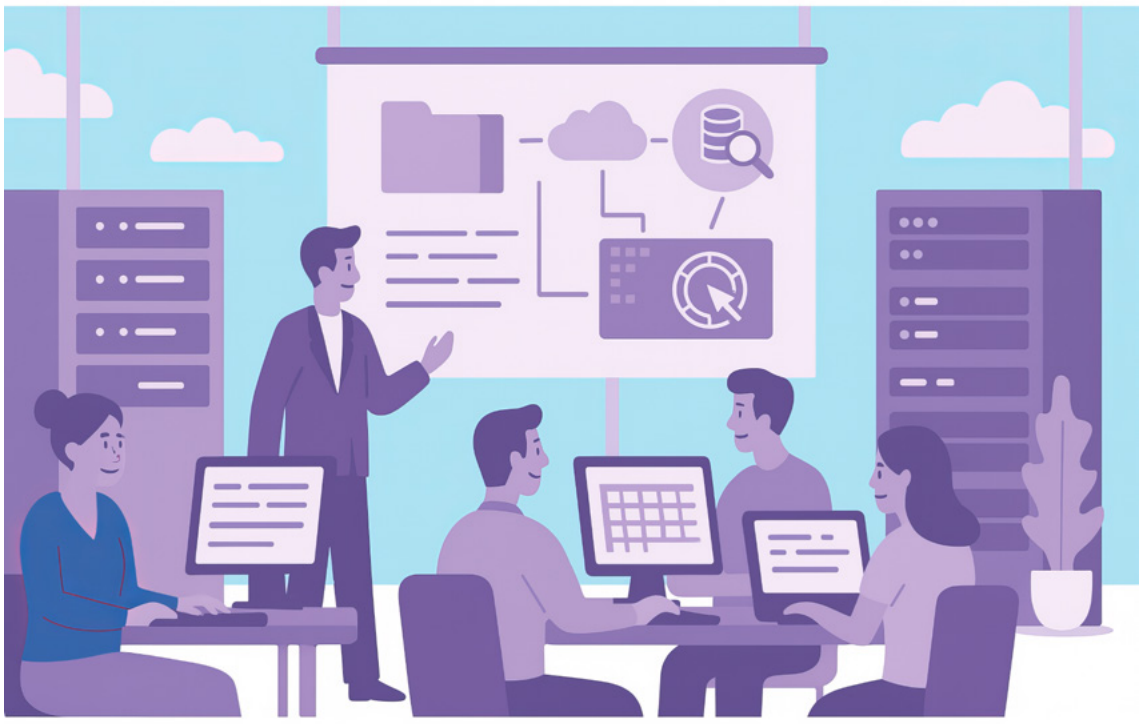
A	**D-0, D-1, D-3, ...**	• It is recommended to begin an AOP dashboard with D-0, as it is likely most airports will have the most tactical information for this day based on A-CDM • Next, expand the time horizon towards D-1 and plan tomorrow's operations, taking all capacity and traffic demand elements into consideration • Perform a DCB process to stay within desired airport performance parameters • After this has been completed, expand the time horizon to D-3, D-7, and so on
B	**Automation, Support Tools**	• Consider which processes can be automated • Data is easier to process than contextual information • The DCB process can be completed via meetings or with assistance ('what if') simulation tools that can help to develop better informed decisions • Simulations can be linked to specific scenarios • Systems should follow the process – not the other way around
C	**Develop Operational Scenarios (Playbook)**	• For typical situations that happen regularly at the airport, or that have a large impact, it is smart to develop a Playbook which describes the typical situation, the mitigating measures, and the effect on performance • Each scenario should also describe the role of each actor and what they need to do

8. SYSTEM REQUIREMENTS

It can be derived from the performance services descriptions that, as well as people and process, there must be an IT system that:

- Holds the relevant data
- Exchanges data/information with the NM/NOP
- Visualises the data with appropriate KPIs (dashboard)
- Generates alerts when thresholds are or will be exceeded
- Changes the data reflecting the decisions and measures taken
- Records/stores the data
- Enables and performs analyses

While all these elements typically already exist in the form of an Airport Operational Database (AODB) and its interfaces, as well as commercial off-the-shelf data analysis solutions, the emphasis remains on producing a reliable AOP for which the IT system is an enabler. To generate a plan with satisfactory quality – aside from increasing the scope of the data used – consideration should be given to improving forecasting and predictions of timestamps (e.g. TOBT) and KPI evolution. This could be arranged potentially in combination with a Demand Capacity Balancing tool for all parts of the airport operation (not just runways).



9. SUPPORT AND LESSONS LEARNT

9.1. Role of SESAR Deployment Manager and SESAR Deployment Programme

The SESAR Deployment Manager (SDM) was established at the end of 2014 under the oversight of the European Commission with the aim to synchronise and coordinate the deployment of the European Regulation called Common Projects (CP)[13]. The SDM synchronises and coordinates implementation of the CP by providing a workplan known as the "SESAR Deployment Programme" to guide and support all operational stakeholders involved in SESAR ATM modernisation. The SDM defines the scope of the activities, the synchronisation needs, and the suggested approach for deploying all the CP1 functionalities, as well as AOP and AOP–NOP integration amongst others. In this context, SDM coordinates two large projects valued at over EUR 224 million, co-funded by CINEA and involving 25 airports, 2 ANSPs, and the Network Manager – with the aim to implement the AOP and AOP-NOP by the end of 2027. All airports are represented in the Airport Integration Task Force (refer to Section 9.2) where lessons learnt and best practices are shared. For more information, please refer to the SDM website: www.sesardeploymentmanager.eu.

9.2. Airport Integration Task Force (AITF)

The Airport Integration Task Force (AITF) was established in 2024 by ACI EUROPE with the aim to ensure proper coordination and cooperation amongst the airport community in the implementation of AOPs and AOP-NOP integration. The group, which is open to all ACI EUROPE member airports, brings the airports together and allows them to share the best practices and experience in implementing the AOP and/or AOP-NOP (including A-CDM, etc.). Moreover, it acts as one voice for airports regarding all topics linked to AOPs and AOP-NOP integration. In case you would like to join the group, or would like more information on the AITF, please contact Ms Barbora Smolikova (barbora.smolikova@aci-europe.org).

9.3. MIRROR and ECRA[14]

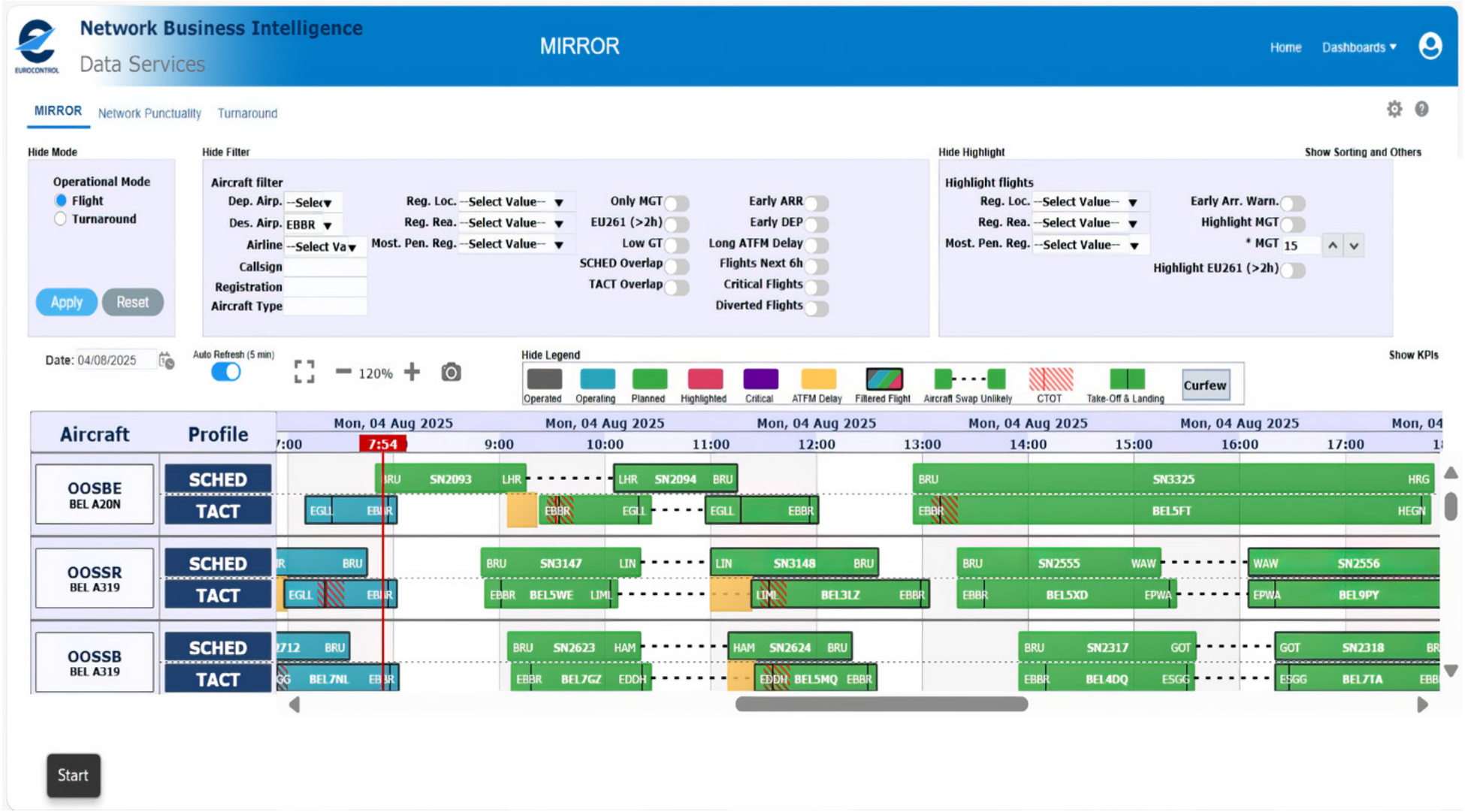
Although A-CDM is a prerequisite for an AOP, there are supporting tools that can help any airport to get started. EUROCONTROL's visualisation tool MIRROR creates a sequence of flights for each aircraft in the European aviation network, enabling operational stakeholders to predict delays more accurately, and take measures to mitigate their impact. This increases the efficiency and sustainability of flights and reduces the financial impact for airlines.

MIRROR is the basis of the European Connected Regional Airports (ECRA) service, which supports airports in enhancing their situational awareness with the basic NM connectivity that fills the small and regional airport predictability gap. The service is web-based and therefore relatively easy and cost-effective to implement for regional airports.

[13] A Common Project is a Commission Implementing Regulation which mandates the implementation of the most essential operational changes in the European ATM Master Plan by the Member States of the European Union and their operational stakeholders.

[14] See Annex G (References) for more info.

Figure 5: MIRROR tool (sample)

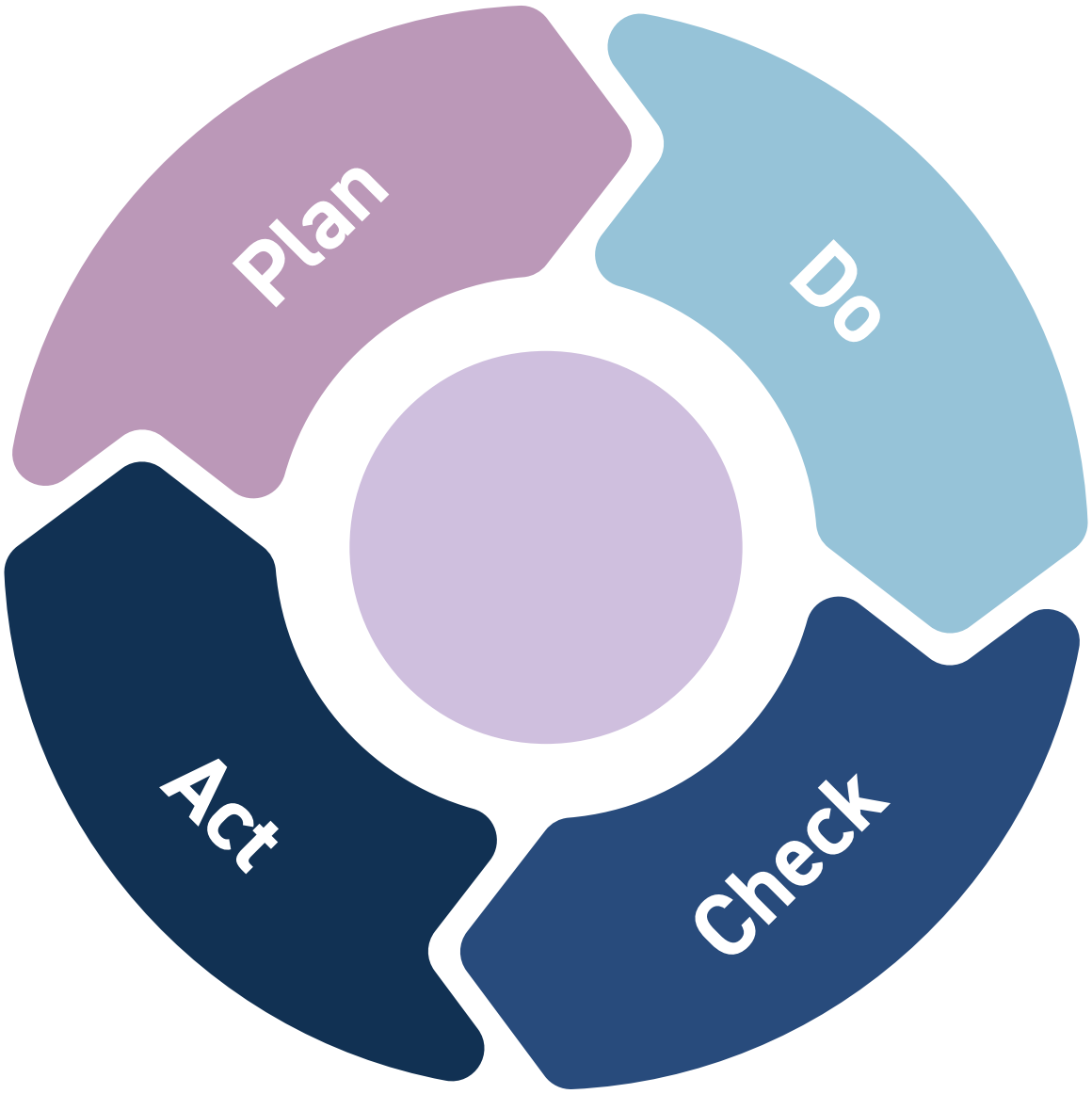


ANNEXES

A. MAPPING THE PERFORMANCE SERVICE TO PLAN-DO-CHECK-ACT

A typical management cycle can be performed using the PDCA or Plan-Do-Check-Act method (sometimes called Plan-Do-Check-Adjust). It is an iterative design and management method used in business for the control and continual improvement of processes and products. This simple and well-known method can also be used for the AOP to steer, monitor and manage airport performance.

Figure 6: PDCA method - Management Plan



PDCA	PDCA cycles vs Airport Performance Services	AOP[15]
Plan	Establish objectives and processes required to deliver the desired results.	**Steer**
Do	Carry out the objectives from the previous step.	**Monitor** (D-3...D1)
Check	During the Check phase, the data and results gathered from the Do phase are evaluated. Data is compared to the expected outcomes to identify any similarities and differences.	**Monitor & Manage** (D-3...D1)
Act (Adjust)	Also called Adjust, this act phase is where a process is improved. Records from the Do and Check phases help identify issues with the process either in the immediate short-term or the longer term. These issues may include problems, non-conformities, opportunities for improvement, inefficiencies, and other issues that result in outcomes that are evidently less-than-optimal. Root causes of such issues are investigated, found, and eliminated by modifying the process. Risk is re-evaluated. At the end of the actions in this phase, the process has better instructions, standards, or goals. Planning for the next cycle can proceed with a better baseline.	**Day of Operations: Manage** (D-0) **—** **After Day of Operations: Post-Ops** (D+1)

The Act (Adjust) step can be viewed in different timeframes. When executed immediately after a deviation is detected, this resembles a short-term control loop, which for the context of the AOP can be associated with the Manage Airport Performance part of the performance services through the implementation of mitigation measures. If the outcomes are more aggregated and compared with the plan over a longer period of time, this can be viewed as part of the Post-Operations Analysis in the context of the AOP, with the objective of improving the processes in place for the Monitor Airport Performance step or a review of the objectives and thresholds as set in the Steer Airport Performance step.

In order to check if the plan is yielding the desired outcome, the correct means to perform the check must be found.

For this purpose, a set of meaningful and descriptive KPIs and supporting information elements/metrics must be identified (see Section 5) and compared to pre-defined and agreed thresholds.

The KPIs compared to the previously defined goals and objectives define the magnitude of the deviation. If deviation thresholds are exceeded, alerts ('Monitor Service') should be implemented in the AOP for the short-term control loop to take effect. These alerts should trigger AOP stakeholders (APOC) to take action ('Manage Service') and mitigate the deviation to restore performance.

[15] The timeframe mentioned in the AOP column (brackets) are indicative only.

Demand Capacity Balancing (DCB) will play an important role in managing and monitoring the AOP but will not be further described here. However, many of the KPIs presented in this document are set up for proactive performance management purposes and reflect a performance forecast that can be beneficial for Demand Capacity Balancing purposes.

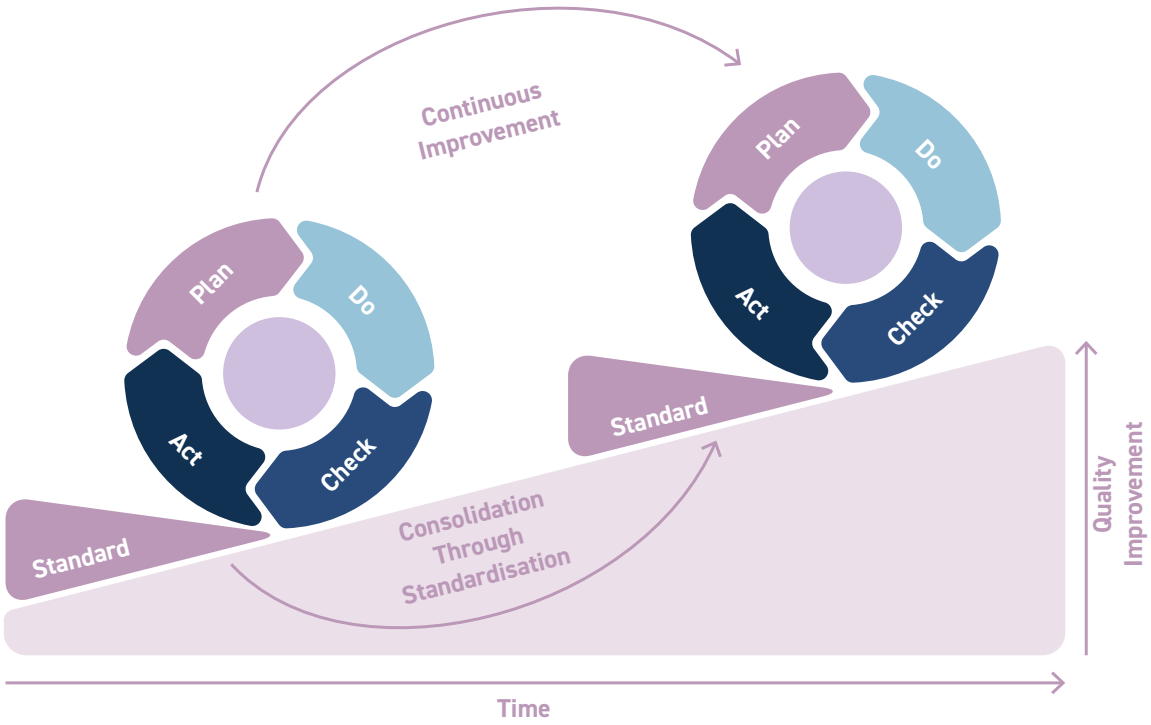
In order to set up and maintain the four performance services, it is recommended to establish an Airport Performance Committee or governance scheme. This is out of scope for this document.

The seasonal AOPs are stored to be used in Post-Operations (Post-Ops) Analysis.

The main question to be answered in the Post-Ops Analysis is what the quality of the AOP was at D-1, and if operations at D-0 went as foreseen, including the mitigation measures taken before and during the day of operations. Was it effective and were the AOP stakeholders able to keep the airport performance within the pre-defined parameters (Steer Performance, KPIs)? If not, what was the root cause? Have there been similar events in the past? Is there a trend or a risk of this happening again?

What worked well and should be kept, and what should be done to improve airport performance next time?

Figure 7: Post-Ops Analysis Method



Ideally, a good Post-Ops Analysis should be data-driven, enriched with contextual information provided by operational experts that were involved during the days of operations with significant events.

The Post-Ops Analysis should be done after a significant event (e.g. resulting in departure delays) and should also be done on a regular basis (weekly, monthly, or seasonally). The lessons learned and/or new data should be used to improve the quality of the AOP in the future. Post-Ops KPIs can vary from airport to airport depending on the prioritised area of improvement that the airport intends to address.

The process should be described in the appropriate airport manual(s) and shared with local stakeholders. An Airport Performance Committee or governance scheme could play a central role here.

Find out more about the performance services with the SESAR Joint Undertaking Solution 21. It is possible to seek guidance from ACI EUROPE and SESAR Deployment Manager experts: contact details in Annex H.

B. KEY PERFORMANCE INDICATORS (KPIs) AND DATA LEVELS OVERVIEW

The CP1 Regulation does not specify which data elements the AOP should contain. However, it mentions that the Extended AOP supports landside and airside operations at airports. The Regulation also specifies that the data elements to be shared with the NOP must be agreed among the stakeholders.

As a result, ACI EUROPE and the NM agreed to a comprehensive list of KPIs associated with each of the three data levels. Each KPI contains:

- ID
- Name (title)
- Nature
- Data Level (KPIs, contextual information, input data)
- Purpose
- Calculation Rules
- Domain
- Applicability
- Time Bracket
- Area (airside, landside)
- Process
- Typical source

The KPIs, contextual information and input data are grouped in 3 different data levels:

	Applicability	Provision	Definition / Formula
LEVEL 1	All airports	Minimum commitment	Standards (for data exchanged with the NOP) and standardisation guidelines (for data only in the AOP) apply
LEVEL 2	All airports	Optional	If the data element is included, the common harmonisation guidelines apply
LEVEL 3	Local	Optional	Common standard does not apply

LEVEL 1

This represents the baseline of the construction of the AOP and of AOP-NOP connection. The KPIs associated with Level 1 are to be provided by each airport involved. Their definition/formula is standardised for AOP-NOP exchange and harmonised for the rest of the data, to allow comparability between airports (also for potential AOP-AOP exchange in the future).

LEVEL 2

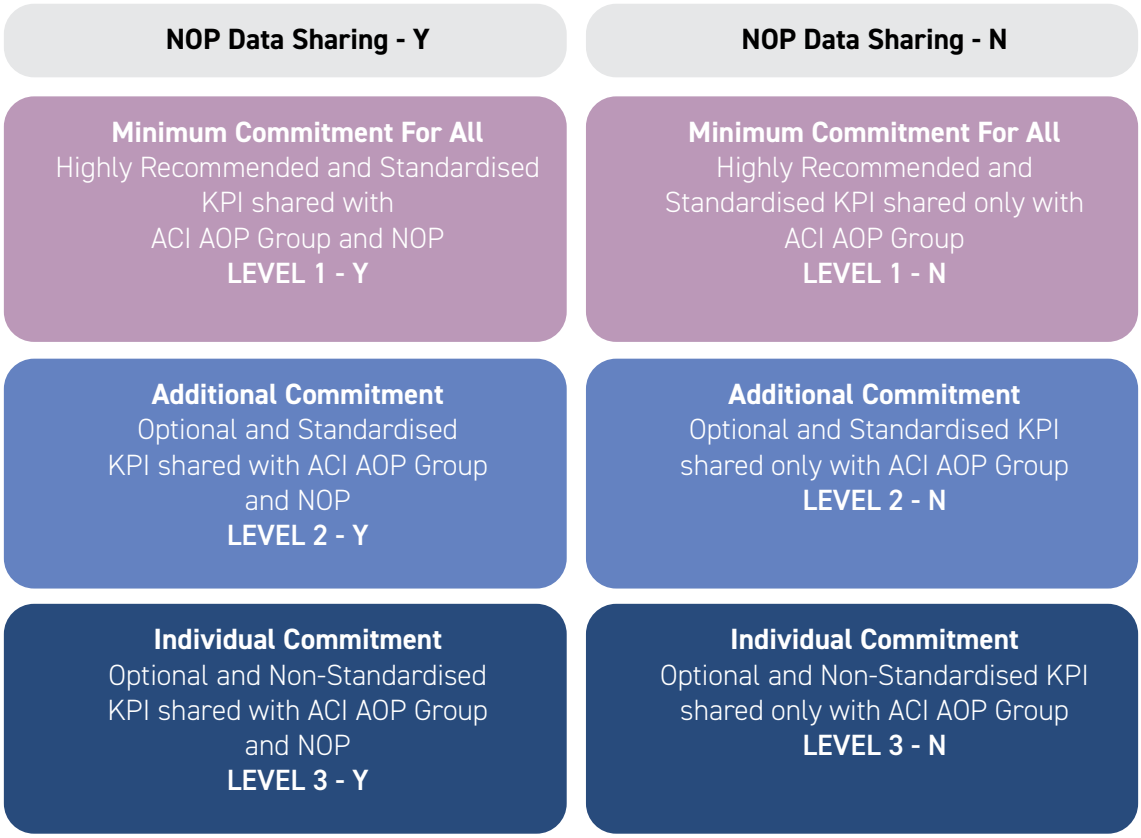
The KPIs associated to Level 2 could optionally be provided from each airport involved. If implemented, their definition/formula follows the defined standardisation if shared with the Network Manager and is harmonised across airports for data not (yet) shared, to maintain comparability. This benefits AOPs, giving stakeholders a better picture on how operations are running at each airport.

LEVEL 3

The KPIs associated with Level 3 could optionally be provided by an airport. At this level each airport can define their own KPIs that are useful to their operational needs.

This represents the last mile of an AOP and will include all those peculiarities and competitive difference that would not be common between all airports.

Figure 8: Overview of AOP Data Levels



C. KPI LIST AND DATA LEVELS

Not all data in the AOP needs to be shared with the NOP, as it may be relevant for local purposes only (e.g. landside operations without network impact/relevance).

Therefore, for each level, the data that must be shared with the NOP is marked with 'Y' (YES) and when it is considered optional with 'N' (NO).

The table below shows all the KPIs and contextual information elements (titles) that should be in the AOP. A Microsoft Excel spreadsheet contains all the details for the KPIs and what must be shared with the NOP. Please refer to Annex G (References) for access.

Note: It is assumed that the G-API (General Arrival Planning Information) and P-DPI (General Departure Planning Information) data exchanges which build on A-CDM will also be implemented. For details of these please refer to the contacts in Annex H.

The optional sharing of KPIs with the NOP and/or by airports peer to peer would require exchange protocols and methods to be developed.

LEVEL 1

Sharing with NOP – YES	Sharing with NOP – NO
• Runway Configuration Status – Current • Flight Schedule Update	• Schedule Completion Rate – Current Day • Hourly Schedule Completion Rate – Current Day • Departure On-Time Performance (Punctuality) – Current Day • Last Rolling Hour Departure On-Time Performance (Punctuality) – Current Day • Hourly Departure On-Time Performance Prediction (Punctuality) – Current Day • Arrival On-Time Performance (Punctuality) – Current Day • Last Rolling Hour Arrival On-Time Performance (Punctuality) – Current Day • Hourly Arrival On-Time Performance Prediction (Punctuality) – Current Day • Last Rolling Hour Average Taxi Time Inbound – Current Day • Last Rolling Hour Average Taxi Time Outbound – Current Day • Last Rolling 3 Hour Average Of Ground Times Narrow Bodies – Current Day • Last Rolling Hour Startup Delay – Current Day • Rolling Startup Delay Prediction – Current Day • Hourly PRM Request Prediction – Next Day

LEVEL 2

Sharing with NOP - YES	Sharing with NOP - NO
• Runway Configuration Status – Prediction • Available Maximum Arrival Capacity • Traffic Volume Regulation • ELDT Information And ELDT Source From G-PI AOP To NOP • Cherry Picking Via B2B TTAs • Flight Schedule Update • Flight Priority Level • Airport Curfew Environment* • Airport Curfew Flight*	• List of Cancellations – Current Day • List of Expected Cancellations – Current Day • Hourly Departure On-Time Performance Prediction (Punctuality) – Next Day • Past Rolling 3 Hours Departure Punctuality of Regulated Flights (CTOTs) – Current Day • Hourly Arrival On-Time Performance Prediction (Punctuality) – Next Day • Average Delay of Unpunctual Flights – Now • Current Stand Occupancy Ratio – Current Day • Stand Occupancy Ratio Prediction – Current Day • List of Stand Changes – Current Day • Contact Stands Allocation Performance – Current Day • Hourly Towing Prediction – Current Day • Current Number of Refuellings With Passengers On Board – Current Day • Expired TOBTs of Past Rolling Hour – Current Day • TOBT Update Performance – Post-Ops • Past Rolling Hour ASAT/TSAT Offset Performance – Current Day • Past Rolling Hour ATOT/TTOT Offset Performance – Current Day • Past Rolling Hour AOBT/TSAT Offset Performance – Current Day • Past Rolling Hour Off Block Deviation From ASAT • Accuracy of Turnaround Times – Post-Ops • Hourly Deicing Demand Prediction – Current Day • Hourly Deicing Throughput – Current Day • Past Rolling Hour Deicing Performance – Current Day • Misconnected Baggage Prediction – Current Day • Transfer Baggage Prediction – Next Day • Misconnected Baggage – Post-Ops • List of Departures With More Than Two Hours of Delay – Current Day • Hourly Number of Non-Schengen Arrivals – Current Day • Hourly Number of Non-Schengen Departures – Current Day • Hourly Security Utilisation Prediction Per Checkpoint Area – Current Day • Hourly Security Utilisation Prediction Per Checkpoint Area – Next Day • Hourly Border Control Utilisation Prediction – Current Day • Hourly Border Control Utilisation Prediction – Next Day • Current Waiting Times At Security Check Points – Current Day • Current Waiting Time At Passport Control Area(s) – Current Day • Hourly Transfer Security Check Utilisation Index Prediction – Current Day

* Only for airports with a curfew

LEVEL 3

Sharing with NOP - YES	Sharing with NOP - NO
• Airport Events	• Runway Capacity Prediction Inbound • Runway Capacity Prediction Outbound • Early Arrival Flight List Prediction – Current Day • Daily ATFM Arrival Delay Caused By Arrival Regulation – Post-Ops • Hourly Arr & Dep Rwy Utilisation Prediction – Current Day • Hourly Arr & Dep Rwy Utilisation Prediction – Next Day • Current Arr Aircraft Holdings (Airborne) – Current Day • Hourly Average Holding Time For Stand Inbound Prediction And Number of Flights Waiting – Current Day • Number of Flights Waiting For Inbound Stand – Current Day • Contact Stands Allocation Performance Prediction – Best Effort • Pushback/Towing Capability (Crew+Equipment) – Current Day • Ramp Crew Availability Index – Current Day • Last Rolling 3 Hour Average Recovered Delay Minutes – Current Day • MTTT Compliance – Post-Ops • Clearance Delivery Reaction Time • TOBT Accuracy Vs Prediction ARDT-TOBT – Post-Ops • De-Icing Capability Prediction Remote (Crew + Equipment) • De-Icing Capability Prediction On-Stand (Crew + Equipment) • List of Flights At Risk For Curfew Infringement – Current Day • Hourly Predicted Baggage Carousel Waiting Time • Baggage Carousel Waiting Time – Current Day • Baggage Forecast Accuracy – Current Day • Last Minute Baggage Offload Performance – Post-Ops • Current Gate Occupation Ratio – Now • Prediction of Gate Occupancy Ratio • Bus Utilisation Prediction – Current Day • Bus Utilisation Prediction – Next Day • Hourly Pax Waiting Time Prediction Security – Current Day • Hourly Pax Waiting Time Prediction Security – Next Day • Area Occupancy – Now • Number of Pax Impacted By Dep Cancellations – Current Day • PRM Forecast Accuracy – Post-Ops

D. SAMPLE QUESTIONS

Below are some sample questions related to the implementation roadmap (Section 7.2 Guidance / Roadmap). The numbers refer to the item numbers from Section 7.2.

The questions below are not complete but intended to assist in setting up your local project.

Item N°	Sample questions related to Implementation Roadmap
1	• What AOP information are you going to share with local and external stakeholders? • How will you agree on airport performance KPIs with other stakeholders? • Do you have agreements set up with all stakeholders to use the data? • What data do you think you need to steer, monitor, manage and perform post-ops?
4	• What triggers do you want to see? • Are the KPI thresholds set correctly? • Who is going to act on each trigger? • When do you have a good or a bad day operational day, in terms of punctuality or another KPI? • How do you assess and report performance? • How do you monitor performance on D-0?
5	• Which stakeholder has the most accurate information at any given time? • What NOP information (network) might be relevant for your airport? • How can you feed the data and contextual information into the AOP? • How will you use this data? Who will monitor, receive triggers, and act? (a process is needed)
6	• What elements determine airport capacity? • What elements determine traffic demand?
7	• What tools (mitigating measures) do you have at your disposal to reduce/increase capacity? • What tools (mitigating measures) do you have at your disposal to reduce/ increase traffic demand?
14	• In what scenarios can airport performance issues be expected, and what is the likely severity of the impact on the operations? For example, strong winds from direction X, poor visibility, runway closure, low staffing levels, etc. • What mitigation measures can you take in certain scenarios? (Playbook)
15	• How do you manage if interventions need to be adjusted? • What changes are needed to mandates and procedures? Note, this will inform Steer Airport Performance, Monitor Airport Performance, Manage Airport Performance and may be informed by Post-Operations Analysis. • What information (data and contextual) can be used for Post-Operations Analysis? • What arrangement can be made to feed Post-Operations Analysis conclusions and recommendations into process improvement? • Is there a likely scenario missing from the Playbook?
16	• How and when do you communicate airport performance with stakeholders?

E. GLOSSARY (DEFINITIONS)

Acronym	Meaning
A-CDM	Airport-Collaborative Decision Making
ACISP	The Airport CDM Information Sharing Platform
ANSP	Air Navigation Service Provider
AO	Airport Operator
AOBT	Actual Off-Block Time
AODB	Airport Operator Data Base
AOP	Airport Operations Plan
API	Arriving Planning Information (message)
APOC	AirPort Operations Centre
ARDT	Actual Ready Time
ASAT	Actual Start Approval Time
ATC	Air Traffic Control
AU	Airspace User
B2B	Business to Business
CP1	Common Project One (EU Regulation 2021/116)
CTOT	Calculated Take-Off Time
D-1	Day before Operations (Pre-Tactical)
D-0, D	Day of Operations (Tactical)
D+1	Day after Operations (Post-Ops)
DCB	Demand Capacity Balancing
DPI	Departure Planning Information (message)
eAOP	Extended AOP
ECRA	European Connected Regional Airports (EUROCONTROL)
ELDT	Estimated Landing Time
FMP	Flow Management Position (ATC)
G-API	General – API (message)
iAOP	Initial AOP
ICD	Interface Control Document
IR	Implementing Rule (EU Regulation)
KPI	Key Performance Indicator
MET	Meteorology (weather)
MTTT	Minimum Turn-round Time
NM	Network Manager (EUROCONTROL)
NOP	Network Operations Plan
P-DPI	Predicted – DPI (message)
PRM	Passenger with Reduced Mobility
SWIM	System Wide Information Management ('internet')
SWIM yellow profile	Technical requirements for information exchange in ATM
TOBT	Target Off-Block Time
TSAT	Target Start-Up Approval Time
TTA	Target Time of Arrival

F. AOP IMPLEMENTERS

	Airports which have or are implementing AOP
1	Amsterdam Airport Schiphol
2	Athens International Airport
3	Barcelona El Prat Airport
4	Berlin Brandenburg Airport
5	Brussels Airport
6	Copenhagen Airport
7	Dublin Airport
8	Düsseldorf Airport
9	Frankfurt Airport
10	Geneva Airport
11	Hamburg Airport
12	Helsinki Airport
13	Lisbon Airport
14	London Heathrow Airport*
15	Lyon Saint-Exupéry Airport
16	Madrid-Barajas Adolfo Suárez Airport
17	Málaga-Costa del Sol Airport
18	Milan-Linate Airport
19	Milan-Malpensa Airport
20	Munich Airport
21	Nice Côte d'Azur Airport
22	Oslo Airport
23	Palma de Mallorca Airport
24	Paris – Charles de Gaulle Airport
25	Paris – Orly Airport
26	Prague Airport
27	Rome-Fiumicino Airport
28	Stockholm-Arlanda Airport
29	Stuttgart Airport
30	Vienna Airport
31	Warsaw Chopin Airport
32	Zurich Airport

All CP1 airports are aiming to have an AOP by the end of 2027.[16]

* not a CP1 Airport

[16] CP1 Implementing Regulation (EU) No 716/2014 has been incorporated into the Agreement on the European Economic Area as well as into the Agreement between the European Community and the Swiss Confederation on Air Transport, with the effect of including the Oslo Gardermoen, Zürich Kloten and Geneva airports into its scope insofar as ATM functionalities 1, 2, 4 and 5 are concerned. To achieve the full network benefits, it would be desirable that those airports equally implement Common Project One, in the context of the relevant agreements.

G. REFERENCES

CP1 Regulation
https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R0116

SWIM factsheet
https://www.eurocontrol.int/sites/default/files/2021-05/swim-tiyp-factsheet.pdf

SWIM yellow profile - specifications
EUROCONTROL Specification for SWIM TI Yellow Profile

AIRPORT CORNER (EUROCONTROL)
Public Airport Corner - Strategic Airport Information

KPI list
An Excel verson of the KPI list with calculation rules can be obtained from the ACI EUROPE contact listed in Annex H.

ACI EUROPE APOC Guidebook
https://www.aci-europe.org/downloads/resources/ACI%20EUROPE%20APOC%20Guidance.pdf

European Connected Regional Airports (ECRA)
https://www.eurocontrol.int/service/european-connected-regional-airports

MIRROR flight visualisation tool (Eurocontrol)
https://www.eurocontrol.int/news/mirror-tool-helps-predict-mitigate-delay

H. CONTACTS

ACI EUROPE
For AOP content, guidance material, coordination with the SESAR Deployment Manager and Network Manager, please contact Barbora Smolikova (barbora.smolikova@aci-europe.org).

SESAR Deployment Manager
For support regarding the SESAR Deployment Manager, Programme, CEF calls, or further coordination, please contact Barbora Smolikova (barbora.smolikova@aci-europe.org), Alex von Eckartsberg, (a.voneckartsberg@fraport.de), and/or Tim Robinson (tim.robinson@sesardeploymentmanager.eu)

EUROCONTROL
For AOP-NOP exchange or validation, please contact Alex von Eckartsberg, (a.voneckartsberg@fraport.de)

ACI EUROPE is the European region of Airports Council International (ACI), the only worldwide professional association of airport operators. ACI EUROPE represents over 600 airports in 55 countries. Our members facilitate over 90% of commercial air traffic in Europe. Airports and air connectivity support 14 million jobs, generating €851 billion in European economic activity (5% of GDP). In response to the Climate Emergency, in June 2019 our members committed to achieving Net Zero carbon emissions for operations under their control by 2050, without offsetting.

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