The Amsterdam Delay Allocation Method

The better way for airport delay analysis

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Schiphol

Welcome to Amsterdam Airport

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1. Executive Summary

On-Time Performance (OTP) defines the heartbeat of aviation operations and enables the industry to operate the schedule as promised to the customer. Having thorough understanding of the cause of delays is crucial for improving OTP.

When analysing the cause of delays, airports heavily rely on IATA delay codes as reported by the airline and/or ground handlers. These codes are often based on subjective perspectives and may be formulated with limited available information due to the operational intensity.

There is a large amount of data available for airports in their Airport Operations Database (AODB), especially when operating with Collaborative Decision Making (A-CDM) processes! Seize the data and let it speak for itself.

Amsterdam Airport Schiphol has developed a solution to provide end-to-end insight into flight delays through algorithms.
This method is called the Amsterdam Delay Allocation Method (ADAM).

This means that the delay build-up of a single flight can be explained by five reasons with deeper differentiators below as well, instead of the regular two to three from delay codes, based on factual data from the AODB.

The increased use and improved accessibility of emerging technologies such as Artificial Intelligence and algorithms aren’t fully exploited in OTP analysis worldwide.

Schiphol is expanding the existing ADAM model by using the Deep Turnaround solution, enhancing the depth of the insights it offers.
The algorithm can also assist decision makers to adopt the new IATA delay code scheme (AHM732) with a delay code advisor based on ADAM.

At Schiphol we firmly believe in the method and fully trust the methodology. The sole reason to publish our method is because we want to encourage other airports to explore the possibilities for adoption.

ADAM provides the opportunity to analyse multiple delay reasons per flight that are also in depth in the origin that helps understand delay much more thoroughly than when using delay codes.

Jeffrey Schäfer

Process Owner aircraft turnaround at
Royal Schiphol Group

2. Introduction

High quality insight and deep knowledge in the origin of delay is paramount to the reputation and enables improvement for airports.

On-Time Performance (OTP) defines the heartbeat of aviation operations. It enables the industry to operate the schedule as promised to the customer, leaving passengers satisfied and at their destinations on-time. From an operational perspective OTP means that resources are utilized optimally. To maintain and improve OTP, each company active in the chain of flight operations must analyse and improve their specific contribution to the industry.

The importance of high-quality delay analysis

On-Time Performance guarantees that the designed schedule of an airline is viable, including their assets (aircraft) and staff ending up at the right place at the right time. Additionally, for airports, good OTP means that the scarce airport assets, including runways, taxiways, stands, the terminal building and access roads, are used as designed. Furthermore, OTP is a defining factor for the reputation of the industry. Therefore, good insight and knowledge in the origin of flight delay is paramount to reputation and opens the door to performance improvement.

The challenge of good OTP analysis

When analysing the cause of delays, airports heavily rely on IATA delay codes as reported by the airline and/or ground handlers, which is based on the point of view, often made with the restricted available information. Additionally, there's often no more than two reported reasons, which heavily limits having a full overview backed by data.

The limited overview of the delay structure of each flight has inspired Amsterdam Airport Schiphol to venture deeper into the available data.

The solution: a delay breakdown algorithm

The Amsterdam Delay Allocation Method (ADAM) provides a complete breakdown of all reasons for departure delay. This has been the key method for delay analysis at Schiphol airport since early 2019.

We want to encourage airports to adopt the method. At Schiphol we firmly believe in the method and fully trust the methodology. The sole reason for publishing our method is to encourage other airports to explore the possibilities for their delay analysis. The ADAM provides the opportunity to analyse multiple delay reasons per flight, that are also in depth in the origin, which helps understand delays much more thoroughly than when using delay codes.

Emerging technologies

The increased use and improved accessibility to emerging technologies such as Artificial Intelligence and algorithms aren't fully exploited in OTP analysis. There is a large amount of data available for airports in their Airport Operations Database (AODB), especially when operating with Collaborative Decision Making (A-CDM) processes!

Seize the data and let it speak for itself

The current developments in Artificial Intelligence (e.g. Deep Learning with Turnaround monitoring) are paving the way towards more standardised, factual and deeper delay analysis.

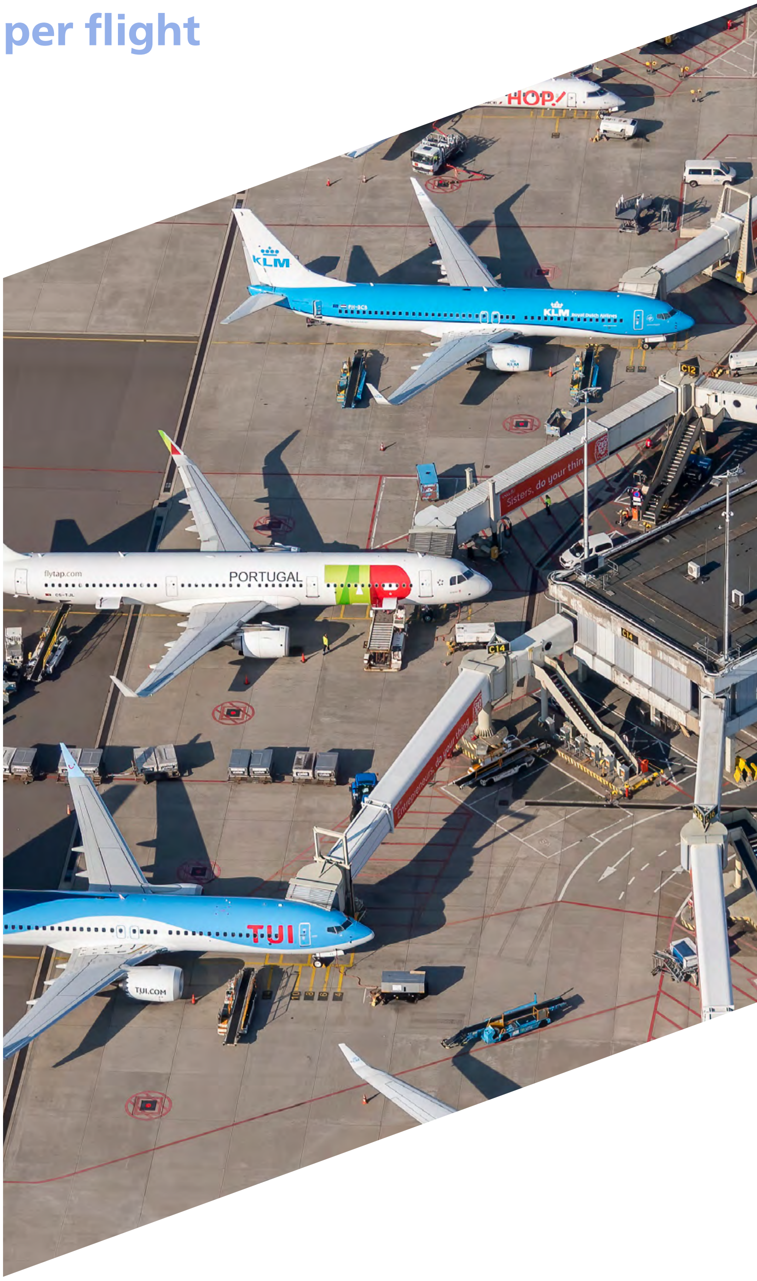
How to analyse OTP?

Analysing OTP often means falling back on the established sole method: the IATA delay code scheme.

The IATA delay code scheme for decades enabled the aviation industry to uniformly report on delays using a categorised method of +/- 90 codes and even more subcodes. In general, the IATA delay codes provide a first overview of what caused poor performance. However, the following issues arise:

- They are reported by hand, influenced by the reporter
- They are reported with the information available to staff at that time: situational awareness is key
- They are targeted at one or two main reasons and don't provide the full picture.
- Airports don't always receive delay codes of all flights.
- 18 delay codes completely make up 80% of the reported delay minutes.

The ADAM provides the opportunity to analyse multiple delay reasons per flight



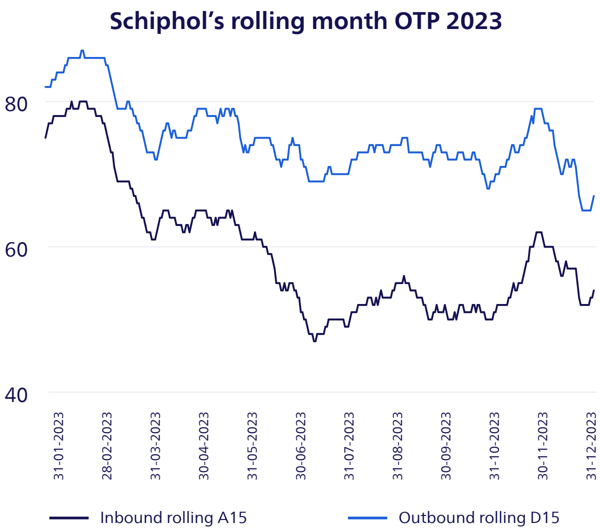
On-Time Performance is under pressure

Increasing complexity, congestion at both airports and in the air, and scarce resources in the entire chain puts pressure on the system and deteriorates OTP.

To improve performance, airports must have a deep understanding of the origin of delays in a factual and uniform way.

Increased complexity in operations due to (e.g.) labour shortages, increased resource utilization and increased costs has hampered the improvements in OTP and costs the industry millions of euros a day.

To enable transparency, Eurocontrol's Central Office for Delay Analysis (CODA) and ACI-Europe's Airport Performance Network (APN-E) publishes joint performance reports, offering the first Europe-wide transparent OTP reporting.



If one airport sneezes, Europe catches a cold

These reports highlight that across Europe, with some variations of course, airports see low OTP across the board. Additionally, the punctuality of all airports influence one another. Therefore, improvement must also come from a collaborative approach, requiring similar methods.

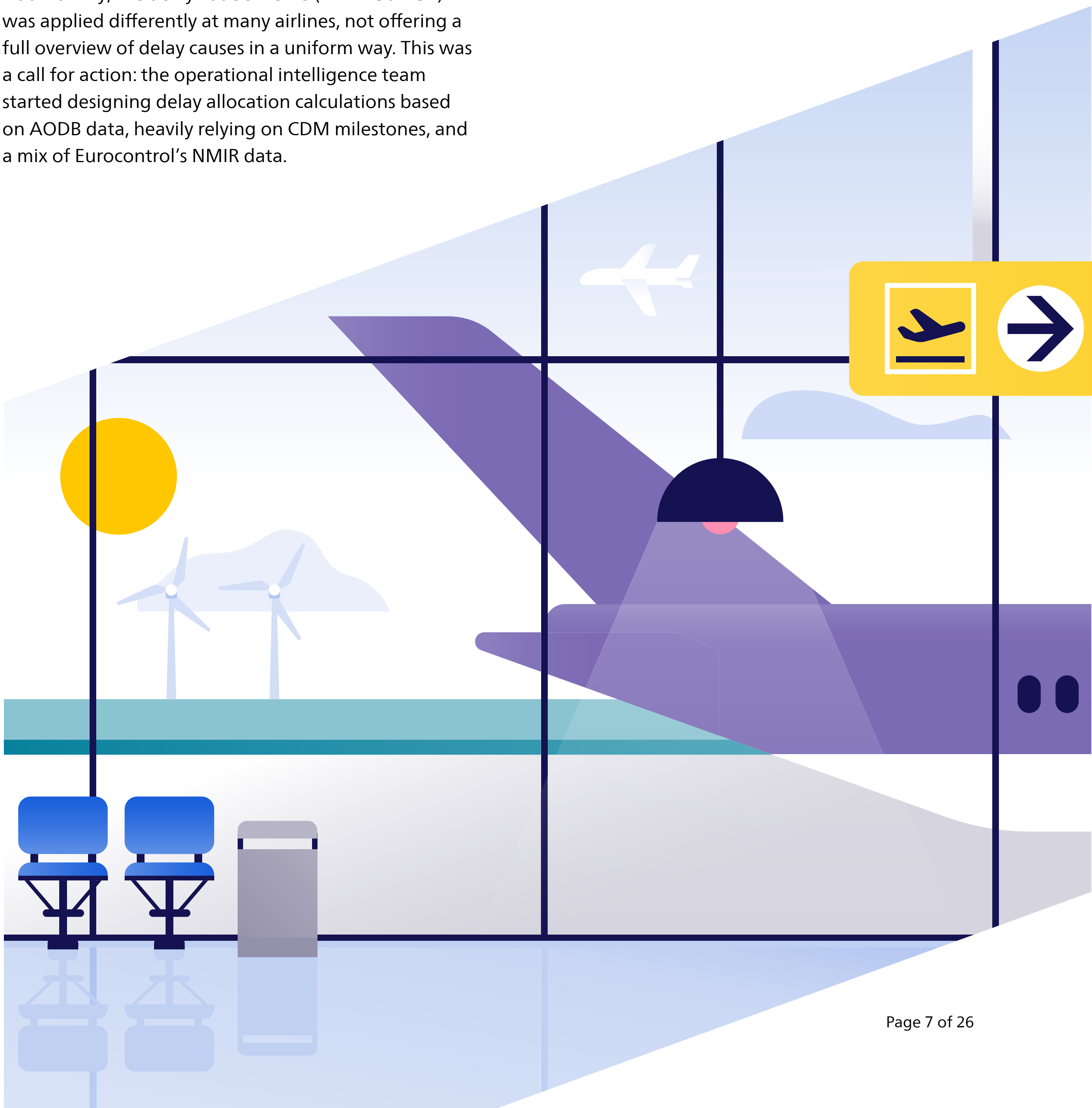
3. The Amsterdam Delay Allocation Method

Solution

The concept of the Amsterdam Delay Allocation Method (ADAM) dates back to 2019 when OTP was made the goal for Amsterdam Airport Schiphol. Naturally, the first question from the board of directors was: how are we going to improve OTP? At this time, the airport relied on the limited amount of delay codes that were sent to the airport for each flight. They didn't provide a lot of context, seeing as the quality of the delay codes was also low.

Additionally, the delay code scheme (AHM730/731) was applied differently at many airlines, not offering a full overview of delay causes in a uniform way. This was a call for action: the operational intelligence team started designing delay allocation calculations based on AODB data, heavily relying on CDM milestones, and a mix of Eurocontrol's NMIR data.

The goal of the ADAM is to determine the cause of flight delay, long and short. Flight delay is the time between actual departure time (AOBT) and scheduled departure time (SOBT). The ADAM determines the full delay, accurate to the second, of any flight. The total delay of any flight is composed of the following five reasons: schedule, reactionary, turnaround, start-up and pushback delay.



The result of many months of designing, validating, and trial & error was a deterministic algorithm that allocates delay time (accurate to the second) to five main categories:

- Schedule delay
- Reactionary delay
- Turnaround delay
- Start-up delay
- Pushback delay

These 5 categories sum up 100% of the flight delays without any overlap. They are the building blocks for ADAM and can be expanded with additional data.

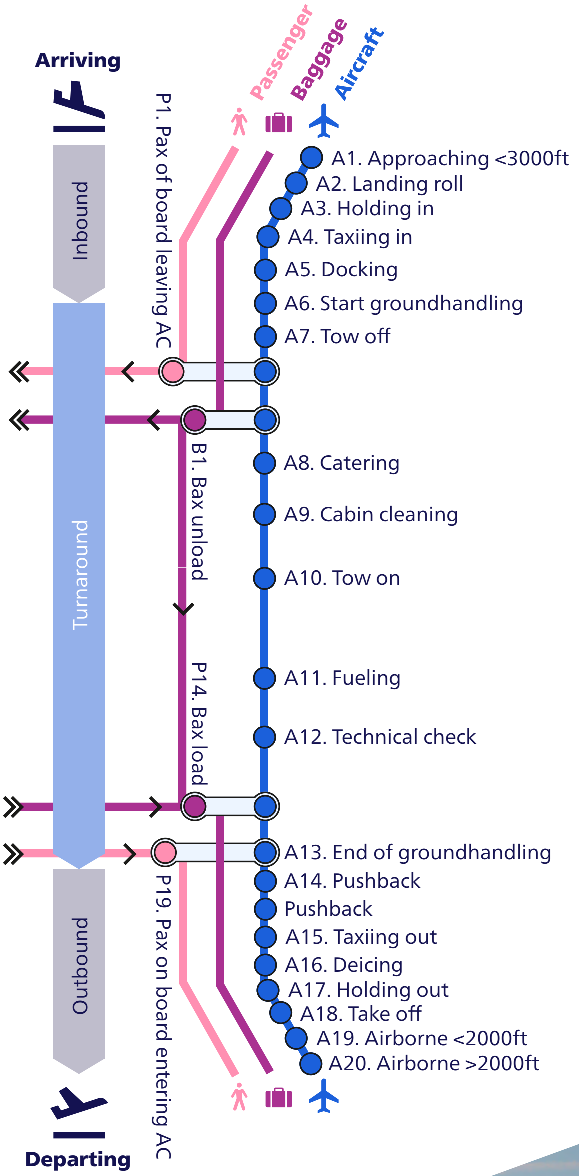
In chronological order, explaining the breakdown:
When a flight is scheduled to perform a turnaround, the scheduled ground time should be at least equal to the minimum time required to turn around. If not, this is schedule delay.

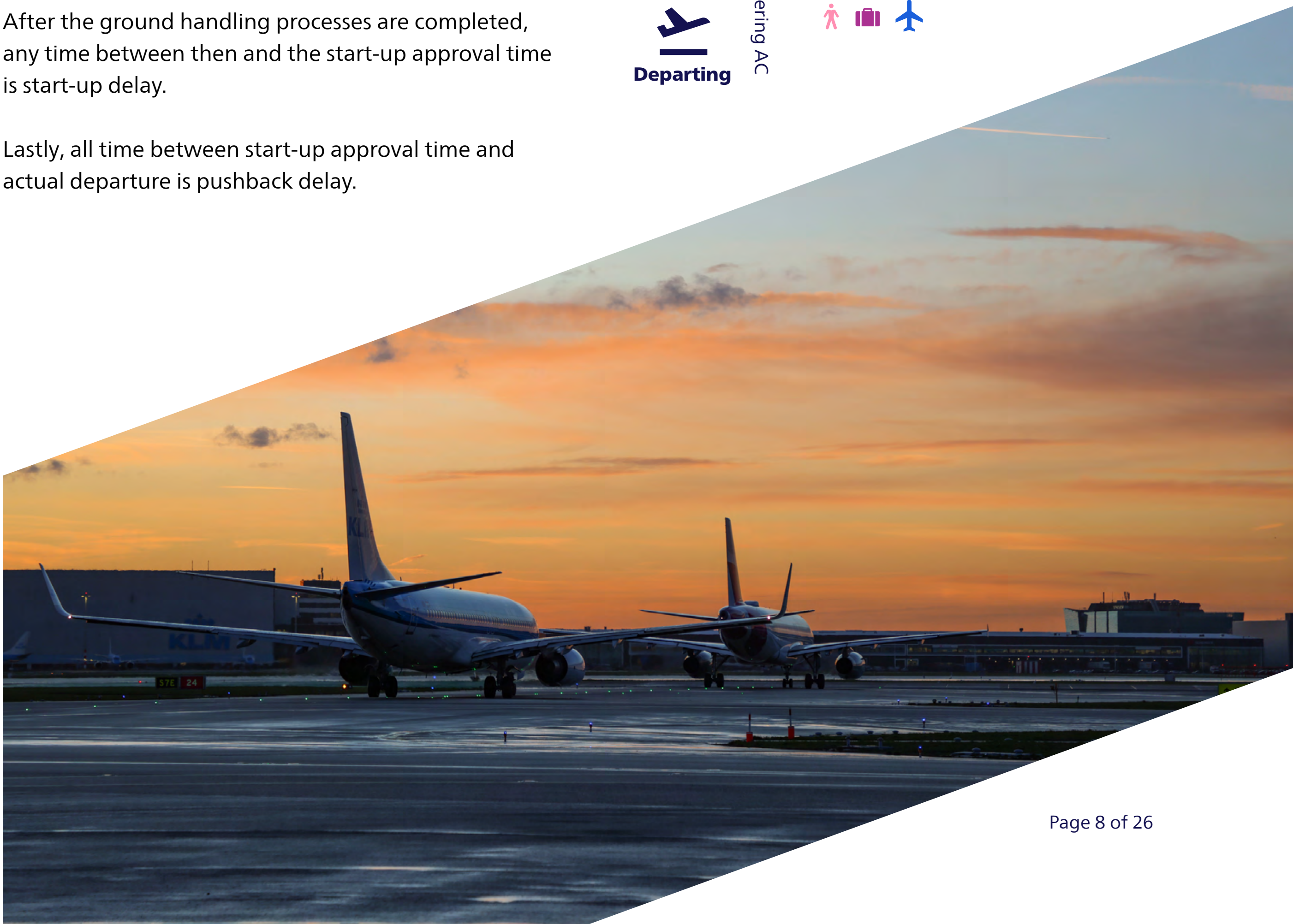
After the inbound flight arrives, there should still be enough time to perform the turnaround before the next departure. If not, this is reactionary delay.

Then, all ground handling processes should be finished before the scheduled time of departure. If not, this is ground handling delay.

After the ground handling processes are completed, any time between then and the start-up approval time is start-up delay.

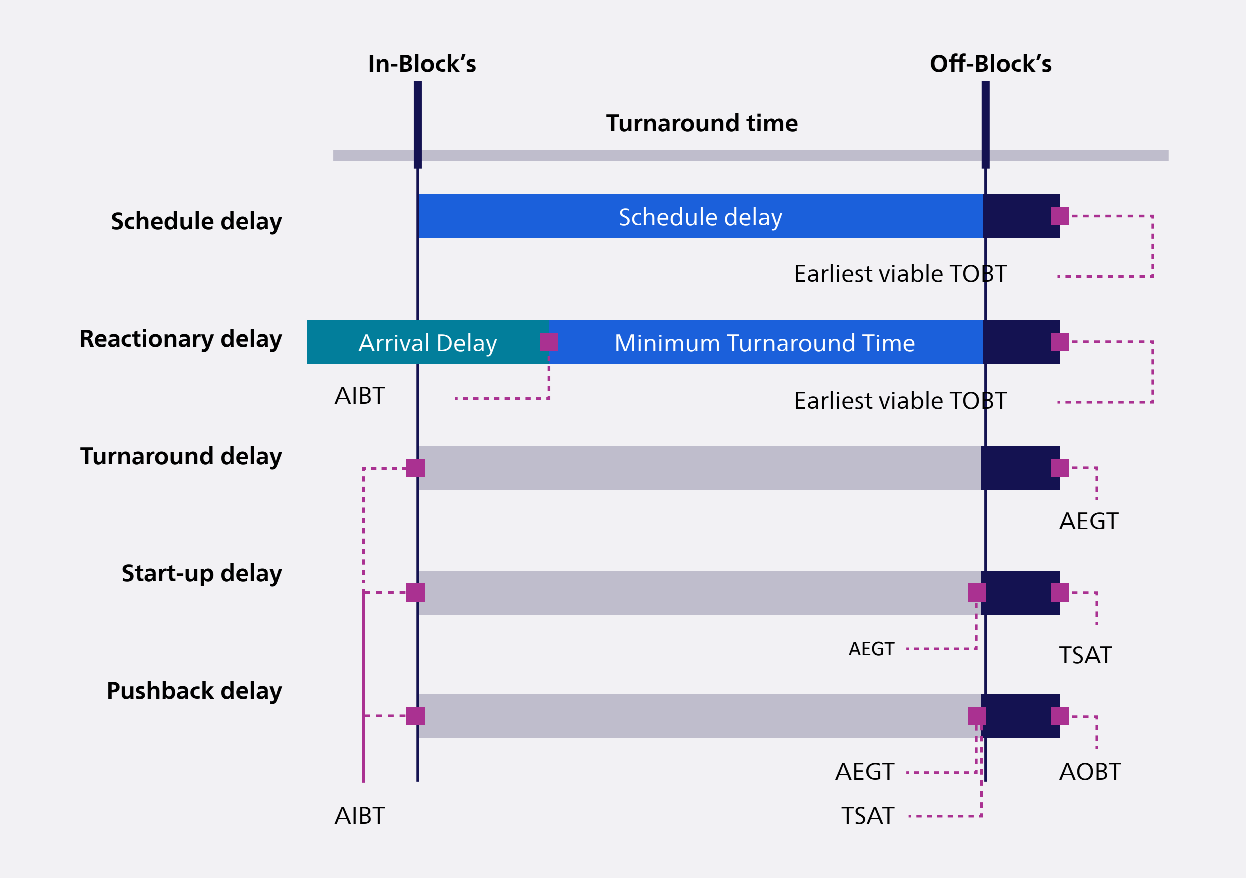
Lastly, all time between start-up approval time and actual departure is pushback delay.





The five categories

The five main categories of ADAM provides full explanation of the flight delay characteristics of each flight. Below, the 5 main categories are explained.



Total delay

The total delay is the net difference between actual time of departure / Actual Off Blocks Time (AOBT) and Scheduled time of departure/Scheduled Off-Block Time (SOBT). This can only be a positive number, otherwise delay is zero.

Schedule delay

The part of the delay that is attributable to a turnaround being too short to meet the minimum turnaround time. E.g.: a scheduled turnaround time is 60 minutes but the minimum turnaround is 90 minutes.

Reactionary delay

The part of the delay that is attributable to an arrival delay that can't be recovered during the turnaround before departure.

Turnaround delay

The part of the delay that is attributable to the aircraft turnaround process, not being able to get the aircraft ready within the designated time.

Start-up delay

The part of the delay that is attributable to start-up procedures after aircraft handling is finished.

Pushback delay

The part of the delay that is attributable to the time between start-up approval (TSAT) and actual off-blocks time (AOBT).

Venturing deeper

After determining the five main categories, there are opportunities for more depth in differentiating the causes of these specific delay categories.

ADAM is built up using a hierarchy where the sum of the calculations in each level must be exactly the sum of the level above. The delay time is the exact difference between the Scheduled Off-Blocks Time (SOBT) and the Actual Off-Blocks Time (AOBT).

There are 4 ADAM levels:

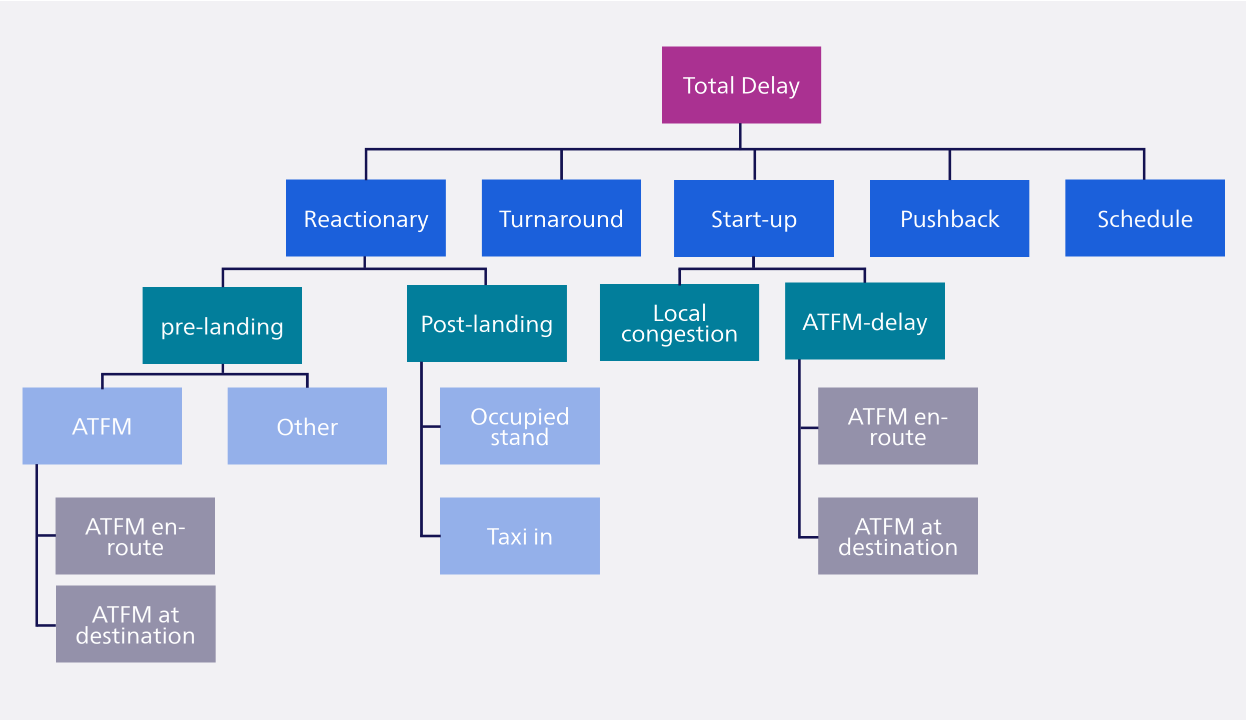
- Level 1: Total delay
- Level 2: Main ADAM categories
- Level 3: differentiating calculations splitting up level 2 reasons
- Level 4: differentiating calculations splitting up level 3 reasons

Who can create ADAM?

Having A-CDM procedures and data certainly enables the best version, but it isn't a prerequisite. The building blocks can be altered to what data is available but affects its' performance and quality.

The following data is required per level:

- **Level 1**: generic flight data from the AODB
- **Level 2**: detailed flight data with multiple timestamps (CDM)
- **Level 3**: detailed flight data either based on external sources and/or advanced cross-flight relations.
- **Level 4**: equal to level 3.



Schedule delay

A schedule delay occurs when the Scheduled Turnaround Time (STT) is shorter than the Minimum Turnaround Time (MTT) specific for the related aircraft and airline. This means that by design a flight will be delayed due to the too-short schedule.

In practice this delay type mainly occurs during disrupted operations (e.g. weather) where airlines, especially homebased ones, swap aircraft to operate different flights than originally anticipated, potentially having the aircraft arrive after it was supposed to depart.

Reactionary delay

A reactionary delay occurs when the arriving flight is delayed beyond the possibility of delay recovery during the turnaround. A reactionary delay is calculated by comparing the Actual In-Blocks Time (AIBT) plus the Minimum turnaround time (MTT) to the Scheduled Off-Blocks Time (SOBT), excluding schedule delays. Reactionary delays occur both before and after landing at the destination airport.

Pre-landing reactionary delay

A reactionary delay that already occured before landing at the airport is caused by two main factors: Air Traffic Flow Management (ATFM) regulations and delays that occured during the flight en-route to the airport or at the origin airport. Currently ADAM does not provide options to calculate these in detail, but options are present.

Examples of 'other' pre-landing reactionary delays are origin airport delays, air navigation re-routing or go-arounds and missed approaches before landing.

ATFM-related reactionary delays occur due to airspace or destination airport restrictions delaying the arrival.

Post-landing reactionary delay

When a flight lands on time at the airport it can be delayed by two main factors: the stand is still occupied and it has to hold or the taxi-in time is prolonged due to various reasons (ground re-routing, congestion, docking not possible immediately, etc.).

Turnaround delay

A turnaround delay occurs when a flight experiences a delayed aircraft turnaround process. This delay includes any of the turnaround and ground handling processes including but not limited to: baggage handling, cargo handling, aircraft maintenance, aircraft servicing, terminal process delays, delayed (transferring) passengers, Passengers with Reduced Mobility, passenger (de-)boarding, fueling, towing on and off (note: not to be confused with pushback), inoperative assets.

Due to the limited amount of data most airports have in this process, there's no differentiators yet. But see chapter 6 for future developments with Artificial Intelligence (AI) systems in turnaround monitoring.

Start-up delay

Start-up delay occurs when there's an imbalance between demand and capacity for departure runways, airspace or destination airports. This results in the flight departing later than the time they were ready to go.

Local start-up delay

Local start-up delay occurs when the imbalance between demand and capacity is present on the departure runway. This means that Air Traffic Control (ATC) must re-allocate flights to later timeslots to match demand and capacity.

Two possible differentiators are the reason behind the imbalance: if demand is higher than maximum capacity the airport runways can provide, it's because of a too-high peak. If demand is regular but capacity decreased, it's because of factors influencing the ability of ATC to offer maximum capacity (e.g. weather).

Air Traffic Flow Management (ATFM) start-up delay

ATFM delay occurs when the imbalance between demand and capacity is present in the airspace or at the destination airport. These two main factors can be distinguished, even with the reason behind the airspace or airport delay, using Eurocontrol data.

Pushback delay

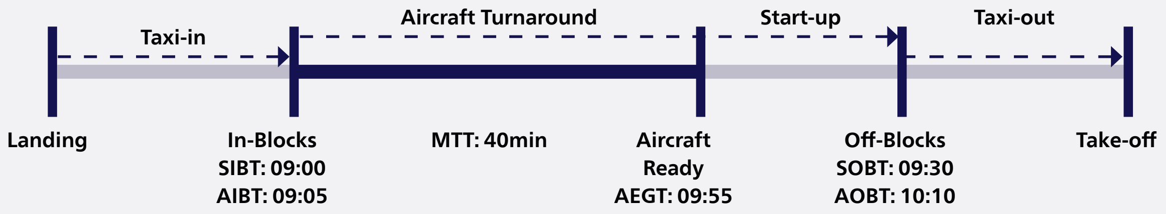
A pushback delay occurs when a flight has received start-up clearance but does not immediately push back. Reasons behind it are (but not limited to): cul-de-sac congestion, pushback truck not being fully ready, communication re-lay delays, technical malfunctions.

This delay reason is often a residual delay because no flight leaves at the same second as the pushback clearance is given. It could also be considered to be part of start-up delay at level 3.

4. Use cases and examples

This chapter focuses on fully understanding the use of ADAM with examples and use cases for insights into delay characteristics.

The short version of the calculations required for the level 1 and 2 delays of the ADAM are described below. Please see the technical note for the official (data minded) calculations.



SIBT: 09:00
AEGT: 09:55

SOBT: 09:30
TSAT: 10:05

MTT: 40 min
AOBT: 10:10

AIBT: 09:05

Total delay: 40 minutes

Delay Category	Calculation
Schedule delay	MTT – (SOBT-SIBT)
Reactionary delay	(AIBT+MTT) - SOBT) – schedule delay
Turnaround delay	(AEGT-SOBT) – Reactionary – schedule delay
Start-up delay	Earliest of TSAT or AOBT – latest of AEGT or SOBT
Pushback delay	AOBT-TSAT or total delay – schedule – reactionary – turnaround – start-up delay

Schedule delay
10 minutes
40 min - 30 min

Reactionary delay
5 minutes
09:45 – 09:30 – 10 min

Turnaround delay
10 minutes
09:55 – 09:30 – 10 min – 5 min

Start-up delay
10 minutes
09:55 – 10:05

Pushback delay
5 minutes
10:10 – 10:05

Reactionary delay

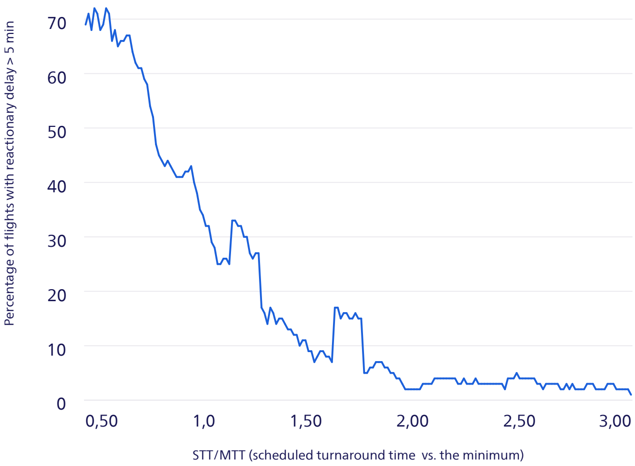
Reactionary delay is the delay an outbound flight endures as a result of a late inbound aircraft. A reactionary delay can only occur when the inbound delay results in the actual in-blocks time plus the Minimum Turnaround Time (MTT) being later than the scheduled off-blocks time, resulting in an outbound delay.

Key Insights

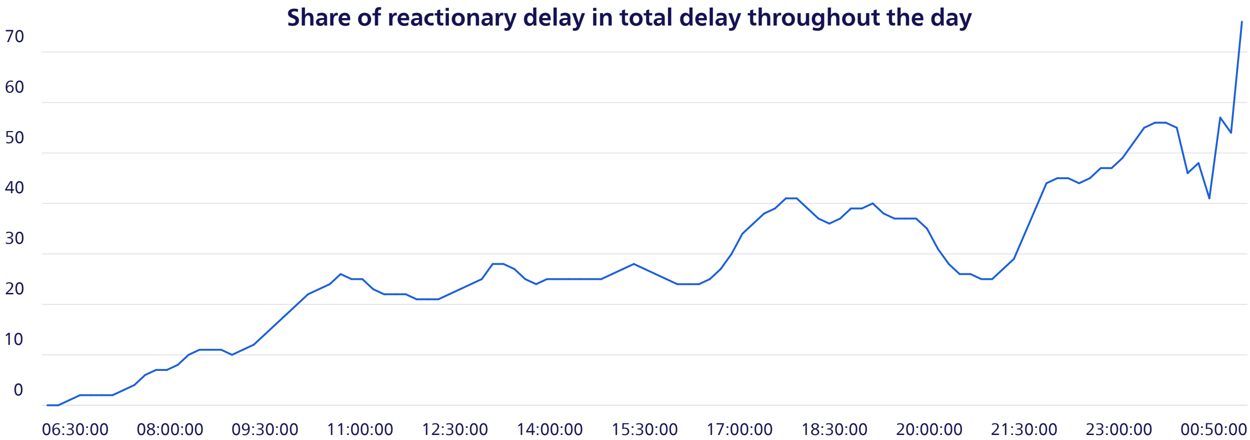
As long as the scheduled turnaround is long enough, relative to the minimum required time, the odds for reactionary delay diminish. It's determined that after a turnaround of at least 1.5 times the minimum, the odds of developing a reactionary delay is near zero. This can be easily explained because this means that the arrival delay must be substantial (30 minutes plus) for it to even start to count.

Moreover, knowing exactly how much reactionary delay there was per flight, you can see that reactionary delay accumulates and increases throughout the day if not recovered. This highlights the case for a high performing first wave, resulting in better end-of-day performance.

When a scheduled turnaround is longer than 1.5 to 2.0 times the minimum, the risk of reactionary delay diminishes



Share of reactionary delay in total delay throughout the day

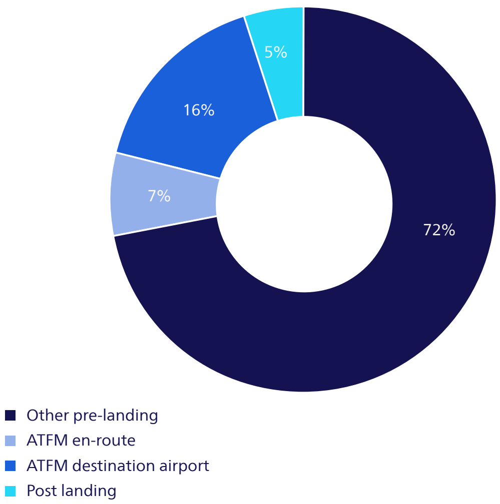


Reactionary delay often remains unexplained for airports as the origin airport or unknown airspace delays account for the grand majority of delay minutes. The only chance for explaining these reactionary delays are if other airports share their respective ADAM data with another airport.

It's even the case for Schiphol, where the airport is well known for ATFM regulations (mostly due to weather and aerodrome capacity regulations). 'Only' 20% of reactionary delay was caused by ATFM regulations in 2023. However, this is still a significant portion to add on top of other delays.

Additionally this calculation method enables to differentiate post-landing delays between long taxi-in times and actual waiting for a free stand.

Reasons behind reactionary delays as a share of the total



Turnaround Delay

Turnaround delay occurs, naturally, during the turnaround process. This delay includes any of the turnaround and ground handling processes including but not limited to: baggage handling activities, aircraft maintenance, Passengers with Reduced Mobility (PRM) processes, passenger (dis)embarking, fueling, towing on and off (not to be confused with push-back), assets inoperative, etc.

It's the delay that is added by the airport processes of all relevant parties and defines the punctuality of a turnaround. This enables airports to introduce the pure ground delay KPIs which are added at the airport.

Note: the Minimum Turnaround Time has a significant effect on the calculation of ground handling delay. Also, flights with a reactionary delay have an increased risk for turnaround delay. This has multiple probable causes:

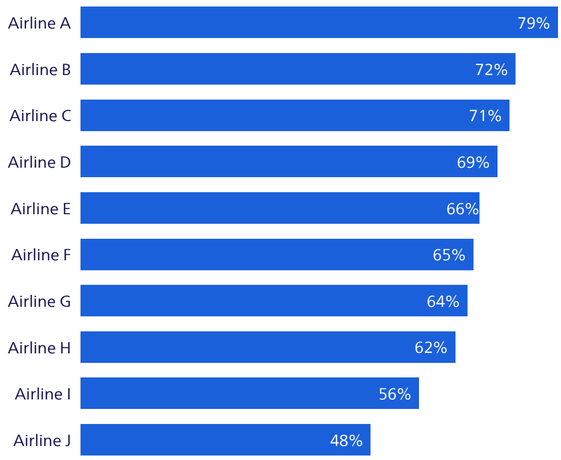
- The Minimum Turnaround Time is not viable;
- The additional required processes due to late arrival take longer
- Operations are disrupted overall: causing additional knock-on delays (e.g. waiting for transfer passengers etc.)

By setting the threshold of acceptable turnaround delay, an airport can calculate turnaround punctuality, which relates to OTP (D15). It's also the type of delay most influenced by airports, making it a crucial KPI.

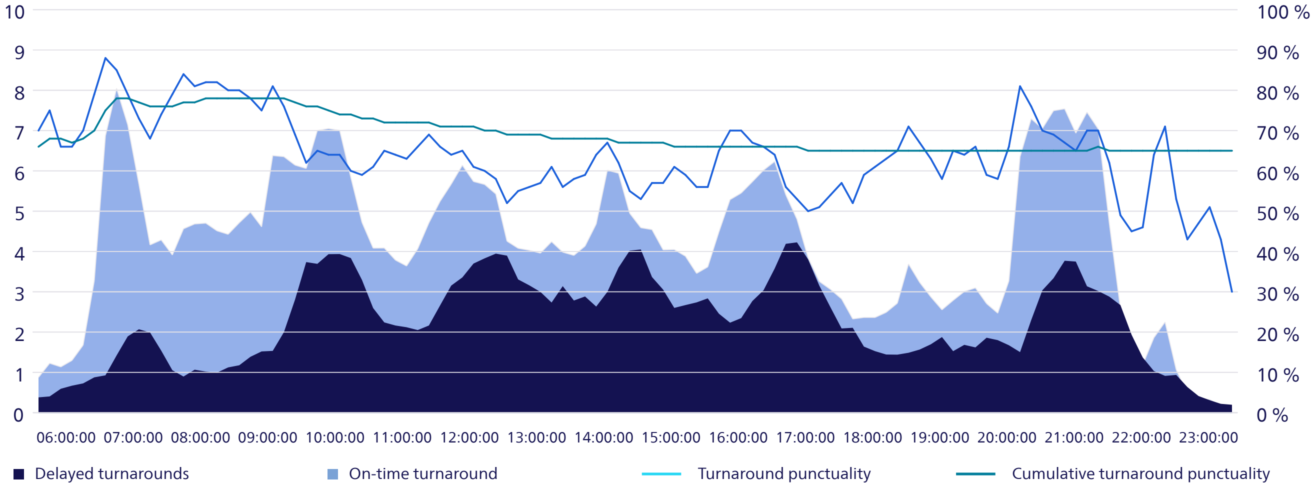
6
Minutes
Avg. Turnaround for flights **without** reactionary delay

12
Minutes
Avg. Turnaround for flights **with** reactionary delay

Turnaround Punctuality for selected airlines



Turnaround Punctuality throughout the day



Start-up delay

Start-up delay occurs when there is an imbalance between the supply and demand of runway capacity at an airport or airspace capacity within the network. This results in a flight departure later than when the flight was ready (AEGT).

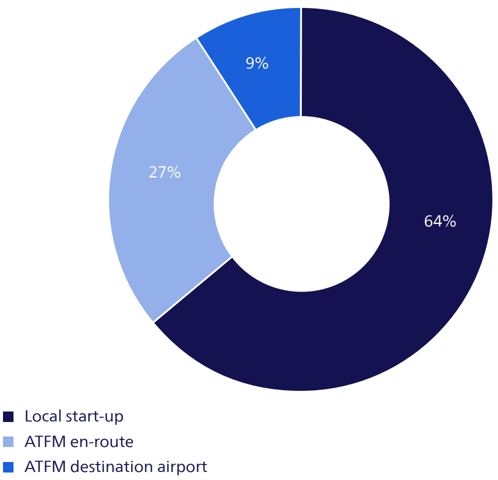
There are two reasons for start-up delay: local start-up delay and outbound ATFM-delay. When there is no ATFM-regulation, all start-up delays are due to airport congestion. With an ATFM-regulation, all start-up delay is due to the airspace restrictions and specifying local start-up delay is not possible.

Note: When AEGT is before SOBT or the AOBT is before TSAT, the time between these two will not count as delay but as process delay (as it doesn't have a full net effect on delay).

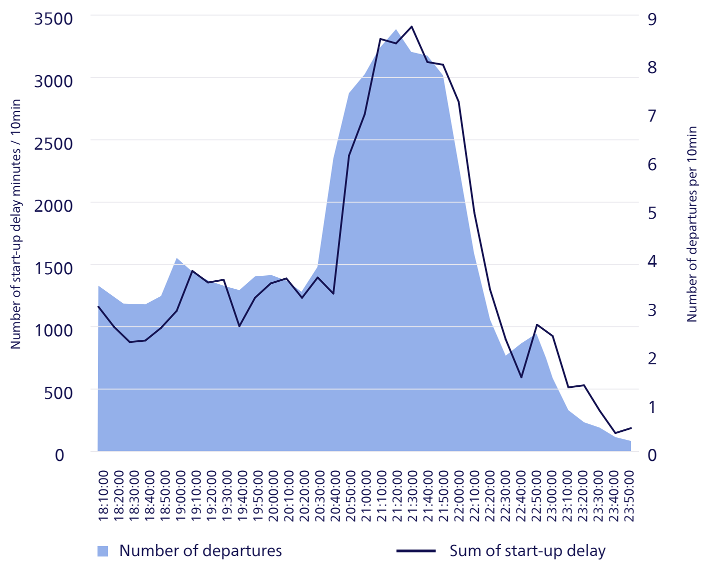
The cause of start-up delay at Amsterdam Airport Schiphol is split evenly by local and ATFM delays.

Local start-up delay often correlated significantly with simultaneous demand for runways, as visualised below.

Reasons behind start-up delay as a share of the total



Start-up delay strongly reponds to the number of simultaneous flights

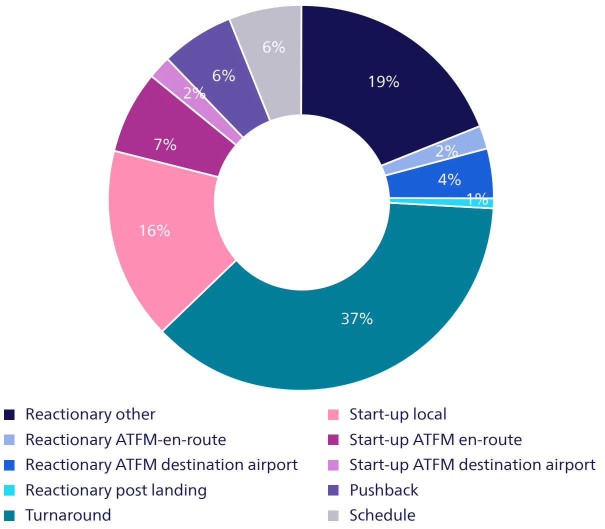


Combined Insights of ADAM

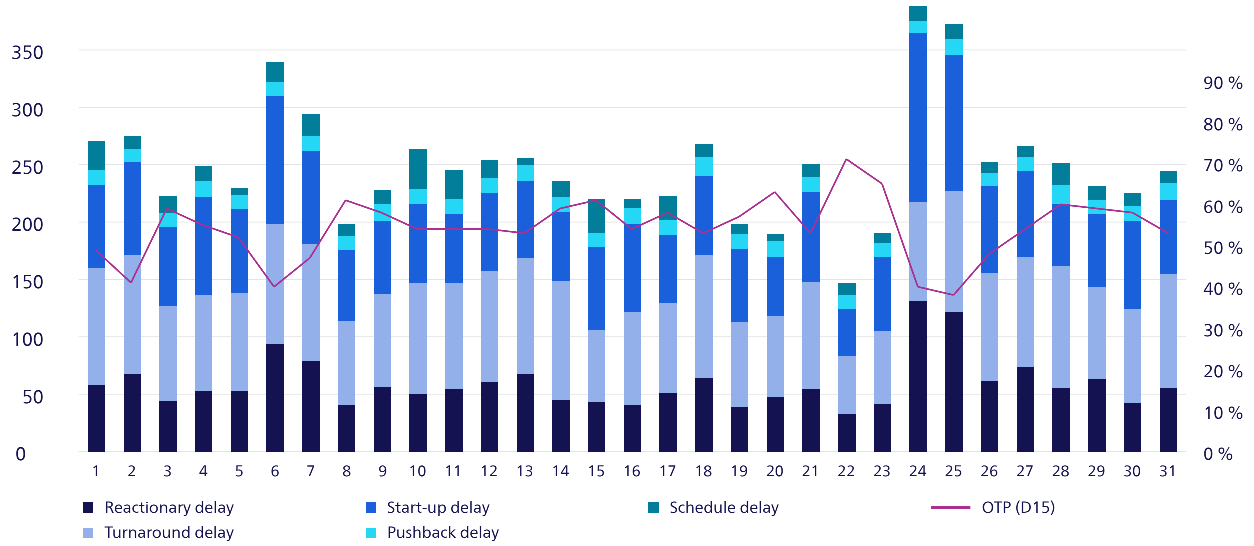
When combined into one, ADAM shows its true force.

When relying on delay codes you will get a maximum of two to three delay codes per flight. The ADAM enables up to 8 delay causes per flight. This gives much more depth to delay analysis. And because it's fully contextualised to AODB data, further influences can be traced back more easily.

Full breakdown of outbound delay



Stacked ADAM categories and OTP (D15) per day of a random month in 2023



5. Technical note

For developers

To develop the ADAM at your airport, you need the calculations as described in this chapter. Also, it's important to note that there's various data quality elements to be aware of.

The sole reason to publish the Schiphol method is to encourage other airports to follow a data driven path to delay and OTP improvement.

Required data fields and definitions

Note: The ADAM can only be calculated if the inbound and outbound flights are linked. The model relies on analysis of the turnaround of a flight to have full overview.

Data quality note

The model only thrives if the quality of the input data is high. We recognise that improbable delay results are always caused by poor data quality. Most notable are:

- AIBT and AOBT: correct registration of these timestamps is crucial
- MTT: an incorrect MTT will disturb the calculation of schedule, reactionary and turnaround delay.
- Turnaround and start-up delay: When a flight misses its departure slot due to not calling ready in-time, they have to re-set their TOBT according to CDM procedures. This means that a part of the additional delay due to the last minute TOBT delay is part of turnaround delay.

Required data from the AODB

Field name	Alternative	Note(s)
AIBT	-	Last AIBT
ALDT	-	Last ALDT
ATFM Delay	-	ATFM delay at AOBT
EIBT	-	EIBT at ALDT
ELDT	ALDT	ELDT at ALDT
AOBT	-	Last AOBT
ASRT	ASAT	ASRT at AOBT
ATOT	-	Last ATOT
CTOT	-	CTOT at AOBT
EOBT	TOBT, AEGT	EOBT at AOBT
EXOT	-	EXOT at ATOT
SOBT	-	
AEGT	TOBT*, EOBT	*: TOBT at AOBT
TSAT	-	TSAT at AOBT
TTOT Target	ETOT, TTOT, ATOT	
MTT	-	Quality is crucial
SIBT	-	

Required data from Eurocontrol NMIR to link with AODB

Field name	Description
ADEP	Airport of departure (ICAO)
ADES	Airport of destination (ICAO)
ATFM delay (min)	ATFM Delay in minutes as computed by the ETFMS system.
MP Regulation Reason name	Most Penalising associated label to the regulation code.
MP RL	Most penalising location identifier

Calculating each level

Delay Level	Delay Type	General Calculation	Note(s)
1	Total delay	AOBT-SOBT	Only when result >0
2	Schedule delay	MTTT – (SOBT-SIBT)	Only when result is >0
	Reactionary delay	(AIBT+MTTT) - SOBT) – Schedule delay	
	Turnaround delay	(TOBT-SOBT) - Reactionary delay – Schedule delay	
	Start-up delay	Min(TSAT;AOBT) – Max(TOBT;SOBT)	
	Pushback delay	Total delay – schedule – Reactionary – Turnaround – Start-up	Residual delay
3	Reactionary Post-landing	Reactionary delay – (ALDT-SLDT*)	*: SLDT = SIBT-EXIT
	Reactionary Pre-landing	Reactionary delay – Post-landing delay	
	Start-up local	Min(TSAT;AOBT) – Max(TOBT;SOBT) For flights without a CTOT at AOBT	'Min' stands for the earliest value and 'max' for the latest
	Start-up ATFM	Min(TSAT;AOBT) – Max(TOBT;SOBT) For flights with a CTOT at AOBT	'Min' stands for the earliest value and 'max' for the latest
4	Reactionary pre-landing ATFM en-route	Pre-landing reactionary delay for flights with Inbound ATFM-delay with MP_RL ≠ ADES	
	Reactionaryz pre-landing ATFM destination airport	Pre-landing reactionary delay for flights with inbound ATFM-delay with MP_RL = ADES	
	Reactionary pre-landing other	Reactionary_prelanding – Reactionary inbound ATFM delay	
	Reactionary post-landing stand occupied	Stand free time – EIBT*	*: EIBT at ALDTCannot be greater than reactionary post-landing delay
	Reactionary post-landing long taxi-in	Reactionary post-landing – reactionary stand-occupied	
	Start-up ATFM en-route	Start-up ATFM-delay flight with MP_RL_TYPE ≠ AD	
	Start-up ATFM destination airport	Start-up ATFM-delay flight with MP_RL_TYPE = AD	

6. Future developments

Work to do!

An algorithm like ADAM can be expanded and exploited to countless use cases and additions.

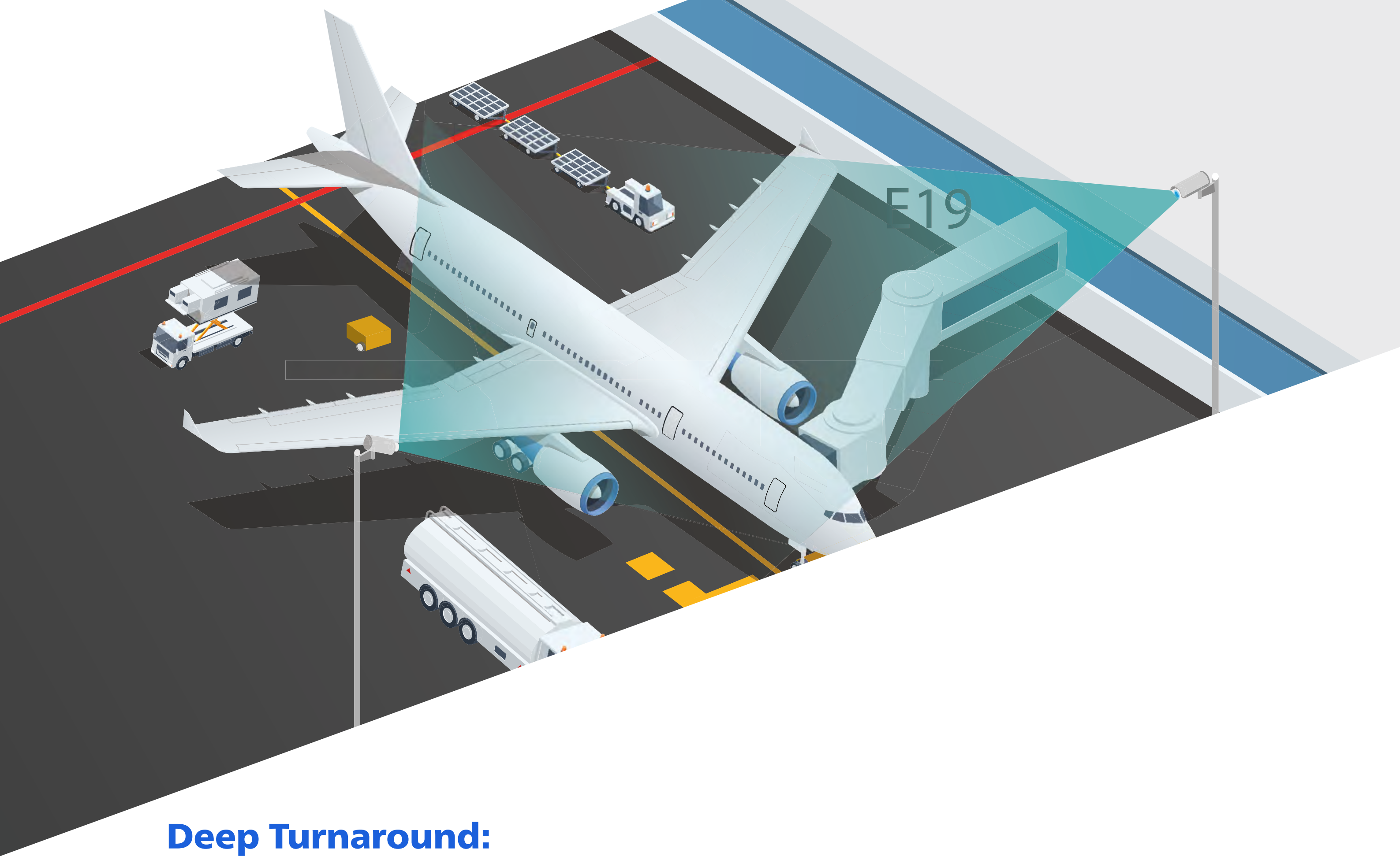
The current model serves as the foundation for additional developments from various corners of airport operations. In this chapter we will venture even deeper into the opportunities Schiphol currently sees.

Expanding on passenger & baggage processes

Adding the two other processes active in airport operations will open up possibilities to see the role of terminal and baggage operations in OTP. The baggage system's make-up process and boarding process, which run parallel to the aircraft handling processes, are viable processes to add.

Because ADAM is developed as a deterministic algorithm that must count up to the total delay, the model hasn't yet been able to add these processes fully accurately. However, with focus on the touch-points between aircraft handling and terminal & baggage operations, there are definitely possibilities.

The two current and future developments are the addition of Deep Turnaround and the delay code advisor.



Deep Turnaround: Our Turnaround AI solution

Expanding on turnaround processes

As seen in the further details on turnaround delay, there's still a big gap in the detailed insights of this category. This is because the turnaround process is a black box. At Schiphol we have developed a turnaround monitoring tool called Deep Turnaround.

Deep Turnaround is an artificial intelligence (AI) model using computer vision to monitor all processes of the aircraft turnaround. By knowing each individual step of the turnaround process, we can see where all turnaround delays occur.

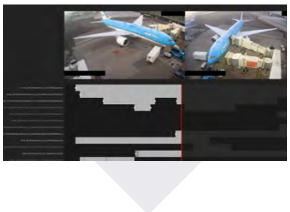
Using the data Deep Turnaround generates, ADAM will be expanded to distinguish turnaround delays due to baggage handling, aircraft servicing, pushback, boarding.

Deep Turnaround adds new data to ADAM to further deepen the insights for reactionary, turnaround and pushback delay. It detects whether the apron was free on-time as well as registering 70+ unique events of the turnaround process, including pushback.

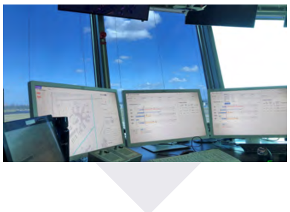
For more information about Deep Turnaround, and its use at other airports, visit **www.schiphol.nl/deepturnaround**

From images...
2 cameras are installed at every stand, sending snapshots every 5 seconds to the cloud

To data…
Images are processed in our AI model that distinguishes over 30 processes on the apron



To insights…
A live data stream and historical database access to all generated data



To value…
Continuous improvement based on single-source of truth, improvement of CDM

Delay Code Advisor

The next step

The new IATA AHM732 delay code scheme will greatly improve the standardised reporting of delay to airlines compared to the current (or old) AHM730/731. It follows the pattern of process – reason – stakeholder in delay reporting.

While this new scheme provides a fresh method towards allocating delay, it also increases the complexity. Handling agents have to pick from thousands of different combinations, coming from the current ±100 codes.

Example: A flight with a reactionary post-landing delay due to stand occupation due to a delayed outbound flight being delayed because of ground handling reasons, the new delay code scheme provides:

Process	Reason	Stakeholder
Aircraft Late (A)	Stand Blocked by Aircraft (D)	Ground Handler (K)

At Amsterdam Airport Schiphol we're working on a method to prescribe delays based on the ADAM and the Deep Turnaround algorithm called the delay code advisor (DeCodA). This system enables direct recommendations for the probable delay causes of more than eighty percent of the reported delays, enabling all users to identify and report delays quickly and accurately.

This method flips the standards of validating delay codes with data to providing delay codes with data

The technology enabling the delay code advisor are ADAM and Deep Turnaround.

7. Conclusion

This whitepaper has explained the flight delay analysis activities and vision of Amsterdam Airport Schiphol. Using the Amsterdam Delay Allocation Method (ADAM) enables airports to have:

- more detailed and accurate data
- better actionable information on delay breakdown
- uniform way of reporting delay
- data-backed information
- possibilities to expand the model as soon as new data becomes available

Future further development of ADAM includes the inclusion of other AI models such as the turnaround monitoring systems (Deep Turnaround at Schiphol) and further differentiating turnaround delays.

When the new IATA delay code scheme is adopted, Schiphol envisions the use of the available ADAM data and other AI sources (e.g. Deep Turnaround) to prescribe delay codes with the underlying data as sources, greatly reducing workload and improving accuracy.

The most significant future development may perhaps be to change the delay analysis approach: we only focus on searching for the causes of delays, not the causes of on-time flights.

Visit **www.schiphol.nl/adam** to follow recent developments around the Amsterdam Delay Allocation Method.

8. Abbreviations

Because the aviation industry can't do without them

Abbreviation	Meaning	Note
A15	Arrival'15	Flights arriving within 15 minutes from schedule
A-CDM	Airport – Collaborative Decision Making	
ACI	Airport Council International	
ADAM	Amsterdam Delay Allocation Method	
AEGT	Actual End of Ground handling Time	CDM milestone
AHM	Airport Handling Manual	IATA document
AIBT	Actual In-Blocks Time	CDM milestone
ANSP	Air Navigation Service Provider	
AOBT	Actual Off-Blocks Time	CDM milestone
AODB	Airport Oprator DataBase	
APN-E	Airport Performance Network – Europe	
ATC	Air Traffic Control	
ATFM	Air Traffic Flow Management	
CODA	Central Office for Delay Analysis	Eurocontrol department

Abbreviation	Meaning	Note
D15	Delay'15	Flights departing within 15 minutes from schedule
IATA	International Air Transport Association	
KPI	Key Performance Indicator	
MTT	Minimum Turnaround Time	Time required to an aircraft ready for departure
NMIR	Network Manager Interactive Reporting	
OTP	On-Time Performance	
PRM	Passenger with Reduced Mobility	
SIBT	Scheduled In-Blocks Time	CDM milestone
STT	Scheduled Turnaround Time	SOBT-SIBT
SLA	Service Level Agreement	
SOBT	Scheduled Off-Blocks Time	CDM milestone
TOBT	Target Off-Blocks Time	CDM milestone
TSAT	Target Start-up Approval Time	CDM milestone

Schiphol

www.schiphol.nl/adam