

# THE MANUAL

## Airport CDM Implementation



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# RECORD OF AMENDMENTS

The following table records the complete history of the successive amendments to the Manual.

Number	Date of issue	Date of applicability	Reason for amendment	Pages affected
1	April 2006	April 2006	Additional Sections	7-0 to 7-10 Attachments
2	October 2006	October 2006	Alignment with final OCD & FRD	All
3	December 2008	October 2008	Update and OCD-FRD alignment. Generic Processes and other material added	All
3.1	July 2010	July 2010-06-04	e-version / editorial changes	All
4	March 2012	April 2012	e-version / Airport CDM adverse conditions	Attachment 7 added

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# INTRODUCTION

The Airport CDM Implementation Manual is designed to facilitate the harmonised implementation of Airport Collaborative Decision Making (Airport CDM) at European airports. The Implementation Manual guides the user through all the steps required for successful implementation and operation. Guidance is given from the time a management decision has been taken to organise an Airport CDM project through to implementation. The measurement of success and planning for operational use are included as a basis for analysis and evaluation after implementation.

As such, it is an essential reference document for Aircraft Operators, Air Traffic Services, Airport operations, Ground Handlers, service providers and any other partners with a contribution to make to, and a benefit to derive from, Airport Collaborative Decision Making. It should be noted that military movements at airports vary considerably and a local decision may be needed to define the input required by military partners into the Airport CDM process. This Implementation Manual will provide important information to decision makers as well as technical and operational experts charged with the actual implementation.

The structure and content of the Implementation Manual considers that various partners, though aiming for the same global improvement in air transport infrastructure efficiency, require different sets of information. The Implementation Manual indicates when specific information relates to one or a group of partners whilst emphasising the requirement to respect the needs of other partners.

The Implementation Manual contains, for the benefit of senior management, information on the Airport CDM concept and its benefits. It is derived from the Airport CDM Operational Concept Document and forms the basis for the Airport CDM Functional Requirements Document, the EUROCAE interfacing documentation and the ETSI A-CDM Community Specifications Document. It also includes documented experience gained in existing Airport CDM projects.

# Airport CDM Concept Elements

**(Airport CDM) Information Sharing** is essential in that it forms the foundation for all the other elements and must be implemented first.  

**5 Collaborative Management of Flight Updates** enhances the quality of arrival and departure information exchanges between the Network Operations and the CDM airports. 

**4 (CDM in) Adverse Conditions** achieves collaborative management of a CDM airport during periods of predicted or unpredicted reductions of capacity. 

**3 (Collaborative) Pre-departure Sequence** establishes an off-block sequence taking into account operators preferences and operational constraints. 

**2 Variable Taxi Time** is the key to predictability of accurate take-off in block times especially at complex airports. 

**1 The Milestones Approach (Turn-Round Process)** aims to achieve common situational awareness by tracking the progress of a flight from the initial planning to the take off. 

# ABBREVIATIONS & ACRONYMS

All coloured Acronym rows are time parameters which have a standard length of four characters.

Acronyms	Definition	Explanation
<b>ACARS</b>	Aircraft Communications Addressing and Reporting System	
<b>ACC</b>	Area Control Centre	
<b>ACGT</b>	Actual Commence of Ground Handling Time	The time when ground handling on an aircraft starts, can be equal to AIBT (to be determined locally)
<b>ACISP</b>	Airport CDM Information Sharing Platform	
<b>ACZT</b>	Actual Commencement of De-icing Time	The time when de-icing operations on an aircraft starts
<b>ADEP</b>	Aerodrome of Departure	
<b>ADES</b>	Aerodrome of Destination	
<b>ADEXP</b>	ATS Data Exchange Presentation	ADEXP provides a format for use primarily in on-line, computer to computer message exchange. ADEXP is a format, not a protocol
<b>ADIT</b>	Actual De-icing Time	Metric AEZT – ACZT
<b>A-DPI</b>	ATC-Departure Planning Information message	DPI message sent by the CDM Airport to the Network Operations (ETFMS) notifying the TTOT between ATC time of pre-departure sequencing and ATOT
<b>AEGT</b>	Actual End of Ground handling Time	The time when ground handling on an aircraft ends, can be equal to ARDT (TBD locally)
<b>AEZT</b>	Actual End of De-icing Time	The time when de-icing operations on an aircraft end
<b>AFTN</b>	Aeronautical Fixed Telecommunication Network	
<b>AGHT</b>	Actual Ground Handling Time	The total duration of the ground handling of the aircraft. Metric ACGT - AEGT
<b>AIBT</b>	Actual In-Block Time	The time that an aircraft arrives in-blocks. (Equivalent to Airline/Handler ATA –Actual Time of Arrival, ACARS = IN)

Acronyms	Definition	Explanation
<b>ALDT</b>	Actual Landing Time	The time that an aircraft lands on a runway. (Equivalent to ATC ATA –Actual Time of Arrival = landing, ACARS=ON)
<b>AMAN</b>	Arrival Manager	An arrival flow management tool that optimises the traffic flow into a TMA and/or runway(s) by calculating TLDT (Target LanDing Time) taking various constraints and preferences into account
<b>ANSP</b>	Air Navigation Service Provider	An organisation responsible for management of flight traffic on behalf of a company, region or country
<b>AO</b>	Aircraft Operator	A person, organisation or enterprise engaged in or offering to engage in an aircraft operation. (ICAO Doc 4444, Chapter 1)
<b>AOBT</b>	Actual Off-Block Time	Time the aircraft pushes back / vacates the parking position. (Equivalent to Airline / Handlers ATD – Actual Time of Departure & ACARS=OUT)
<b>AOC</b>	Airport Operator Committee	
<b>APP</b>	Approach Control Unit	
<b>ARDT</b>	Actual Ready Time (for Movement)	When the aircraft is ready for start up/push back or taxi immediately after clearance delivery, meeting the requirements set by the TOBT definition
<b>ARR</b>	Arrival	Inbound flight
<b>ARZT</b>	Actual Ready for De-icing Time	The time when the aircraft is ready to be de-iced
<b>ASAT</b>	Actual Start Up Approval Time	Time that an aircraft receives its start up approval
		Note: the moment the start up approval is given can be in advance of the TSAT
<b>ASBT</b>	Actual Start Boarding Time	Time passengers are entering the bridge or bus to the aircraft
<b>A-SMGCS</b>	Advanced Surface Movement Guidance and Control System	System at airports having a surveillance infrastructure consisting of a Non-Cooperative Surveillance (e.g. SMR, Microwave Sensors, Optical Sensors etc) and Cooperative Surveillance (e.g. Multi-lateration systems)

## ABBREVIATIONS & ACRONYMS

Acronyms	Definition	Explanation
<b>ASRT</b>	Actual Start Up Request Time	Time the pilot requests start up clearance
<b>ATC</b>	Air Traffic Control	Service provided by ground-based controllers who direct aircraft on the ground and in the air. This to separate, organise and expedite the flow of air traffic
<b>ATFCM</b>	Air Traffic Flow and Capacity Management	ATFM extended to the optimisation of traffic patterns and capacity management. Through managing the balance of capacity and demand the aim of ATFCM is to enable flight punctuality and efficiency according to the available resources with the emphasis on optimising the network capacity through Collaborative Decision Making process. (CFMU Handbook ATFCM_Operating_Procedures_for_FMP_1.0)
<b>ATFM</b>	Air Traffic Flow Management	A service established with the objective of contributing to a safe, orderly and expeditious flow of air traffic by ensuring that air traffic control capacity is utilised to the maximum extent possible, and that the traffic volume is compatible with the capacities declared by the appropriate Air Traffic Services authority. (ICAO Annex 11, Chapter 1)
<b>ATM</b>	Air Traffic Management	Management of the demand for, and the use of airspace
<b>ATOT</b>	Actual Take Off Time	The time that an aircraft takes off from the runway. (Equivalent to ATC ATD–Actual Time of Departure, ACARS = OFF)
<b>ATS</b>	Air Traffic Services	The service provided by Air Traffic Controllers working at airports for the arrival and departure flight phases and in Air Traffic Control Centres for the en route flight phase
<b>ATTT</b>	Actual Turn-round Time	Metric AOBT – AIBT
<b>AXIT</b>	Actual Taxi-In Time	Metric AIBT – ALDT
<b>AXOT</b>	Actual Taxi-Out Time	Metric ATOT – AOBT
<b>CBA</b>	Cost-Benefit Analysis	A formal discipline used to help appraise, or assess, the case for a project or proposal. This is achieved by weighing the total expected costs against the total expected benefits of one or more actions in order to choose the best or most profitable option

Acronyms	Definition	Explanation
<b>C-DPI</b>	Cancel – Departure Planning Information message	This message informs the Network Operations that previously sent DPI is no longer valid
<b>CFMU (renamed Network Operations)</b>	Central Flow Management Unit	Central Flow Management Unit (CFMU), Brussels – A Central Management Unit operated by EUROCONTROL. (ICAO Doc 7754, Volume I, Part V.III, paragraph 3)
<b>CHG</b>	Modification message	Standard message sent to Network Operations to change flight plan data
<b>CNL</b>	Flight Plan Cancellation	Standard message sent to Network Operations to cancel flight plan
<b>CPDLC</b>	Controller Pilot data Link Communication	
<b>CTOT</b>	Calculated Take Off Time	A time calculated and issued by the appropriate Central Management unit, as a result of tactical slot allocation, at which a flight is expected to become airborne. (ICAO Doc 7030/4 – EUR, Table 7)
<b>DCL</b>	Departure Clearance (Data link)	
<b>DEP</b>	Departure	Outbound flight
<b>DLA</b>	Delay message	Standard message sent to Network Operations to delay flight plan OB
<b>DMAN</b>	Departure Manager	DMAN is a planning system to improve the departure flows at an airport by calculating the Target Take Off Time (TTOT) and Target Start up Approval Time (TSAT) for each flight, taking multiple constraints and preferences into account
<b>DPI</b>	Departure Planning Information message	Message from Airport to Network Operations. See also A-DPI, C-DPI, E-DPI, T-DPI
<b>ECZT</b>	Estimated Commencement of De-icing Time	The estimated time when de-icing operations on an aircraft are expected to start
<b>EDIT</b>	Estimated De-icing Time	Metric EEZT – ECZT
<b>E-DPI</b>	Early – Departure Planning Information message	First DPI message that is sent from the CDM Airport to the Network Operations (ETFMS) notifying the ETOT
<b>EET</b>	Estimated Elapsed Time	The estimated time required to proceed from one significant point to another (ICAO)
<b>EEZT</b>	Estimated End of De-icing Time	The estimated time when de-icing operations on an aircraft are expected to end

## ABBREVIATIONS & ACRONYMS

Acronyms	Definition	Explanation
<b>EIBT</b>	Estimated In-Block Time	The estimated time that an aircraft will arrive in-blocks. (Equivalent to Airline/Handler ETA – Estimated Time of Arrival)
<b>ELDT</b>	Estimated Landing Time	The estimated time that an aircraft will touch-down on the runway. (Equivalent to ATC ETA – Estimated Time of Arrival = landing)
<b>EOBT</b>	Estimated Off-Block Time	The estimated time at which the aircraft will start movement associated with departure (ICAO)
<b>ERZT</b>	Estimated Ready for De-icing Time	The estimated time when the aircraft is expected to be ready for de-icing operations
<b>ETFMS</b>	Enhanced Tactical Flow Management System	ETFMS receives radar derived data provided by the Air Navigation Service Providers (ANSPs), position report data provided by the Aircraft Operators and meteorological data. ETFMS uses this data to update the existing data coming from flight plans and flow measures
<b>ETO</b>	Estimated Time Over	
<b>ETOT</b>	Estimated Take Off Time	The estimated take off time taking into account the EOBT plus EXOT.
<b>ETTT</b>	Estimated Turn-round Time	The time estimated by the AO/GH on the day of operation to turn-round a flight taking into account the operational constraints
<b>EXIT</b>	Estimated Taxi-In Time	The estimated taxi time between landing and in-block
<b>EXOT</b>	Estimated Taxi-Out Time	The estimated taxi time between off-block and take off. This estimate includes any delay buffer time at the holding point or remote de-icing prior to take off
<b>FIDS</b>	Flight Information Display System	
<b>FIR</b>	Flight Information Region	
<b>FLS</b>	Flight Suspension message	Standard message sent from Network Operations to suspend flight plan OBT
<b>FMP</b>	Flow Management Position	Provides a vital flow of information from their operational ATC Unit to the Network Operations about the current situation within their ACC and the operational situation at the airport

Acronyms	Definition	Explanation
<b>FPL</b>	Filed Flight Plan	ICAO derived flight plan
<b>FRD</b>	Functional Requirements Document	This document specifies the minimum set of requirements to implement Airport CDM
<b>FSA</b>	First System Activation	
<b>FUM</b>	Flight Update Message	A message sent from the Network Operations to a CDM Airport providing an ELDT, ETO and flight level at the last point of route
<b>GH</b>	Ground Handler	Company responsible for handling of aircraft during turn-round at the airport
<b>HMI</b>	Human-Machine Interface	The aggregate of means by which people—the users—interact with the system—a particular machine, device, computer program or other complex tools
<b>ICAO</b>	International Civil Aviation Organisation	
<b>IFPS</b>	Integrated Initial Flight Plan Processing System	A system of the Network Operations designed to rationalise the reception, initial processing and distribution of IFR/GAT flight plan data related to IFR flight within the area covered by the participating States. (ICAO Doc 7030/4 – EUR, paragraph 3.1.1 new)
<b>IFR</b>	Instrument Flight Rules	
<b>KPI</b>	Key Performance Indicator	
<b>LoA</b>	Letter of Agreement	
<b>LVP</b>	Low Visibility Procedures	
<b>MoU</b>	Memorandum of Understanding	
<b>MTTT</b>	Minimum Turn-round Time	The minimum turn-round time agreed with an AO/GH for a specified flight or aircraft type
<b>MVT</b>	Movement message	Standardised IATA format message, sent via SITA to destination airport, AO and other recipients, containing departure data of a flight
<b>OCD</b>	Operational Concept Document	
<b>PAX</b>	Passengers	
<b>PMP</b>	Project Management Plan	

## ABBREVIATIONS & ACRONYMS

Acronyms	Definition	Explanation
<b>REA</b>	Ready message	
<b>REJ</b>	Rejection message	
<b>RFP</b>	Replacement Flight Plan	
<b>RWY</b>	Runway	
<b>SAM</b>	Slot Allocation Message	
<b>SIBT</b>	Scheduled In-Block Time	The time that an aircraft is scheduled to arrive at its first parking position
<b>SID</b>	Standard Instrument Departure	Published flight procedures followed by aircraft on an IFR flight plan immediately after take off from an airport
<b>SIT1</b>	Network Operations Slot Issue Time	The time when the Network Operations issues the SAM (Slot Allocation Message). This is normally two hours before EOBT
<b>SLA</b>	Service Level Agreement	
<b>SLC</b>	Slot Cancellation message	Standard message from Network Operations sent when flight regulations are canceled
<b>SOBT</b>	Scheduled Off-Block Time	The time that an aircraft is scheduled to depart from its parking position
<b>SRM</b>	Slot Revision Message	Standard message from Network Operations sent when flight regulations are revised
<b>SSR</b>	Secondary Surveillance Radar	
<b>STAR</b>	Standard Arrival Route	
<b>STTT</b>	Scheduled Turn-round Time	Metric SOBT - SIBT
<b>TBD</b>	To Be Defined	
<b>T-DPI</b>	Target - Departure Planning Information message	This DPI message is sent from the CDM Airport to the Network Operations (ETFMS) notifying the Target Take Off Time (TTOT)
<b>TOBT</b>	Target Off-Block Time	The time that an <b>Aircraft Operator or Ground Handler</b> 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 clearance from the TWR

Acronyms	Definition	Explanation
<b>TSAT</b>	Target Start Up Approval Time	<p>The time provided by ATC taking into account TOBT, CTOT and/or the traffic situation that an aircraft can expect start up / push back approval</p> <p>Note: The actual start up approval (ASAT) can be given in advance of TSAT</p>
<b>TLDT</b>	Target Landing Time	<p>Targeted Time from the Arrival management process at the threshold, taking runway sequence and constraints into account. It is not a constraint but a progressively refined planning time used to coordinate between arrival and departure management processes.</p> <p>Each TLDT on one runway is separated from other TLDT or TTOT to represent vortex and/or SID separation between aircraft</p>
<b>4D Trajectory</b>	4 Dimension Trajectory	<p>A set of consecutive segments linking way-points and/or points computed by FMS (airborne) or by TP or Routing function (ground) to build the vertical profile and the lateral transitions (each point defined by a longitude, a latitude, a level and a time</p>
<b>TTOT</b>	Target Take Off Time	<p>The Target Take Off Time taking into account the TOBT/TSAT plus the EXOT.</p> <p>Each TTOT on one runway is separated from other TTOT or TLDT to represent vortex and/or SID separation between aircraft</p>
<b>TWR</b>	Aerodrome Control Tower	
<b>VFR</b>	Visual Flight Rules	
<b>VTT</b>	Variable Taxi Time	<p>Common name for inbound (EXIT) and outbound (EXOT) Taxi Times. The Variable Taxi Time replaces the default Taxi Time</p>
<b>WBS</b>	Work Breakdown Structure	
<b>WP</b>	Work Package	

# DEFINITIONS

	Definition
<b>Adverse Conditions Concept Element</b>	<p>Adverse Conditions Element consists of collaborative management of the capacity of an airport during periods of a predicted or unpredicted reduction of capacity</p> <p>The aim is to achieve a common situational awareness for the Airport CDM Partners, including better information for the passengers, in anticipation of a disruption and expeditious recovery after the disruption</p> <p>The Concept Elements Information Sharing, Milestones Approach, Variable Taxi Time, and Pre-departure Sequencing need to be implemented at the airport before Adverse Conditions can be implemented successfully</p>
<b>Airport Collaborative Decision Making (Airport CDM)</b>	<p>Airport Collaborative Decision Making is the concept which aims at improving Air Traffic Flow and Capacity Management (ATFCM) at airports by reducing delays, improving the predictability of events and optimising the utilisation of resources</p> <p>Implementation of Airport CDM allows each Airport CDM Partner to optimise their decisions in collaboration with other Airport CDM Partners, knowing their preferences and constraints and the actual and predicted situation</p> <p>The decision making by the Airport CDM Partners is facilitated by the sharing of accurate and timely information and by adapted procedures, mechanisms and tools</p> <p>The Airport CDM concept is divided in the following Elements:</p> <ul style="list-style-type: none"><li>■ Information Sharing</li><li>■ Milestone Approach</li><li>■ Variable Taxi Time</li><li>■ Pre-departure Sequencing</li><li>■ Adverse Conditions</li><li>■ Collaborative Management of Flight Updates</li></ul> <p>Note: Airport CDM is also the name of the EUROCONTROL project coordinating the implementation of the Airport CDM concept on ECAC airports. This project is part of the DMEAN and SESAR programs</p>
<b>Airport CDM Information Sharing Concept Element</b>	<p>The Information Sharing Element defines the sharing of accurate and timely information between the Airport CDM Partners in order to achieve common situational awareness and to improve traffic event predictability</p> <p>The Airport CDM Information Sharing Platform (ACISP), together with defined procedures agreed by the partners, is the means used to reach these aims</p> <p>Information Sharing is the core Airport CDM Element and the foundation for the other Airport CDM Elements. It needs to be implemented before any other Concept Element</p>

## Definition

### **Airport CDM Information Sharing Platform (ACISP)**

The Airport CDM Information Sharing Platform (ACISP) is a generic term used to describe the means at a CDM Airport of providing Information Sharing between the Airport CDM Partners

The ACISP can comprise of systems, databases, and user interfaces

### **Airport CDM Partner**

An Airport CDM Partner is a stakeholder of a CDM Airport, who participates in the CDM process. The main Airport CDM Partners are:

- Airport Operator
- Aircraft Operators
- Ground Handlers
- De-icing companies
- Air Navigation Service Provider (ATC)
- Network Operations
- Support services (Police, Customs and Immigration etc)

### **Alert**

A system generated message which alerts the Airport CDM Partners of an irregularity and which normally requires one or more partners to make a manual intervention to resolve the irregularity

### **CDM Airport**

An airport is considered a CDM Airport when Information Sharing, Milestone Approach, Variable Taxi Time, Pre-departure Sequencing, Adverse Conditions and Collaborative Management of Flight Updates Elements are successfully implemented at the airport

### **Collaborative Management of Flight Updates Concept Element**

The Collaborative Management of Flight Updates Element consists of exchanging Flight Update Messages (FUM) and Departure Planning Information (DPI) messages between the Network Operations and a CDM Airport, to provide estimates for arriving flights to CDM Airports and improve the ATFM slot management process for departing flights

The aim is to improve the coordination between Air Traffic Flow and Capacity Management (ATFCM) and airport operations at a CDM Airport

The Concept Elements Information Sharing, Milestone Approach, Variable Taxi Time, Pre-departure Sequencing, and Adverse Conditions need to be implemented at the airport before the Collaborative Management of Flight Updates can be implemented in cooperation with Network Operations

### **Event**

An event is a distinct occurrence in the planning or operations of a flight that a person or system perceives and responds to in a specific way

### **Ground Handler**

A Ground Handler is the company or person(s) that perform ground handling

### **Ground Handling**

Ground Handling covers a complex series of processes and services that are required to separate an aircraft from its load (passengers, baggage, cargo and mail) on arrival and combine it with its load prior to departure

[Source: [www.iata.org](http://www.iata.org)]

## DEFINITIONS

	Definition
<b>Milestone</b>	<p>This is a significant event that occurs during the planning or operation of a flight</p> <p>A successfully completed milestone will trigger the decision making process for downstream events and influence both the further progress of the flight and the accuracy with which the progress can be predicted</p>
<b>Milestone Approach Concept Element</b>	<p>The Milestone Approach Element describes the progress of a flight from the initial planning to the take off by defining Milestones to enable close monitoring of significant events</p> <p>The aim is to achieve a common situational awareness and to predict the forthcoming events for each flight with off-blocks and take off as the most critical events</p> <p>The Concept Element Information Sharing needs to be implemented at the airport before it can successfully implement the Milestone Approach</p> <p>The Milestone Approach combined with the Information Sharing element is the foundation for all other Concept Elements</p>
<b>Pre-departure Sequencing Concept Element</b>	<p>The pre-departure sequencing is the order that aircraft are planned to depart from their stands (push off-blocks) taking into account partners' preferences. It should not be confused with the pre-take off order where ATC organise aircrafts at the holding point of a runway</p> <p>The aim is to enhance flexibility, increase punctuality and improve slot-adherence while allowing the airport partners to express their preferences</p> <p>The Concept Elements Information Sharing, Milestone Approach, and Variable Taxi Time need to be implemented at the airport before the Pre-departure Sequencing can be implemented</p> <p>Note: The pre-departure sequence can also be derived by a departure manager (DMAN), which calculates based on demand the take off time TTOT and derives the TSAT from the runway sequence. Airports can implement different solutions to achieve the pre-departure sequence, depending on local traffic complexity and surface congestion</p>
<b>Target Time</b>	<p>In A-CDM, a target time relates to the time of an airport milestone and serves as a "contract" between partners who are thus committed to achieving the milestone at this time. The time is derived only through a collaborative process and is used for milestone monitoring</p>
<b>Variable Taxi Time</b>	<p>Variable Taxi Time is the estimated time that an aircraft spends taxiing between its parking stand and the runway or vice versa</p> <p>Variable Taxi Time is the generic name for both inbound as outbound taxi time parameters, used for calculation of TTOT or TSAT. Inbound taxi time (EXIT) includes runway occupancy and ground movement time, whereas outbound taxi time (EXOT) includes push back &amp; start up time, ground movement, remote or apron de-icing, and runway holding times</p>

## Definition

### **Variable Taxi Time Concept Element**

The Variable Taxi Time Element consists of calculating and distributing to the Airport CDM Partners accurate estimates of taxi-in and taxi-out times to improve the estimates of in-block and take off times. The complexity of the calculation may vary according to the needs and constraints at the CDM Airport. The aim is to improve the traffic predictability

The Concept Elements Information Sharing and Milestone Approach need to be implemented at the airport before Variable Taxi Time can be implemented



# 1. UNDERSTANDING AIRPORT CDM

Airport Collaborative Decision Making (Airport CDM) is now embedded in the ATM operational concept as an important enabler that will improve operational efficiency, predictability and punctuality to the ATM network and airport stakeholders. It is expected that Airport CDM will have an impact on the operating efficiency of airport partners, and may eventually contribute to reduced buffer times for resource planning and flight times due to enhanced predictability. It is recognised that the implementation of Airport CDM will transform many of the communication policies and procedures that have historically dominated the airport operations environment, bringing substantial improvements to all partners.

✚ **Airport CDM is often equated with nothing more than better information sharing. As an essential element to the management of flights, there is more to Airport CDM than just that.**

As the name implies, Airport CDM is about partners working together and making decisions based on more accurate and higher quality information, where every bit of information has the exact same meaning for every partner involved. More efficient use of resources, and improved event punctuality as well as predictability are the target results.

In the absence of Airport CDM, operational decisions may often be incorrect, or do not get made at all. Partners may make conflicting decisions as a result of lack of information or the receipt of information that has diverging meaning to different partners. Addressing these shortcomings individually will bring improvements but we can talk about Airport CDM only when the whole complex set of issues is addressed in its totality and the following is achieved:

Data quality and timeliness is substantially improved

Data is shared by all partners

The meaning of data provided is the same for all partners, in other words they have a common situational awareness

Common functions to enable this awareness are defined and are implemented using shared information to support ATM decisions

✚ **Airport CDM requires very close collaboration between ALL THE PARTNERS involved in the management of flights**

Further to Airport and Aircraft Operators, Air Traffic Service Providers, Ground Handling companies and the Network Operations, other airport partners may also play a role. For example, a blockage of the airport access road can have a major impact on the number of passengers late for check-in. Airport CDM Partners will want to know about obstructions for their passengers and cargo load.

## 1.1 Understanding the Impact

When Airport CDM is introduced as a project on an airport, the partners have to come together and discuss the impact and organisation of such a project. Moreover, they need to prepare their own organisations for the work ahead, and how the cooperation with partners will be organised. Two main topics can cause difficulties in and between each organisation:

- New procedures, the consequence of more information sharing and use of automation
- Culture change, the impact of Airport CDM on people and organisations

### 1.1.1 New Working Procedures

As Airport CDM includes a whole set of new procedures and processes, a training phase to understand these new features will be needed for all personnel. For the purpose of knowledge exchange between operational experts from different working areas, it is of great importance that training is conducted with partners with the relevant expertise. This joint approach into new working procedures will then provide multiple perspectives of activities by individual persons and organisations, and assess both the individual and collective impact of new procedures on the working floors.

Where it comes to the integration of existing technology, or development of new automation applications, engineers are needed in discussions to understand the operational problems and to be able to extrapolate the technical impact on individuals and organisations.

### 1.1.2 Culture Change

One major difficulty with project organisation will be the political process between partners. This is normally at management level where interest between partners has to be identified and the collective way forward negotiated. However once the project actually commences, the real problems will come to light, when operational staff are discussing their daily working procedures with other partners. For the first time, differences in working methods are shared transparently and sometimes even colleagues in the same company may be confronted with deviating procedures on similar jobs.

It will become clear how deep the different working methods are rooted within the people on the working floor. To alter their daily tasks towards a common

shared awareness and overall agreed methodology will be the biggest challenge throughout the Airport CDM project.

Important requirements to enable such culture change are: transparency of information, stimulation by management, and concise documentation of discussions and meeting minutes.

## 1.2 From Concept to Implementation

Airport CDM is a concept that promotes intense collaboration between partners, using improved quality of information and more timely exchange of information, which is interpreted in exactly the same way by all partners.

Airport CDM is implemented in the airport environment through the introduction of processes which realise the aims of the Concept Elements. The processes are described in terms of:

- Rules and procedures
- Input information requirements
- Output information requirements
- Human-Machine Interface (HMI) requirements

Rules and procedures describe what is to be done with information received, what output information to generate and send, and what actions to undertake in response to specific information or events.

Input and output requirements describe the information needed by that process to fulfil its task properly and the information that has to be output as result of fulfilling its task.

Airport CDM processes allow for manipulation of information to facilitate modified output for decision



## 1. UNDERSTANDING AIRPORT CDM

making. In a simple environment, an Airport CDM process may be carried out by a human being, using nothing more complicated than a telephone and a pen and paper.

It will become clear from this Implementation Manual that Airport CDM is not complicated and certainly need not be expensive. One of the main attractions is that it brings high benefits to a wide range of partners with relatively low investment.

### Local and Regional

Whilst it is easy to perceive an airport operation as the interaction of essentially local factors, ATM decisions will be influenced by events often hundreds of miles away. Airport CDM must bring together all the information needed for better decision making, irrespective of its origin, local or remote.

Airport CDM brings substantial benefits to all partners by improving the quality of information on which decisions are made. This will lead to enhanced operationally efficiency and facilitate optimum use of available capacity.

With the number of airports implementing Airport CDM increasing, the network benefits will be increased. These benefits include an enhanced flow management process and reduced number of wasted ATFM slots resulting in more used capacity throughout the network.

**(Airport CDM) Information Sharing** is essential in that it forms the foundation for all the other elements and must be implemented first.  

**5 Collaborative Management of Flight Updates** enhances the quality of arrival and departure information exchanges between the Network Operations and the CDM airports. 

**4 (CDM in) Adverse Conditions** achieves collaborative management of a CDM airport during periods of predicted or unpredicted reductions of capacity. 

**3 (Collaborative) Pre-departure Sequence** establishes an off-block sequence taking into account operators preferences and operational constraints. 

**2 Variable Taxi Time** is the key to predictability of accurate take-off in block times especially at complex airports. 

**1 The Milestones Approach (Turn-Round Process)** aims to achieve common situational awareness by tracking the progress of a flight from the initial planning to the take off. 

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## 2. SETTING UP AN AIRPORT CDM PROJECT

The cost and benefits for all partners of implementing Airport CDM have been identified through operational trials at a significant number of European airports (information on airports currently implementing Airport CDM can be found on [www.euro-cdm.org](http://www.euro-cdm.org)). This information will encourage management at other airports to investigate these specific costs and benefits in order to be able to implement Airport CDM. Airport CDM requires the structured cooperation of many partners; success will only be realised if all the partners are aware of what is required of them, and continue doing so even in the light of temporary set-backs.

✦ **In short, to start the Airport CDM project, the following steps are taken:**

- **Get all partners on board**
- **Set the Objectives**
- **Set the Organisation**
- **Write the Plan**
- **Start Implementing**

To take a decision of implementing Airport CDM, many steps are taken by the parties who wish to do so. Such process, from interest to achieving the final status, is described in the first section 2.1. Often the first steps involve lot of discussions in order to have all the airport partners see the benefits for the airport as a whole, and individually. In section 2.2 education of the partners is presented in order to take away concerns, and achieve full partner support.

The objectives are listed in section 2.3, which feed the organisation structure described in section 2.4. The first activity of the program manager should be to develop a program plan, including the individual projects and activities (section 2.5). It is of importance to take into account the essential order of the Concept Elements, as they are dependent on each other (section 2.6).

Inventory and resources are described high level in section 2.7. Important to qualify for the network exchange is to evaluate the implementation on the airport, as described in section 2.8.

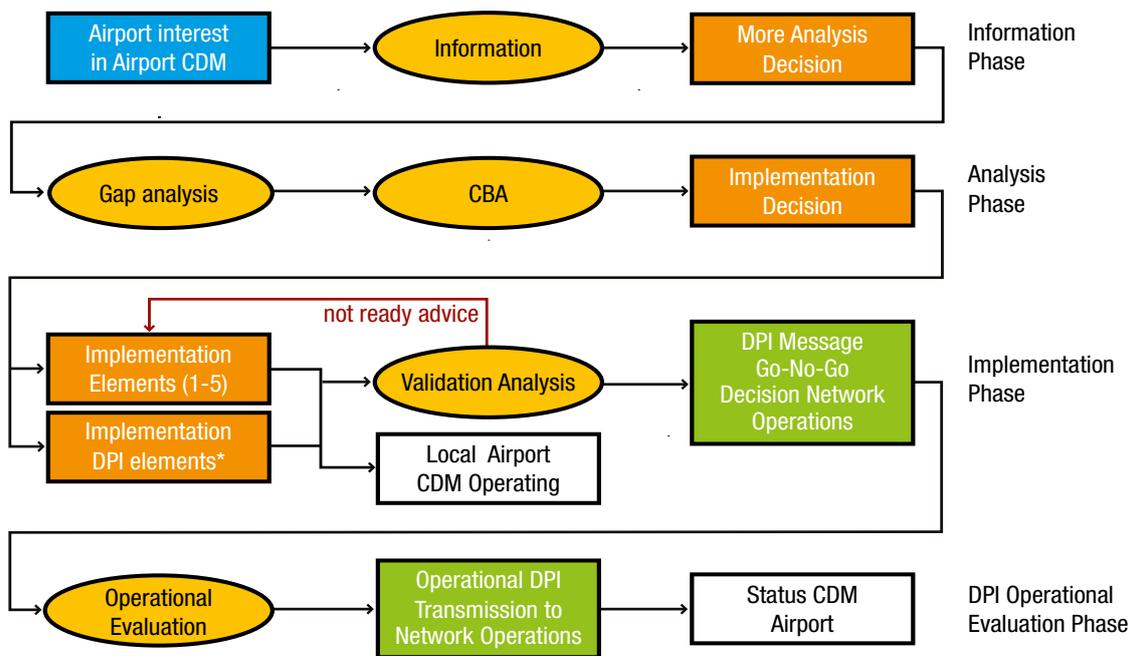
### 2.1 General Airport CDM Implementation Process

In Figure 1 the general process for airports deciding on Airport CDM implementation is presented. It shows the airport decisions in blue boxes, external consultation in yellow boxes, Network Operations decisions in green boxes and arrows linking the boxes as they all form a process to be completed, starting from interest expressed for Airport CDM to CDM Airport status.

In Figure 1 (on next page) it becomes clear that there are four phases from the moment it is decided Airport CDM may be of interest for their airport until full implementation. During the first Information Phase many organisational decisions need to be taken in order to get support from all partners (ATC, Airport, AOs, Ground Handlers), based on benefits. The normal result of this phase is that more consultation and analysis is needed in order to convince all partners with a strong business case.

In the second Analysis Phase more investigations can be conducted by having a GAP Analysis done by EUROCONTROL or independent consultants. This GAP Analysis determines the operational and technical need for development to meet the Airport CDM minimum requirements with a common CDM platform and related processes and operational procedures. This GAP Analysis is considered as the baseline measurement.

In case the GAP Analysis concludes that much needs to be done to implement Airport CDM suc-



\* The technical support for the DPI element can be implemented either in parallel with elements 1-5 or after their completion

**Figure 1: General process for Airport CDM Implementation**

cessfully, airport partners may decide to perform a Cost Benefit Analysis (CBA) in order to get an insight in foreseen benefits and investments. Such a CBA can be conducted by independent consultants or by economic experts available to the airport parties. The objective of the GAP Analysis is to determine what needs to be implemented; the CBA may contribute to a managerial decision on whether Airport CDM will be implemented at the airport.

Once the decision to implement is positive, the Implementation Phase kicks-off. In this phase the Concept Elements 1) Information Sharing, 2) Milestones Approach Turn-round process, 3) Variable Taxi Time, 4) Collaborative Pre-Departure Sequencing, and 5) Adverse Conditions are implemented. The order of implementation is

important, as all elements build on top of the previous element in order to achieve the desired output with the exception of the Variable Taxi Times element.

The sixth Concept Element, Collaborative Management of Flight Updates, or DPI message transmission to Network Operations, can be implemented together with the Milestones Approach, and airports may receive implementation advice from Network Operations also at this stage. However, after the implementation of the Concept Elements, successful validation and operation of CDM elements is a pre-requisite in order to qualify for operational evaluation tests by Network Management Operations, before live operations with DPI transmission, and finally receiving the CDM Airport status.



### 2.2 Educating and Convincing all Partners

Whilst most potential partners recognise Airport CDM as beneficial and worth introducing, when it comes to actually sharing information or establishing links for closer cooperation, the enthusiasm may diminish when potential problems arise. This is not entirely unexpected as the operation may have matured individually. It is this problem within which Airport CDM needs to solve.

#### The challenges

Whilst all projects contain challenges, some of which cannot be known until they are realised, the Airport CDM trials that have been conducted thus far consistently demonstrate several challenging areas. The fact that hitherto basically unconnected systems will now have to be adapted, at least to the level of enabling mutual communication, may in itself be seen as problematic.

✎ **The challenges could be: programme credibility, scepticism on the part of the team members, security and data ownership concerns and conflicting interests.**

It is essential that all Airport CDM projects incorporate a programme of education for the partners. This will encourage them to participate and actively support both the implementation and the daily running of Airport CDM and to be satisfied with its benefits.

#### The sensitivity of data

Concerns may arise from the fact that data, especially if made available consistently and comprehensively, conveys much more information than the sum of its elements.

Whilst the touchdown time or target off-block time for an individual flight is unlikely to give a competitive advantage to anyone, knowledge of all the events of the flights of an airline can be used to identify relationships, tendencies and the like. The net result may indeed be commercially sensitive intelligence on an operator's state of affairs and this should be protected.

Another dimension concerns security, where movement data of specific flights needs to be protected from unauthorised access to eliminate specific threats.

#### The value of data

Commercial considerations arise from the realisation that aircraft movement data is valuable, since it can be used to generate savings and organisations considering themselves owners of the data will wish to capitalise on that value. While this is defensible from a purely commercial point of view, it is against the spirit of the Airport CDM concept.

✎ ■ **Conflicting priorities is a common problem**

■ **The Airport CDM implementation project should be seen as a high priority by both management and those responsible for implementation on a day to day basis**

Airport CDM is built on commitment and a willingness to cooperate for the greater good of the team. It is therefore essential that the Airport CDM project be established and led by an organisation and a person within that organisation, who has credibility, integrity, and dedication to the goals of the project. The organisation and the responsible individuals must be innovative, efficient problem solvers, and distinguish themselves as fair, reasonable, and open-minded.

It is recommended that the team leaders consider forming committees and / or specialised working groups to guide the project decision making process (i.e. Steering Group, Working Group, etc.).

### **Comprehensive education**

The programme to educate and convince all partners must contain a module explaining Airport CDM in general, leading on to the subject of the Airport CDM implementation project. This module must stress the collaborative nature of Airport CDM, the relatively low costs involved and the potential benefits, including the quick-win opportunities.

✎ **EUROCONTROL offers Airport CDM training courses, both at the Institute of Air Navigation Services in Luxembourg and on location, upon request. Such courses are free of charge for airport partners.**

A specific module must be devoted to identifying the measures that will be taken to protect data from both commercial and security aspects. The issue of withholding data, unless paid for, has been discussed in various forums. Organisations truly dedicated to improving air traffic management will find ways of sharing data in an acceptable framework.

Conflicting priorities can be intimidating and discouraging, however of all the obstacles, this is probably the easiest to overcome. It requires patience, perseverance, a firm belief in the objectives and well-reasoned arguments. Partners with initial reservations are likely to become supporters when they see the achievements or when successful implementation finally makes staying out a non-option.

### **Local partners truly local?**

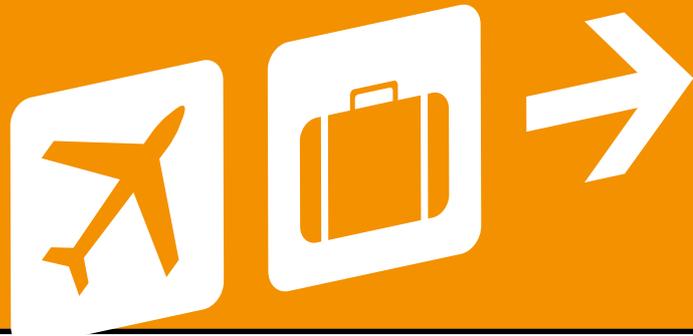
It is important to recognise that some partners, who may appear local, are in fact based far away, possibly in other regions of the world (e.g. airline's operations centre). It may therefore be necessary to go beyond their local presence in order to get a decision on Airport CDM implementation. Once the higher level decision has been made, the work should continue locally.

**The introduction of Airport CDM requires a culture change.** This fact needs to be recognised and accepted by the partners as soon as possible, in order to progress. Continuous collaboration and decision making based on data with new accuracy requirements, or on data that was just not available before, means working in a new environment that requires some adapting.

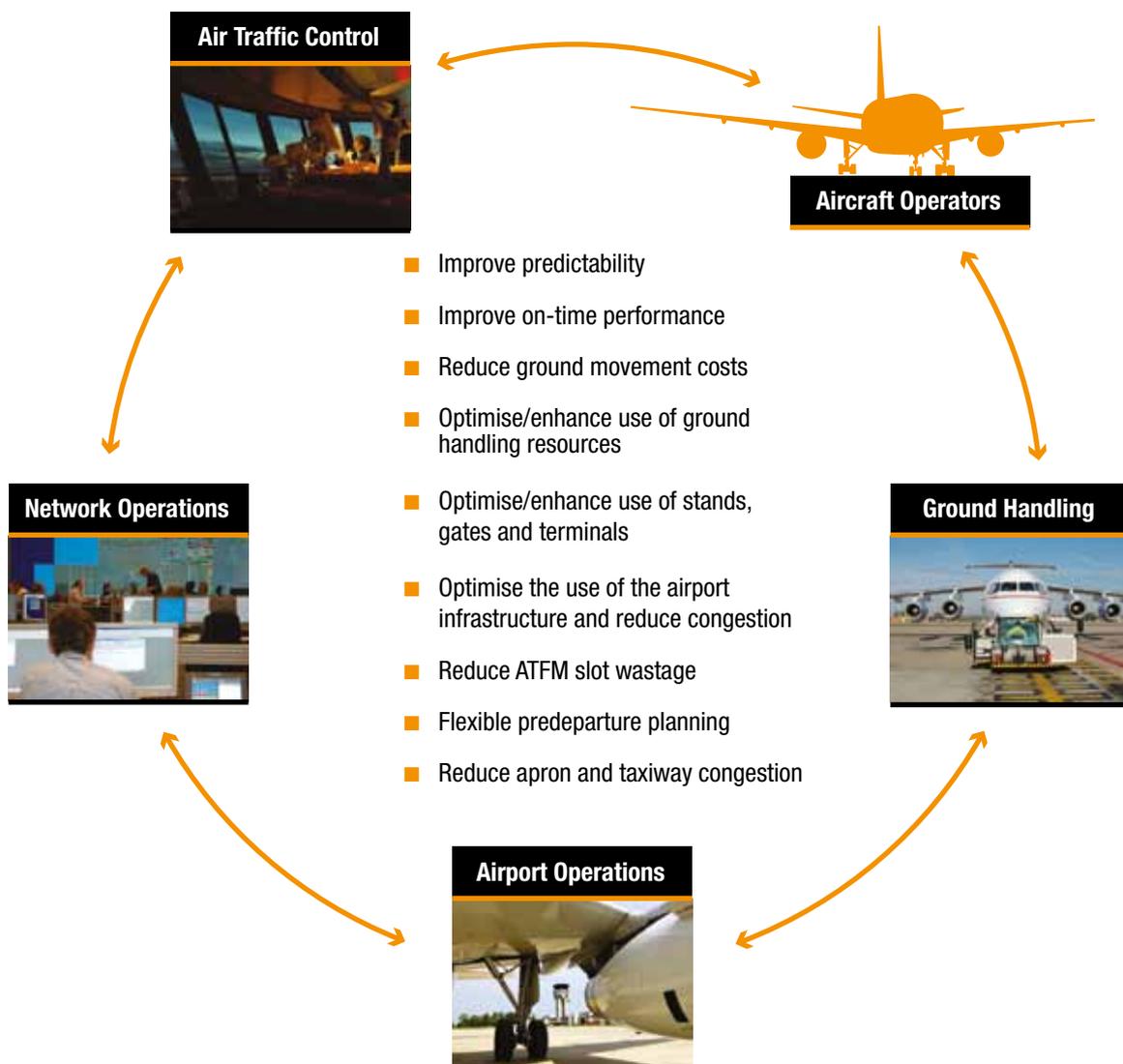
## **2.3 Setting the Objectives**

The objectives of each individual airport partner are diverse and may, in some cases, be both contradictory whilst also being complementary. Some partners will not possess a full understanding of the particular operations and priorities of others. This is normal in the aviation world and is something that Airport CDM will address.

All Airport CDM Partners have a common prime objective, namely to maintain a safe, smooth and efficient air transport service for the benefit of passengers and cargo. In order to achieve this prime objective there are many supporting objectives. Figure 2 represents supporting objectives with which most partners can identify. This list is not exhaustive and there may well be others, particular to each airport. Airport CDM covers these supporting objectives and provides solutions in the Airport CDM Concept Elements.



## AIRPORT CDM COMMON OBJECTIVES



## 2.4 Setting the Organisation Structure

Once the content and benefits of Airport CDM are understood and the objectives have been set, the most crucial phase starts, which is to organise a project for Airport CDM activities, where the project will be managed properly according to an agreed timeline with all partners involved.

Lessons from airports implementing Airport CDM have learned that this phase often results in long, sometimes stalling, discussions on who finances the project, who runs the project, and how to organise sub-projects and monitor progress at the steering board level.

Figure 3 shows a generic organisation scheme which consists of a high management steering board, one Project Manager with supporting staff, an operational

reference group, and several sub-projects including Sub-Project Managers, executing the actual work.

**Depending on the size and complexity of the airport the proposed functions should be performed by a limited or a larger number of staff.**

The **Strategic Steering Board** should be high level management, preferably the Chief Operations Officers (COO) of the individual partners, or one level below the COO. The board should have access to performance review and operational expertise, which usually is available for the COO in charge. This Steering Board can be an existing steering board monitoring multiple projects, in order to utilise existing human resources.

The Strategic Steering Board can be advised by EUROCONTROL, Airline Operations Committee (AOC) if not already part of the SSB, or other external bodies.

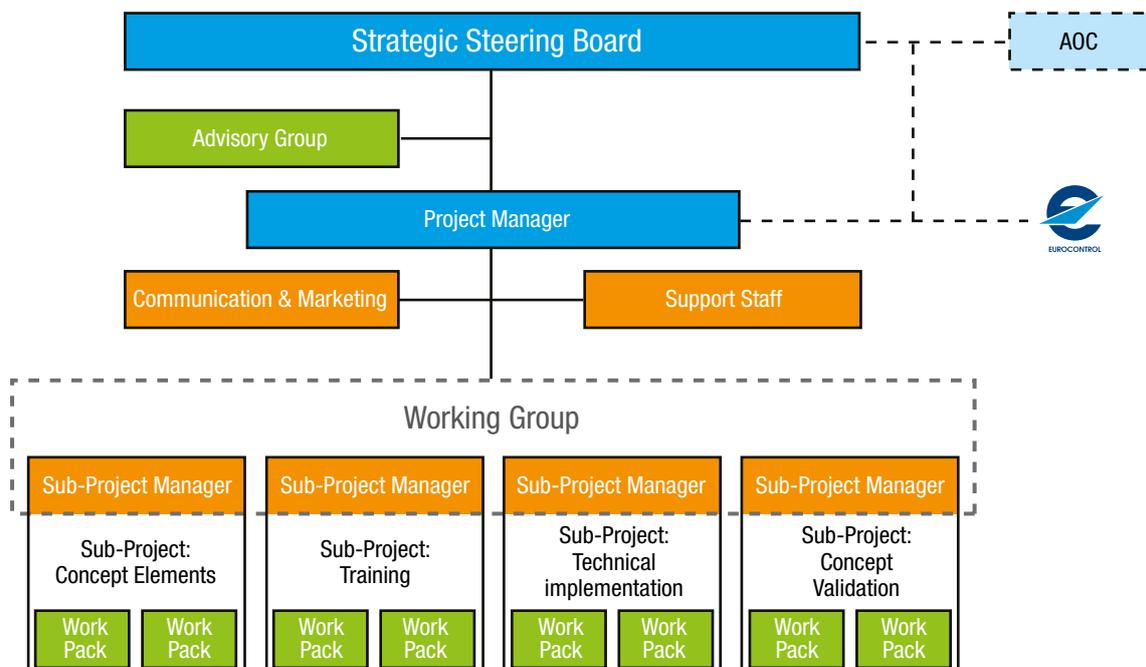


Figure 3: Basic Organisation Structure for the Airport CDM program

## 2. SETTING UP AN AIRPORT CDM PROJECT



An internal **Operational Advisory Group** should contain operational experts from the various partners, who are frequently gathering to align their recommendations to the Strategic Steering Board via the Project Manager, and are getting their information from independent consultations of project members, and formal progress reports from Project Manager and Sub-Project Managers. Their recommendations must be based on the latest progress reports and documentation hence they should have access to all persons participating, and all documents that are being developed.

The **Project Manager** is the overall executive, responsible for the total project and all sub-projects under the umbrella of Airport CDM. This person has full mandate from the Strategic Steering Board, and will be occupied with his work full time, dependent on the size of the airport, amount of partners involved, project complexity, and number of projects needed.

The Project Manager has full budget control for projects and staff activities, and should report directly to the Strategic Steering Board. He collects progress reports from the Sub-Project Managers, and evaluates their functioning. All work is performed according to a description of work, or project management plan, in order to be transparent and clear to all.

Supporting staff will be organised directly to the Project Manager, however should also support the projects. One key staff project should be **Marketing and Communication**, internal and external, in order to continuously raise the awareness of the Airport CDM project. The staff includes operational experts and managers with personnel charisma and presentation skills, who can deliver the project needs and benefits to any internal and external audience required, in order to achieve full support for the project from management, customers, governmental organisations, etc.

The **Sub-Project Managers** are the leaders of the individual activities, who are joined for coordination in the Working Group. Examples of these projects can be one or multiple Concept Elements, Validation activities, Technical development, Validation or Statistical Performance Analysis, or other related work. The support of coordination with the various projects is important, as dependent activities should be communicated and coordinated in order to achieve the desired overall effects.

The Sub-Project Managers are part timers, dependent on the size and complexity of their project. They are full mandated by, and report to, the Project Manager. In case of work package leaders, the Sub-Project Manager is responsible for their functioning, and shall assign and evaluate these work package leaders or project members. A project management plan shall be the basis document for all activities, approach and planning, on both project and sub-project level.

In the next section the project management plan and role of Project Managers is elaborated.

**Supporting staff** such as secretary and accountancy will be available to project and Project Managers, in order to achieve their tasks according to plan. Usually existing staff can be used however they should be instructed from a project point of view in order to get a clear project mandate for their effort.

Finally **Training** should be one of the key projects or supporting staff bodies, as all personnel should be trained for new operational procedures or managerial consequences of airport partner interdependencies. Courses should be organised, preferably in a mixed partner environment to have staff from several operational airport partners in one room, discussing new procedures and viewing the problems that occur during the many activities in the turn-round of an aircraft,

and solutions offered by Airport CDM. Instructors should be fully trained on the Airport CDM concept, and have credits via the Instructor Course provided by EUROCONTROL.

With the organisation structure in place, the next step will be to develop a multi partner project management plan, and assign staff to the described functions.

## 2.5 Programme and Project Management

Once all partners involved have indicated their willingness to implement the selected functionality, a common multi-partner Program (or Project) Management Plan (PMP) will be created, which organises all activities, projects, and planning. It is important to get all partners to sign up to an agreed version of the PMP so that everyone has a common reference document.

👉 **The PMP should be developed based on best project management practices, such as those defined by the non profit Project Management Institute ([www.pmi.org](http://www.pmi.org)).**

While all partners participate on a voluntary basis, one should be appointed as program manager, with the aim of ensuring the setting up of the PMP with the help of all partners involved. The main responsibility of the Program Manager will be to ensure the plan is executed within time and budget.

👉 **It is important that the partners agree and appoint an Airport CDM Program Manager to manage all the organisational aspects.**

The **Program** or **Project Manager** could be one of the main partners or from an independent, neutral organisation focusing only on overall program and project management activities. The Program Manager

will be in overall control of the day-to-day project coordination and will report to a Project Steering Committee composed of each partner's representatives. The Program Manager will maintain an action/decision register to enable tracing of all decisions taken by the project committee, or within the project.

The contents of the PMP should be selected from the following indicative list, on the understanding that local requirements will determine the final contents:

- Scope (the outline of the project)
- Objectives (Specific, Measurable, Achievable, Relevant and Time-oriented)
- A description of the phases of the project (Concept, Development, Execution Termination)
- Projects and Project Management
- Risk Management
- Quality Management
- Work Packages (who is responsible for work and when and how it is to be delivered)
- Work Breakdown Structure (WBS)
- Deliverables
- Communication plan
- Finance and Funding
- Partners and resources

A responsibility assignment matrix can be used to identify the roles and responsibilities of each partner throughout the project.

A work breakdown structure (WBS) will detail a list of work packages, including the inter-dependency between each of them, required to achieve the overall project objective. Each work package will be defined using a standard description template, for example:

- Person responsible
- Objectives
- Duration

## 2. SETTING UP AN AIRPORT CDM PROJECT



- Principal activities
- Inputs
- Outputs
- Indicator of success (KPIs)
- Risks

Once the WBS, timing and costing have been finalised, the project execution can start. A “rolling wave” principle will be applied whereby the PMP will be reviewed on a regular basis to ensure the overall objective is still implemented within time and budget. If change is required to the PMP, then a new version of the PMP will be agreed by all of the signatories.

Person responsible
Objectives
Duration
Principal activities
Inputs
Outputs
Indicator of success
Risks

**Figure 4: Task description**

A project risk register must be set up and maintained identifying the major project risks, the likelihood of the risks occurring and the likely impact of the risk (see also Chapter 4). A mitigation action will be identified and the WBS will be adapted accordingly (e.g. foresee some buffer time between some tasks or identify backup supplier for critical resources).

A quality management approach shall also be identified, commencing with standard review procedures of documents and document change control procedures in accordance with ISO9000. A Communication Plan must be developed identifying who needs to know what information about the project and its progress. It will also identify performance indicators to be monitored and communicated.

Finally, at the end of the project, a project close out activity is to be foreseen to review the overall project achievement and compare it to the initial project objectives.

WP00	Project management
WP01	Task1
WP02	Task2
WPXX	Project close out

**Figure 5: Example of Project Work Breakdown Structure**

### 2.6 Implementation order of Airport CDM Concept Elements

As explained in Chapter 1, the most important aim of Airport CDM is to improve efficiency, punctuality and predictability. This is achieved through better decisions based on more accurate and timely information. The improved quality of this information also enables increased flexibility and efficiency.

It is essential to achieve a common situational awareness for all partners by making full use of commonly agreed responsibilities and procedures. In order to ensure the continued high quality of decisions, a performance monitoring system should be established. In order to facilitate such a monitoring system for consistent and interoperable implementation at minimum development cost, a number of Airport CDM Concept Elements have been defined (Chapter 3) that meet the following criteria:

- Involve a decision
- Result in an operational improvement
- Involve the appropriate airport partners
- Are supported by agreed rules and procedures
- Are based on shared information of the same quality level

With this list of criteria, the six Concept Elements are developed and defined in this document. These Concept Elements are dependent on each other, and hence require a recommended order of implementation. However, local considerations, such as size and complexity of the airport, may require simultaneous implementation of all elements or influence the type of element implementation e.g. sequencing on a small airport can be done manually rather than automatically, if this enables the airport to meet the information accuracy requirements set in the next chapters.

Below, the list of Concept Elements is presented:

- Information Sharing
- Milestone Approach
- Variable Taxi Time
- Pre-departure Sequencing
- Adverse Conditions
- Collaborating Management of Flight Updates

Of the available Airport CDM Concept Elements, Information Sharing is essential in as much as it creates the foundation by enabling the sharing of information and creating a common situational awareness. In addition, it potentially brings predictability and resource efficiency benefits. After the creation of this information platform (see also chapter 3.2), the main priority is implementation of the Target Off-Block Time (TOBT) by using the Milestone Approach to improve predictability during the turn-round process of aircraft. Together, Information Sharing and the Milestone Approach are the essential requirements for implementation of the remaining Concept Elements.

➤ **All Airport CDM projects must commence with the implementation of Airport CDM Information Sharing. Other elements can be selected and implemented either simultaneously as one process or in the recommended order to enable the successive elements to be most beneficial at the location in question.**

## 2.7 Inventory for Implementation

An obvious method of minimising costs is to utilise existing resources to the maximum extent possible, including networks, computers, displays, etc.

➤ **Airport CDM elements implemented as software applications are neither computation intensive nor mission critical in the sense that an ATC system is.**

Existing networks and other hardware can usually be used, minimising the need for buying new equipment. Adding the Airport CDM elements to existing systems can be cost effective, however it should be borne in mind that modifying host systems may be more expensive than building appropriate interfaces into the software application itself.

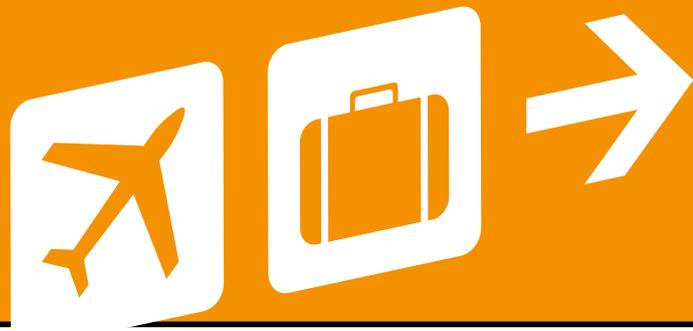
➤ ■ **An inventory of partners' existing systems is required (see to Attachment 3.2)**  
■ **Appropriate resources may already be available**

## 2.8 Gap Analysis and Completeness Assessment

Before commencing an implementation project, it is recommended that each airport has a Gap Analysis performed by EUROCONTROL or an independent consultancy company. This analysis has the purpose to achieve a clear vision of what is available and what is missing within the airport partners' technical infrastructure (see Attachment 3.2).

At the end of the implementation project an external Completeness Assessment will be performed by either EUROCONTROL or a consultancy company, in order to recommend to Network Operations on the exchange of DPI messages to feed the network with airport Target Take Off Time (TTOT) predictions. This Completeness Assessment will be conducted

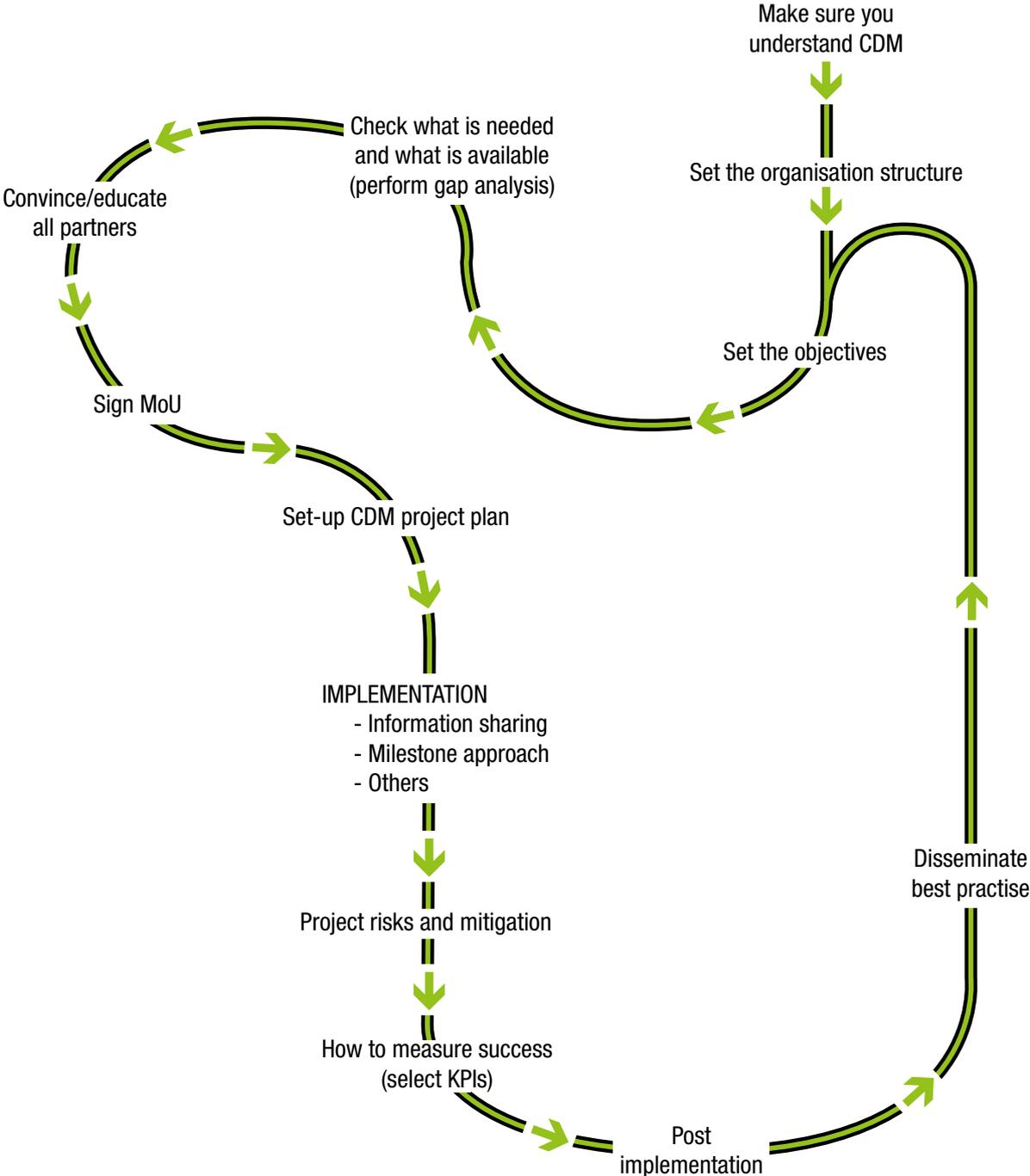
## 2. SETTING UP AN AIRPORT CDM PROJECT



on agreed Completeness Assessment Criteria to ensure both harmonisation and maturity of implementation throughout European airports **(see attachment 6)**.

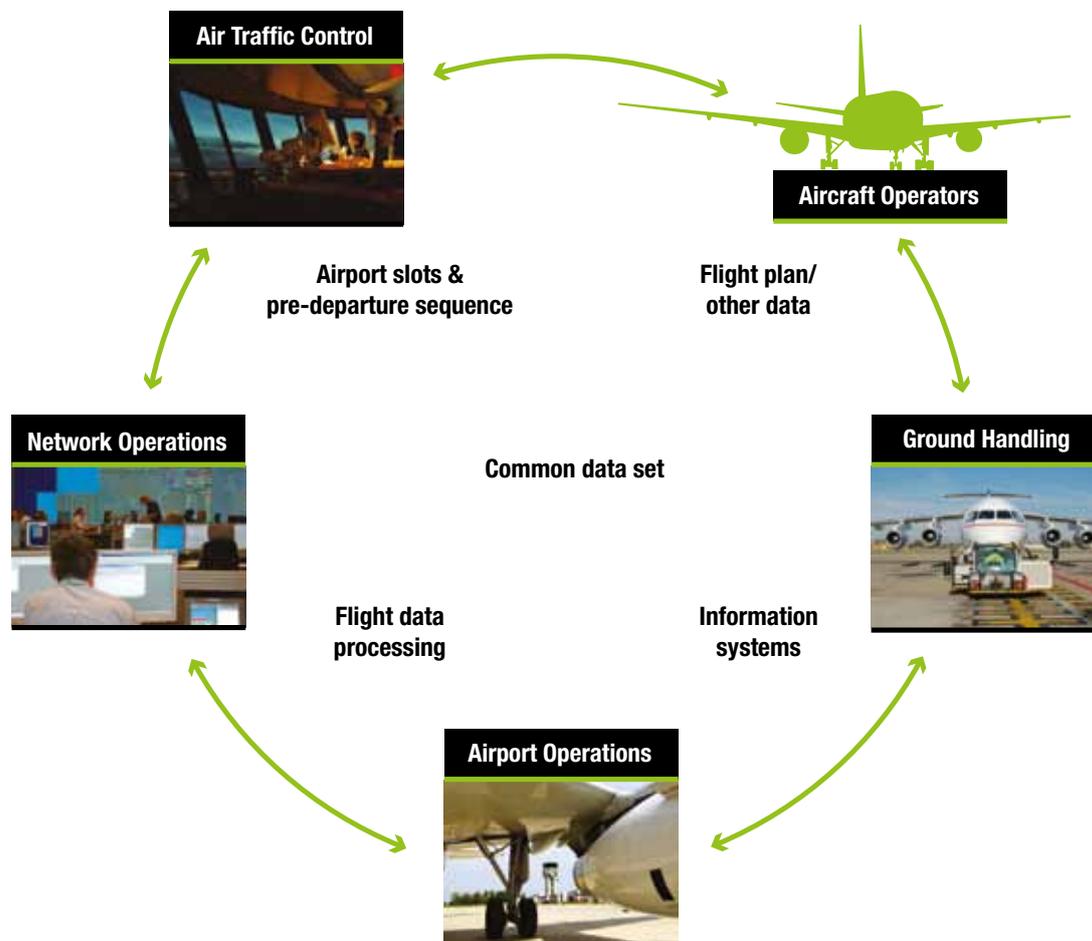
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# AIRPORT CDM IMPLEMENTATION - STEP BY STEP



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# 3. IMPLEMENTATION



## 3.1 Introduction

In this chapter, the various Airport CDM Concept Elements are described with the focus on implementation, based on the Operational Concept Document (OCD, reference 1). The order of element implementation is stressed since the elements depend heavily on each other. At the airport of implementation many specific issues can be decided locally, in order to be flexible based on the unique conditions in which an airport operates. How implementation leads to technical considerations is also subject to local pragmatism and financial decisions.

The description of the Concept Elements contains the minimum level of required functionality. Additionally, the quality of information and, where applicable, desirable technical processes or operational procedures will be added in attachments.

This Implementation Manual does not preclude the need for a detailed specification for each of the described elements, however such specification will be developed as part of the implementation project considering local deviations and / or prevailing circumstances that may justify a different approach to achieve the same result.

Information Sharing is the first Concept Element, which creates the foundation for all other functions, while being beneficial in its own right. Therefore, it is essential to implement this element, before other Airport CDM Concept Elements and functions, in order to achieve a smooth implementation of the succeeding Concept Elements.

In Figure 2 the relevance of Airport CDM Information Sharing is shown.

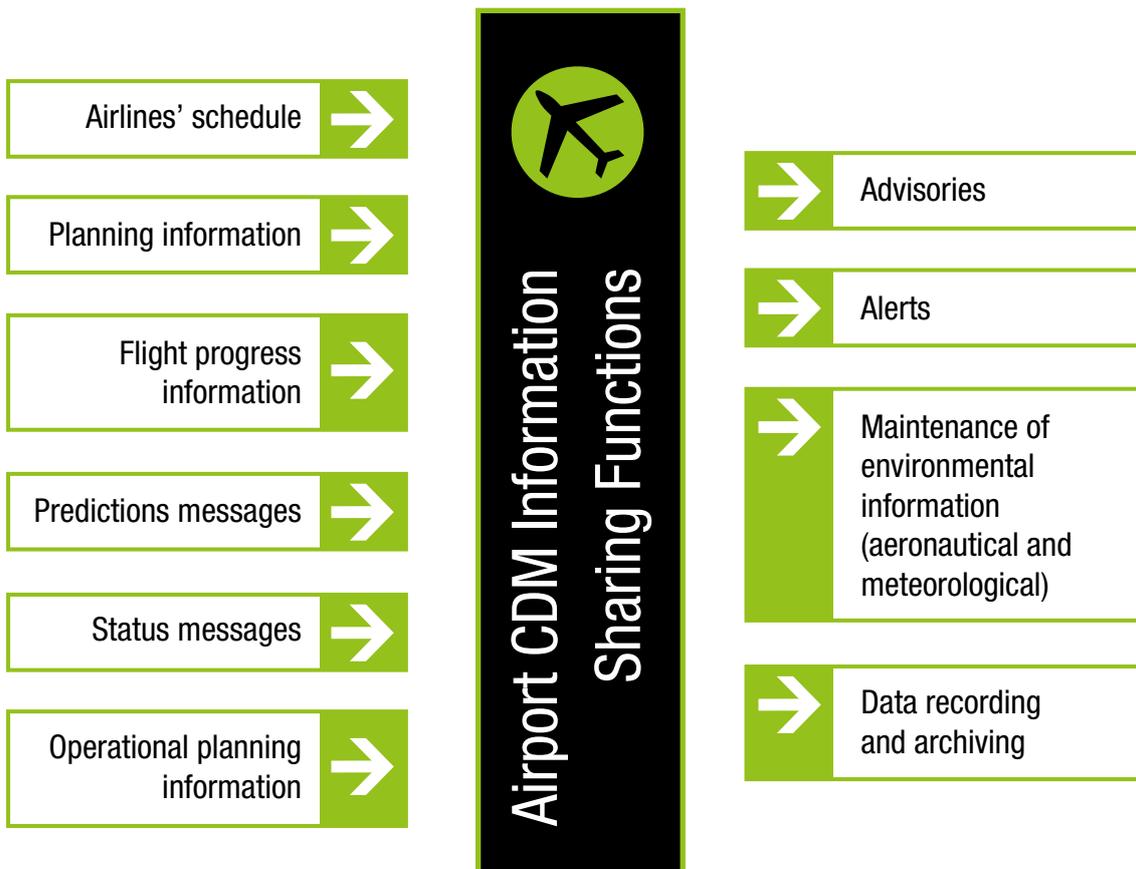


Figure 2

### 3. IMPLEMENTATION



With Information Sharing implemented, the TOBT prediction by the Aircraft Operator or Ground Handler becomes the second major step to implement, before all other elements. This Milestone Approach is the main innovation compared to current way of operation on airports. The Milestone Approach aims to have an early and accurate prediction by the Aircraft Operator, in order for Air Traffic Control, Airport Operator, and Ground Handlers to anticipate for resources or traffic planning purposes. With prediction of TOBT in place, improved prediction of target take off times, start up times, and taxi time will become possible.

Once Information Sharing and the Milestone Approach are implemented, Variable Taxi Time (VTT) is the next essential step to take. Sequencing still does not make sense when the standard taxi time values are applied, as in today's air traffic management. With VTT in place, the link between off-block time and take off time becomes transparent to all parties and Network Operations, and a proper prediction of the take off time can be communicated towards the network function represented by Network Operations.

With Information Sharing, Milestone Approach for TOBT prediction, and Variable Taxi Time in place, the final steps can be implemented. Off-Blocks sequencing is often needed in order to regulate traffic flows on large airports, with complex aprons, taxiways, or bottleneck at the runway or stands. With this sequencing function the TSAT can be calculated, and hence the TTOT at the runway. The sequence prediction automates this process and provides early TSAT and TTOT transparency towards all partners.

With the above four elements in place, the last local airport step is to implement CDM in Adverse Conditions. Using sequencing for the situation where different bottlenecks occur, this enables Air Traffic Control to keep the traffic capacity maximally utilised, even when capacity has dropped significantly. Also for the capacity

recovery period, after an adverse situation, this process can help to speed-up the time where maximum capacity needs to be achieved.

With all local Airport CDM Concept Elements successfully implemented, the airport is ready to connect with the Network Operations for Departure Planning Information exchange, or DPI message exchange. The predicted TTOT's coming out of the TOBT prediction and sequencing processes are sent to Network Operations, feeding them to adjust the Network Operations derived Calculated Take Off Time (CTOT) accordingly. With this element in place, Network Operations starts to react on predictions coming from the Aircraft Operator, rather than to impose restrictive and inflexible constraints to an airline as is done today.

This Collaborative Management of Flight Updates element is considered the main achievement for the airport to provide service to the Aircraft Operators. At the same time, from a European network perspective, this contribution to the network will enhance predictions on Flow and Capacity management, enabling the network to become better utilised, with potentially a higher capacity.

This Concept Element is the last element to be implemented, as Network Operations requires the airport to provide high quality data to the network. This can only be the case when the processes on the airport level are organised according to the Concept Elements described in this chapter. It is for this reason that it is highly recommended to implement the Airport CDM Concept Elements according to the order in this document, as described above. In the future, an external audit can be imposed on the basis of a Community Specification (by EU) to verify the maturity of the Airport CDM implementation, before the exchange with Network Operations can be established.

**In the sections below, each of the Concept Elements is described in more detail.**

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### 3.2 Airport CDM Information Sharing

#### 3.2.1 Objectives and Scope

Airport CDM Information Sharing supports local decision making for each of the partners and facilitates implementation of Airport CDM elements by:

- Connecting Airport CDM Partners data processing systems
- Providing a single, common set of data describing the status and intentions of a flight
- Serving as a platform for information sharing between partners

To achieve the above, Airport CDM Information Sharing:

- Collates and distributes planning and flight progress information, originating from ATFM, ATS, Aircraft Operators and Airport Operators
- Collates and distributes event predictions and status messages
- Generates advisories and alerts
- Provides information concerning the status of aeronautical aids / systems and meteorological sources
- Enables data recording and archiving for statistical analysis and other charges (e.g. financial purposes)

Information Sharing is in fact the “glue” that ties the partners together in their aim to efficiently coordinate airport activities, and forms the foundation for other Airport CDM Concept Elements.

#### 3.2.2 Requirements for Implementation of Information Sharing

The following requirements apply for implementation of Airport CDM Information Sharing:

1. Creation of an Airport CDM Platform
2. Standardised format for information transmission and data storage
3. Real-time delivery of available information or data.
4. Generic and local processes are directly linked to the Airport CDM Platform and triggered based on data events or processing
5. Alert messages to partners are triggered based on events or calculations
6. Use of interactive and interdependent User Display or Human-Machine Interface (HMI)

##### 3.2.2.1 Airport CDM Platform

For an Airport CDM Platform, all functions are described in the Functional Requirement Document (reference 2). These detailed functions refer to the Concept Elements of Airport CDM, in order to outline the specifications of a system. Airport CDM Information Sharing requires that shared information is available through a common system, connected via proper interfacing to all partners' systems and databases. This common system is the main infrastructure, which is known as the Airport CDM Platform and must be developed, either by modifying an existing system (e.g. Airport or ATC), or designing a new one.

*Note: It must be noted that sensitive commercial information shall not be accessible to competing Aircraft Operators, but only to other partners such as ATC or Airport.*

### 3.2.2.2 Information Standards

Format of the data is essential to avoid inconsistencies or data recognition problems. As different partners have different formats, filters and converters should be specified and developed in order to interface different systems and avoid data problems.

Efficient implementation requires that the standards used, including data conventions, are universally acceptable. The standards used must also satisfy the safety, security and reliability requirements, without creating an overkill situation and increasing costs unnecessarily. As a minimum, an agreement must be reached between all partners concerned in respect of the format and data conventions of the messages to be exchanged. (see Attachment 3.1 for a sample of a MoU)

Agreement on computer platforms and operating system aspects can provide substantial savings and is highly recommended. Incorporation into an existing system will require a different approach from that of a completely new implementation.

- ■ **It is recommended that new implementations use a PC platform and an operating system with good connectivity and compatibility**
- **Message formats must have at least AD-EXP support**
- **Web-based solutions are a good way of ensuring access at minimum cost**

### 3.2.2.3 Real-Time Information Transmission

Delivery of updated data to the central platform is essential to let others react on latest information. Hence those databases and the transmission channels require real-time performance of updating, and have database calculation functions acting upon new information designed both event and time driven.

### 3.2.2.4 Platform Procedures and Processes

Both generic and local processes are developed to enable scenarios to occur with the appropriate responses. Generic processes have been developed for the Milestone Approach Element (see chapter 3.2), and operational procedures are planned for de-icing and pre-departure (off-block) Sequencing. Local procedures closely following the functional requirements ensure, in themselves, a high degree of uniformity.

### 3.2.2.5 Alert Messages

Alerting is an important result of information sharing and information processing. Once new information is derived out of parameters that have entered the Airport CDM platform, it must be validated whether the value of the new information is compliant with tolerances and limits. Processes defined in the attachment will provide what parameters need to be checked, and what message shall be sent to the relevant partners after an inconsistency is detected.

### 3.2.2.6 Human-Machine Interface (HMI)

#### General considerations

It is recommended that the functionality of Airport CDM Information Sharing is implemented as a software application, utilising a standard windowing interface in order to keep costs to a minimum. This Implementation Manual will not give specific solutions, however a number of guidelines are provided in order to ensure that the various local implementations are consistent with each other. Whilst certain details may be subject to local adaptation, many of the HMI features are common, irrespective of the location.

Some of the information processed by the software application may be commercially sensitive or may not be freely disclosed for security reasons. Such data and / or the results of the calculations must be protected by the HMI. It is recommended that this is best achieved by the use of User Profiles.



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Protection of the data inside the software application will also need to be ensured. Protected databases, encryption, firewalls and other commercial off the shelf security products should be considered as ways to ensure the appropriate protection of sensitive data.

➤ **The technical infrastructure of Airport CDM does not require expensive solutions!**

### **Uniformity of information**

The basic principle is that all users with the same level of access rights shall always see the same information. This principle must also be carried forward to the HMI. Any changes to information will be displayed to all users with the appropriate access rights.

### **Lists, windows and pop-ups**

As a minimum, the following lists are recommended:

- Operations list
- Arrival list
- Departure list

Additionally, a general information window is envisaged. Pop-ups may be used for specific purposes, e.g. alerts.

Since the software application will be outputting timed data referring to the same event category (e.g. landing), but with different significance (e.g. scheduled, estimated or actual), it is essential that the HMI makes such differences clearly identifiable.

### **Alerts**

The alerts specified in the definition of the software application must be displayed by the HMI in a user-friendly manner and filtered according to the User Profiles. Alerts may use changes of colour of the text or background or display of certain symbols.

### 3.2.3 High level Information provided by Main Partners

The partners are the main sources of data provision to the Airport CDM Platform. Below is a list of partners and associated data.

#### Aircraft Operator / Ground Handler

- Aircraft movement data
- Priority of flights
- Changes in turn-round times
- TOBT updates
- Planning data
- Information concerning de-icing
- Flight plans
- Aircraft registration
- Aircraft type
- Flight type

#### Airport

- Slot data, including relevant information such as ADES, SOBT
- Stand and gate allocation
- Environmental information
- Special events
- Reduction in airport capacity

#### Network Operations

- Data from flight plans
- SAM
- SRM
- FUM (Flight Status / ELDT) including change (CHG) or cancellation (CNL) messages

#### Air Traffic Control

- Real-time updates for ELDT or TLDT
- ALDT
- Runway and taxiway condition
- Taxi times and SID
- TSAT
- TTOT
- Runway capacity (Arrival / Departure)
- A-SMGCS data/radar information

#### Other Service Providers

- De-icing companies (estimated and actual times related to de-icing)
- MET Office (forecast and actual meteorological information)
- And others (fire, police, customs, fuel etc.)

➤ The above mentioned data can be provided by either the originator or other sources existing locally, e.g. ATC, ATS Reporting Office, Airport database etc.



Large TOBT display in front of aircraft for Ground Handler staff and pilot awareness



Brussels Airport CDM display for planning purposes



Show/No Show of Fits with status Startup Given  
 Calculations mode TSAT (with/without) CTOT  
 Runway capacity "what if" mode

North runway  
 Number  
 Status of handling  
 Callsign  
 De-icing remark  
 Target start up Approval Time  
 Detailed info for selected flight

Estimate Off-Block Time  
 Minimum Departure Interval  
 Standard Instrumental Departure Route  
 Calculated Take Off Time  
 Target Off-Block Time

SEPL-Dialog DFS North (FLF700)

Application Edit View Sort MDI

utc Runway Capacity  CTOT Off  
 SUG On CAB Warning Off Line

NR	MAS	CSN	TSAT	TOBT	CTOT	SID	MDI	EOBT
1	<	BAGS2C	06:28	06:26*		GIV		06:30
2	<	GW1081	06:30	06:30		GIV		06:30
3	A	DLH828	06:35	06:35*		GIV		06:35
4	-	SWR1121	06:40	06:40*		RID		06:40
5	A	RUS1531	06:42	06:40		EVI	07:01	06:40
6	*	LGL9722	06:56	06:55		RID		06:55
7	>	DLH1372	06:55	06:55		RID		06:55
8	+	DLH040	07:01	07:00*		MIQ		07:00
9	*	DLH9EH	07:03	07:03		ANK		07:00
10	+	DLH6UX	07:10	07:05*		MIQ		07:05
11	+	DLH1YK	07:05	07:05*		MIQ		07:05
12	+	LTU414	07:12	07:10*	07:40	GIV		07:00
13	+	DLH8UJ	07:15	07:10*		MIQ		07:10
14		DLH362	07:14	07:10*		MIQ		07:10
15	+	DLH9JX		07:15*		GIV		07:15
16		DLH7AJ		07:15*		GIV		07:15
17		DAT56V		07:20*		GIV		07:20
18	+	DLH55P				GIV		07:05
19	+	DLH2JC				ANK		07:05
20		DLH8PP				GIV		07:15
21	+	DLH4KJ				ANK		07:05
22	+	DLH967				GIV		07:20
23		DLH8FF				GIV		07:20
24		DLH9TK				GIV		07:20
25		DLH7PL				MIQ		07:20

+ DLH6UX -DACHF -LH : 10 (RMT) =10 (TXT) +0 (RDY) +0 (DCT)  
 CAP: 30 POS: 326E SID: MIQ6N

08:30 GW1081 : CAB expired!

Munich SEPL display with TSAT sequence based on TOBT and other factors

# DATA SOURCES

## Aircraft Operator/ Handling Agent



- planning data
- turn-round times
- flight plans
- movement data
- priority of flights
- aircraft registration and type changes
- TOBT
- movement messages

## Air Traffic Control



- ELDT
- ALDT
- TSAT
- TTOT
- runway and taxiway conditions
- taxi times
- SID allocation
- runway capacity
- A-SMGCS data/  
radar information



## Airport CDM Information Sharing



## Airport Operations

- stand and gate allocation
- environmental information
- special events
- reduction in capacity
- airport slot data
- ADES
- SOBT



## Network Operations



## Service Providers

- de-icing companies
- MET office  
(forecast & actual met. info)
- and others  
(fire, police, customs, fuel, etc...)



### 3.2.4 Processing of Information

#### ATC Flight Plan (FPL)

Most airports, whether they are coordinated or not, can extract from their databases the scheduled information needed for their daily operations (IATA format). That information should be integrated with the available FPL information in ICAO format (note) in order to build a 4D profile of the flight.

*note: The flight plan as filed with an ATS unit by the pilot or a designated representative, without any subsequent changes (ICAO Definition). When the word “message” is used as a suffix to this term, it denotes the content and format of the filed flight plan data as transmitted.*

#### Special events / environmental and weather information

This information is available on the day of operations and shall be considered for (re-) planning purposes. Special event information may be available in advance in case of e.g. large sport events.

#### 3.2.4.1 Common data related to the aircraft

##### Aircraft Registration

Aircraft registration is normally provided on the day of the operation. At coordinated airports, the registration shall be linked to the Airport Slot Programme for the day of operation. Changes to the aircraft registration shall be communicated. Airport slot and aircraft registration shall be correlated.

##### Aircraft Operator / Ground Handler

From the ATC Flight Plan, the Aircraft Operator can be defined. The Ground Handler providing the servicing of an aircraft while it is on the ground can be abstracted from the Aircraft Operator.

##### Aircraft Type

e.g. Boeing 747, 737 or Airbus 319 or 380, etc.

##### Aircraft Parking Stand

Number or character of multiple digits

Common data related to the aircraft	Data extracted from arriving flight information	Data extracted from departing flight information
■ Aircraft registration	■ Aircraft identification	■ Aircraft identification
■ Aircraft flight status	■ ADEP	■ ADES
■ Aircraft type	■ Inbound flight type	■ SID
■ Aircraft parking stand	■ Take off time from outstation	■ Outbound flight type
■ Boarding gate	■ EET	■ De-icing
■ Turn-round time	■ Landing time	■ Off-block time
■ Handling agent	■ Taxi-in time	■ Taxi-out time
■ TOBT	■ In-block time	■ Take off time

#### Aircraft related data elements of a CDM operation

### Boarding Gate

In case needed also mention the terminal.

### Turn-round Time

The Minimum Turn-Round Time (MTTT) is determined when the field is initialised, however the data is overwritten by an Estimated Turn-Round Time (ETTT) when a value is entered by an agent. MTTT will depend on aircraft type, possibly type of stand, airline procedures, etc., and will be derived from an agreed table available in the airport database. Values of MTTT shall be determined for each aircraft type and stored as a default or initialisation value.

### TOBT

TOBT can be calculated as ELDT+EXIT+ MTTT or ALDT+EXIT+ MTTT or AIBT + MTTT.

If TOBT is earlier than EOBT, then EOBT value is displayed as TOBT, until updated / confirmed by the Aircraft Operator or Ground Handler. Confirmation can also be triggered automatically based on a time parameter before TOBT.

### Aircraft Flight Status

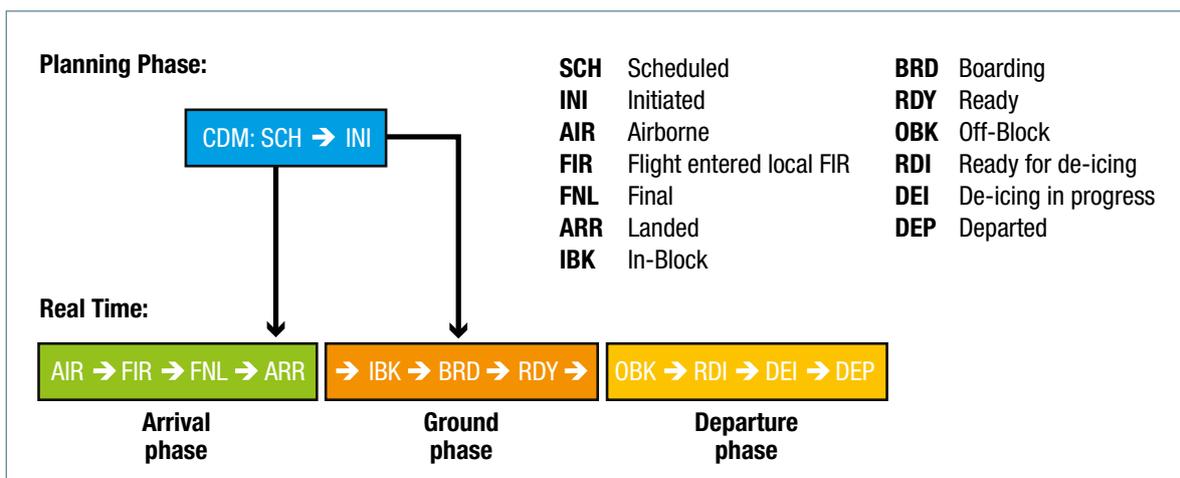
In the planning phase, the aircraft flight status is initially set as Scheduled (SCH), when a scheduled departure time is detected in the Airport database. The next transition will be to the Initiated Status (INI), when the departure information is confirmed by a FPL coming from ATC. In the tactical phase, the aircraft flight status updating process will be performed by real-time messages triggered by events. These can be found in attachment 4, Event Triggers.

#### 3.2.4.2 Data extracted from the arriving flight information

### Aircraft identification <sup>1</sup>

When the ATC Flight Plan is received, the aircraft identification is used to correlate the ATC Flight Plan with the airport schedule. If correlation is not possible the ATC Flight Plan shall be presented to an operator for processing.

1- A group of letters, figures or a combination thereof which is either identical to, or the coded equivalent of, the aircraft call sign to be used in air-ground communications, and which is used to identify the aircraft in ground-ground air traffic services communications (ICAO Definition).



**Aircraft flight status: in addition the ground radar picture used by ATC (e.g. A-SMGCS) can be shared by CDM partners so that the location of aircraft and vehicles can be monitored on the aerodrome surface**



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### **Aerodrome of Departure (ADEP)**

When the ICAO flight plan is received, the ADEP therein shall be compared with the airport slot ADEP. In case of a discrepancy, the ICAO flight plan shall be presented to an operator for processing.

### **Inbound flight type**

Schengen/Non-Schengen, cargo, general aviation etc.

### **Estimated Elapsed Time (EET)**

Derived from the filed flight plan.

### **Take off time of inbound flight**

ATOT from outstation.

### **Landing time**

ELDT, TLDT, ALDT

### **In-block time of inbound flight**

EIBT, AIBT

### **Estimated taxi-in time**

EXIT

#### **3.2.4.3 Data extracted from the departing flight information**

### **Aircraft identification**

When the filed flight plan is received, the aircraft identification is used to correlate the flight plan with the airport slot of the flight. If correlation is not possible, or if the airport slot is already correlated, the filed flight plan shall be presented to an operator for processing.

### **Aerodrome of Destination (ADES)**

When the filed flight plan is received, the ADES therein shall be compared with the airport slot ADES. In case of a discrepancy, the filed flight plan shall be presented to an operator for processing.

### **Standard Instrumental Departure (SID)**

Defaults to that based on RWY in use and ADES or as input by ATC.

### **Outbound flight type**

Schengen/Non-Schengen, cargo, general aviation etc.

### **Off-block time**

SOBT, EOBT, TOBT / TSAT, AOBT.

SOBT shall be extracted from the airport slot and entered together with the programme for the day.

### **Take off time**

ETOT, CTOT, TTOT, ATOT

### **Estimated taxi-out time**

EXOT

## **3.2.5 Local Settings and Platform Inputs**

The Airport CDM Platform receives most of its information automatically from the partners' databases. However, certain manual inputs are required to be set locally on the airport, or even individually per person. These include:

- System management
- Individual display settings
- Response to alerts
- Change of default values
- Change of arrival or departure sequence
- Changes to airport configuration and runway capacity

The HMI will allow only inputs and / or changes to be made in accordance with the access rights embedded in the User Profile. For example, Aircraft Operators or Ground Handlers may only affect inputs or changes for their own flights. Similarly, the arrival or

departure capacity, sequence and runway to be used may only be changed by ATC, whilst ATC will not have access rights to change details of a flight which are in the domain of the Aircraft Operator.

### 3.2.6 Regulatory Aspects

The implementation of this Airport CDM functionality at an airport does not, in any way, negate any of the applicable rules and regulations already in force.

Airport CDM is based on the voluntary cooperation of the various partners, as a consequence of the mutual recognition of the benefits that will accrue for all. Currently, community specifications are under development by the European Commission.

Nevertheless, in order to ensure reliable and consistent operation, the roles and responsibilities of all partners need to be formalised in a comprehensive Memorandum of Understanding and, where applicable, Service Level Agreements. The latter is of particular significance in respect of those partners undertaking certain services on behalf of others. Attachment 3 contains samples of a Memorandum of Understanding (MoU).

It is important that the partners also agree and appoint an Airport CDM Project Manager to manage all the organisational aspects, as mentioned earlier.

### 3.2.7 Publication of Information

The availability of the Airport CDM Information Sharing function will have to be made known to all concerned. Information will be available from, at least, the following sources:

- Operator handbooks and training material
- Website
- AIS channels

Operator handbooks and training material will be produced to ensure the uniform training of operators and the harmonised implementation of procedures. The Operator handbooks will have a common core and additional supplements to reflect the particular environments of the various partners. Aircraft Operators will also want to use extracts as supplements to on-board documentation.

The training material is probably best developed as an interactive, self-teaching course, with specific modules also suitable for pilots. This approach can save expensive training time.

Enough copies of both the Operator handbook and training material should be stocked, so that new partners can be given sufficient copies as soon as they come on-board.

The specific procedures applicable as a result of the implementation of this functionality will also have to be published via the usual AIS channels, including the AIP (**see generic AIP text in Attachment 3.3**).



### 3.3 The Milestone Approach for the Turn-Round Process

#### 3.3.1 Objective and Scope

Where Airport CDM Information Sharing has been implemented, significant further improvements can be achieved by implementing the Milestone Approach for the turn-round process. Here, the progress of a flight is tracked in the Airport CDM Platform by a continuous sequence of different events, known as milestones, and rules for updating downstream information and the target accuracy of the estimates are defined. Different Airport CDM Partners can be responsible for different milestones, with the aim of integrating all of the milestones into a common seamless process for the flight.

The main objective of the Milestone Approach is to further improve the common situational awareness of all partners when the flight is inbound and in the turn-round flight phases. More specifically, the objectives are to:

- Determine significant events in order to track the progress of flights and the distribution of these key events as Milestones
- Define information updates and triggers: new parameters, downstream estimates updates, alert messages, notifications, etc.
- Specify data quality in terms of accuracy, timeliness, reliability, stability and predictability based on a moving time window
- Ensure linkage between arriving and departing flights
- Enable early decision making when there are disruptions to an event.
- Improve quality of information

#### The Milestone Approach focuses on:

- A set of selected milestones along the progress of the flight (arrival, landing, taxi-in, turn-round, taxi-out and departure), where the partners involved in the flight process change.
- Time efficiency performance, which is measured for each milestone or between two milestones.

The flight profile is built by linking the above, so that time performance between every milestone and its update in real-time becomes a fundamental parameter for the Milestone Approach. Timely shared information is paramount to enable each partner to react in time to update their milestones in real-time. In this way performance improvements in predictability and efficiency can be obtained by the action of each partner and shared between partners.

Once a flight has been activated in the Airport CDM Platform, on receipt of the ATC Flight Plan, several default values for this flight can be added based on generic and local rules e.g. stand number, variable taxi times, Estimated Off-Block Time and a Target Take Off Time. Aircraft Operators and Ground Handlers can review and update certain default values in order to improve the quality of the prediction, e.g. based on the number of passengers or the progress of connecting flights.

One of the main contributions to performance from Airport CDM is the TOBT. Its quality can be assessed, by measuring its timeliness, accuracy and predictability. The confidence for decision making relies on the quality of the TOBT, which in turn depends on several other milestones, so the precision of each milestone should also be analysed to identify which ones need to be improved to obtain an accurate TOBT.

The progress of the flight is monitored automatically and as the flight progresses through each of the milestones, more information is added and modified as it

becomes available (i.e. flight plan, ATFM measures, actual progress etc), and the downstream milestones are updated accordingly and alerts are raised, if required. A delayed arrival will usually have an impact on the departure phase of the flight using the same airframe, and can also affect:

- the crew
- the flights carrying transfer passengers
- the gate/stand occupation and subsequent partner resource planning

Should the flight become late, the Aircraft Operator is prompted to re-plan (e.g. stand and gate changes) or re-schedule the corresponding outbound flight and any associated connecting flight(s).

Post-process analysis will not only enable the partners to monitor the benefits of Airport CDM but also help them to establish the precise reasons for not meeting the Milestone requirements in respect of individual flights. Action can then be undertaken to minimise the effects in the future or eliminate the causes altogether, e.g. by updating default values.

### 3.3.2 Requirements for Implementation

The main requirements for this element are:

- Have the technical infrastructure and hence Information Sharing in place and working properly
- Have local agreement on what processes are needed to improve turn-round predictability of events
- Proper display of output generated by Milestone processes

#### 3.3.2.1 Technical infrastructure

This functionality is based on the already implemented Information Sharing. Additional data input and output must be provided for, in addition to the re-

quired computing logic if implemented as a software application.

#### 3.3.2.2 Stakeholder agreement on implementation of Generic Milestone Processes

This document (see attachment 2) provides generic processes, which may be adapted according to local needs. However, it is of importance that all partners agree to the procedures implemented, and adjust their way of working based on this agreement.

#### 3.3.2.3 Human-Machine Interface

The specific user interface requirements are limited and are best met by combining with the HMI of the Airport CDM Information Sharing. Important output from this Concept Element are messages sent according to the procedures, which shall be presented to the Airport CDM Platform users, preferably in their existing display.

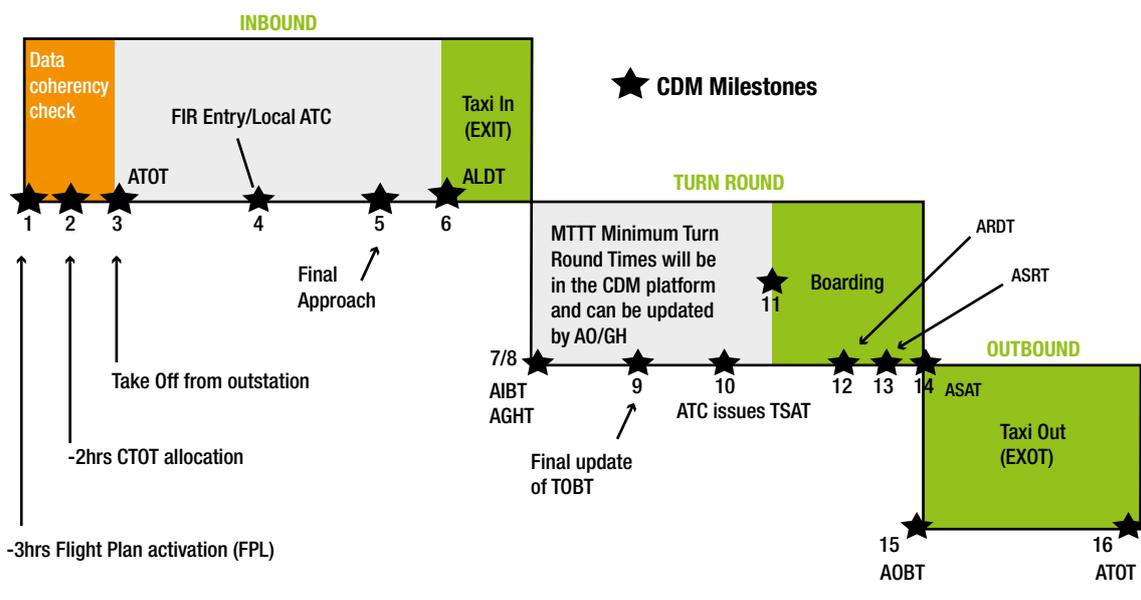
### 3.3.3 The Defined Milestones

A total of 16 basic Milestones have been defined. The list of Milestones is indicative, more milestones may need to be included to cover for extra information updates on key events, such as de-icing. Local procedures may dictate that some milestones may not be required, and are therefore considered as not highly recommended. The defined Milestones are presented in the table below. **Related processes and alert messages are contained in Attachment 2.**

### 3. IMPLEMENTATION



Number	Milestones	Time Reference	Mandatory / Optional for Airport CDM Implementation
1	ATC Flight Plan activation	3 hours before EOBT	Highly Recommended
2	EOBT – 2 hr	2 hours before EOBT	Highly Recommended
3	Take off from outstation	ATOT from outstation	Highly Recommended
4	Local radar update	Varies according to airport	Highly Recommended
5	Final approach	Varies according to airport	Highly Recommended
6	Landing	ALDT	Highly Recommended
7	In-block	AIBT	Highly Recommended
8	Ground handling starts	ACGT	Recommended
9	TOBT update prior to TSAT	Varies according to airport	Recommended
10	TSAT issue	Varies according to airport	Highly Recommended
11	Boarding starts	Varies according to airport	Recommended
12	Aircraft ready	ARDT	Recommended
13	Start up request	ASRT	Recommended
14	Start up approved	ASAT	Recommended
15	Off-block	AOBT	Highly Recommended
16	Take off	ATOT	Highly Recommended



### 3.3.4 Description of Milestones

The following table describes in detail each Milestone, including its origin, timing, required data quality and effect. The section is written as the concept is supposed to work. For a detailed description please read the Generic Procedures in attachment 2.

<b>MILESTONE 1      ATC Flight Plan Activated</b>	
<b>Definition</b>	The ICAO flight plan is submitted to ATC. The Airport CDM Platform is initiated for this flight, and all available information is processed.
<b>Origin and priority</b>	The ATC Flight Plan is submitted by the Aircraft Operator and distributed by the IFPS. All involved ATC units receive the flight plan, including departure and destination aerodromes.
<b>Timing</b>	Normally this takes place 3 hours before EOBT, however it may be later. In some cases a repetitive flight plan (RFPL) has been submitted, covering daily or weekly flights.
<b>Data Quality</b>	The ATC Flight Plan corresponds to the airport slot programme.
<b>Effect</b>	One aircraft turn-round normally includes an arriving and a departing flight, meaning that it will have two related flight plans. For coordinated airports, the outbound flight is already known. The flight plan may be used to update certain information such as type of aircraft. For long distance flights, the ELDT may differ from the airport slot. For non coordinated airports, the flight plan is used to initiate the outbound flight. The flight is ready not later than 15 minutes after the planned EOBT. The DPI process commences the correct messaging with Network Operations (if implemented – see attachment 2 for details).
<b>Procedures</b>	<p>To check consistency between ATC Flight Plan, Airport Slot and Airport flight data and then confirm the flight to the Network Operations and allow further local processing of the flight.</p> <p>This check shall be performed to verify the consistency between the ATC Flight Plan, Airport Slot and Airport flight data before the first E-DPI is sent. The AO must provide correct information before this first E-DPI message, in order to feed Network Operations with consistent SOBT, aircraft registration, and first destination data, as early in time as possible. The E-DPI message should not be sent if no or inconsistent information is provided.</p> <p>This process is triggered by:</p> <ul style="list-style-type: none"> <li>■ The first activation of the ATC Flight Plan (earliest EOBT-3 hr), or</li> <li>■ New or late submissions of the ATC Flight Plan, after cancellation or revised EOBT</li> </ul>
<b>Operational Status (changes to)</b>	INITIATED
<b>Action on CDM Operation (ACISP)</b>	<p>ELDT and EIBT updated for an arrival</p> <p>EOBT and ETOT updated for a departure</p> <p>The DPI process commences (if implemented – see section 3.7.3 for details).</p>

### 3. IMPLEMENTATION



<b>MILESTONE 2      EOBT - 2 hr</b>	
<b>Definition</b>	At EOBT-2 hr most flights will be known in the Airport CDM Platform including if they are regulated or not. All regulated flights receive a CTOT from Network Operations.
<b>Origin and priority</b>	The CTOT is issued by the Network Operations and is sent to relevant ATS units as well as the departure aerodrome. CTOT flights usually have a priority over unregulated flights.
<b>Timing</b>	If the flight is regulated, a CTOT is issued at EOBT-2h.
<b>Data Quality</b>	Not applicable.
<b>Effect</b>	For inbound flights, ELDT is updated based on information provided by the FUM messages, taking into account the actual progress of the flight.
<b>Procedures</b>	<p>To check (before or after take off from outstation) whether AO/GH flight estimates are consistent with the ATC Flight Plan and to inform Network Operations about the updated take off time estimate, using a T-DPI Message.</p> <p>This check shall be performed to verify feasibility of the ATC Flight Plan estimated off block time at EOBT-2 hrs. At EOBT-2 hrs Network Operations is informed through the first T-DPI message. Calculation basis for the TTOT shall take into account EIBT+MTTT+EXOT, if later than EOBT+EXOT. In the case of manual input of TOBT, this estimate will override the EIBT+MTTT estimate, hence TTOT equals TOBT+EXOT.</p> <p>This procedure is triggered by</p> <ul style="list-style-type: none"> <li>■ a time stamp, at EOBT – 2h.</li> </ul>
<b>Operational Status (changes to)</b>	N. A.
<b>Action on CDM Operation (ACISP)</b>	ETOT/TTOT/CTOT Mark appropriate fields as REGULATED

### **MILESTONE 3      Take Off from Outstation**

**Definition**                      The ATOT from the outstation (ADEP)

**Origin and priority**          The outstation provides ATOT to the Network Operations and Aircraft Operator.

**Timing**                              The information is directly available after occurrence of the milestone.

**Data Quality**                      The accuracy of ATOT is +/- 1 minute.

**Effect**                              If the departure airport is more than 3hrs flying time from the destination airport the ATOT is received from either the Network Operations FUM or via the Aircraft Operator / Ground Handler. Using the ATOT an ELDT can be calculated by using the Estimated Elapsed Time on the FPL.

If the flight is within 3hrs flying time of the destination airport the Network Operations monitors progress of the flight using the ETFMS and send a Flight Update Message (FUM) that provides updates of the flight's progress.

**Procedures**                      To check whether the AO/GH estimated landing time after take off from outstation are consistent with the outbound ATC Flight Plan, and when needed inform the Network Operations about the updated take off time estimates using a T-DPI-t Message.

This check shall be performed to verify feasibility of the ATC Flight Plan at take off from outstation. A TTOT tolerance of 5 minutes is respected before Network Operations is informed of the updated TTOT. Calculation basis for the TTOT shall take into account EIBT+MTTT+EXOT. In case EOBT is later than EIBT+MTTT, TTOT equals EOBT+EXOT. In the case where TOBT is available this prediction will overrule the EIBT+MTTT estimate, hence TTOT equals TOBT+EXOT.

This process is triggered by  
■ the take off from outstation.

**Operational Status  
(changes to)**                      AIRBORNE

**Action on CDM  
Operation (ACISP)**              ELDT, EIBT, TOBT and TTOT updated



<b>MILESTONE 4      Local Radar Update</b>	
<b>Definition</b>	The flight enters the FIR (Flight Information Region) or the local airspace of the destination airport.
<b>Origin and priority</b>	This information is normally available from the Area Control Centre (ACC) or Approach Control Unit that is associated with an airport. The radar system is able to detect a flight based upon the assigned SSR code when the flight crosses a defined FIR/ATC boundary.
<b>Timing</b>	Dependent upon the position of the airport in relation to the FIR boundary.
<b>Data Quality</b>	Must be equal to the accuracy of the ATC system.
<b>Effect</b>	<p>Update of the ELDT can trigger a new TOBT to be entered by the AO/GH, or calculated automatically by the Airport CDM Platform. The accuracy of ELDT is particularly important at this stage since downstream decisions are taken, such as stand /gate / aircraft changes, preparation of arrival sequence, preparation of ground handling operations, decisions for connecting passengers.</p> <p>Uncertainty and ELDT non-accuracy at this stage significantly increase risks for bad and last minute decisions and internal disruptions. The objective to decrease the number of stand and gate changes in the last 30 minutes requires high accuracy regarding departure and arrival times. Therefore, taking into account the taxi-in time (EXIT), any change to a stand or gate is not preferred after ELDT-30'.</p> <p>The update of TOBT for the related departing flight takes place following this milestone. Decisions such as the turn-round period, connecting passengers etc are taken and need to be stable at this event. An estimated in-block time (EIBT) is computed using the ELDT and the estimated taxi-in time.</p>
<b>Procedures</b>	<p>To commence the TOBT process and check whether the AO/GH TOBT is consistent with the ATC Flight Plan. Network Operations is informed when the TTOT changes by more than the agreed TTOT tolerance.</p> <p>This check shall be performed to verify feasibility of the ATC Flight Plan given the updated TOBT. The TTOT tolerance is respected before Network Operations is informed of updated TTOT.</p> <p>This process is triggered by</p> <ul style="list-style-type: none"> <li>■ the detection of the flight by radar in either FIR, TMA, or on Final Approach.</li> </ul>
<b>Operational Status (changes to)</b>	FIR
<b>Action on CDM Operation (ACISP)</b>	ELDT, EIBT, TOBT and TTOT updated

## MILESTONE 5 Final Approach

<b>Definition</b>	The flight enters the Final Approach phase at the destination airport.
<b>Origin and priority</b>	This information is normally available from ATC. The radar system detects a flight based upon the assigned SSR code and identifies when the flight crosses either a defined range / position or passes/leaves a predetermined level.
<b>Timing</b>	Dependent upon local parameters that are defined by ATC.
<b>Data Quality</b>	Must be equal to the accuracy of the ATC system.
<b>Effect</b>	Update of the ELDT to determine a new TOBT. When a flight reaches this stage it is usually between 2 and 5 minutes from landing (depending on the parameter set by ATC). This is often the prompt for many partners to start moving resources connected with the flight, such as positioning a parking marshal and ground handling services.
<b>Procedures</b>	<p>To commence the TOBT process and check whether the AO/GH TOBT is consistent with the ATC Flight Plan. Network Operations is informed when the TTOT changes by more than the agreed TTOT tolerance.</p> <p>This check shall be performed to verify feasibility of the ATC Flight Plan given the updated TOBT. The TTOT tolerance is respected before Network Operations is informed of updated TTOT.</p> <p>This process is triggered by</p> <ul style="list-style-type: none"><li>■ the detection of the flight by radar in either FIR, TMA, or on Final Approach.</li></ul>
<b>Operational Status (changes to)</b>	FINAL
<b>Action on CDM Operation (ACISP)</b>	ELDT, EIBT, TOBT and TTOT updated



<b>MILESTONE 6 Landed</b>	
<b>Definition</b>	ALDT – Actual Landing Time. This is the time that an aircraft touches down on a runway. (Equivalent to ATC ATA – Actual Time of Arrival landing, ACARS=ON).
<b>Origin and priority</b>	Provided by ATC system or by ACARS from equipped aircraft.
<b>Timing</b>	The information is directly available after occurrence of the milestone.
<b>Data Quality</b>	Data is available with an accuracy of +/- 1 minute.
<b>Effect</b>	<p>The occurrence of ALDT triggers an update of downstream estimates: TOBT and TTOT are updated automatically or inserted manually by the Aircraft Operator / Ground Handler, calculated on the basis of the defined turn-round period for the departing flight.</p> <p>The EIBT can be updated according to the ALDT +EXIT.</p>
<b>Procedures</b>	<p>To check whether the AO/GH TOBT is consistent with the ATC Flight Plan. Network Operations is informed when the TTOT changes by more than the agreed TTOT tolerance.</p> <p>This check shall be performed to verify feasibility of the ATC Flight Plan given the updated TOBT or ATC Flight Plan. A TTOT tolerance is respected before Network Operations is informed on updated TTOT.</p> <p>This process is triggered by</p> <ul style="list-style-type: none"> <li>■ Actual Landing Time: ALDT</li> </ul>
<b>Operational Status (changes to)</b>	LANDED
<b>Action on CDM Operation (ACISP)</b>	ELDT changes to ALDT, EIBT, TOBT and TTOT updated

**MILESTONE 7****In-Block****Definition**

AIBT - Actual In-Block Time. This is the time that an aircraft arrives in-blocks.  
(Equivalent to Airline/Handler ATA – Actual Time of Arrival, ACARS = IN)

*Note: ACGT is considered to commence at AIBT*

**Origin and priority**

ACARS equipped aircraft or automated docking systems or ATC systems  
(e.g. A-SMGCS) or by manual input.

**Timing**

The information is directly available after occurrence of the milestone.

**Data Quality**

Data is available with an accuracy of +/- 1 minute.

**Effect**

The occurrence of AIBT should trigger an update of downstream estimates: TOBT and TTOT are updated automatically or inserted manually by the Aircraft Operator / Ground Handler, calculated on the basis of the estimated turn-round period for the departing flight.

**Procedures**

To check whether the AO/GH TOBT is consistent with the ATC Flight Plan. Network Operations is informed when the TTOT changes by more than the agreed TTOT tolerance.

This check shall be performed to verify feasibility of the ATC Flight Plan given the updated TOBT or ATC Flight Plan. A TTOT tolerance is respected before Network Operations is informed on updated TTOT.

This process is triggered by

- Actual In Blocks Time: AIBT

**Operational Status  
(changes to)**

IN-BLOCK

**Action on CDM  
Operation (ACISP)**

EIBT changes to AIBT  
TOBT and TTOT updated



<b>MILESTONE 8</b>	<b>Ground Handling Started</b>
<b>Definition</b>	<p>Commence of Ground Handling Operations (ACGT).</p> <p><i>Note: this milestone is specific to flights that are the first operation of the day or that have been long term parked. For flights that are on a normal turn-round ACGT is considered to commence at AIBT.</i></p>
<b>Origin and priority</b>	<p>Aircraft Operator / Ground Handler will provide the information.</p>
<b>Timing</b>	<p>The information is directly available after occurrence of the milestone.</p>
<b>Data Quality</b>	<p>Data is available with an accuracy of +/- 1 minute.</p>
<b>Effect</b>	<p>The occurrence of ACGT triggers an update of downstream estimates: TOBT is updated automatically or inserted manually by the Aircraft Operator / Ground Handler, calculated on the basis of the estimated turn-round period for the departing flight.</p>
<b>Procedures</b>	<p>To check whether the AO/GH TOBT is consistent with the ATC Flight Plan. Network Operations is informed when the TTOT changes by more than the agreed TTOT tolerance.</p> <p>This check shall be performed to verify feasibility of the ATC Flight Plan given the updated TOBT or ATC Flight Plan. A TTOT tolerance is respected before Network Operations is informed on updated TTOT.</p> <p>This process is triggered by</p> <ul style="list-style-type: none"> <li>■ Actual Commence of Ground Handling: ACGT</li> </ul>
<b>Operational Status (changes to)</b>	<p>IN-BLOCK</p>
<b>Action on CDM Operation (ACISP)</b>	<p>ETTT/TOBT, TTOT updated</p>

## MILESTONE 9 Final Confirmation of the TOBT

**Definition** The time at which the Aircraft Operator or Ground Handler provide their most accurate TOBT taking into account the operational situation.

**Origin and priority** The Aircraft Operator / Ground Handler provides the information.

**Timing** The information is provided t minutes before EOBT (t is a parameter time agreed locally).

**Data Quality** Accuracy is agreed locally.

**Effect** The aim of the final TOBT is to give a timely, accurate and reliable assessment of the off-block time. It is recognised that main benefits of sharing the TOBT are expected in case of disruptions (internal or external). In such cases, the difference between EOBT (shared by ATC, Network Operations and Stand / Gate Management) and TOBT may be important.

An accurate TOBT at [EOBT-t minutes] is a pre-requisite for ATC to establish a push back / pre-departure sequence. Emphasis is put on the need for the Aircraft Operator to integrate his own strategy to compute a TOBT related to the flight. Following the receipt of the TOBT, the ATC system will calculate and provide the Estimated Taxi-Out Time (EXOT) based on the predicted traffic load, gate / stand location, runway in use, and waiting period at the Holding Position, etc.

The flight is introduced into the pre-departure sequence. The Aircraft Operator / Ground Handler, in coordination with the aircrew, can manage the turn-round process accordingly.

**Procedures** To check whether the AO/GH TOBT is consistent with the ATC Flight Plan. Network Operations is informed when the TTOT changes by more than the agreed TTOT tolerance.

This check should be performed at a predefined time (local parameter) to confirm TOBT prior to TSAT issue and verify feasibility of the ATC Flight Plan estimates given the updated TOBT. A TTOT tolerance is respected before Network Operations is informed on updated TTOT.

This Milestone Process is actually constantly applicable in the CDM Platform, as soon as a TOBT is available. However the confirmed TOBT prior to TSAT has special status, where AO/GH check the quality of TOBT before TSAT issue.

**Operational Status (changes to)** IN-BLOCK

**Action on CDM Operation (ACISP)** This process is triggered by ■ a new TOBT or TTOT update. No need to confirm an existing TOBT if it has been manually modified before.

### 3. IMPLEMENTATION



MILESTONE 10	TSAT Issued
<b>Definition</b>	The time ATC issues the Target Start Up Approval Time
<b>Origin and priority</b>	ATC
<b>Timing</b>	The information is provided t-minutes before EOBT, where t is a parameter agreed locally
<b>Data Quality</b>	Accuracy is agreed locally.
<b>Effect</b>	The flight is stabilised into the pre-departure sequence. The Aircraft Operator/ Ground Handler, in coordination with the aircrew, can manage the turn-round process accordingly.
<b>Procedures</b>	<p>First step: To inform all relevant partners of the TSAT that has been allocated to the flight. The Network Operations is informed by a T-DPI-s for non regulated flights.</p> <p>Second step: To check whether the number of TOBT updates exceeds a tolerance defined locally, after TSAT has been issued.</p> <p>First: The TSAT will indicate to the partners the time when the start up approval can be expected. Network Operations will be informed with a T-DPI-s for non regulated flights. No check is performed.</p> <p>Second: A check shall be performed to see the number of TOBT updates after TSAT has been issued. In case the number of TOBT updates exceeds a threshold, then the TOBT input should be processed according to local procedure.</p> <p>This process is triggered by</p> <ul style="list-style-type: none"> <li>■ A defined time (local parameter) before TOBT</li> <li>■ TOBT update after TSAT issue</li> </ul>
<b>Operational Status (changes to)</b>	SEQUENCED
<b>Action on CDM Operation (ACISP)</b>	TTOT updated

**MILESTONE 11****Boarding Starts**

<b>Definition</b>	<p>The gate is open for passengers to physically start boarding (independent of whether boarding takes place via an air-bridge/pier, aircraft steps or coaching to a stand).</p> <p>This is not to be confused with the time passengers are pre-called to the gate via flight information display systems (FIDS) or public address systems.</p>
<b>Origin and priority</b>	Automatic from airport system or manual input by Aircraft Operator/ Ground Handler.
<b>Timing</b>	The information is directly available after occurrence of the milestone.
<b>Data Quality</b>	Data is available with an accuracy of +/- 1 minute.
<b>Effect</b>	When boarding commences it gives the Airport CDM Partners a good indication of whether the TOBT/TSAT will be respected.
<b>Procedures</b>	<p>First step: To inform all relevant Airport CDM Partners of Actual Start Boarding Time (ASBT).</p> <p>Second step: To check whether boarding starts in time to respect TOBT and inform the AO/GH in case TOBT needs to be updated.</p> <p>Inform of Actual Start Boarding Time (ASBT) when it occurs. At a certain time before TOBT (local variable e.g. corresponding to aircraft type) a check shall be performed to check the boarding status.</p> <p>This process is triggered by</p> <ul style="list-style-type: none"><li>■ a time variable &lt;value&gt; minutes before TOBT.</li></ul>
<b>Operational Status (changes to)</b>	BOARDING
<b>Action on CDM Operation (ACISP)</b>	N.A.



<b>MILESTONE 12 Aircraft Ready</b>	
<b>Definition</b>	The time when all doors are closed, boarding bridge removed, push back vehicle connected, ready to taxi immediately upon reception of TWR instructions (ARDT).
<b>Origin and priority</b>	Provided by the Aircraft Operator/ Ground Handler.
<b>Timing</b>	The information is directly available after occurrence of the milestone.
<b>Data Quality</b>	Data is directly available with an accuracy of +/- 1 minute.
<b>Effect</b>	ATC refines the pre-departure sequence. The pilot requests start up just before TSAT, following coordination with the Ground Handler. (Dispatcher / Supervisor / Redcap).
<b>Procedures</b>	<p>First step: To inform all relevant Airport CDM Partners of Actual Ready Time (ARDT) in the Airport CDM Platform and that the aircraft is ready for start up / push-back.</p> <p>Second step: To inform the AO/GH that TOBT has passed and the Airport CDM Platform has not yet received ARDT or Ready Status (RDY).</p> <p>Inform of ARDT or RDY confirming that the flight follows the indicated TOBT. At TOBT + tolerance the AO/GH are informed that TOBT has passed and there has not been a ready status message yet.</p> <p>This procedure is triggered by</p> <ul style="list-style-type: none"> <li>■ an input to the Airport CDM Platform.</li> </ul>
<b>Operational Status (changes to)</b>	READY
<b>Action on CDM Operation (ACISP)</b>	N.A

## **MILESTONE 13      Start Up Requested**

<b>Definition</b>	The time that start up is requested (ASRT).
<b>Origin and priority</b>	ATC (based on pilot request).
<b>Timing</b>	The information is directly available after occurrence of the milestone.
<b>Data Quality</b>	Data is available with an accuracy of +/- 1 minute.
<b>Effect</b>	ATC confirms TSAT to the pilot in order to maintain the aircraft in the pre-departure sequence. Provided the aircraft was ready on time (ARDT), it is now up to ATC to assure that a regulated flight can respect its CTOT.
<b>Procedures</b>	<p>First step: To inform all relevant Airport CDM Partners of Actual Start up Request Time (ASRT) in the Airport CDM Platform.</p> <p>Second step: to alert all relevant Airport CDM Partners when no start up has been requested inside the locally agreed TSAT tolerance window.</p> <p>Inform of ASRT when it occurs. If the start up request is not made by TSAT + tolerance, the AO/GH is informed that no start up has been requested, and should update TOBT.</p> <p>Timestamp when the tolerance window has passed at TSAT.</p>
<b>Operational Status (changes to)</b>	N.A
<b>Action on CDM Operation (ACISP)</b>	N.A



<b>MILESTONE 14      Start Up Approved</b>	
<b>Definition</b>	ASAT - Actual start up Approval Time. This is the time that an aircraft receives its start up approval.
<b>Origin and priority</b>	ATC
<b>Timing</b>	The information is directly available after occurrence of the milestone.
<b>Data Quality</b>	Data is available with an accuracy of +/- 1 minute.
<b>Effect</b>	On receipt of ATC approval, the aircraft will start up, push back and start to taxi.
<b>Procedures</b>	<p>First step: To inform all relevant Airport CDM Partners of Actual start up approval Time (ASAT) in the Airport CDM Platform and that the aircraft has received start up approval / push-back clearance.</p> <p>Second step: To check if ASAT is in accordance to TSAT and to alert all relevant Airport CDM Partners when no start up has been granted.</p> <p>Inform of ASAT when it occurs. In case the start up approval is not granted at TSAT + tolerance, all relevant partners should be informed. The flight will be re-sequenced.</p> <p>Start up request by flight crew (voice or DCL) or a locally defined time around TSAT if Milestone Process 13 is omitted.</p>
<b>Operational Status (changes to)</b>	N.A
<b>Action on CDM Operation (ACISP)</b>	N.A

<b>MILESTONE 15      Off-Block</b>	
<b>Definition</b>	AOBT – Actual Off-Block Time. The time the aircraft pushes back/vacates the parking position (Equivalent to Airline/Handler ATD – Actual Time of Departure ACARS=OUT).
<b>Origin and priority</b>	ACARS equipped aircraft or automated docking systems or ATC systems (e.g. A-SMGCS) or by manual input.
<b>Timing</b>	The information is directly available after occurrence of the milestone.
<b>Data Quality</b>	Data is available with an accuracy of +/- 1 minute.
<b>Effect</b>	TTOT updated considering the EXOT.
<b>Procedures</b>	<p>First step: To inform all relevant Airport CDM Partners of Actual Off-Block Time (AOBT) in the Airport CDM Platform and that the aircraft has commenced push-back / taxi from parking position.</p> <p>Second step: To check if TTOT changes by more than the agreed tolerance and inform Network Operations.</p> <p>Inform of AOBT when it occurs. AOBT always triggers an A-DPI message to Network Operations or in the case of remote holding at a defined time prior to TTOT. After a first A-DPI is sent this check shall be performed to check TTOT updates against the TTOT tolerance before Network Operations is informed, with a new A-DPI, of the updated TTOT.</p> <p>This process is triggered by AOBT detection.</p>
<b>Operational Status (changes to)</b>	OFF-BLOCK
<b>Action on CDM Operation (ACISP)</b>	AOBT recorded



**MILESTONE 16    Take Off**

<b>Definition</b>	ATOT – Actual Take Off Time. This is the time that an aircraft takes off from the runway. (Equivalent to ATC ATD–Actual Time of Departure, ACARS = OFF).
<b>Origin and priority</b>	Provided by ATC system or from ACARS equipped aircraft.
<b>Timing</b>	The information is directly available as soon as possible after occurrence of the milestone.
<b>Data Quality</b>	Data is available with an accuracy of +/- 1 minute.
<b>Effect</b>	FSA and MVT messages are sent.
<b>Procedures</b>	To inform all relevant Airport CDM Partners about the actual take off.  An airborne message is generated and the flight is removed from the departure sequence.  This process is triggered by Tower FDPS, A-SMGCS / Radar detection or ACARS.
<b>Operational Status (changes to)</b>	DEPARTED / TAKE OFF
<b>Action on CDM Operation (ACISP)</b>	ATOT recorded

### **3.3.5 Responsibility to Planning Adherence**

The Aircraft Operator / Ground Handler is responsible for ensuring the aircraft is ready for start up in accordance with the declared TOBT / TSAT. After start up, ATC is responsible for ensuring the flight meets the CTOT. The responsibilities of all airport partners are described in Attachment 2 – Generic Airport CDM Procedures and Processes.

### **3.3.6 Testing and Fine Tuning**

The application creates a number of milestones when a flight is activated. Thereafter, and during the management / handling of the flight, calculated milestones can be compared to the real-time ones, to ensure the meeting of the objectives. Testing the application concentrates on validating the Milestones calculated by it, to ensure that the correct reference base is utilised.

### **3.3.7 Publication of information**

Operator handbooks and training material will explain the details of the Milestone Approach.



### 3.4 Variable Taxi Time

#### 3.4.1 Objectives and Scope

Accurate taxi times are essential for calculating the following important times in the Milestone Approach:

- the Estimated In-Block Time (EIBT)
- the Estimated and Target Take Off Time (ETOT and TTOT)
- the Calculated Take Off Time (CTOT) by Network Operations.

At complex airports the layout of runways and parking stands can result in a large difference in taxi time. Instead of using a standard default value, a calculation of the different permutations based upon historic data, operational experience and/or an integrated tool will provide a set of more realistic individual taxi times.

For arrivals an Estimated taXi-In Time (EXIT), added to the Estimated/Actual Landing Time (ELDT), will provide an accurate EIBT which will be beneficial for stand and gate planning, pre-departure sequencing and ground handling resource management.

For departures, an Estimated taXi-Out Time (EXOT), added to the Estimated Off-Blocks Time (EOBT) or Target Start up Approval Time (TSAT) will provide an ETOT or TTOT which can be used by the Network Operations to provide a realistic CTOT, to update the flight profile within ETFMS and hence optimise flow and capacity management of European air traffic.

The duration of the taxi time is calculated to the required accuracy, based on general and location-specific rules.

➤ Knowledge of realistic taxi times under changing conditions:

- Enables ATC to optimise the push back, taxi and take off sequence and hence reduce queuing and taxiway congestion
- Improves CTOT compliance

#### 3.4.2 Definition of Taxi Time

For Airport CDM purposes, taxi time is considered to be:

- For arriving flights: the Actual taXi-In Time (AXIT) is the period between the Actual Landing Time (ALDT) and the Actual In-Block Time (AIBT)
- For departing flights: the Actual taXi-Out Time (AXOT) is the period between the Actual Off-Block Time (AOBT) and the Actual Take Off Time (ATOT)

For calculation purposes within the CDM Platform, taxi times will be referred to as estimated taxi-in (EXIT) and estimated taxi-out (EXOT) as there is no requirement for a scheduled, actual or target taxi time.

#### 3.4.3 Requirements for Implementation

In order to derive accurate estimates for taxi times, it is of essence Information Sharing is in place.

➤ In order to keep track of the traffic situation taxi time parameters can be adjusted in order to hold or release aircraft at / from the stand, with the purpose to regulate traffic based on actual events. Surveillance data from radar or routing information from Advanced SMGCS, clearance input from controllers, or manual controller correction of taxi time values are all means to modify the taxi time estimates into more realistic values

### 3.4.4 Parameters Affecting Taxi Time

The most common parameters affecting taxi times are:

- Airport layout and infrastructure
- Runway(s) in use (including the distance of the taxi holding positions from the runway)
- Number of runway crossings required
- Aircraft parking stand location
- Meteorological conditions
- Aircraft type and operator
- Aircraft weight
- Push back approval delivery time
- Remote de-icing / anti-icing
- Traffic density
- Local operating procedures

### 3.4.5 Methods for Calculating Taxi Times

At most small airports there is no need for variable taxi times as the layout of terminals and runways normally means that the current default value will be sufficient. At medium and large airports the configuration of the runways and layout of terminal buildings can result in significant differences in taxi times for arriving and departing flights. In the situation where taxi times vary significantly a calculation should be made taking the following into account:

- The current default taxi times
- Input from operational expertise (e.g. ATC, local operators and Stand and Gate Management)
- Aircraft type / category
- Average taxi times based on historical data
- Specific taxi times based on operational conditions
- Taxi routings according to RWY in use

#### 3.4.5.1 Default taxi times

Default taxi times are used at most airports today, normally a single taxi time is attributed to each runway configuration (e.g. landing runway 03L = 5 minutes taxi-in time and Departure runway 03R = 9 minutes taxi-out time). These values apply to all types of aircraft, all weather conditions and all parking stands. This introduces inaccuracies and makes adherence to the CTOT difficult.

The default taxi time method may continue to be used at small airports where the accuracy achievable with this method is sufficient.

#### 3.4.5.2 Operational expertise

One of the most accurate sources of information at an airport concerning taxi times is from partners such as locally based AO's, ATC, Ground Handlers and Stand and Gate Management. These partners regularly deal with the movement of traffic and should be involved when evaluating the operational constraints and considerations concerning taxi times.

#### 3.4.5.3 Aircraft type / category

The different types of aircraft or wake vortex categories of aircraft should be taken into account as a significant variation can exist depending on the various aircraft types using the airport.

#### 3.4.5.4 Average taxi times based on historical data

The default taxi time method can be improved by replacing the default values with average taxi times calculated using historical data applicable for different runway configurations and either individual stands or groups of stands. It may also be necessary to consider different periods of the year, different days of the week, week-ends, periods of the day, arrival / departure mix, etc.



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The unimpeded taxi times may be deduced from simulations, historical data or actual measurements. They should take into account typical taxi speeds and aircraft types.

The unimpeded taxi times can be used for arriving flights and departing flights, where there is normally no queuing prior to take off.

### 3.4.5.5 Specific taxi times based on operational conditions

At airports where there is frequently a queue of aircraft prior to take off it is necessary to add additional time to the unimpeded times to account for any delay incurred at the holding point.

This extra time will be subject to local constraints but could be systematically updated according to information available in the Airport CDM Information Sharing Platform.

### 3.4.5.6 Advanced taxi time calculation

The methods previously detailed concern static data obtainable from look up tables. Future systems or tools (e.g., A-SMGCS) should be able to accurately

and progressively predict the taxi time dynamically using more sophisticated data sources. Any ground movement surveillance equipment, taking into account the conditions or position of the aircraft, will be able to improve the prediction of EIBT and ETOT or TTOT.

## 3.4.6 System Context

### Accuracy requirements

The accuracy requirements of taxi time calculations can be defined as Long, Medium and Short Term, as shown in the following table.

Note that these figures are still tentative.

### HMI considerations

The process used to apply variable taxi times must be an integral part of the Airport CDM Information Sharing.

Even in the most comprehensive system, not all eventualities can be covered by predetermined modification factors. There is therefore a need to enable the entry of manual modifications to the basic calculation of taxi time.

Timelines	Time periode covered	Input	Required Accuracy
Long Term	Off-Block Time - 3h to Off-Block Time - 2h	Predicted static data (current runway in use, and planned stand). If this information is not available then a default value should be used	+/- 7 minutes
Medium Term	Off-Block Time - 2h to Off-Block Time - 30 min	Update static data (current runway in use, and planned stand)	+/- 5 minutes
Short Term	Off-Block Time - 30 min to Actual Off-Block Time	Current runway in use and actual stand	+/- 2 minutes

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### 3.5 Pre-departure Sequencing

#### 3.5.1 Objectives and Scope

In most situations in air traffic management today, the principle of “first come first served” is applied. The result is that flights are often pushed back in an order that is not the optimal in the given ATC situation and/or which does not take into account the preferences of the Aircraft Operators. Often, “first come first served” leads to queuing near the runway threshold, and hence long waiting times with great quantities of fuel consumed by Aircraft Operators.

Pre-departure sequencing allows ATC to handle the Target Off-Block Times (TOBTs) obtained from the turn-round process in a way that flights can depart from their stands in a more efficient and optimal order. Based on aircraft progress by using the TOBT, as well as the operational traffic situation on the aprons, taxiways and near runways, ATC can provide a **TSAT** which places each aircraft in an efficient **pre-departure sequence (off-blocks)**. This results in regulated traffic flows towards the runways more steadily than today’s “first come first served” method.

➤ **The main objectives of Pre-departure Sequencing are:**

- Enhance sequence transparency
- Improve event predictability by creating **TSAT and TTOT predictability**
- Improve punctuality (e.g. slot adherence, **Airline Operator schedule**)

These objectives contribute to the high level objectives to improve efficiency and predictability for all Airport CDM Partners. Examples are an improvement of ground handling efficiency, or improved stand and gate management once the TSAT is known in

advance. It is expected that with improved predictability the overall flexibility will increase for each partner, especially when it comes to resource planning or planned buffer time calculation.

Applying this Concept Element, controllers remain responsible to ensure runway throughput, optimal capacity and safety. However for optimised runway sequencing the concept of Departure Management (DMAN) in combination with Arrival Management (AMAN) and A-SMGCS implementation, can be considered a key enabler in airport planning as well as network optimisation (Ref 9). For each airport it can be identified locally what resource forms the bottleneck to optimise: apron, gates, taxiways, or runways. An important change in sequencing can be identified when de-icing is needed. Then de-icing may become the bottleneck, and therefore sequence planning requires adjustment to the resource with the smallest capacity.

#### 3.5.2 Requirements for Implementation

##### 3.5.2.1 Presence of other Concept Elements

➤ **Pre-departure Sequencing will only work properly in conjunction with other Airport CDM Concept Elements.**

This element uses information from other CDM Concept Elements. Therefore, before being implemented, Information Sharing, Milestone Approach and Variable Taxi Time elements need to be in place at the airport concerned. Further, this element is a key requirement for the most advanced Concept Elements described later in this document: Adverse Conditions and Collaborative Management of Flight Updates.

### 3.5.2.2 Partner information exchange

The essential requirement of this pre-departure sequence element is the ability of partners to communicate accurate off-block predictions and preferences. Key parameters sent via ACISP are TOBT and preferences from one airline to prioritise (e.g. flight X before flight Y), and TSAT as output from ATC to all partners. The local implementation will determine the method how such information is made known to ATC.

➤ It is important to ensure that local arrangements are made for expressing preferences by all Airport CDM Partners to avoid misunderstandings.

### 3.5.2.3 Human-Machine Interface

In most systems possibilities for the indication of the preferences will include free text messages and even methods like a telephone call. However, it is important that in all cases the CDM recording facility be involved in some way to ensure proper traceability for all transactions. An example of the Munich display is shown below.

HR	HAZ	CSN	TSAT	TOBT	CTOT	SID	MDI	EORT
1	<	BAG92C	06:28	06:26*		GIV		06:30
2	<	GN1081	06:30	06:30		GIV		06:30
3	A	DLH928	06:35	06:35*		GIV		06:35
4	-	SVR1121	06:40	06:40*		RID		06:40
5	A	RUS1591	06:42	06:40		EVX	07:01	06:40
6	*	LGL9722	06:56	06:55		RID		06:55
7	>	DLH1372	06:55	06:55		RID		06:55
8	-	DLH040	07:01	07:00*		MIQ		07:00
9	*	DLH95H	07:03	07:03		ANK		07:00
10	+	DLH6UX	07:10	07:05*		MIQ		07:05
11	+	DLH1YE	07:05	07:05*		MIQ		07:05
12	-	LTU414	07:12	07:10*	07:40	GIV		07:00
13	+	DLH8UJ	07:15	07:10*		MIQ		07:10
14	+	DLH962	07:14	07:10*		MIQ		07:10
15	+	DLH93X		07:15*		GIV		07:15
16	+	DLH7A3		07:15*		GIV		07:15
17	+	DAT56V		07:20*		GIV		07:20
18	+	DLH55P				GIV		07:05
19	+	DLH2JC				ANK		07:05
20	+	DLH8FP				GIV		07:15
21	+	DLH4FJ				ANK		07:05
22	+	DLH967				GIV		07:20
23	+	DLH8FF				GIV		07:20
24	+	DLH9TK				GIV		07:20
25	+	DLH7PL				MIQ		07:20

### 3.5.2.4 Procedures

The Pre-departure Sequencing is directly interacting with the Generic Processes acting on ACISP, as described in chapter 3 and Attachment 2.1 and 2.2.

Once a new or updated TOBT is inserted by the AO or GH, the Generic Processes perform consistency checks and send out alerts in case of discrepancy. A TSAT is derived and issued well in advance of the TOBT (locally determined value), TTOT is calculated with VTT in combination with additional factors such as de-icing. TSAT and TTOT are distributed via ACISP to the partners, and TTOT is sent to Network Operations for slot update.

In the final phase before off-blocks, the pilot will be in communication with the Clearance Delivery controller. For this a new procedure is described in Attachment 2.3, and can be performed either via radio or data link. Below, details of the sequencing process are described.

### Establishing the initial sequence

Via the Airport CDM Platform a list of TOBTs is made available to ATC and other CDM partners representing the flight statuses of various flights. ATC, taking due account of the operational situation, will confirm the TOBT of each flight at some stage by providing a corresponding TSAT which is either equal to or later than the TOBT. These TSATs represent the pre-departure sequence in which flights will leave their stands.

The sequence is optimised taking known constraints into account. These include constraints that may arise from regulations (CTOT), the need to maximise runway throughput and ground movement interactions (e.g. push back from adjacent stands). It is of essence to note that besides the TSAT also the TTOT must be calculated. Each TTOT must be unique for a



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flight with an assigned runway, separated by vortex, SID, or arrival separation values. For runway use in mixed mode especially the latter is of importance, in order to avoid the situation where and Target Landing Time (TLDT) is equal to any TTOT since this represents a conflict in the planning of that particular runway.

Arrival Managers (AMAN) and Departure Managers (DMAN) are automated enablers, as required by the SESAR program, to be implemented in the coming decades. These will output the TLDT for arrivals and TTOT for departures on such mixed mode runway, and hence need close coordination or even integration to deliver conflict free planning or sequencing.

### Handling of preferences

ATC will initially sequence flights in the order in which the confirmed Target Off-Block Times (TOBT) are received, modified by known constraints, as explained above. Using the Airport CDM Platform, Aircraft Operators and the Airport Operator may express certain preferences whereas ATC will take these into account to the possible extent. The initial sequence is then modified, reflecting also the preferences as much as they were accepted.

One typical case where the Aircraft Operator preference can be applied is when two or more flights operated by the same Aircraft Operator will be ready at the same time (they have identical TOBTs) and one requires priority over the other due to AO reasons. Another case is where the Aircraft Operator requests a different take off order for his own flights, if other traffic is not harmed by that sequence swap.

DMAN, or the Pre-departure Sequencing application, has the role of considering the preference requests. E.g. flights with identical TOBT but operated by different Aircraft Operators may be sorted on the basis

of the existing delay they were allocated, in agreement with local performance targets.

Ground Handlers and other service providers will be able to allocate push back tugs to the correct flights at the appropriate time by monitoring the allocation of TSATs.

✦ **With Pre-departure Sequencing, the Aircraft Operator, Ground Handler or Airport Operator can express through TOBT a preference for the order at off-block or take off.**

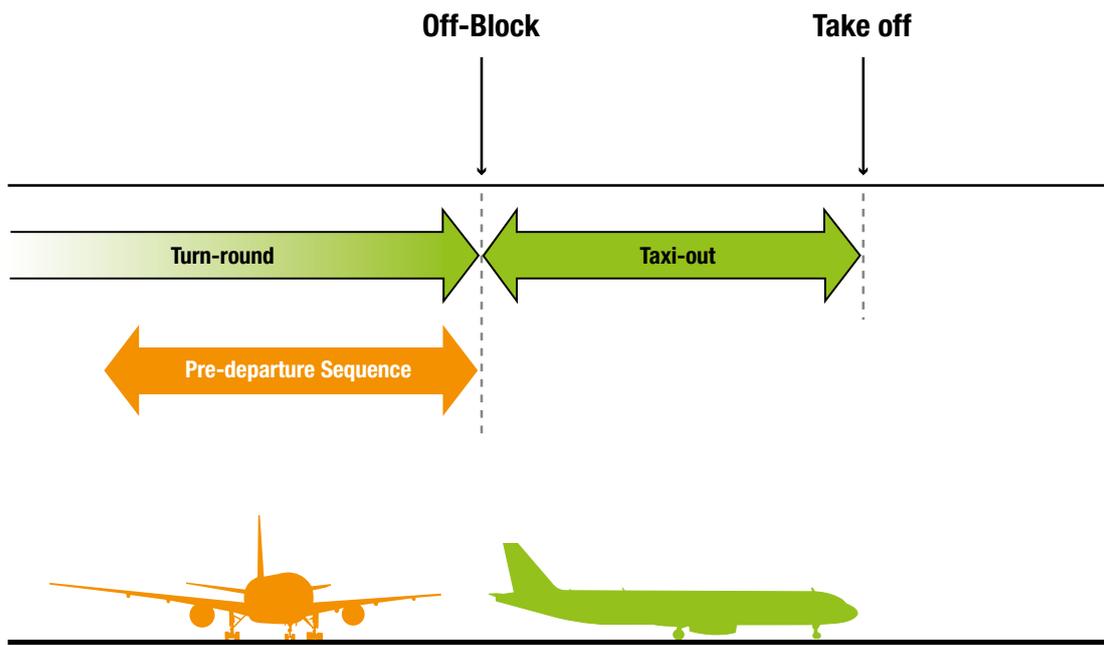
### 3.5.3 Regulatory Aspects

Protection of data and avoiding unauthorised access is one of the most important built-in features of CDM. In the case of Pre-departure Sequencing, ensuring that only authorised and well founded requests are passed to ATC is especially important. Any abuse or improper requests will quickly lead to loss of credibility of this Concept Element.

### 3.5.4 Publication of Information

It is important to ensure that all partners who may legitimately express a preference are fully conversant with the availability of this possibility and that they actively make use of it whenever appropriate. Keep in mind that the preference may in fact come from a partner or department of a partner, who is not located on or near the airport.

✦ **Make partners aware of the availability of this feature! Encourage them to use it!**



Collaborative pre-departure sequence based on constraints and preferences



### 3.6 Adverse Conditions

#### 3.6.1 Objectives and Scope

Many different events, both planned and unplanned, can disrupt the normal operation of an airport and reduce its capacity to levels substantially below that of normal operations.

There are adverse conditions which can be foreseen with more or less accuracy and both their scope and likely effects are predictable. Snowy conditions, industrial action allowing the maintenance of elementary services, etc. would fall in this category.

A fire or aircraft incident / accident is more difficult to prepare for in terms of procedures. In fact too detailed, pre-arranged procedures may even be more of a hindrance than a help.

The Adverse Conditions Element aims to enable the management of reduced capacity in the most optimal manner possible and to facilitate a swift return to normal capacity once adverse conditions no longer prevail.

This element also ensures that de-icing, whether on stand or remote, becomes part of the overall process of handling a flight. The time required for de-icing becomes visible to the partners and it can also be accounted for in the calculation of the various target times.

➤ **Predictability can be enhanced substantially by the application of the Adverse Conditions Concept Element.**

#### 3.6.2 Requirements for Implementation

##### 3.6.2.1 Presence of other Concept Elements

Adverse Conditions Element will only work properly in conjunction with other Airport CDM Concept Elements. Therefore, Information Sharing, the Milestone Approach, Variable Taxi Time and Pre-departure Sequencing all need to be in place for this element to be effective at the airport concerned.

##### 3.6.2.2 Technical infrastructure

While most adverse conditions will not impact the ability of the CDM related infrastructure to perform normally, there might be situations where the normal CDM functions are not sufficient. E.g. requirement for a CDM Cell

##### 3.6.2.3 Human-Machine Interface

Since the output of this element is almost exclusively alerts and warnings, the HMI must cater for the appropriate display and prominence of such outputs.

Since some warnings will come well in advance of the condition concerned, they should be handled in a way that are not forgotten or overlooked.

##### 3.6.2.4 Procedures

Most airports have developed certain procedures and specific arrangements to deal with periods of adverse conditions, whether planned or unplanned. Today, not all procedures are equally effective and they are often applied inconsistently or without proper coordination between the partners concerned. The process to analyse the effectiveness of the procedures and to identify areas that need improvement does not exist.

At some airports, procedures and actions to be followed and carried out are not connected to the type of adverse condition, but to the capacity-change it causes. This results in a less rigid system and covers all possible eventualities with less need to educated guesswork in the planning.

Regardless of the approach chosen, the Adverse Conditions element requires to maintain the monitoring of the CDM elements. The use of proven, effective and fully coordinated procedures could reduce the consequence of adverse conditions, being capacity changes and long recovery times.

No two airports are the same and the procedures applicable to predictable and unpredictable adverse conditions will be different by definition. However, there are certain common considerations which should form the basis of the procedures, irrespective of the local differences. The following should be undertaken:

- Prepare an adverse conditions or crisis plan of procedures and actions
- Make sure the procedures are simple and are the same as those used in normal operations, where possible
- Ensure that all partners, at all levels, are familiar with the procedures
- Appoint an Airport CDM Coordinator who will be responsible for coordinating the activities

### Predictable adverse conditions

➤ **Even among predictable adverse conditions, some are more predictable than others. It is important that the procedures developed and the measures implemented take this into account.**

For example, two types of predictable adverse conditions, which fall on the opposite extremes of being more or less predictable, are:

- weather forecasts
- planned maintenance.

The latter will in all likelihood stay within the pre-notified period of time and hence tight planning of resources and procedures around that time period is appropriate. Forecast icing or low visibility has not only uncertainty in whether it will occur at all, but uncertainty exists also in regard of the time period during which it is to be taken into account. This calls for planning with a much wider latitude.

Here is a list of the most significant predictable adverse conditions:

- **Weather and associated runway and taxiway configuration** – Especially wind will have a major impact on the runways to be used and the associated taxi routes that will be utilised. The expected configuration will determine the capacity available in the given period at the airport. This information has to be shared between the Airport CDM Partners.
- **Need for de-icing** – The need for de-icing is predicted, together with the level of de-icing to be performed. The impact on capacity is determined and the resulting information has to be shared among the Airport CDM Partners.
- **Construction and maintenance works** – Planned works of this kind may or may not have an impact on capacity. If they do, the impact is evaluated and the resulting information must be shared between the Airport CDM Partners.

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- **Technical resource availability** – Every airport needs a minimum set of technical resources to achieve its nominal capacity. The actual and future availability of those resources is monitored and if their availability changes, the impact on capacity is evaluated. The resulting information must be shared between the Airport CDM Partners.
- **Industrial action** – Each Airport CDM Partner has to provide timely information on any known, planned industrial action affecting their operation. The impact on other partners and capacity as a whole is evaluated. The resulting information has to be shared between the partners.

The effects of the above and other predictable adverse conditions can be allocated different “alert levels”, while the alert levels in turn have associated procedures and other provisions, as necessary.

While partners will get information on the nature of the disruption, they will also be given an alert appropriate to the level of the disruption(s) concerned.

- **Partners must follow the pre-agreed procedures, arrange their resources accordingly and in general, keep the effects of the disruption to the minimum.**

#### Unpredictable adverse conditions

Obviously, unpredictable adverse conditions are difficult to anticipate. Nevertheless, they do fall into one of two categories:

- The adverse condition is very similar or identical to one of the already defined predictable adverse conditions (such as planned maintenance) and hence the same procedures can be used to deal with it.

- The adverse condition is such that none of the existing special conditions can be applied (e.g. burst tyre aircraft which is blocking the runway).

In the latter case, organised improvisation is required but even here, certain basic steps and procedures can be pre-agreed to avoid having to improvise everything.

In both cases it is essential to monitor the actual impact on capacity, using pre-agreed key indicators. This is the best way to ensure that the conclusions are correct and transparent to all the partners.

The concept of “alert levels” can be applied also in the case of unpredictable adverse conditions.

#### The CDM Coordinator and the CDM Cell

Although Airport CDM Partners work closely and collaboratively as part of the CDM environment, at times, like in adverse conditions, an appointed coordinator is needed to make sure all the special procedures and other measures required are properly applied.

The CDM Coordinator should be a person with good knowledge of all aspects of airport operations, including the most important details of the partner operations. He or she must have an understanding of the CDM principles, its network aspects and also the CDM facilities and procedures applicable at the airport in question. Thorough knowledge of the adverse condition procedures and the decision makers concerned is also essential.

- **Not all airports will be able to justify having a full time CDM Coordinator and in most cases, it is not needed.**

The task may be allocated to one or several people with the appropriate qualifications.

Whatever the arrangements, the main tasks of the CDM Coordinator include:

- Monitor the predicted or actual alert levels and modify these as necessary
- Coordinate the activation of special procedures agreed at local level
- Ensure that all partners follow the agreed procedures as applicable
- Coordinate ad hoc actions and decisions as needed
- Activate the CDM Cell if available and necessary

Setting up a CDM Cell, managed by the CDM Coordinator, is also highly recommended. This body, which may be virtual to ensure cost-effectiveness, will need to have representatives, authorised to make decisions, from all the airport partners.

➤ **Airport CDM Cell managed by the Airport CDM Coordinator = the focus of activity during adverse conditions.**

The main tasks of the Airport CDM Cell during adverse conditions are:

- Collect and collate critical information about the adverse condition and the reduced airport capacity
- Find the most constraining factors of airport capacity
- Evaluate and declare the overall airport capacity
- Make collaborative high level decisions for the management of airport operations during the adverse condition
- Provide information to relevant parties about the local situation

The Airport CDM Cell can act as a focal point for decisions and corresponding information promulga-

tion when adverse conditions result in a change of resource availability. (e.g. the number of available stands in snow conditions) The Airport CDM Partners will need to collaboratively make decisions and establish priorities for actions to be undertaken (e.g. decide on the order of snow clearing, or on a list of cancelled or delayed flights). Even if standard procedures had been established, it is often necessary to confirm these, especially if the actual situation is slightly different from those foreseen. In all cases, the Airport CDM Cell is in the best position to facilitate the collaborative processes.

The Airport CDM Coordinator and the Airport CDM Cell can play an important central role in fulfilling the airport's responsibility of informing the Network Operations when a reduction in airport capacity occurs or is likely to occur, which is expected to impact the overall ATFM network.

**De-icing operations**

Although de-icing may be seen as part of winter operations, its significant impact on airport capacity qualifies it to be treated under adverse conditions.

De-icing operations impact the milestones which are downstream and hence changes to the de-icing sequence must be reflected further down the line.

It is important to include the company performing de-icing in the CDM information sharing process. The de-icing sequence is established by the De-icing Company in collaboration with the Ground Handlers, Aircraft Operators and ATC. To create an efficient sequence, the following information needs to be shared between the partners in case of de-icing conditions:

- Target Off-Block Time
- Target Start Up Approval Time
- Calculated / Estimated / Target Take Off Time



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- Type of de-icing (i.e. on-stand or remote de-icing)
- Hold-over time of de-icing fluid ( depending of the type of fluid used, mixture and temperature )
- Type of aircraft
- Level of de-icing (i.e. parts of the aircraft to be de-iced )

A number of de-icing specific statuses have also been established, as follows:

- RDI – Ready for De-icing
- DEI – De-icing in progress

These statuses are inserted between OBK and DEP in the case of remote de-icing and between RDY and OBK in the case of on-stand de-icing.

Several significant times have been defined to take account of de-icing. These are summarized in the following table.

Acronyms	Description	Definition
<b>ARZT</b>	Actual Ready for De-icing Time	The time when the aircraft is ready to be de-iced
<b>ERZT</b>	Estimated Ready for De-icing Time	The estimated time when the aircraft is expected to be ready for de-icing operations
<b>ACZT</b>	Actual Commence of De-icing Time	The time when de-icing operations on an aircraft start
<b>ECZT</b>	Estimated Commence of De-icing Time	The estimated time when de-icing operations on an aircraft are expected to start
<b>AEZT</b>	Actual End of De-icing Time	The time when de-icing operations on an aircraft end
<b>EEZT</b>	Estimated End of De-icing Time	The estimated time when de-icing operations on an aircraft are expected to end
<b>ADIT</b>	Actual De-icing Time	Metric AEZT – ACZT
<b>EDIT</b>	Estimated De-icing Time	Metric EEZT – ECZT

#### Planning Phase:



- SCH** Scheduled
- INI** Initiated
- AIR** Airborne
- FIR** Flight entered local FIR
- FNL** Final
- ARR** Landed
- IBK** In-Block

- BRD** Boarding
- RDY** Ready
- OBK** Off-Block
- RDI** Ready for de-icing
- DEI** De-icing in progress
- DEP** Departed

#### Real Time:



Arrival phase

Ground phase

Departure phase

#### Aircraft Flight Status

**De-icing may be on-stand or remote.**

On-stand de-icing is part of the turn-round process and is under the responsibility of a De-icing Company and/or Ground Handler, in direct coordination with the Aircraft Operator and the pilot. De-icing must be considered also as a factor in the calculation of TOBT.

Remote de-icing is included in the taxi-out time. When the aircraft is ready to leave the stand, it gets clearance to taxi to the de-icing area where the actual de-icing is performed in coordination with the pilot and ATC.

**Particulars of on-stand de-icing**

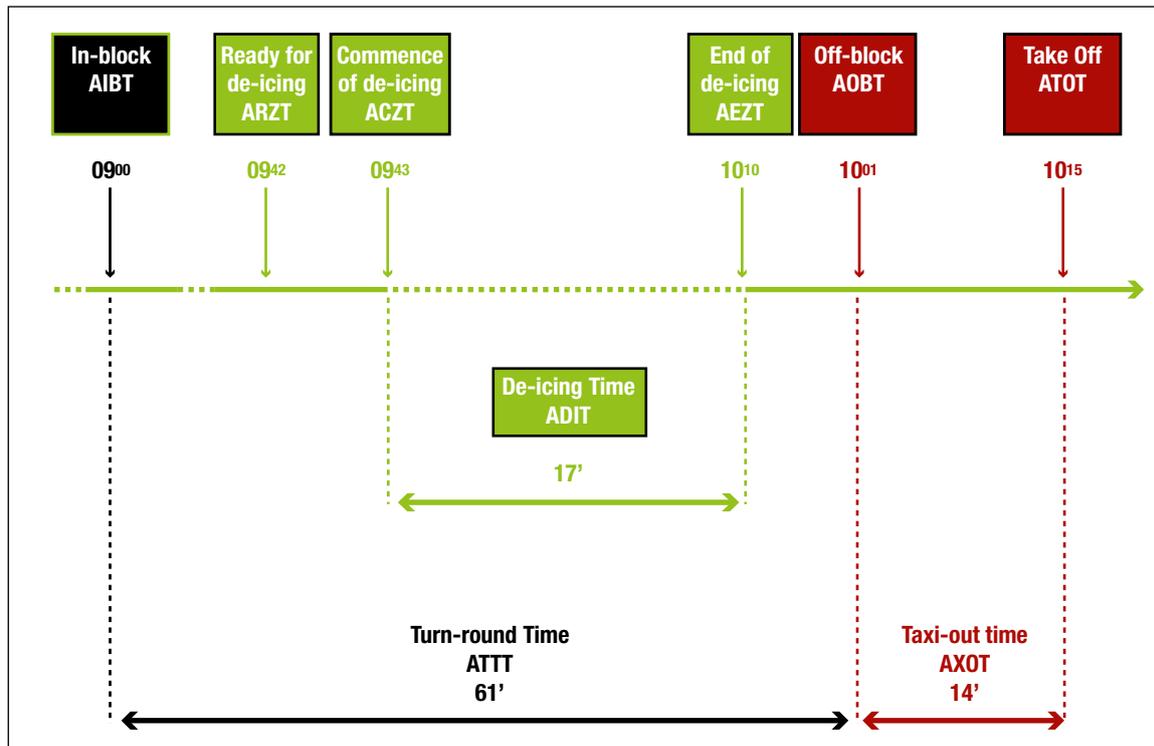
This is the case when the de-icing operation is carried out while the aircraft is still on stand. There are airports and stands at certain airports where such de-icing is not allowed.

For each flight, the Aircraft Operator / Ground Handler will give the de-icing company an estimate of the time when the aircraft will be ready for de-icing operations (EZRT).

The de-icing company will build the de-icing sequence using the ERZT of all the flights they are responsible for. Then, for each flight, the De-icing Company will give an estimate of the time when the de-icing operations are expected to start (ECZT).

This de-icing sequence is updated in real-time, taking into account the actual status and estimates of each flight.

The figure below shows the integration of de-icing into the turn-round process:





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#### Particulars of remote de-icing

Remote de-icing is defined as de-icing operations that are performed in a dedicated remote area. At some airports, de-icing is performed just after push back. This kind of de-icing can be considered as remote de-icing, without any holding before actual de-icing.

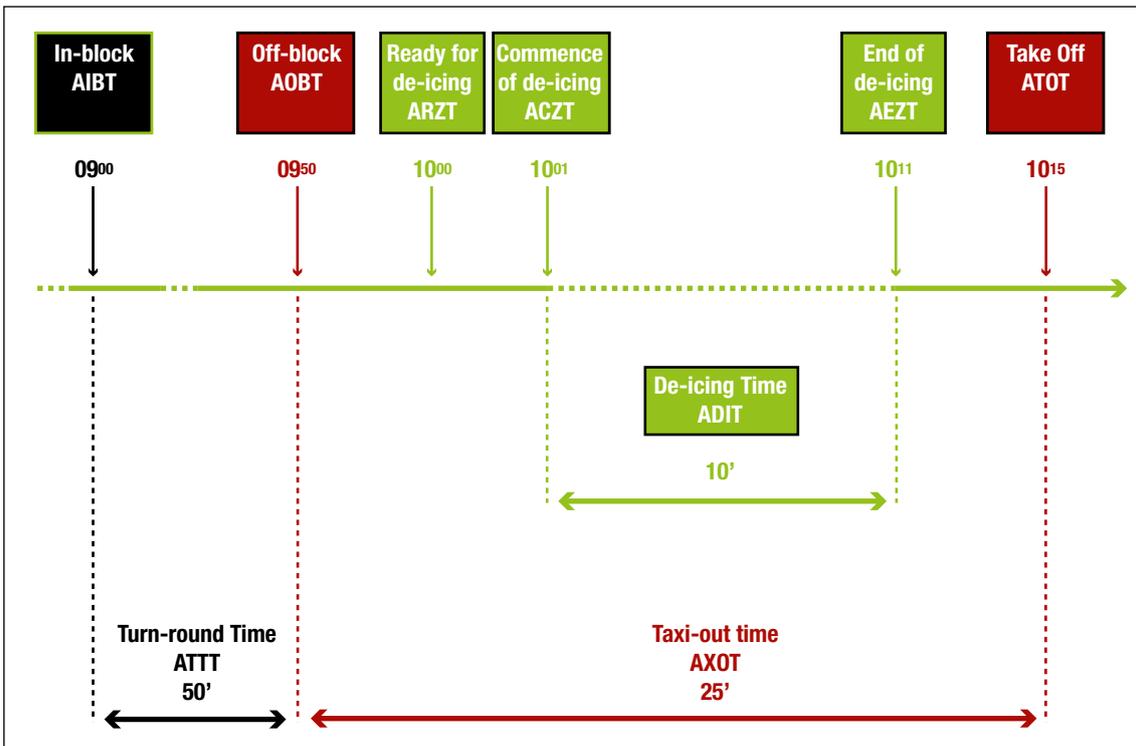
For a particular flight, the Aircraft Operator / Ground Handler will issue a TOBT.

Then ATC and De-icing Companies will collaboratively build the de-icing and the pre-departure sequences. The result will be, for each flight, a TSAT and an estimate of the time when the de-icing operations will start (ECZT), both estimates being linked with each other and with the estimated taxi-out time (EXOT).

The following figure illustrates the integration of remote de-icing into the taxi-out.

#### 3.6.3 Testing and Fine Tuning

This CDM Concept Element is in fact the trigger for implementing and carrying out pre-agreed procedures or at the least, acting in accordance with the needs of given situations. The procedures and partner activities need to be analysed and evaluated after each adverse condition event. The aim is to measure performance in terms of how far the target capacity level was maintained and how close the “return to normal” time was to the target times. (see Attachment 1.4.3 “Proposed KPIs for measuring recovery time after adverse conditions”)



The procedures and allocated activities will doubtless change as the response is refined. It should not be forgotten that the content, timing and type of alerts and warnings issued by Adverse Conditions element can also influence the effectiveness of the procedures and hence this aspect must also be regularly evaluated and improved when necessary.

The timing and contents of warnings can influence the effectiveness of the response. These aspects must also be reviewed regularly.

### **3.6.4 Regulatory Aspects**

Adverse Conditions may raise issues of liability that go well beyond eventual financial liability. For instance, the proper triggering of the fire / rescue teams or declaring a medical emergency are responsibilities that exist irrespective of the implementation of Airport CDM.

It is important to ensure that there is no confusion as to who should alert whom and that activating the CDM cell is not equivalent of sounding a general or specific alert. It is also important that the procedures cover also the aspects of proper alerting alongside the CDM aspects of reacting to adverse conditions.

### **3.6.5 Adverse conditions - Expert panel study**

The study in attachment 7 was carried out by the A-CDM Adverse Conditions - Expert Panel between June 2009 and September 2010, and was approved by the A-CDM Coordination Group in November 2010.

***Detailed study on “Adverse Conditions - Impact Assessment, Processes and Best Practices”  
to be found in Attachment 7.***



### 3.7 Collaborative Management of Flight Updates

#### 3.7.1 Objectives and Scope

The scope of ATFCM, in the ECAC area, is on managing the balance of demand and capacity in a gate-to-gate perspective. Within this scope, the goal of this strategy is to enable flight punctuality and efficiency having regard to the available resources with the emphasis on optimising the network capacity. This strategy does not look for imposing ATFCM solutions to airspace users through ATFM delays emanating from the Network Operations, but rather through a robust and comprehensive collaborative decision making process that will enable widespread dissemination of relevant and timely information.

One of the essential enablers for developing ATFCM is the availability and accuracy of information, with emphasis on flight plan data quality as it is the basis for all ATFCM tactical decisions. The quality of the information is progressively improving as time comes closer to the departure time; however, from a network point of view, there is a gap between the accuracy of the take off time estimate provided by the Aircraft Operator and the accuracy of the Actual Take Off time provided by ATC. By providing Network Operations with precise ETOT/TTOT information and all changes thereto, CDM Airports will ensure the continued accuracy of the traffic prediction.

The Collaborative Management of Flight Updates integrates Airport CDM into the core of the flow and capacity management process. By establishing Airport CDM information exchange with the Network Operations systems, Collaborative Management of Flight Updates is re-conciliating the network view with Airport operations, closing the loop between en route / arrival constraints and departure planning.

The main benefits of Collaborative Management of Flight Updates are:

- It ensures the completeness of information between en route and airport operations
- It improves predictability of ground operations through enhanced initial information about inbound flights
- It improves estimates of take off times, allowing a more accurate and more predictable view of the traffic situation, resulting in improved ATFM slot allocation.

Collaborative Management of Flight Updates is the Airport CDM contribution to ATFCM. This improved cooperation with the Network Operations slot allocation process will further enhance the flexibility of aircraft and airport operations. It will facilitate management of the Adverse Conditions.

In Collaborative Management of Flight Updates the exchange of information between the Network Operations and the airport is realised by:

- Sending Departure Planning Information Messages (DPI) from the airport concerned to the Network Operations
- Sending Flight Update Messages (FUM) from the Network Operations to the airports concerned

Collaborative Management of Flight Updates will bring significant benefits in term of network management. It will not only improve the accuracy of the flight information before departure, leading to better efficiency of the ATFCM activity, but it will also open the door to a more collaborative approach to traffic management between the network level and local operations (Aircraft Operators and airports).

Actions on flights (and on flows) will be improved due to this relationship, reducing the need for “one side” measures (MDI or Slot allocation). It may also develop towards a real gate-to-gate approach, considering not only the ATC constraints but also the airport constraints for an improved service to Aircraft Operators.





### 3.7.2 Requirements for Implementation

It is essential that the supply and quality of data and communications meet the prescribed requirements to ensure the appropriate protection of the Network Operations operation. An airport that meets all the requirements specified for allowing direct communication with the Network Operations is designated a “CDM Airport”. This status will be recognised in the Service Level Agreement concluded between the airport and the Network Operations.

In order to become a CDM Airport, an airport is required to comply with the following:

- All Airport CDM Concept Elements are successfully implemented
- Appropriate Service Level Agreements exist between all participating airport partners
- Data quality and communications capabilities meet the requirements specified by the Network Operations
- A Service Level Agreement is signed between the CDM Airport and the Network Operations
- One single focal point at each CDM Airport shall be assigned for communication (see Attachment 6 and reference 7)

The Airport CDM Partners will need to designate a common representative who will act on their behalf in all aspects of working with the Network Operations. This operational contact person is not necessarily the local Airport CDM implementation Project Manager. The Network Operations will systematically communicate via the Airport CDM Information Sharing Platform, which is normally responsible for the generation, updating and sending of DPI messages and the interpretation of the FUM. Communications between CDM Airport and the Network Operations will take place on the network

to be specified by the Network Operations. In most cases this means the AFTN and future replacement of AFTN (see reference 5)

The mixture of data ownership and the fact that several updates coming from different Airport CDM Partners can trigger the DPI messages imply special processing requirements that need to be satisfied by Airport CDM Information Sharing and agreed by all partners.

#### 3.7.2.1 Standards to be used

Detailed description of the format and triggers of the DPI and FUM messages, standards to be used, technical information, can be obtained from the Network Operations via the web site [www.NetworkOperations.eurocontrol.int](http://www.NetworkOperations.eurocontrol.int).

#### 3.7.2.2 Regulatory aspects

In order to exchange data with the Network Operations, an airport must satisfy certain requirements and be designated as a CDM Airport. While the Network Operations is not a regulatory agency, it does have a license to prescribe mandatory conditions its partners must meet in order to use the Network Operations services. It also has the power to withdraw a service when a partner fails to abide by the conditions applicable. (see Attachment 6 - “DPI implementation criteria and validation process”) The Network Operations will conclude a Service Level Agreement with a designated focal point at each airport. This focal point must be duly authorised by all Airport CDM Partners to act on their behalf.

### 3.7.3 Messages from the CDM Airport to the Network Operations

The Departure Planning Information (DPI Messages) supply the Network Operations with flight data related updates. The DPI messages contain accurate

Estimated Take Off Times (ETOT), Target Take Off Times (TTOT), Taxi Times and Standard Instrument Departures (SID) information. Subsequent DPI messages work as updates to previously sent information, containing progressively more accurate information.

The automated transmission of the DPI messages is triggered by system events derived from the Milestone Approach processes at the airport. Each DPI message relates to a single flight only. The Network Operations processes the DPI messages received and if necessary, the CTOT is re-calculated (improved or deteriorated). A Flight Update Message (FUM, see below) is sent by the Network Operations to the flight's next destination airport.

**There are five types of DPI messages:**

1. **E-DPI – Early DPI**
2. **T-DPI-t – Target DPI-target & (T-DPI-p – Target DPI-provisional)**
3. **T-DPI-s – Target DPI-sequenced**
4. **A-DPI – ATC DPI**
5. **C-DPI – Cancel DPI**



**The E-DPI message:** It notifies the ETOT 2 to 3 hours before off-block time. The main purpose of the E-DPI is to confirm that the flight is going to occur, thus eliminating ghost and duplicated flights. Before an E-DPI is sent, it is required that the Airport CDM Platform matches the flight plan and airport slot.

**The T-DPI message:** It is sent between 2 hours before off-block time and ATC time of pre-departure sequencing. It supplies an accurate Target Take Off Time (TTOT). Use of the variable taxi time calculation will permit an accurate TTOT to be calculated, which will then allow the Network Operations to optimise the CTOT re-calculation and send improvements whenever possible.

A T-DPI-t contains data based on TOBT that has been confirmed by the Aircraft Operator or Ground Handler. It is extremely important that provisions be put in place ensuring that T-DPI-t messages are sent only with the agreement of the Aircraft Operators.

T-DPI-p provides a provisional TOBT, calculated by the system, not yet acknowledged by the Aircraft Operator

**The A-DPI message:** It is sent between off-blocks and take off. It serves to supply the Network Operations with a very accurate Target Take Off Time (TTOT) based on the ATC established and stable departure sequence. It will allow a better monitoring of departures and will facilitate the identification of late updates requiring specific attention.

**The C-DPI message** serves to supply the Network Operations with a cancellation of a previously sent ETOT or TTOT, is no longer valid and when a new one is not yet known. A typical operational example is a technical problem with the aircraft after an ATC clearance has been given. The C-DPI message suspends the flight in ETFMS.

The Network Operations sends back to the CDM Airport reply messages to the DPI messages. Two types of replies can be distinguished:

1. Error messages, when for example ETFMS, the Enhanced Tactical Flow Management System, was not able to process the DPI message
2. Alert messages, when for example ETFMS discovered an IFPS inconsistency



### 3.7.4 Messages sent from the Network Operations to the CDM Airport

The Network Operations sends Flight Update Messages (FUM) to supply airports of destination with an Estimated Landing Time (ELDT). In addition to the ELDT, the FUM contains the last point in the flight plan route with the corresponding Estimated Time Over (ETO) and also a flight status.

A FUM is sent for the first time at 3 hours before the ELDT. FUM updates will be sent each time a significant update of the flight occurs in ETFMS. It contains the most recent information known to the Network Operations, based upon its own flight profile calculation, flight data and radar position updates received from ATC and DPI messages concerning the flight if it is not yet airborne. The FUM has considerable advantages over traditional Movement messages:

- It is visible to all airport partners via the Airport CDM Platform
- It is sent systematically and automatically
- It is first sent at ELDT- 3 hours, thereby expanding the available time horizon
- It is sent when the ELDT changes by more than 5 minutes

### 3.7.5 Procedures to be used

DPI and FUM are system to system messages, triggered by events and sent automatically. In an environment where Collaborative Management of Flight Updates has been implemented, actions such as confirming the TOBT and other milestones have a significance that extend into the core of the flow management process and local procedures must reflect this (e.g. by ensuring that only authorised persons may confirm a TOBT). Discrepancies between the filed flight plan data and DPI message data are reported by Network Operations via the Network Operations terminal and in DPI reply messages.

The Network Operations terminal is an existing flow management tool, widely used by ATC, Aircraft Operators and Ground Handlers. A new Network Operations Interface for TOWers (CITO) is now available for ATC at airports. CITO can also be used by small towers for CTOT monitoring.

### 3.7.6 Evaluation and deployment

Prior to deployment, Collaborative Management of Flight Updates will be evaluated. The exchange of DPI and FUM messages is the subject of extensive evaluation and tests. The results of the tests will determine the final form of interaction between the Network Operations and the CDM Airport. Three airports Munich, Brussels and Zurich are operationally exchanging DPI messages with Network Operations and several European airports are near to commence trials. In depth operational evaluation must be completed before extending to other airports. The process from initial testing until final transfer into operations will follow the picture next page.

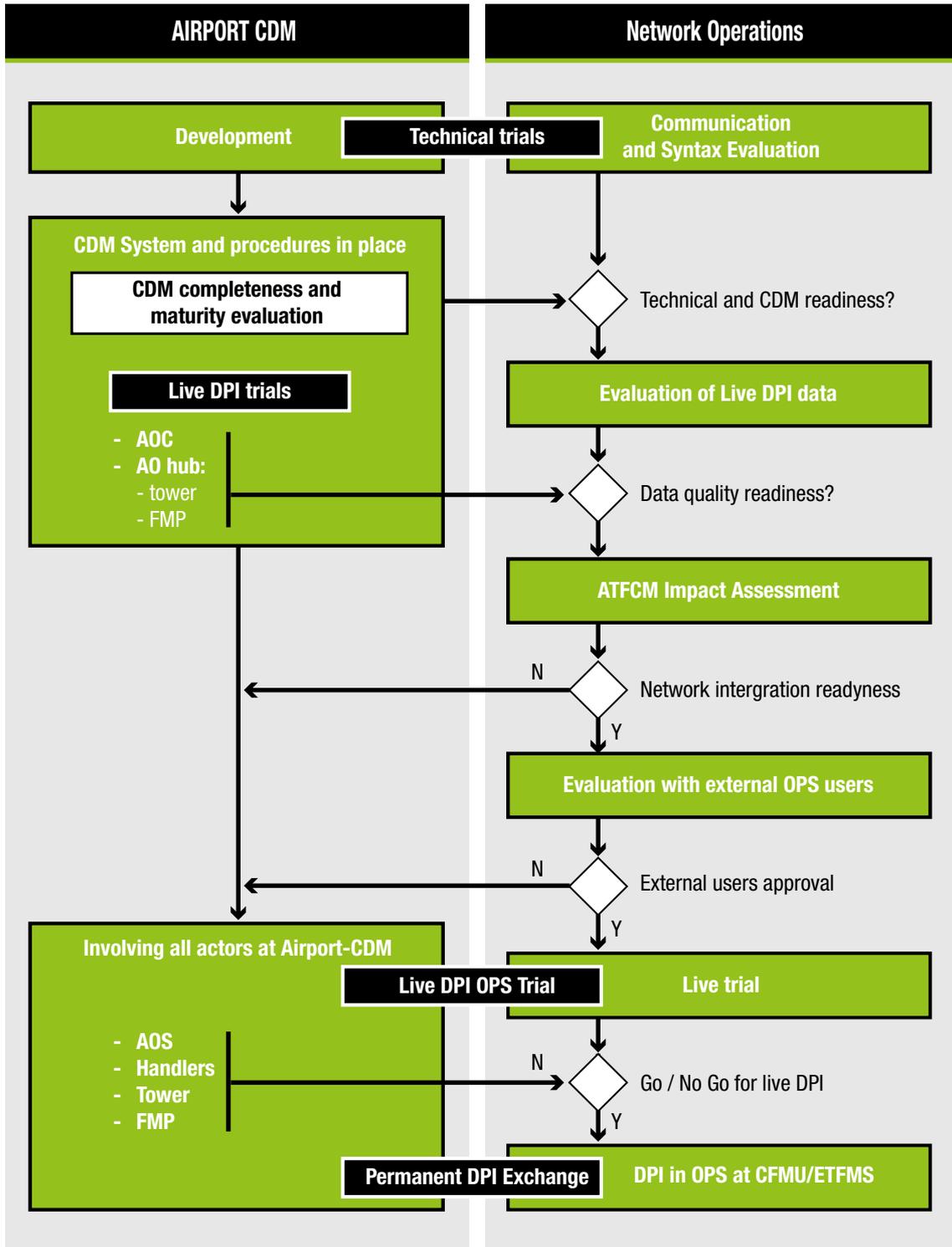
Operational trials shall be performed as many as necessary to confirm operational suitability followed by a Go/No Go meeting before operational implementation in ETFMS.

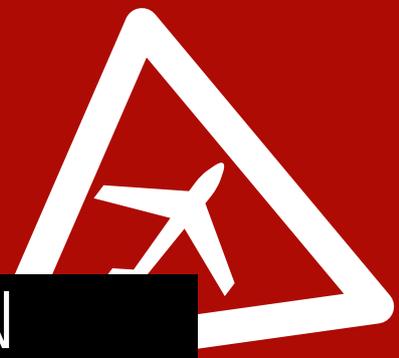
The evaluation is divided into 6 Phases:

1. Communication and Message Syntax
2. Evaluation of Live Data
3. ATFCM Impact Assessment
4. Evaluation with OPS users
5. Live Trial
6. Transfer into operation

The transition from one phase to the next is according to the following scheme and is preceded by a readiness review as described in previous chapters. The Operational Evaluation Criteria will be published in Network Operations document on the Network Operations web-site.

# AIRPORT CDM – NETWORK OPERATIONS PROCESS FOR DPI IMPLEMENTATION





## 4. PROJECT RISKS & MITIGATION

### 4.1 General CDM Risks and their Mitigation

An implementation project will be complex as it takes account many different partners and the culture change required for successful implementation of Airport CDM. All Airport CDM projects face a number of common and clearly identifiable risks. Some risks are unique to Airport CDM, others will be known from

other projects but in the Airport CDM context they attract a special significance.

A summary of risks and potential mitigation actions that have already been practiced by partners who have engaged in successful Airport CDM trials follows:

<b>RISK 1</b>	<b>NON-ACTION with respect to Airport CDM</b>
<b>Definition</b>	Airport CDM is not implemented.
<b>Result</b>	Inefficiencies continue, demands for improvements become louder, possibly resulting in more expensive solutions.
<b>Mitigation</b>	Popularise Airport CDM via all available means and to all possible partners, explaining that it is not complicated or expensive, yet the benefits are very significant.
<b>Probability / Impact</b>	Low / High.
<b>RISK 2</b>	<b>CDM awareness not sufficient amongst airport partners</b>
<b>Definition</b>	Awareness and hence commitment of one or more partners is lacking during project planning or actual implementation.
<b>Result</b>	Delayed or stall of project execution.
<b>Mitigation</b>	Better marketing and communication needed, early and continued benefits demonstrated at the airport to raise awareness. The continued lobbying for Airport CDM activities is required through the Airport CDM Project Manager.
<b>Probability / Impact</b>	Medium / High

<b>RISK 3</b>		<b>Implementation not consistent with Airport CDM implementation principles</b>
<b>Definition</b>	Not adhering to functional requirements when defining system and implementation. Complex project requiring common effort from many partners.	
<b>Result</b>	Project can be put in jeopardy, implementation may become fragmented or non-consistent.	
<b>Mitigation</b>	Basic and agreed principles from international level to be followed. Fully transparent and coherent local PMP to be agreed from the outset. Baseline must be respected and maintained, but can be enhanced in line with project maturity. Project to allow open mind and have freedom to consider new ideas and solutions.	
<b>Probability / Impact</b>	Low / Medium	

<b>RISK 4</b>		<b>Conflicting interests of partners</b>
<b>Definition</b>	While aiming for the same ATM improvements, partners may still have different or even conflicting priorities and/or interests.	
<b>Result</b>	Difficult to convince all partners to participate.	
<b>Mitigation</b>	Better marketing and communication; reassure partners of the confidentiality of data and demonstrate benefits from other trials and implementations. Continued lobbying, with good arguments and presentation material.	
<b>Probability / Impact</b>	Medium / Medium	

## 4. PROJECT RISKS & MITIGATION



### RISK 5 Stringent requirements for non-disclosure

**Definition** Partners are reluctant to release data.

**Result** Project can be put in jeopardy, implementation may become fragmented or non-consistent.

**Mitigation** Better marketing and communication, stressing the Airport CDM principle of protecting the confidentiality of data.  
Promote the use of the standard non-disclosure agreement in the form of the MoU in the attachment 3.1 of this Implementation Manual.  
Demonstrate security features built into the Airport CDM application (e.g. user profiles, passwords).

**Probability / Impact** Medium / High

### RISK 6 One or more partners withdraw from project

**Definition** Unforeseen withdrawal of a major partner due to any reason (bankruptcy, budget restrictions, changes of priority).

**Result** Loss of important data source, loss of important data destination and hence less effective decision making. Project objectives may be jeopardised.

**Mitigation** Involving as many partners as possible at the airport will reduce the impact of any one partner's withdrawal.  
Not being dependent on one partner e.g. an airline alliance rather than individual Aircraft Operators.

**Probability / Impact** Medium / High

<b>RISK 7</b>	<b>Disagreement between Airport CDM Partners in respect of cost / benefit and performance values</b>
<b>Definition</b>	Partners' conflicting interests may prevent a defined base line being adopted for measurement purposes.
<b>Result</b>	Credibility of the project suffers. Results are put in doubt, project cannot serve as reference for other implementations. Partners may loose interest.
<b>Mitigation</b>	Better marketing and communication. Independent before / after assessments by external organisations. Phased assessments needed to demonstrate benefits of each phase of the project. Agree KPIs and measurement methodology at project level.
<b>Probability / Impact</b>	Medium / High

<b>RISK 8</b>	<b>Insufficient cooperation from the airport</b>
<b>Definition</b>	Airports may consider at any phase of the project that it is of less priority and reduce the availability of their operational staff to participate in the project or restrict the available budget.
<b>Result</b>	Lack of operational specialists may slow down or completely stall the project.
<b>Mitigation</b>	Better marketing and communication. Clear requirements of airport partners in the form of a project plan agreed from the outset. Flexibility within the project plan to change priorities if required. Utilise the local Airport CDM Project Steering Group. Comprehensive / timely reports to all higher management of all partners to maintain support. Early benefits demonstrated to keep interest.
<b>Probability / Impact</b>	Low / High

## 4. PROJECT RISKS & MITIGATION



<b>RISK 9</b>	<b>Data acquisition not satisfactory</b>
<b>Definition</b>	Poor data quality or inefficient acquisition.
<b>Result</b>	Unreliable project results, poor cost / benefit ratio.
<b>Mitigation</b>	Better marketing and communication. Reassure partners on confidentiality of data. Standard acronyms and definitions to be used by all partners. Propose standard non-disclosure agreements. Assist trial airports in drafting agreements in the form of MoU(s) and well defined project performance objectives. Agreed KPIs and measurement methodology.
<b>Probability / Impact</b>	Medium / Medium

<b>RISK 10</b>	<b>No go decision</b>
<b>Definition</b>	Following initial drive to consider implementing Airport CDM and project preparation, one or more major partners decide not to go with it.
<b>Result</b>	Project will probably stall, or implementation will have reduced effectiveness.
<b>Mitigation</b>	Better project preparation, including very good arguments and solid business case, convincing examples from other airports, proper transposition of benefits to the subject airport. Highlight negative consequences of inaction.
<b>Probability / Impact</b>	Low / high

<b>RISK 11</b>		<b>Fear of social consequences due to Airport CDM</b>
<b>Definition</b>	Airport CDM changes the core ATM processes at the airport. This has an impact on the need for personnel and their qualifications.	
<b>Result</b>	Fear of the new environment, coupled with ignorance of the real changes may create resistance to the project.	
<b>Mitigation</b>	The changes and their significance must be explained early on. Personnel must be reassured but must receive honest answers. Arrangements must be made for retraining where needed.	
<b>Probability / Impact</b>	Low / Medium	

<b>RISK 12</b>		<b>Lack of involvement of partners' IT departments</b>
<b>Definition</b>	IT departments left out of preparation or brought in late.	
<b>Result</b>	Impossible or too expensive requirements, missed opportunities for forward changes.	
<b>Mitigation</b>	Airport CDM functions use data processing and network resources. IT departments must be involved from the outset to advise on their proper utilisation and also to plan on a timely basis for changes that may be required.	
<b>Probability / Impact</b>	Medium / High	

## 4. PROJECT RISKS & MITIGATION



<b>RISK 13</b>	<b>Data accuracy decreases over time</b>
<b>Definition</b>	Following implementation, data accuracy, timeliness and availability deteriorates.
<b>Result</b>	Level of achieving original objectives decreases.
<b>Mitigation</b>	MoUs, Service Level Agreements and continuous analysis and quality control. Regular meetings between partners to address quality shortfalls. Identify early parameter candidates for future improvements of accuracy
<b>Probability / Impact</b>	Low / High

<b>RISK 14</b>	<b>Partial implementation by partners</b>
<b>Definition</b>	Some partners may implement only partially.
<b>Result</b>	Benefits to others may disappear, overall benefits reduced.
<b>Mitigation</b>	Agreements between all partners clearly stating implementation scope and continued cooperation commitment.
<b>Probability / Impact</b>	Low / Medium

<b>RISK 15</b>	<b>Insufficient system integration</b>
<b>Definition</b>	Diverse systems communicate poorly or not at all.
<b>Result</b>	Loss of confidence, benefits reduced or disappear.
<b>Mitigation</b>	Use standards, involve IT departments.
<b>Probability / Impact</b>	Medium / High

## 4.2 Local Project Risks and their Mitigation

Airport CDM implementation projects invariably involve a large number of partners, with diverse company and cultural backgrounds. At most locations, potential partners operate in isolation.

Airport CDM will demonstrate that there is a better way to work for the benefit of everyone. The reaction by the potential partners to the prospect of Airport CDM is probably the most important risk that the project will face.

The reaction can range from resentment (about the implied criticism of the existing situation), via resistance (due to the “not invented here” syndrome) to enthusiastic embracing of a new way of working. With so many potential partners, the number of combinations is endless.

Neither extreme is desirable. In the resistance scenario, the project will be slowed and stalled at every opportunity (assuming that a first high level decision gets made at all). The enthusiasm scenario may create high expectations and therefore inevitable disappointments when problems appear.

Another risk that may arise at certain airports is the perception that the airport is operationally efficient and there is no need for Airport CDM.

✚ **It is essential that the Project Manager is thoroughly familiar with the opinions that prevail in respect of Airport CDM within the partner organisations.**

The Project Manager must then adopt suitable methods for convincing the partners on the benefits of Airport CDM. If partners view the introduction of Airport CDM as a further enhancement of what they already do well, they will embrace the project more easily.

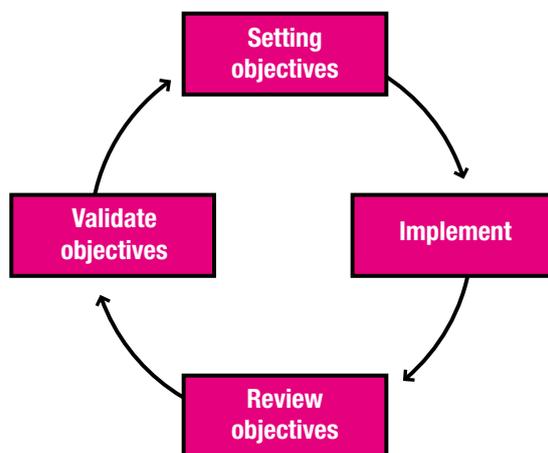
Being honest about the level of benefits that will be achievable and steering overly enthusiastic energies into the confines of realistic limits will maintain the drive without the danger of generating too high expectations.



## 5. HOW TO MEASURE SUCCESS

### 5.1 Reviewing the Agreed Objectives

Objectives need to be set and agreed by all partners, together with an agreed process to measure the achievement of the objectives. It is also vitally important that these agreements cover all the partners, collectively and individually.



When nearing completion of implementation, partners will review the originally agreed objectives to confirm that they are still valid without need for changes. If this is not the case, then the objectives should be changed to reflect the current view by agreement with all partners. This will ensure that measurements taken on completion of implementation reflect the agreed updated objectives.

### 5.2 Agreeing Performance Indicators Appropriate for the Objectives

As indicated above, correct measurement of success is possible only if the relevant process is followed and agreements reached on time. It is poor practice to leave agreement on performance indicators to the end of the project.

In order to measure the effects of Airport CDM implementation, the post implementation performance needs to be compared against the same performance indicators that will be utilised before implementation.

Success of a CDM Airport will be measured not only against its own previous performance, but also in terms of the performance of the entire European airport network. It is therefore important that the performance indicators, and the methods for measuring them, are consistent at European regional level.

Attachment 1 to this Implementation Manual describes the objectives and related performance indicators for implementation of Airport CDM processes and supporting functions at airports. The objectives and related performance indicators are divided into two categories:

- Generic objectives and performance indicators, applicable to all airport partners and corresponding to four main improvement areas i.e. safety, efficiency, environment and capacity.
- Specific improvement objectives and performance indicators defined for each airport partner, including the Network Operations. Each specific objective is linked to at least one global objective.

Selecting performance indicators from those listed in Attachment 1, together with standard measuring methods (see paragraph 5.3), ensures that results will

be comparable with the results of other implementations in Europe using similar methodology.

- ✦ ■ **The list attached to this Implementation Manual is an indicative list of Key Performance Indicators (KPI)**
  - **If needed, additional indicators may be defined and used**

### 5.3 Measuring Performance

- ✦ **Performance measurement must commence well in advance of completion of Airport CDM implementation.**

Whilst most Airport CDM Partners will have some method of performance assessment in place, the performance indicators and measurement methodology may vary significantly between partners. The results, therefore, may not be comparable locally, or on a regional basis.

- ✦ **The measurement procedure, and any associated computer support, should include new elements following Airport CDM implementation.**

Achieved improvements can be measured by comparing the status of the agreed performance indicators in the “before” and “after” situations.

### 5.4 Reporting Mechanisms and feedback

One of the most important principles of the Airport CDM concept is collaboration in a transparent and open manner. This principle must also extend to measurement of performance and results.

- ✦ **To maintain credibility and the long-term viability of the Airport CDM concept, an unbiased reporting mechanism must be put in place, to provide feedback to all partners on all aspects of the operation.**

In the context of Airport CDM, credit can only be attributed to accurate and open disclosure of results, whether positive or negative. Improvements will only accrue if a no-blame culture is developed, where problems are revealed with the aim of reducing them and enabling others to learn from them.

Information from the reporting mechanism is important for all partners when:

- a. Validating their business-case
- b. Making decisions to add further elements of Airport CDM

- ✦ ■ **Measurement of success is an iterative process and the feedback mechanism is an integral part of it**
  - **Periodic performance reviews identify further improvements**



## 6. POST - IMPLEMENTATION ACTIVITIES

### 6.1 Airport CDM Becomes a Daily Operation

Airport CDM has been successfully implemented, the objectives have been met and partners are satisfied with their investment. Following a summer and winter season spent with an operational Airport CDM, the positive results are convincing.

- ■ **Collaborative Decision Making is a culture**
- **Completion of the implementation project is not completion of Airport CDM**

During the first implementation, all partners will have been made aware of the need for the culture change, namely the practice of sharing data in order to base decisions on data received. When implementation has taken place, the new culture of working together will become the rule of the day.

People will come and go, at both management and operations levels and the newcomers may or may not bring with them the same commitment to Airport CDM as their predecessors. It is important that each partner has a succession policy in place, to ensure the principles of Airport CDM continue to be applied in order to maintain the benefits.

### 6.2 Continued Education of All Partners

- ■ **The nature of Airport CDM requires all partners to be given the opportunity to stay ahead of developments**
- **A programme of continuous education, based on the latest experience gained at the home airport and elsewhere, must be put in place**

This need not be an expensive exercise, but it must be effective. It is important that management is constantly reminded of the improvements being achieved as a result of Airport CDM. Operators must also be kept aware of the positive results their Airport CDM related efforts are achieving. Changes to procedures and/or working practices will be developed as a result of problems identified through the reporting mechanism.

The high profile of the Airport CDM project should be maintained. Placing articles in company magazines, organising Airport CDM meetings at least once a year and publishing Airport CDM related pamphlets are the most common and relatively inexpensive ways of maintaining the profile.

### 6.3 Preparing for New Functions

Airport CDM functions, if implemented as software applications, are in fact programmes that take data generated in the course of managing flights and then act on the data in an intelligent way, in order to assist operators in making decisions concerning those flights.

As experience with collaboration and sharing of data grows, new ways of treating that data will be developed, enabling new information to be derived from it.

## 6.4 International Participation

Although Airport CDM reflects the close cooperation of local airport partners, the airport itself is a part of the ATM network. It affects, and is affected by, operational improvements or degradations at other airports. Thus, local Airport CDM becomes part of a European regional programme to improve air traffic management.

Experience gained in the course of implementation of Airport CDM will provide a source of information that can potentially avoid repetition of common mistakes.

- ✎ **Lessons learned must be made freely available and exchanged via the appropriate fora, such as Airport CDM related working groups at EUROCONTROL and any other events organised on the subject.**



## 7. FREQUENTLY ASKED QUESTIONS

### 7.1 General Airport CDM Questions

#### 7.1.1 Airport CDM in the overall ATM context

##### How is Airport CDM included in the overall European ATM Strategy?

Airport CDM is part of the operational concept developed to support the EUROCONTROL ATM Strategy for the years 2000+ (ATM 2000+ Strategy).

The ATM 2000+ Strategy has been developed at the request of the Transport Ministers of the European Civil Aviation Conference (ECAC), to cater for the forecast increase in European Air Traffic which will demand a quantum increase in ATM and airspace capacity. The Strategy was adopted by the Ministers at their MATSE/6 meeting on 28 January 2000. The Strategy was updated in 2003.

The implementation of Airport CDM started as a short and medium term objective of the ATM 2000+ Strategy and DMEAN programme, hereafter is an objective of the SESAR programme.

More information on the overall European ATM strategy is available at [http://www.eurocontrol.int/corporate/public/standard\\_page/cb\\_atm\\_strategy.html](http://www.eurocontrol.int/corporate/public/standard_page/cb_atm_strategy.html).

##### Is there a relationship between CDM in Europe and in the USA?

Although the concept of collaboration between partners is the same in Europe and the USA, the context and issues raised are different.

CDM was first successfully introduced in the USA to cope with heavy capacity reductions mainly due to en route or airport bad weather conditions; while in Europe, Airport CDM initially focussed on increasing the predictability of airport operations to avoid the airports becoming the restricting bottleneck to the overall ATM system.

## 7.1.2 Airport CDM and Advanced ATC tools

### What link does Airport CDM have with AMAN / DMAN / A-SMGCS?

Advanced ATC tools like AMAN, DMAN and A-SMGCS cooperate with the Airport CDM concept by sharing information and optimising arrivals (AMAN), departures (DMAN) and ground movement (A-SMGCS).

The main impact of each system on Airport CDM is as follows:

AMAN improves the quality of ELDT (both accuracy and timeliness)

DMAN improves the quality of TTOT (both accuracy and timeliness) and indirectly the quality of TSAT

A-SMGCS provides situational awareness and improves short-term predictions of taxi times

More can be found in reference 9

## 7.1.3 Costs and Benefits of Airport CDM

### How much will the implementation of Airport CDM cost?

Airport CDM may produce high returns for relatively low costs.

Since each airport is site specific, a local cost benefit analysis has to be performed to support the decision to implement Airport CDM. A generic CBA report has been developed, together with a model freely available to any airport partner interested in evaluating potential costs and benefits of Airport CDM.

The CBA report and model are available on the Airport CDM website at [www.euro-cdm.org](http://www.euro-cdm.org)

### Who produces the local Cost Benefit Analysis (CBA) for Airport CDM?

After common, agreed Key Performance Indicators and measurement methodology have been produced, each airport partner is responsible for producing their own cost benefit analysis. They need to take into account their individual cost benefit evaluation practices as well as the EUROCONTROL generic CBA model for Airport CDM.

The Airport CDM Project Manager is responsible for coordinating actions and collecting and consolidating individual CBA results which are in the public domain.

More information on these issues are available in chapters 2.4 Business Case Considerations & 4.1 General CDM Risks and their Mitigation of the Airport CDM Implementation Manual and on the Airport CDM website at [www.euro-cdm.org](http://www.euro-cdm.org)

## 7. FREQUENTLY ASKED QUESTIONS



### 7.1.4 Implementation of Airport CDM

#### What are the results of the first CDM implementations at airports?

The results of the first CDM implementations at airports can be found in the implementation reports of the airports concerned. They are available on the Airport CDM website at [www.euro-cdm.org](http://www.euro-cdm.org)

#### Where can one find the 'lessons learnt' from CDM trial airports?

The lessons learnt can be found in the implementation report for each trial airport. They are available on the Airport CDM website at [www.euro-cdm.org](http://www.euro-cdm.org)

#### How can EUROCONTROL support Airport CDM implementation either locally or remotely?

EUROCONTROL supports the implementation of Airport CDM with the existing generic documentation:

- Airport CDM Implementation Manual
- Airport CDM Applications Guide
- Operational Concept Document
- Functional Requirements Document
- Airport CDM Cost Benefit Analysis

These and other documents, including those related to the first trial airports, are available on the Airport CDM website at [www.euro-cdm.org](http://www.euro-cdm.org)

With a wealth of experience behind them, the EUROCONTROL Airport CDM team can offer consultancy and support to project management, locally or remotely, to any airport wishing to implement Airport CDM.

#### Does implementing Airport CDM result in a change of working practices for the airport partners?

Even more than a change in working practices, the big challenge in implementing Airport CDM is the culture change that is necessary for all the partners involved. In addition to new tools and procedures, the airport partners have to adopt a mentality of sharing and cooperating with each other.

### Does implementing Airport CDM require documented procedures?

It is recommended that any procedure created or modified following implementation of Airport CDM is documented and the information distributed as appropriate (including promulgation in the AIP if appropriate).

### Does implementing Airport CDM require training?

Training sessions should be organised to familiarise operational staff with any tool or procedure created or modified by the implementation of Airport CDM.

Each airport partner should be responsible for the training of their own staff but common training sessions involving several airport partners should also be organised.

### When can an airport be considered a 'CDM Airport'? Will airports obtain an accreditation for compliance after implementing CDM?

An airport is considered a CDM Airport when all the Elements; Information Sharing, Milestone Approach, Variable Taxi Time, Pre-departure Sequencing, Adverse Conditions and the Collaborative Update of Flight Messages, are being applied at the airport. (see chapter 3.7.2).

Currently there are no international regulations specific to Airport CDM. Neither accreditation nor a CDM label is awarded to airports for the implementation of CDM. EUROCONTROL issues only a certificate to acknowledge that Airport CDM has been successfully implemented with a connection to the Network Operations using the DPI facility.

It is up to each airport to validate implementation, measure the achievement of the objectives and constantly monitor the quality of services by setting up post operational analysis tools and procedures and performance indicators.

More information is available in chapter 5 "How to Measure Success".



## 7. FREQUENTLY ASKED QUESTIONS

### 7.1.5 Airport CDM Project Management

#### When should a Memorandum of Understanding for a local Airport CDM project be signed?

Since the Memorandum of Understanding sets the framework of the Airport CDM Project, it should be signed by all the airport partners as soon as they have decided to implement Airport CDM and they have agreed on the general objectives and responsibilities of each participant.

More information on the Memorandum of Understanding and a sample MoU are available in Attachment 3.1

#### Do airport partners such as Customs, Police, Security Companies, Meteorological Services, etc. need to be considered as 'Airport CDM Partners'?

Any airport partner that participates in the CDM process can be considered as an Airport CDM Partner. Consequently, and depending on the local situation, Customs, Police, Security Companies or Meteorological Services and the like can be considered as Airport CDM Partners.

#### What is the role of EUROCONTROL in a local Memorandum of Understanding for Airport CDM?

The Memorandum of Understanding is a local agreement between airport partners. EUROCONTROL will normally participate in an external consultancy / facilitation role and should not be considered as one of the partners who will sign the Memorandum of Understanding.

#### Which airport partner should lead the project?

The project should be led by one of the main airport partners situated locally and in contact with the other airport partners.

#### What impact will the lack of involvement of one or several airport partner(s) have on the project?

A summary of risks and potential mitigation associated with an Airport CDM implementation is available in chapter 4 "Project risks and mitigation".

## What are the qualities of a local Airport CDM Project Manager?

The main qualities of a local Airport CDM Project Manager are:

- Excellent knowledge of the local airport partners and environment
- Known and trusted by the airport partners
- Thorough understanding of the Airport CDM concept
- Dynamic character
- Communication skills
- Persuasive and motivating abilities
- Diplomatic skills

The Project Manager may come from one of the main partners or from an independent, neutral organisation focusing only on overall project management activities.

## Should an Airport CDM project have one or more Project Manager(s)?

All the airport partners involved in the Airport CDM project should agree on one Project Manager responsible for supervising all the organisational aspects and in overall control of the day-to-day project coordination.

At the same time, each airport partner should name an internal Project Manager responsible for the management of the implementation of Airport CDM inside their own organisation, in close cooperation with the overall Project Manager and with the other partners.



## 7. FREQUENTLY ASKED QUESTIONS

### 7.2 Information Sharing

#### Does Airport CDM implementation necessarily mean a new system?

Implementing Airport CDM does not necessarily mean new system(s) but the existing one(s) may need adaptation to support the Airport CDM concept.

#### What is the quality of Airport CDM data?

Data Quality is specified in terms of accuracy, timeliness, reliability, stability and predictability based on a moving time window.

#### How can an airport partner ensure that they have the best possible CDM information?

Implementation of Information Sharing also means that a performance monitoring system has to be established.

All data and their sources have to be constantly recorded and time stamped in order to run post-operational analyses. Common Key Performance Indicators agreed between all the airport partners have to be used in order to have a clear picture of the quality of Airport CDM information.

If a significant fall in data quality is noticed, agreed corrective action has to be taken.

#### Which data has to be recorded?

All data received and sent by the CDM Information Sharing Platform as well as the results of all calculations in the platform have to be recorded together with their source and time.

### **If a number of information sources are available, which one should be chosen?**

A list of event / information source priorities has to be defined and maintained locally as part of the implementation of the CDM Information Sharing Platform.

Sources have to be classified from best to worst in terms of data quality (accuracy and timeliness), taking account of their availability, reliability and security. Note that the order of the sources may change while sources become more and more accurate with time.

An automated process has to be set up in the CDM Information Sharing Platform to ensure that the selected source is always the best available.

Data monitoring and post-operational analysis should be used to permanently check the source priority process.

### **Is there a standard for the exchange of Airport CDM data?**

There is no Airport CDM standard, but efficient implementation requires that the standards used, including data conventions, are not local or proprietary to the greatest extent possible. The standards used must also satisfy the safety, security and reliability requirements, without creating an overkill situation and increasing costs unnecessarily.

As a minimum, agreement must be reached between all partners concerned in respect of the format and data conventions of the messages to be exchanged.

More information is available in Chapter 3.2.2.2 "Information Standards"

### **What are the benefits of the airport partners using the new EUROCONTROL Airport CDM acronyms?**

A prerequisite to the implementation of Airport CDM and information sharing is that all the airport partners use the same language.

Today the same name may have different meanings depending on the airport partner, leading to ambiguity and risk of misunderstanding.

As an example, ATC defines the Estimated Time of Arrival (ETA) as the time when a flight is expected to touch down at an airport while for Aircraft Operators ETA is when a flight is expected to arrive in-blocks. This ambiguity is resolved with the new EUROCONTROL Airport CDM acronyms: ELDT for the Estimated Landing Time and EIBT for the Estimated In-Block Time.



## 7. FREQUENTLY ASKED QUESTIONS

### Can information at a CDM Airport be accessed remotely (e.g.: Airline OCC based at another airport)?

It is strongly recommended that remotely based airport partners be able to access the CDM Information Sharing Platform.

Many solutions exist to achieve this and it is up to the airport partners to select the most appropriate one.

### How should confidentiality of Airport CDM data be managed?

The Airport CDM Partners themselves must identify data that they wish to have treated confidentially. It is vital that only essential, legitimate requirements be posed in this respect. Data that is designated confidential will then be protected by agreed methods, including de-identification, limited access rights, etc.

The clauses of confidentiality have to be specified according to the laws applicable in the territory the airport is located in and must be included in the Memorandum of Understanding. (see Attachment 3.1 for guidelines and an example of a Memorandum of Understanding).

### Should an airport partner charge for the data supplied in the frame of the Airport CDM project?

Any data supplied by an airport partner who signed the Memorandum of Understanding on Airport CDM should be available free of charge to the other CDM Airport Partners.

The only exception could be airport partners who may wish to access data, but who are not signatories to the MoU. They may be allowed to do so with the agreement of the signatory partners. A service charge should be levied for this service which may act as an incentive for them to sign up to become data providers.

## 7.3 Milestone Approach for Turn-Round Process

What is the difference between the milestones listed in the Milestone Approach and the events described in Information Sharing?

An event is a distinct occurrence in the planning or operations of a flight that a person or system perceives and responds to in a specific way.

A milestone is a significant event that allows the progress of a flight to be followed. A successfully completed milestone will trigger the decision making process for downstream events and influence both the further progress of the flight and the accuracy with which the progress can be predicted.

Is it necessary to implement all 16 milestones described in the Milestone Approach Element?

The list of 16 milestones described in the Milestone Approach Element is indicative. Local circumstances will dictate which ones to use or whether new ones need to be defined.

Who is responsible for the TOBT, the Airline or the Ground Handler?

By default, the Aircraft Operator is responsible for the TOBT, but some may prefer to delegate a part or the totality of the responsibility and/or management of the TOBT procedure to its Ground Handler. This is done in recognition of the fact that Ground Handlers are best placed to know the flight status and progress when the aircraft is in-blocks. But it should always be up to the Aircraft Operator to make the final decision to delay a flight.

## 7.4 Variable Taxi Time

Does the Network Operations take account of a variable taxi-out time implemented at an airport?

Today the Network Operations uses a default taxi-out time for each runway at an airport. This can be changed on the day of operation following a request of the FMP concerned. It can also be modified for a given time period.

Collaborative Management of Flight Updates should allow a CDM Airport to send to the Network Operations a variable taxi-out time for each departing flight.

## 7. FREQUENTLY ASKED QUESTIONS



### 7.5 Pre-departure (Off-Block) Sequencing

#### Is there a difference between “pre-departure” and “departure sequence”?

The pre-departure sequence is the order that aircraft are planned to depart from their stands/parking positions taking into account partners preferences while the departure sequence is the pre-take off order where ATC organise aircraft at the holding point of a runway. The order of flights can change between pre-departure and departure.

#### Does it mean that the ‘first come, first served’ principle, which is fair, is abandoned?

The ‘first come, first served’ principle is not abandoned in the Pre-departure Sequencing Element but it is improved using new technology and tactical planning based on CDM procedures. The principle is applied earlier in the decision process in order to increase efficiency and better use capacity of the airport.

ATC initially sequence flights in the order that the confirmed TOBTs are received. In the situation where an Aircraft Operator has indicated a preference between specific flights operated by that Aircraft Operator, ATC also endeavour to take into account the preference request providing that flights operated by other Aircraft Operators are not penalised. The pre-departure sequence is then finalised considering any other constraints such as CTOT and other traffic.

#### Do regulated flights have priority over non-regulated ones in Pre-departure Sequencing?

Regulated flights do not have priority over non-regulated ones in Pre-departure Sequencing, but adherence to the ATFM slot and the objective of having a regulated flight airborne within its CTOT window is considered as a constraint by ATC when building and managing the pre-departure sequence.

#### Is it possible for two or more Aircraft Operators (e.g. in the same alliance) to nominate preferences between all their flights?

The implementation of Pre-departure Sequencing gives the technical means to Aircraft Operators to indicate preferences. It is up to each Airline or alliance of Aircraft Operators to agree on the range of utilisation of preferences.

The procedure and limits of such agreements should be clearly defined in a Service Level Agreement signed by all the contracting Aircraft Operators.

If a flight is held on stand because of a TSAT later than its TOBT, who is responsible for the extra charges incurred and for the delay?

This issue should be resolved at a local level using Service Level Agreements.

What impact does a non-reported delay to a particular flight have on the pre-departure sequence?

A non-reported delay can wreak havoc with the sequence, impact other flights in the sequence and cause inducted delays. Moreover, it may lower the runway throughput, occupy resources longer than expected and more generally reduce the efficiency of the ground operations.

## 7. FREQUENTLY ASKED QUESTIONS



### 7.6 Adverse Conditions

#### Where is the dividing line between 'normal operations' and 'adverse conditions'?

The dividing line between normal operations and adverse conditions varies from one airport to another according to the local context. Some situations that are considered as normal conditions at an airport may reduce the capacity of another one. This is the case, for example, of de-icing operations: Nordic airports are used to manage de-icing operations daily and maintain an optimal airport capacity during the winter seasons while the same conditions can cause severe disruption in Southern airports.

The types of adverse conditions have to be defined by the airport partners at each airport in a preliminary study to implementation of Adverse Conditions.

#### What is the difference between 'runway capacity' and 'airport capacity'?

The runway capacity is defined as a value, to be handled within a given period based on the standard separation minima. The runway capacity is defined and managed by ATC.

The airport capacity is defined as the amount of aircraft that can be handled by the airport partners within a given time period based on airport infrastructure (landside and airside), political and environmental restrictions and human and technical resources available.

Airport capacity includes runway capacity.

#### Is the implementation of a CDM Coordinator and a CDM Cell mandatory?

The implementation of a CDM Coordinator and a CDM Cell is not mandatory but it is recommended. They have been defined to facilitate the management of Adverse Conditions, the exchange of data and to allow a better coordination to quickly and smoothly return to normal operations.

#### Which airport partner is responsible for assuming the role of CDM Coordinator in adverse conditions?

The CDM Coordinator should be chosen among the main airport partners based on the airport following an agreement between all the airport partners.

### Who should each airport partner allocate to the CDM Cell in case of activation?

The participants to the CDM Cell allocated by each airport partner should be part of the executive operational staff with an excellent knowledge its organisation's operations and a good experience of airport operations. He should have the authority to promptly make decisions and the ability to manage efficiently human and technical resources.

### What happens if, after negotiation and agreement, the departure demand of the Aircraft Operators still exceeds the reduced capacity of the airport?

As in normal operations, ATC has the final decision on the departure capacity during periods of reduced capacity. The reduced departure rate and potential delays are reflected in the TSAT allocated to each flight by ATC.

During adverse conditions, it is fundamental that all the airport partners indicate their intentions through a TOBT/TSAT procedure and stick to the estimates given.

## 7. FREQUENTLY ASKED QUESTIONS



### 7.7 Collaborative Management of Flight Updates

#### What are the benefits for airport partners participating in the Collaborative Management of Flight Updates process?

The airport partners participating to the Collaborative Management of Flight Updates process will benefit from better planning of their flight operations due to more accurate times. The full scope of the benefits will be evaluated with the current trials.

#### What is the expected added value of the Collaborative Management of Flight Updates for CDM partners?

The Collaborative Management of Flight Updates is twofold:

- Providing airport partners with more accurate arrival times based on real-time data
- Providing Network Operations with data currently not available in flight plans (see Chapter 3.7.3 for examples of messages)

#### What steps are required for airport partners to implement Collaborative Management of Flight Updates?

An airport will be considered as a CDM Airport if it is equipped with a CDM Information Sharing Platform available for all the partners, the Milestone Approach is applied, Variable Taxi Time, Pre-departure Sequencing and Adverse Condition Elements are successfully implemented.

DPI-Processing in ETFMS is system-wide and cannot be adapted to individual airport specifications. For this reason and also in order to avoid confusion by the users, it is important that the same processes at the CDM Airports are followed by all the airports from which DPIs are sent and processed by ETFMS.

*Note: Upon conclusion of experiments the CDM Airport and the Network Operations will have to agree quality objectives before implementing Collaborative Management of Flight Updates. A bi-lateral evaluation shall be performed before the procedure can be validated and available for all the airport partners. (see Attachment 6)*

### What is the planning of the FUM / DPI implementations by the Network Operations?

Collaborative Management of Flight Updates are operational with Network Operations. (Processing of FUM and DPIs). It will be deployed with airports according to their readiness to fulfil all pre-requisites.

### In the Collaborative Management of Flight Updates is it possible to separate provision of arrival estimates from departure estimates?

Initial conclusions of the current trials indicate the benefits of enhancing arrival estimates for airport partners. Upon final conclusions of these experiments it should be possible to identify benefits for both arrival and departure estimates for all partners. Currently it is being examined whether it would be possible to separate provision of arrival estimates from departure estimates when airports are in the process of becoming CDM Airports.

### What is different in the management of an ATFM slot with and without DPI messages?

Management of ATFM slots must go first via the management of TOBTs in the CDM Airport (TOBT updates, TSAT calculation). Manual coordination between CDM Airport and Network Operations can be made in case of significant discrepancies. Local procedures must be established accordingly.

### How can a remotely based Aircraft Operator be aware of the messages exchanged between an airport and the Network Operations?

Via the Network Operations terminals. A new section in the flight data display is dealing with Airport information and gives details in case of discrepancy. The operational log for one flight is listing the messages received by ETFMS for that flight. The status of the flight regarding CDM Airport is indicated in the flight. list with the current

### What will be the impact of the Collaborative Management of Flight Updates on the 'ready' procedure?

The REAdy procedure remains in place with CDM Airports. Its application must be aligned with pre-departure sequencing. Flights ready to depart and able to depart quickly may benefit from a delay reduction when the situation on the airport permits (TIS=0, remote holding, low traffic periods,..).



## 7. FREQUENTLY ASKED QUESTIONS

### What is the prerequisite for the Network Operations to engage in the Collaborative Management of Flight Updates?

Full Airport CDM has to be established and operational at the airport for a specified minimum amount of time (6 months) before the Collaborative Management of Flight Updates is enabled operationally.

Collaborative Management of Flight Updates by Network Operations, i.e., DPI-Processing in ETFMS, is system-wide and cannot be adapted to individual airport specifications. For this reason and in order to avoid confusion by the users, the same processes at the CDM Airports shall be followed by all the airports from which DPIs are sent and processed by ETFMS.

*Note: The Network Operations will only get involved if a single local point for data exchange (supported by an appropriate communication means) is established following an agreement of all partners at the airport (normally, it will be the Airport Operator or ATC).*

### How would the confidentiality of the Collaborative Management of Flight Updates data exchange be ensured?

At airport level a Memorandum of Understanding (MoU) between the airport partners defines the ownership, the responsibilities, the rules for exchange and the confidentiality of data between the different parties. In particular, it specifies for each data in the Airport CDM Platform who is the owner, how it is managed and updated and who can read it and modify it. The rules for connections between systems to feed the Airport CDM Platform are also described in this MoU.

Upon conclusion of experiments and if required, a Service Level Agreement (SLA) between the Network Operations and the airport may be established to define the ownership, the responsibilities, the rules for exchange and the confidentiality of data between both parties.

### What happens if there is a discrepancy between DPI data and flight plan data?

The following discrepancies are tracked by ETFMS:

- EOBT # TOBT more than 15min
- ARCTYP # from FPL,
- REG inconsistent with FPL

These discrepancies are indicated in the Network Operations terminal. It is the responsibility of the AO to restore consistency of the flight plan.

### Should an AO update the EOBT of its flight according to TOBT provided to the Airport CDM Platform?

The current situation of flight plan processing and procedures makes it compulsory for an AO to update the EOBT of the flight plan when the TOBT differs more than 15 min from the EOBT.

### Should an AO update the EOBT of its flight according to the TSAT calculated by the CDM Platform?

TSAT is delivered by pre-departure sequencing tool according to TOBT, CTOT and local departure constraints. The AO has no obligation to update the EOBT according to TSAT provided the EOBT is aligned with TOBT as stated above.

### Will an AO be penalized by the early transmission of the T-DPI to Network Operations?

While a DLA can only delay the EOBT of a flight, T-DPIs can move TOBT forward and backward in time. This is made possible by the transmission of the SOBT in the E-DPI. The SOBT is the earliest value for the TOBT, but a 15 min tolerance is available in case a flight is ready in advance. It is important that TOBT is anticipated as much as possible by the AO.

### Will late updates of TSAT penalize AOs?

Outside special circumstances such as LVP or icing situation etc., late updates will concentrate in real late problems (luggage problems, technical failures, lost passengers, etc.) based on statistics, these cases should not represent more than 3% of the flights. Processing of late updates has been significantly improved in ETFMS but will not prevent some flights to be caught into bad situations. Remember that for excessive penalisation of a flight, a manual procedure exist between CDM Airport and Network Operations to address these cases.

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# APPENDIX

## Airport CDM Implementation Checklist

The Airport CDM Implementation Manual describes the recommended process of implementing Airport CDM. The following checklist has been developed in order to facilitate tracking steps completed and the effort still required.

It also serves as an at-a-glance introduction to Airport CDM implementation. For each of the checklist items, more information is available in the Implementation Manual in the sections indicated.

### 1. Are you familiar with the Airport CDM concept?

- **If not, suggested reading includes:** Airport CDM Applications Guide, Airport CDM Implementation Manual and accompanying CD-ROM, Airport CDM Website ([www.euro-cdm.org](http://www.euro-cdm.org)), Airport CDM OCD and FRD.
- **Remember the main CDM messages:**
  - CDM is a new culture of collaboration
  - Low cost, high returns
  - Needs cooperation from all partners
  - Information must be provided free
  - Information commercially and security sensitive must be handled accordingly
  - We can only talk of Airport CDM if the defined functions are used

### 2. Set up an Airport CDM project

- **Start a new project or incorporate into an existing one.** You may set up the Airport CDM project as part of an existing activity but there must be clear and separately identifiable objectives, responsibilities, financing and deadlines.
- **Involve all partners right from the start!** Airport CDM is all about collaboration and all interested partners must be able to contribute from day one.
- **Set the objectives!** Remember that the aim is to improve the operational situation at the airport as a whole and not only that of individual partners.
- **Do not be afraid to be persuasive.** However use good arguments and listen to others too.
- **Select the concept elements to be implemented.** While any step aimed at improving the exchange of information may be considered as a CDM step, for the identified benefits to be realised, the defined Airport CDM functionality must be implemented. If similar functionality already exists, it may be incorporated into the implementation project.
- **You MUST start with the Airport CDM Information Sharing concept element.** This element provides the foundation upon which all the other elements are based.
- **TOBT must come next!** The benefits are such that it is strongly recommended to give TOBT implementation priority.

- **Make an inventory of what is needed and what is already available.** The aim is to utilise existing or modifiable resources to the maximum extent possible. Buy new only if unavoidable!
- **To enable operational use of Airport CDM, the diverse partner systems must be adapted.** In this context, adaptation means ensuring that those systems can exchange information with each other and can use that information, without endangering their core functions.
- **Make the Business Case but do not expect this to be the same for all partners.** The CBA will be driven by the Key Performance Indicators that will be agreed by all partners. Do not be reluctant to extrapolate from the positive results of other Airport CDM implementations.
- **Educate and convince all partners.** Most difficulties with Airport CDM implementation will come from its culture change aspects. Freely sharing information, protecting confidentiality together and having mutual trust are new concepts the practising of which may not come naturally. Education and convincing by a trusted project manager and an Airport CDM Project Committee can go a long way towards resolving the problems. A good training package covering subjects such as confidentiality and how it is safeguarded is essential. EUROCONTROL offers standard and tailor made Airport CDM training courses.
- **A Multi-Partner Project Plan, the key to success.** In view of the multitude of partners in a typical Airport CDM implementation, a formal project plan and strict adherence to it is essential and well worth the effort of creating.

### 3. Start implementing

- **Source your Airport CDM elements.** The various Airport CDM documents describe the minimum functionality that must be provided. It is however not specified how this should be implemented, who should develop it or where it should be hosted. These are local decisions and require solutions that best fit circumstances and may include the development / modifications of existing systems.
- **Do not accept expensive solutions!** Airport CDM elements are not mission critical in the sense that an ATC system is. They are neither computation intensive nor do they require complicated user interfaces.
- **Suggested implementation sequence of the available concept elements:**
  1. Information Sharing
  2. Milestone Approach
  3. Variable Taxi Time
  4. Pre-departure Sequencing
  5. Adverse Conditions
  6. Collaborative Management of Flight Updates

## APPENDIX

# Airport CDM Implementation Checklist

### 4. Project risks and their mitigation

- **New culture, new solutions, new and old risks**

Airport CDM implementation projects carry risks. Airport CDM requires the close cooperation of many partners, who will have to adopt a whole new company culture of sharing and cooperating. This may include new working methods and new functionality in their systems.

- **Review the risks and plan for their mitigation.**

The Airport CDM Implementation Manual contains a list of risks that have been identified. Their suggested mitigation is also included.

### 5. Measuring success

- **Review agreed objectives.** Obviously, you had an agreed set of objectives. Now is the time to review them again, with the involvement of all partners, to check whether slight changes are required in view of the experience gained.

- **Agree performance indicators appropriate for the objectives.** A set of Key Performance Indicators has been included in the Airport CDM Implementation Manual. Select from these and if needed, develop additional ones and get agreement from all partners.

- **Establish performance baseline.** Improvements will need to be compared to pre-CDM operations. It is important to commence measuring well in advance of implementation.

- **Airport CDM is all about sharing and openness.** Also in respect of success achieved. There is no doubt that Airport CDM works and brings benefits. It may not always happen first time round, or to the extent expected. It is extremely important that a reporting and feedback mechanism is put in place, so that a clear and unbiased picture of the achievements (or lack thereof) is provided to all partners.

A no-blame culture with dedication to Airport CDM will ensure that the feedback is used to drive all concerned towards achieving the original objectives.

### Check out the Attachments!

- In the Attachments you will find information on objectives and key performance indicators, sample documents such as Memorandum of Understanding, Generic Procedures, Inventory & Compliance checklist, Adverse conditions-impact assessment processes and best practices, a list of references and contact details.

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# Airport CDM Objectives & Key Performance Indicators

## 1.1 INTRODUCTION

This document describes the Objectives and related performance indicators for implementation of Airport CDM processes and supporting functions at airports. The document is based on the experiences gained at the initial set of trial airports and will be updated as the trials and functions mature.

The objectives and related performance indicators included in this document are divided as follows:

- Generic objectives and performance indicators, applicable to all airport partners and corresponding to the four (4) main areas identified by EATM, i.e. Efficiency, Environment, Capacity, Safety (1.2)
- Specific target objectives and performance indicators defined for each airport partner, incl. Network Operations. Each specific objective is linked to at least one generic objective (1.3)

The objective of **Airport Operators** is to maximise the throughput and efficiency whilst complying with their operational plan. The major impacts of delays on Airport Operators are mainly the loss of image or reputation and a non-efficient use of airport resources (e.g. manpower, equipment) and infrastructure (e.g. stands and gates). On the other hand, both departure and arrival punctuality is the foundation for efficient operations, leading to a possible reduction or delay of new infrastructure investment. (1.3.1)

The objective of **Aircraft Operators** is to meet their planned schedule. The major impact of delays on Aircraft Operators is additional costs (extra fuel, missed connections and subsequent knock-on effects incurred). (1.3.2)

**Ground Handlers** objectives are to maximise their resource management and maintain Service Level Agreements (incl. departure punctuality and turn-round times). The best use

of available resources depends partly on the quality of arrival and departure estimates. (1.3.2)

**ANSP** objectives at airports are to ensure safety whilst making the best use of the available infrastructure (runways and taxiways). (1.3.3)

**Network Operations** objectives are to protect air traffic services from overloading while at the same time enabling Aircraft Operators to carry out their flight operations as planned with the minimum penalty. This is achieved by making best use of the available air traffic control and airport capacities. (1.3.4)

In addition, a generic legend is provided, clarifying the terms:

- Strategic Objective
- Strategic Performance Driver (only applicable for the Generic Performance Indicators)
- Performance Driver
- Performance Indicator
- Performance Measurement
- Airport CDM Contribution

Specific improvement objectives and their performance indicators for the implementation of Airport CDM are set up to test the improvements made after the CDM implementation. The improvement performance indicators chosen depend on the availability of historical data and objectives set for the Airport CDM implementation, they must therefore be set in advance. (1.4)

The set of performance indicators included in this document has been derived from the jointly defined objectives. Achieved improvements shall be measured by comparing the status of the performance indicators “before and after” Airport CDM operations. Such measurements shall be monitored continuously, in order to improve the quality of service. Additionally, the achieved improvements measured will feed into the Cost Benefit Analysis (CBA) performed by each airport partner.

## GENERIC LEGEND

### Strategic Objective

This is what we want to achieve

### Strategic Performance Driver

This is the means of reaching the strategic objective

Performance Driver	Performance Indicator	Performance Measurement
<p>This is how we can achieve our objective.</p> <p>Performance Driver is a verb.</p>	<p>This is <b>what</b> we get from the measurement.</p> <p>Performance Indicator is an index.</p> <p>It is the result of a mathematical equation between 2 measurable quantities.</p> <p>The increase /decrease trend of this index is our KPI.</p>	<p>This is how we measure each indicator.</p> <p>Performance Measurement is just the measuring method.</p>
D1	P11	M1
D1	P12	M2
D1	P13	M3
D1	P14	M4
D1	P15	M5

### Airport CDM Contribution

This is how **Airport CDM** can facilitate the achievement of the strategic objective.  
Which milestones need to be implemented in order to measure this KPI

# ATTACHMENT 1

## Airport CDM Objectives & Key Performance Indicators

### 1.2 GENERIC OBJECTIVES & PERFORMANCE INDICATORS

#### 1.2.1 Efficiency

##### Strategic Objective



Increase airport **EFFICIENCY**

##### Strategic Performance Driver

Improve punctuality and reduce delays

Performance Driver	Performance Indicator	Performance Measurement
Optimise the turn-round time predictability	<ul style="list-style-type: none"> <li>Turn-round compliance</li> </ul>	<ul style="list-style-type: none"> <li>Measure ATTT vs. (SIBT-SOBT)*</li> <li>Compare MTTT to ATTT</li> </ul>
Improve the ARR predictability	<ul style="list-style-type: none"> <li>EIBT predictability</li> <li>ELDT predictability</li> </ul>	<ul style="list-style-type: none"> <li>Measure EIBT vs.time (timeliness)</li> <li>Measure ELDT vs. time (timeliness)</li> </ul>
Improve the DEP predictability	<ul style="list-style-type: none"> <li>TOBT accuracy &amp; predictability</li> </ul>	<ul style="list-style-type: none"> <li>Compare TOBT to ARDT</li> </ul>
Improve the DEP predictability	<ul style="list-style-type: none"> <li>TSAT accuracy &amp; predictability</li> </ul>	<ul style="list-style-type: none"> <li>Compare TSAT to AOBT</li> </ul>
Reduce Aircraft Operators/ Ground Handlers/ ANSP reaction times	<ul style="list-style-type: none"> <li>READY reaction time</li> </ul>	<ul style="list-style-type: none"> <li>Measure AOBT vs. ARDT</li> </ul>
Reduce average delay of ARR flights (*)	<ul style="list-style-type: none"> <li>Average delay of ARR flights</li> <li>ARR punctuality index</li> </ul>	<ul style="list-style-type: none"> <li>Compare AIBT to SIBT</li> <li>Measure minutes delay per delayed movement</li> </ul>
	<ul style="list-style-type: none"> <li>Time recovery ratio</li> </ul>	<ul style="list-style-type: none"> <li>Measure percentage (DEP delay &lt; ARR delay) / ARR delay percentage</li> <li><b>This being:</b> Number of rotations which DEP delay is smaller than ARR delay divided by number of ARR delays</li> </ul>

to be con'd ▶

(\*) Note:

The scheduled turn-round time has a relevant impact on the results for these KPIs if all the rotations are considered. When recovering delay, it is not clearly identified if the benefit comes from the buffer in the turn-round schedule or in the turn-round time performance itself. (i.e. One turn-round scheduled for 4 hours, if the flight arrives 1 hour late and departs half an hour late, it could be considered as a recuperation in terms of time. But it seems to be far away from the CDM objectives).

Then for the KPIs it is recommended to consider only those turn-rounds which 'available turn-round time' (SOBT-AIBT) is less than X minutes to avoid noise in the results (X between 60 and 120 minutes depending on the turn-round time performance plus reasonable buffer).

Performance Driver	Performance Indicator	Performance Measurement
Reduce average delay of ARR flights *	<ul style="list-style-type: none"> <li>Time lost ratio</li> </ul>	<ul style="list-style-type: none"> <li>Measure percentage (DEP delay &gt; ARR delay) / ARR delay percentage</li> <li><b>This being:</b> number of rotations which DEP delay is bigger than ARR delay divided by number of ARR delays</li> </ul>
Reduce average delay of DEP flights *	<ul style="list-style-type: none"> <li>Average delay of DEP flights</li> <li>DEP punctuality index</li> </ul>	<ul style="list-style-type: none"> <li>Compare AOBT to SOBT</li> <li>Measure minutes delay per delayed movement</li> </ul>
Improve punctuality *	<ul style="list-style-type: none"> <li>Punctuality recovery ratio</li> </ul>	<ul style="list-style-type: none"> <li>DEP punctual / ARR not punctual percentage</li> </ul>
Reduce average delay *	<ul style="list-style-type: none"> <li>Delay recovery time</li> </ul>	<ul style="list-style-type: none"> <li>Compare ARR delay in minutes to DEP delay in minutes</li> </ul>

## Airport CDM Contribution

ALL Airport CDM elements

(\*) Note:

*The scheduled turn-round time has a relevant impact on the results for these KPIs if all the rotations are considered. When recovering delay, it is not clearly identified if the benefit comes from the buffer in the turn-round schedule or in the turn-round time performance itself. (i.e. One turn-round scheduled for 4 hours, if the flight arrives 1 hour late and departs half an hour late, it could be considered as a recuperation in terms of time. But it seems to be far away from the CDM objectives).*

*Then for the KPIs it is recommended to consider only those turn-rounds which 'available turn-round time' (SOBT-AIBT) is less than X minutes to avoid noise in the results ( X between 60 and 120 minutes depending on the turn-round time performance plus reasonable buffer).*

# ATTACHMENT 1

## Airport CDM Objectives & Key Performance Indicators

### 1.2.2 Environment

#### Strategic Objective



Reduce **ENVIRONMENTAL** nuisance

#### Strategic Performance Driver

Reduce engine time

Performance Driver	Performance Indicator	Performance Measurement
Reduce noise on ground	Noise on ground (Ground engine time ARR & DEP phase)	Measure <ul style="list-style-type: none"> <li>■ EXIT vs. AXIT</li> <li>■ EXOT vs. AXOT</li> </ul>
Reduce emission from engines on ground	Emission from engines on ground	

#### Airport CDM Contribution

- Information Sharing
- Pre-departure Sequencing
- Variable Taxi Time

### 1.2.3 Capacity

#### Strategic Objective



Optimise the use of available **CAPACITY**

#### Strategic Performance Driver

Increase airport efficiency

Performance Driver	Performance Indicator	Performance Measurement
Fill the gap between the actual operational capacity and the declared capacity	<ul style="list-style-type: none"><li>■ Accuracy of declared capacity</li><li>■ Over / under capacity</li></ul>	<ul style="list-style-type: none"><li>■ Compare the actual number of movements to the declared capacity</li><li>■ Number of delays due to operational capacity</li></ul>

#### Airport CDM Contribution

ALL Airport CDM elements

# ATTACHMENT 1

## Airport CDM Objectives & Key Performance Indicators

### 1.2.4 Safety

#### Strategic Objective



Improve **SAFETY** by reducing apron and taxiway congestion

#### Strategic Performance Driver

Reduce number of incidents on the movement area

Performance Driver	Performance Indicator	Performance Measurement
Reduce frequency overload	Number of silent coordinations introduced by CDM procedures	Measure the number of silent coordinations introduced by CDM procedures
Reduce number of aircraft moving simultaneously on the manoeuvring area	Number of aircraft queuing on sequence	Measure the number of aircraft queuing on sequence
Reduce number of aircraft incidents on the apron	Number of aircraft incidents	Measure the number of aircraft incidents

#### Airport CDM Contribution

ALL Airport CDM elements

## 1.3 AIRPORT PARTNER OBJECTIVES & PERFORMANCE INDICATORS

### 1.3.1 Airport Operators

#### Strategic Objective



Improve the usage of **INFRASTRUCTURE**

Performance Driver	Performance Indicator	Performance Measurement
Optimise the overall usage of aircraft stands (contact and remote stands)	Overall stands' actual occupation time	Compare the overall stands' actual occupation time with scheduled occupation time
Optimise the usage of contact stands	Contact stands' actual occupation time	Compare the contact stands' actual occupation time with scheduled occupation time
Optimise the usage of boarding gates (contact and coaching)	Boarding gates' actual occupation time	Compare the boarding gates' actual occupation time with scheduled occupation time
Optimise the usage of baggage reclaim belts	<ul style="list-style-type: none"> <li>■ Baggage reclaim belts' actual occupation time</li> <li>■ Baggage reclaim belts' utilisation ratio</li> </ul>	<ul style="list-style-type: none"> <li>■ Compare the baggage reclaim belts' actual occupation time with scheduled occupation time</li> <li>■ Compare first / last bag delivery to SLA</li> </ul>

#### Airport CDM Contribution

Airport CDM

- Information Sharing
- Milestone Approach

# ATTACHMENT 1

## Airport CDM Objectives & Key Performance Indicators

### Strategic Objective



Improve public information **DATA QUALITY**

Performance Driver	Performance Indicator	Performance Measurement
Provide public with accurate and timely ARR and DEP data (both on FIDS and internet)	ARR time accuracy	<ul style="list-style-type: none"> <li>■ Compare EIBT, AIBT and SIBT</li> <li>■ Compare ELDT vs. ALDT</li> </ul>
	DEP time accuracy	<ul style="list-style-type: none"> <li>■ Compare TOBT, SOBT and AOBT</li> </ul>

### Airport CDM Contribution

Airport CDM Information Sharing

## Strategic Objective



Reduce late **AIRCRAFT STAND AND GATE CHANGES**

Performance Driver	Performance Indicator	Performance Measurement
Reduce the number of late aircraft stand changes (e.g. 10 minutes before landing time or even after touchdown)	<ul style="list-style-type: none"> <li>■ Aircraft stand allocation and passenger gate freezing time</li> <li>■ Stand and gate planning adherence</li> <li>■ Stand and gate allocation accuracy</li> <li>■ Passenger gate allocation freezing time</li> </ul>	<b>Measure</b> <ul style="list-style-type: none"> <li>■ Number of aircraft stand changes within e.g. [(ALDT- e.g.10 min) to ALDT]</li> <li>■ Number of aircraft stand changes after landing [ALDT to AIBT]</li> </ul>
Reduce the number of multiple allocation of aircraft parking stands and boarding gates		<b>Measure</b> <ul style="list-style-type: none"> <li>■ Timestamp of gate and/or stand changes</li> <li>■ Last timestamp of change before AIBT</li> <li>■ Number of gate and/or stand changes within (time TBD locally)</li> <li>■ Number of passenger gate changes within (value TBD locally)</li> </ul>
Reduce the number of late passenger gate changes		<b>Measure</b> <ul style="list-style-type: none"> <li>■ Number of passenger gate changes within (time TBD locally)</li> <li>■ Number of aircraft having to wait for a vacant stand (and waiting time per aircraft)</li> </ul>
Reduce the number of multiple allocation of aircraft parking stands and boarding gates	Aircraft stand & passenger gate freezing time	<ul style="list-style-type: none"> <li>■ Number of passenger gate changes within (value TBD locally)</li> </ul>
Reduce the number of late passenger gate changes		<ul style="list-style-type: none"> <li>■ Number of aircraft having to wait for a vacant stand (and waiting time per aircraft)</li> </ul>
Optimise the usage of baggage reclaim belts		
Reduce number of aircraft having to wait for a vacant stand	TOBT/TSAT accuracy	<ul style="list-style-type: none"> <li>■ Compare TOBT/TSAT to AOBT to an identified moment in time (e.g. milestone)</li> </ul>

## Airport CDM Contribution

- Information Sharing
- Milestone Approach
- Variable Taxi Time

# ATTACHMENT 1

## Airport CDM Objectives & Key Performance Indicators

### Strategic Objective



Adhere to **AIRPORT SLOT\***

Performance Driver	Performance Indicator	Performance Measurement
Improve airport slot adherence	Airport slot adherence	<ul style="list-style-type: none"><li>■ Compare AIBT to SIBT</li><li>■ Compare AOBT to SOBT</li></ul>

### Airport CDM Contribution

- Information Sharing
- Milestone Approach
- Variable Taxi Time

\* Airport slot as per EC Directive 793/2004

## Strategic Objective



Improve **OPERATIONAL STAFF INVOLVEMENT**

Performance Driver	Performance Indicator	Performance Measurement
Increase awareness among airport operational staff	<ul style="list-style-type: none"> <li>■ Number of employees trained</li> <li>■ Number of training sessions</li> </ul>	<p><b>Measure the:</b></p> <ul style="list-style-type: none"> <li>■ Number of employees trained</li> <li>■ Number of training sessions</li> </ul>
Ensure their commitment and active participation	<ul style="list-style-type: none"> <li>■ Number of improvement proposals presented by employees</li> <li>■ Number of system evaluation meetings</li> <li>■ Number of proposals accepted</li> <li>■ Number of procedure changes</li> </ul>	<p><b>Measure the:</b></p> <ul style="list-style-type: none"> <li>■ Number of improvement proposals presented by employees</li> <li>■ Number of system evaluation meetings</li> <li>■ Number of proposals accepted</li> <li>■ Number of procedure changes</li> </ul>

## Airport CDM Contribution

Airport CDM Information Sharing

# ATTACHMENT 1

## Airport CDM Objectives & Key Performance Indicators

### 1.3.2 Aircraft Operators, Ground Handlers and Service Providers

Strategic Objective



Improve **PREDICTABILITY OF OPERATIONS**

Performance Driver	Performance Indicator	Performance Measurement
Enhance or optimise aircraft (fleet) utilisation and flexibility	TOBT accuracy	Compare TOBT to ARDT
	TSAT accuracy	Compare TSAT to AOBT
	Aircraft (fleet) utilisation	<p><b>Measure the:</b></p> <ul style="list-style-type: none"> <li>■ Number of aircraft rotations per timeframe (day)</li> <li>■ Number of additional aircraft rotations</li> <li>■ Number of operational hours per aircraft</li> </ul>

Airport CDM Contribution

ALL Airport CDM elements

*Note: "Improved predictability of air transport would generate high added-value: compressing half of flight schedules by 5 minutes on average would be worth somea1,000M per annum in better use of airline and airport resources."*

## Strategic Objective



Improve **AIRLINE RESOURCE MANAGEMENT**

Performance Driver	Performance Indicator	Performance Measurement
Reduce delays due to late personnel (flight crew, maintenance staff etc) and equipment	<ul style="list-style-type: none"><li>■ Delays due to late personnel (flight crew, maintenance staff etc.)</li><li>■ Delays due to late equipment</li></ul>	Measure contributing delays, based on IATA standard delay coding

## Airport CDM Contribution

ALL Airport CDM elements

# ATTACHMENT 1

## Airport CDM Objectives & Key Performance Indicators

### Strategic Objective



Minimise the impact of **DELAYS DUE TO LATE ARRIVAL OF INBOUND FLIGHT**

Performance Driver	Performance Indicator	Performance Measurement
Optimise aircraft stand and resource allocation for delayed flight	Delay recovery time related to stand allocation	(DEP delay < ARR delay) and compare to stand allocation
Reduce turn-round process	Delay recovery time related to turn-round process	<ul style="list-style-type: none"> <li>■ Compare ATTT to MTTT *</li> <li>■ Compare total ARR delay minutes to total DEP delay minutes</li> </ul>

### Airport CDM Contribution

ALL Airport CDM elements

(\*) Note:

*The scheduled turn-round time has a relevant impact on the results for these KPIs if all the rotations are considered. When recovering delay, it is not clearly identified if the benefit comes from the buffer in the turn-round schedule or in the turn-round time performance itself. (i.e. One turn-round scheduled for 4 hours, if the flight arrives 1 hour late and departs half an hour late, it could be considered as a recuperation in terms of time. But it seems to be far away from the CDM objectives).*

*Then for the KPIs it is recommended to consider only those turn-rounds which 'available turn-round time' (SOBT-AIBT) is less than X minutes to avoid noise in the results ( X between 60 and 120 minutes depending on the turn-round time performance plus reasonable buffer).*

## Strategic Objective



Optimise **TURN-ROUND TIME**

Performance Driver	Performance Indicator	Performance Measurement
Turn-round compliance to agreed SLA	<ul style="list-style-type: none"><li>■ Compliance with the STTT or ETTT</li></ul>	<ul style="list-style-type: none"><li>■ Measure SLA turn-round times: ARDT-AIBT (= AGHT)</li></ul>
Improve Turn-round predictability	<ul style="list-style-type: none"><li>■ Compliance with the ETTT</li></ul>	<ul style="list-style-type: none"><li>■ Compare ATTT to STTT or ETTT</li><li>■ Measure number of Milestone alerts</li><li>■ Compare ATTT to ETTT</li></ul>

## Airport CDM Contribution

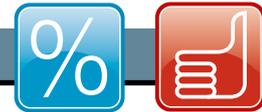
Airport CDM:

- Information Sharing
- Milestone Approach

# ATTACHMENT 1

## Airport CDM Objectives & Key Performance Indicators

### Strategic Objective



Improve **GROUND HANDLER RESOURCE MANAGEMENT**

Performance Driver	Performance Indicator	Performance Measurement
Reduce delays due to late equipment (e.g. buses, push back tractors, steps etc) and personnel	<ul style="list-style-type: none"> <li>■ Delays due to late equipment (e.g. buses, push back tractors, steps, etc)</li> <li>■ Delays due to late personnel</li> </ul>	Measure contributing delays, based on IATA standard delay coding

### Airport CDM Contribution

Airport CDM:

- Information Sharing
- Milestone Approach

## Strategic Objective



Reduce **DELAYS RELATED TO FUELLING SERVICES**

Performance Driver	Performance Indicator	Performance Measurement
Reduce delays due to fuelling	Delays due to fuelling services	Measure contributing delays due to fuelling services, based on IATA standard delay coding
Optimise quality and accuracy of information provided to the fuelling services	TOBT/TSAT accuracy	Compare TOBT/TSAT to ARDT/AOBT
Optimise prioritisation given by AO/GH to fuelling services	Impact on TOBT - delay recovery due to fuelling	Measure positive impact on TOBT of delays due to fuelling prioritisation

## Airport CDM Contribution

Airport CDM:

- Information Sharing
- Milestone Approach

# ATTACHMENT 1

## Airport CDM Objectives & Key Performance Indicators

### Strategic Objective



Reduce **DELAYS RELATED TO DE-ICING SERVICES**

Performance Driver	Performance Indicator	Performance Measurement
Optimise quality and accuracy of information provided to the de-icing services i.e. EOBT, TOBT, aircraft stand or de-icing bay location	TOBT/TSAT accuracy	Compare TOBT/TSAT to ARDT/AOBT
Improve de-icing predictability	Accuracy of de-icing times	<ul style="list-style-type: none"> <li>■ Compare ARZT to ERZT</li> <li>■ Compare ADIT to EDIT</li> </ul>
Reduce delays due to de-icing	Delays due to de-icing services	Measure contributing delays due to de-icing services, based on IATA standard delay coding
Optimise prioritisation given by airport / AO/ GH to de-icing services	Impact on TOBT – delays due to de-icing	Measure impact on TOBT-delays due to de-icing

### Airport CDM Contribution

Airport CDM:

- Information Sharing
- Milestone Approach

## Strategic Objective



Improve **OPERATIONAL STAFF INVOLVEMENT**

Performance Driver	Performance Indicator	Performance Measurement
Increase awareness among airline / ground handling staff	<ul style="list-style-type: none"> <li>■ Number of employees trained</li> <li>■ Number of training sessions</li> </ul>	<p><b>Measure the:</b></p> <ul style="list-style-type: none"> <li>■ Number of employees trained</li> <li>■ Number of training sessions</li> </ul>
Ensure their commitment and active participation	<ul style="list-style-type: none"> <li>■ Number of improvement proposals presented by employees</li> <li>■ Number of system evaluation meetings</li> <li>■ Number of proposals accepted</li> <li>■ Number of procedure changes</li> </ul>	<p><b>Measure the:</b></p> <ul style="list-style-type: none"> <li>■ Number of improvement proposals presented by employees</li> <li>■ Number of system evaluation meetings</li> <li>■ Number of proposals accepted</li> <li>■ Number of procedure changes</li> </ul>

## Airport CDM Contribution

Airport CDM Information Sharing

# ATTACHMENT 1

## Airport CDM Objectives & Key Performance Indicators

### 1.3.3 Aeronautical Navigation Service Providers

#### Strategic Objective



Increase and optimise the **RUNWAY THROUGHPUT**

Performance Driver	Performance Indicator	Performance Measurement
Fill the gap between the actual operational capacity and the declared capacity for all RWY configurations	Compliance of declared RWY capacity, for each RWY configuration	<p><b>Compare</b> declared RWY capacity to:</p> <ul style="list-style-type: none"> <li>■ actual operational RWY capacity</li> <li>■ actual DEP rate</li> <li>■ actual demand</li> </ul> <p><b>Compare</b> actual DEP rate to actual demand</p> <p>→ per hour/day/week...</p> <p>→ for each RWY configuration</p>
Slot compliance and slot adherence	Number of refused TOBT (not compliant with CTOT)	<ul style="list-style-type: none"> <li>■ Number of TOBT not compliant with CTOT</li> <li>■ Measure number of Milestone alerts</li> </ul>
	Percentage DEP outside CTOT window	<p><b>Compare</b> number of DEP outside assigned CTOT window to total number of DEP</p>
	Percentage of DEP outside airport slot Compare Network Operations slot to airport slot	<p><b>Compare</b></p> <ul style="list-style-type: none"> <li>■ number of DEP outside airport slot to total number of DEP</li> <li>■ Number of flights departing outside airport slot</li> </ul>

#### Airport CDM Contribution

ALL Airport CDM elements

## Strategic Objective



Optimise **TAKE OFF AND DEPARTURE** queue by using Variable Taxi Times

Performance Driver	Performance Indicator	Performance Measurement
<p>Optimise DEP sequence and the DEP queue (on apron, taxiways and holding areas)</p> <p>Improve TSAT calculation <i>(using the aircraft wake vortex categories, the SID sequencing - TMA exit point - and Network Operations slot)</i></p>	Accuracy of TSAT, TTOT, EXOT	<ul style="list-style-type: none"> <li>■ TSAT to ASAT</li> <li>■ AXOT to EXOT</li> <li>■ TTOT to ATOT</li> </ul> <p>(compare to an identified moment in time e.g. milestone)</p>
Improve clearance delivery reaction time	Clearance delivery reaction time	<b>Compare</b> ASRT to ASAT

## Airport CDM Contribution

ALL Airport CDM elements

# ATTACHMENT 1

## Airport CDM Objectives & Key Performance Indicators

### Strategic Objective



Improve **OPERATIONAL STAFF INVOLVEMENT**

Performance Driver	Performance Indicator	Performance Measurement
Increase awareness among ATC staff	<ul style="list-style-type: none"> <li>■ Number of employees trained</li> <li>■ Number of training sessions</li> </ul>	<p><b>Measure the:</b></p> <ul style="list-style-type: none"> <li>■ Number of employees trained</li> <li>■ Number of training sessions</li> </ul>
Ensure their commitment and active participation	<ul style="list-style-type: none"> <li>■ Number of improvement proposals presented by employees</li> <li>■ Number of system evaluation meetings</li> <li>■ Number of proposals accepted</li> <li>■ Number of procedure changes</li> </ul>	<p><b>Measure the:</b></p> <ul style="list-style-type: none"> <li>■ Number of improvement proposals presented by employees</li> <li>■ Number of system evaluation meetings</li> <li>■ Number of proposals accepted</li> <li>■ Number of procedure changes</li> </ul>

### Airport CDM Contribution

Airport CDM Information Sharing

### 1.3.4 Central Flow Management Unit (Network Operations)

#### Strategic Objective



Compliance to **ATFM MEASURES (CTOT)**

Performance Driver	Performance Indicator	Performance Measurement
Increase percentage of flights departing between CTOT-5' and CTOT+10'	CTOT Compliance	<ul style="list-style-type: none"><li>■ Compare CTOT with ATOT for regulated flights (-5'/+10')</li><li>■ Measure percentage of missed slots (flights departing outside CTOT window)</li></ul>

#### Airport CDM Contribution

ALL Airport CDM elements

# ATTACHMENT 1

## Airport CDM Objectives & Key Performance Indicators

### Strategic Objective



Improve **PUNCTUALITY**

Performance Driver	Performance Indicator	Performance Measurement
Improve TOT Accuracy	DPI Accuracy DPI Stability	<ul style="list-style-type: none"> <li>■ Compare ETOT (at defined times prior to take off) to ATOT</li> <li>■ Compare TTOT to ATOT</li> </ul>
Improve TOT Stability		<ul style="list-style-type: none"> <li>■ Count DPI messages by type for DEP flights</li> <li>■ Measure time difference between last message and ATOT for each type of DPI</li> </ul>

### Airport CDM Contribution

ALL Airport CDM elements

## 1.4 SPECIFIC IMPROVEMENT OBJECTIVES AND PERFORMANCE INDICATORS

### 1.4.1 Introduction

In order to measure the improvements brought about by Airport Collaborative Decision Making (CDM), it is essential to have a baseline against which the improvements can be evaluated. The baseline must be established using the same Key Performance Indicators (KPIs) which will be applied later in the evaluation.

In line with the complex nature of airport operations, many types of KPIs may be identified. However, getting agreement among the partners on which performance indicator to use is not always easy, especially if there are too many to choose from.

Experience in other performance based services shows that measuring with too high granularity is counter productive, in fact making the results less reliable. This is due to the complex relationships between the indicators and the consequent difficulty in establishing the weighing rules and factors.

It is therefore recommended to select and agree a limited set of KPIs, which however are strongly representative of the most important aspects of Airport CDM, covering the operations of all partners.

## ATTACHMENT 1

### Airport CDM Objectives & Key Performance Indicators (Cont'd)

#### 1.4.2 Selecting the Indicators

It is best to select indicators which are already recorded and archived on a routine basis. It is also perfectly acceptable to use indicators which are already being utilised to measure performance in other contexts. Their inclusion in the Airport CDM performance measurement framework will only enhance their significance.

Properly implemented Airport CDM does have substantial network benefits as CDM Airports interact and the improvements enhance each other. Nevertheless, the performance indicators and measurements established at a given airport should only be used to show the situation at the given airport and NOT to compare one airport to another. While the indicators may be identical at different airports, their changes and significance taken together says a lot about that airport

but are not suitable for direct comparison between airports.

In practice, two indicator categories should be considered

- Availability of data
- Quality of data and estimates

#### Availability of data

The following list contains the data that has to be checked at the various partners for availability. Airport CDM effectiveness measurement is impacted if any is missing.

#### Time related data

See also the acronyms section in the Implementation Manual.

Data			
ACZT	ARZT	CTOT	EXOT
ADIT	ASAT	EDIT	MTTT
AEZT	ASBT	EEZT	SIBT
AGHT	ASRT	EIBT	SOBT
AIBT	ATOT	ELDT	STTT
ALDT	ATTT	EOBT	TOBT
ARDT	AXIT	ERZT	TSAT
ACGT	AXOT	ETOT	TTOT
AEGT	ACZT	ETTT	
AGHT		EXIT	

- First/ last bag delivery times
- Timestamp gate change
- Timestamp stand change
- Airport slot
- Timestamp FIR entry
- ATOT at outstation

## Not time related data

### Airport related data

- Number of contact stands
- Number of stands
- Number of gate changes per flight
- Number of stand changes per flight
- Airport layout
- Runway configurations
- Taxiway configurations
- Declared airport capacity per hour/day/week/...
- Declared RWY capacity per hour/day/week/...
- Actual operational airport capacity per hour/...
- Actual operational RWY capacity per hour/...
- Number of delays due to operational capacity
- Number of airport slots/ hour/day/...
- Number of missed slots per hour/day/...
- Demand per hour/day/... for each runway configuration
- Demand per hour/day/... for the airport
- Number of baggage reclaim belts
- Weather information concerning de-icing, low visibility,...
- Environmental and special events information

### Flight related data

- Date
- Flight type
- Flight plan
- Flight status
- Aircraft movement data
- Delay messages with IATA delay coding
- Number of aircraft rotations per timeframe (day)
- FUM and DPI messages
- SAM and SRM messages (CHG or CNL)

### Other data

- Number of employees per partner
- Number of employees trained
- Number of CDM trainings
- Number of improvement proposals
- Number of system evaluation meetings
- Number of proposals accepted
- Number of procedure changes

# ATTACHMENT 1

## Airport CDM Objectives & Key Performance Indicators

### Quality of data and estimates

Airport CDM performance is best measured along two main axes. On the one hand, the quality of data on which decisions are based and on the other the accuracy of the estimates about the operations affected by the decisions.

Evaluate the accuracy and timeliness of the following data to establish data quality and improvements thereto.

One of the most important improvements to be brought by Airport CDM is more accurate estimated take off times (ETOT). Take off time estimates should therefore be evaluated at various times prior to take off and take off times calculated using default taxi times and variable taxi times should be compared.

### Accuracy of Take Off Time at various moments e.g. the milestones

#### Measure ETOT

1.  $ETOT = EOBT + \text{default taxi time}$
2.  $ETOT = EOBT + EXOT$

#### Measure TTOT

1.  $TTOT = TOBT + \text{default taxi time}$
2.  $TTOT = TOBT + EXOT$
3.  $TTOT = TSAT + \text{default taxi time}$
4.  $TTOT = TSAT + EXOT$
5.  $TTOT = AOBT + \text{default taxi time}$
6.  $TTOT = AOBT + EXOT$

Data Accuracy	Performance Indicator
Landing time	Compare ELDT to ALDT
In-Blocks time	Compare EIBT, AIBT, SIBT
Off-Block time	Compare EOBT or SOBT to AOBT
TOBT	Compare TOBT to ARDT or AEGT
TSAT	Compare TSAT to AOBT, ASRT or ASAT
De-icing time	<ul style="list-style-type: none"> <li>■ Compare EDIT to ADIT</li> <li>■ Compare AEZT – ACZT to EEZT - ECZT</li> </ul>
Take Off time	<ul style="list-style-type: none"> <li>■ Compare ETOT to ATOT (at defined times prior to take off)</li> <li>■ Compare CTOT to TTOT</li> <li>■ Compare TTOT to ATOT</li> </ul>
Taxi-out time	Compare EXOT to AXOT

Measurements must also focus on the compliance with STTT and compliance with CTOT. The scheduled turn-round time has a relevant impact on the results for these KPIs if all the rotations are considered. When recovering delay, it is not clearly identified if the benefit comes from the buffer in the turn-round schedule or in the turn-round time performance itself. (i.e. One turn-round scheduled for 4 hours, if the flight arrives 1 hour late and departs half an hour late, it could be considered as a recuperation in terms of time. But it seems to be far away from the CDM objectives).

Then for the KPIs it is recommended to consider only those turn-rounds which 'available turn-round time' (SOBT-AIBT) is less than X minutes to avoid noise in the results (X between 60 and 120 minutes depending on the turn-round time performance plus reasonable buffer).

#### **STTT compliance:**

- Compare MTTT (SOBT-SIBT) and ATTT (AOBT-AIBT).

#### **Regulated flights:**

- Compare CTOT with ATOT (must be within limits set by the Network Operations currently - 5/+10 mins).

#### **Non-regulated flights:**

- Compare EOBT (-0/+15 mins) + taxi time with ATOT.

### **1.4.3 Proposed KPIs for Measuring Recovery Time after Adverse Conditions**

After each adverse condition event, the aim is to measure and evaluate how many flights were affected and if the targets were maintained.

#### **3 sets of KPIs:**

##### **1. To measure the flow management**

- Measure the adverse conditions period (time adverse conditions finish – time adverse conditions start);
- Measure the reduced declared capacity period (time reduced declared capacity finish – time reduced declared capacity start);
- Compare the 'reduced declared capacity period' to the 'adverse conditions period';
- Measure the normal operation recovery period (time of normal declared capacity – time of adverse condition finish);
- Compare the 'normal operations recovery period' to the 'adverse conditions period'

##### **2. To measure the flights directly affected**

- Measure the number of operations affected during the adverse conditions period (including cancellations);
- Measure the punctuality during the adverse conditions period;
- Measure the average delay during the adverse conditions period.

##### **3. To measure the collateral flights affected**

- Measure the number of operations affected out of the adverse conditions period (including cancellations);
- Measure the punctuality of operations affected out of the adverse conditions period;
- Measure the average delay of operations affected out of the adverse conditions period.

# ATTACHMENT 2

## Procedures & Processes

### 2.1 AIRPORT CDM GENERIC PROCESSES

This section contains the Generic Processes for the Milestone Approach.

#### General

This document describes the Airport CDM Generic Processes that are recommended or highly recommended for implementation of the Milestones Approach Concept Element, as described in the Implementation Manual. The document should be read with the consideration that it describes Milestones events, as well as actions when some Milestones do not occur at the predicted moment. The described processes are automated and the objective is to inform Airport CDM Partners of inconsistencies of provided information as well as updated predictions of Target Off Block, Start Up Approval And Take Off Times.

Based on the agreement by the first Airport CDM Procedures Group held the 28th of February 2007 the operational procedures and system processes to be applied with Airport CDM shall be harmonised.

Based on agreement of the third procedures group meeting held 5-6 June 2008, the alert messages shall be attached as an independent annex to this document, which therefore, contains no references to messages within each of the Milestone Processes. The alert messages of Airport CDM follow an independent process of the alerts that Network Operations sends in reply to a DPI message. Both processes are complementary with each other.

Based on the agreement by the fourth Airport CDM Procedures Group meeting held 10-11 September 2008 the Generic Processes document shall be added to the Implementation Manual and not to the Functional Requirements Document.

Next page, a milestone table is provided that details the changes to the ones existing in the Implementation Manual.

The Milestone Processes are also linked to the Departure Planning Information (DPI) messages that will supply the Network Operations with reliable data concerning the progress of the flight. Specifically the DPIs will update the Estimated Take Off Time commencing at -3hrs and then at regular intervals prior to take off, based on the Milestones of the flight where accurate Estimated and/or Target Take Off Times are provided.

The T-DPI messages can have different status (T-DPI-p, T-DPI-t, T-DPI-s) according to the progress of the flight during the turn-round process at the airport. This document does not elaborate on those statuses; however more detail is included in the Implementation Manual and Network Operations interface documentation.

The outputs of the Milestone processes are alert messages to airport partners and DPI messages to Network Operations. Whereas the milestones mark a special event, the process may also be activated when this event does not occur at the predicted time.

Where it is stated to inform Airport partners on a certain event, it is locally decided which partners are relevant.

#### Alert Messages

The alert messages are not correlated with the Milestone Processes in this version of the document. This may be harmonised in future versions if so required. **The related alert messages can be found in Attachment 2.2.**

For each Milestone Process, the consequence of non-response to messages is stated. Actions for each stakeholder are described to advise on responses.

Alert messages shall trigger a response by the Aircraft Operator or Ground Handler (AO/GH), and in some cases by ATC. Such responses are usually to

update ATC Flight Plan or TOBT information or cancel the alert. Reaction by Network Operations on a DPI message can be to update the flight profile for more accurate traffic predictions, to change, cancel or freeze the CTOT, or cancel the previous DPI message information.

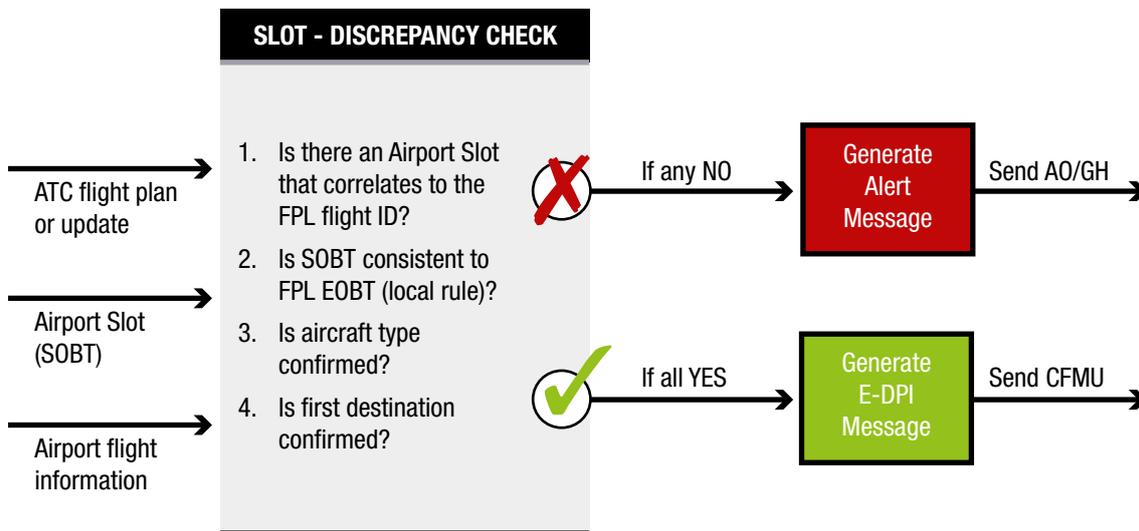
<b>Number</b>	<b>Milestones</b>	<b>Time Reference</b>	<b>Mandatory / Optional for Airport CDM Implementation</b>
1	ATC Flight Plan activation	3 hours before EOBT	Highly Recommended
2	EOBT – 2 hr	2 hours before EOBT	Highly Recommended
3	Take off from outstation	ATOT from outstation	Highly Recommended
4	Local radar update	Varies according to airport	Highly Recommended
5	Final approach	Varies according to airport	Highly Recommended
6	Landing	ALDT	Highly Recommended
7	In-block	AIBT	Highly Recommended
8	Ground handling starts	ACGT	Recommended
9	TOBT update prior to TSAT	Varies according to airport	Recommended
10	TSAT issue	Varies according to airport	Highly Recommended
11	Boarding starts	Varies according to airport	Recommended
12	Aircraft ready	ARDT	Recommended
13	Start up request	ASRT	Recommended
14	Start up approved	ASAT	Recommended
15	Off-block	AOBT	Highly Recommended
16	Take off	ATOT	Highly Recommended

## Milestone 1 Process: ATC Flight Plan Activated

This Milestone is **Highly Recommended**.

### Objective

To check consistency between ATC Flight Plan, Airport Slot and Airport Flight Data and then confirm the flight to the Network Operations and allow further local processing of the flight.



### Description

This check is highly recommended to be performed to verify the consistency between the ATC Flight Plan, Airport Slot and Airport Flight Data before the first E-DPI is sent. The AO must provide correct information before this first E-DPI message, in order to feed Network Operations with consistent SOBT, aircraft registration, and first destination data, as early in time as possible. The E-DPI message is recommended not to be sent if no or inconsistent information is provided.

### Triggers

This process is triggered by

- The first activation of the ATC Flight Plan (earliest EOBT-3 hr), or
- New or late submissions of the ATC Flight Plan, after cancellation or revised EOBT

### Pre-condition

ATC Flight Plan, Airport Slot, aircraft registration, flight first destination\* shall be available.

\*the flight first destination in the airport data base to be compared with the flight plan destination

**Input**

Input is the ATC Flight Plan or an update of it and airport flight information.

**Process**

The ATC Flight Plan (at the earliest EOBT-3 hr), together with airport slot and airport flight data are correlated. This is done by several data checks, where each time the answer should be YES. If any check fails, an alert message is generated. If all pass, an E-DPI message is highly recommended to be generated. Subsequent E-DPI may be sent if defined parameters change such as Aircraft Registration, ETOT, SID etc.

**Output**

Output is either the E-DPI message to Network Operations or an alert message is recommended to be generated to the AO/GH.

**Response to alert messages****AO/GH**

Update ATC Flight Plan and/or resolve the Airport Slot discrepancy.

**Consequences of no action following alert messages**

No E-DPI message is recommended to be sent and no CDM process is recommended to commence until the provided information is confirmed as early as possible and Airport Slot discrepancies are resolved.

**Remark**

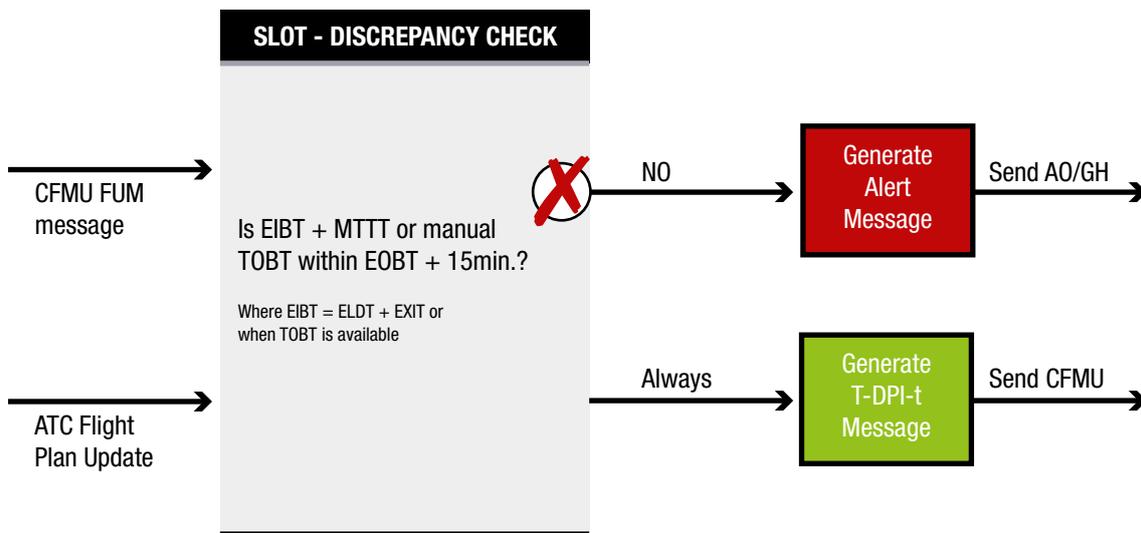
1. ATC Flight Plan activation takes place locally 3 - 4 hours before EOBT.
2. If the ATC Flight Plan is received later than EOBT-3hr, the trigger for the Airport CDM process is the moment the ATC Flight Plan is received.
3. If at any later stage in the Airport CDM process the ATC Flight Plan is cancelled and a new one is sent, this new ATC Flight Plan first has to fulfil Milestone 1 to trigger an E-DPI to the Network Operations system; otherwise subsequent DPI messages will be rejected by the Network Operations.
4. First destination out of ATC Flight Plan may not be available in Airport Database.

**Milestone 2 Process: EOBT - 2h**

This Milestone is **Highly Recommended** whenever it is applicable on a flight.

**Objective**

To check (before or after take off from outstation) whether AO/GH flight estimates are consistent with the ATC Flight Plan and to inform Network Operations about the updated take off time estimate, using a T-DPI message.



**Description**

This check is highly recommended to be performed to verify feasibility of the ATC Flight Plan estimated off block time at EOBT-2 hrs. At EOBT-2 hrs Network Operations is informed through the first T-DPI message. Calculation basis for the TTOT is highly recommended to take into account EIBT+MTTT+EXOT, if later than EOBT+EXOT. In the case of manual input of TOBT, this estimate will override the EIBT+MTTT estimate, hence TTOT equals TOBT+EXOT.

**Trigger**

This process is triggered by a time stamp, at EOBT – 2h.

**Pre-condition**

Milestone 1 is passed. An E-DPI message has been successfully sent to Network Operations.

**Input**

FUM, local procedure, and/or ATC Flight plan update.

### **Process**

At EOBT -2hrs the Estimated Landing Time (ELDT), Estimated Taxi-In Time (EXIT) and the Minimum Turn Round Time (MTTT) are highly recommended to be checked against the ATC Flight Plan EOBT + 15 minutes. In case a TOBT is already available, this TOBT can replace ELDT+EXIT+MTTT. If the calculated estimate or available TOBT is greater than EOBT + 15 minutes the AO/GH is recommended to be informed.

### **Output**

At all times a T-DPI message is sent to Network Operations including any updates following change to TTOT, SID etc. If the FPL discrepancy check fails, an alert message is recommended to be generated and sent to AO/GH. At this stage the T-DPI may have the status: P (provisional).

### **Response to messages**

#### **AO/GH**

Submit a Delay / Change message or cancel and re-file the ATC Flight Plan to resolve the discrepancies.

#### **Network Operations**

The Network Operations may update the flight profile, generate, update or cancel the CTOT according to the new TTOT and SID.

### **Consequences of no action following alert messages**

Not Applicable.

### **Remarks**

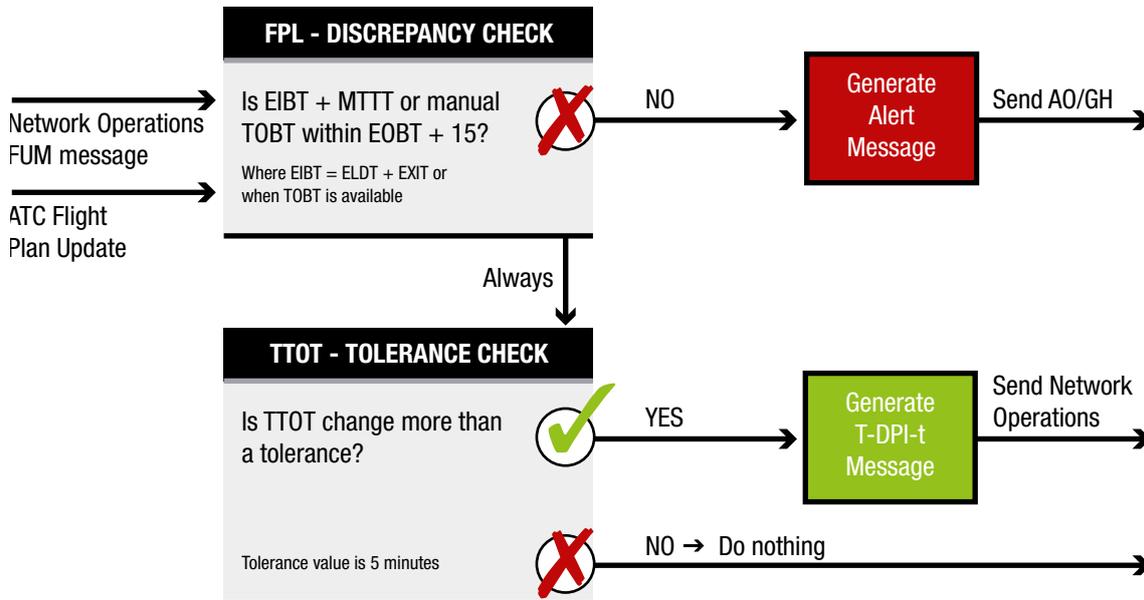
1. Milestone 3 can take place before Milestone 2 in the case of a flight that has departed from outstation before EOBT – 2 hrs.
2. Late ATC Flight Plans are highly recommended to pass the checks on Milestone 1 and 2, before commencing to further milestones.
3. Today Delay messages are sent in case of non conformance of a 15 minute deviation of EOBT. This Delay message may disappear in the future, being replaced by the proposed process described above.

### Milestone 3 Process: Take Off from Outstation

This Milestone is **Highly Recommended** whenever it is applicable on a flight.

#### Objective

To check whether the AO/GH estimated landing time after take off from outstation are consistent with the outbound ATC Flight Plan, and when needed inform the Network Operations about the updated take off time estimates using a T-DPI-c Message.



#### Description

This check is highly recommended to be performed to verify feasibility of the ATC Flight Plan at take off from outstation. A TTOT tolerance of 5 minutes is respected before Network Operations is informed of the updated TTOT. Calculation basis for the TTOT is highly recommended to take into account EIBT+MTTT+EXOT. In case EOBT is later than EIBT+MTTT, TTOT equals EOBT+EXOT. In the case where TOBT is available this prediction will overrule the EIBT+MTTT estimate, hence TTOT equals TOBT+EXOT.

#### Trigger

This process is triggered by the take off from outstation.

#### Pre-condition

Milestones 1 and 2 (if applicable) are passed. The aircraft is airborne, a FUM or any other relevant information is received.

#### Input

FUM after outstation take off and ATC Flight Plan update or any other relevant information.

## Process

The Estimated Taxi-In Time (EXIT) plus the Minimum Turn-round Time (MTTT) is added to the Estimated Landing Time (ELDT). The resulting time is highly recommended to be checked against the ATC Flight Plan EOBT + 15 minutes of the outbound flight. In case TOBT is already available, this TOBT can replace ELDT+EXIT+MTTT. In case the calculated estimate or the available TOBT is not within the EOBT tolerance the AO/GH is recommended to be informed. A TTOT update is checked against the TTOT tolerance value before Network Operations is informed about a changed TTOT.

## Output

A T-DPI-c message is sent to Network Operations only when the TTOT changes by more than the TTOT tolerance or if the SID, aircraft type or registration is modified. If the FPL discrepancy check fails, an alert message is recommended to be generated and sent to the AO/GH.

## Response to messages

### AO/GH

Submit a Delay / Change message or cancel and re-file the ATC Flight Plan to resolve the discrepancies.

### Network Operations

The Network Operations may update the flight profile, generate, update or cancel the CTOT according to the new TTOT and SID.

## Consequences of no action following alert messages

In case the flight is non-regulated it is recommended to be accepted into the ATC Pre-departure Sequence on the basis of the later calculated TOBT. In case the flight is regulated an updated or cancelled CTOT may be received and the flight will be sequenced accordingly. Also a non-regulated flight may become regulated.

## Remarks

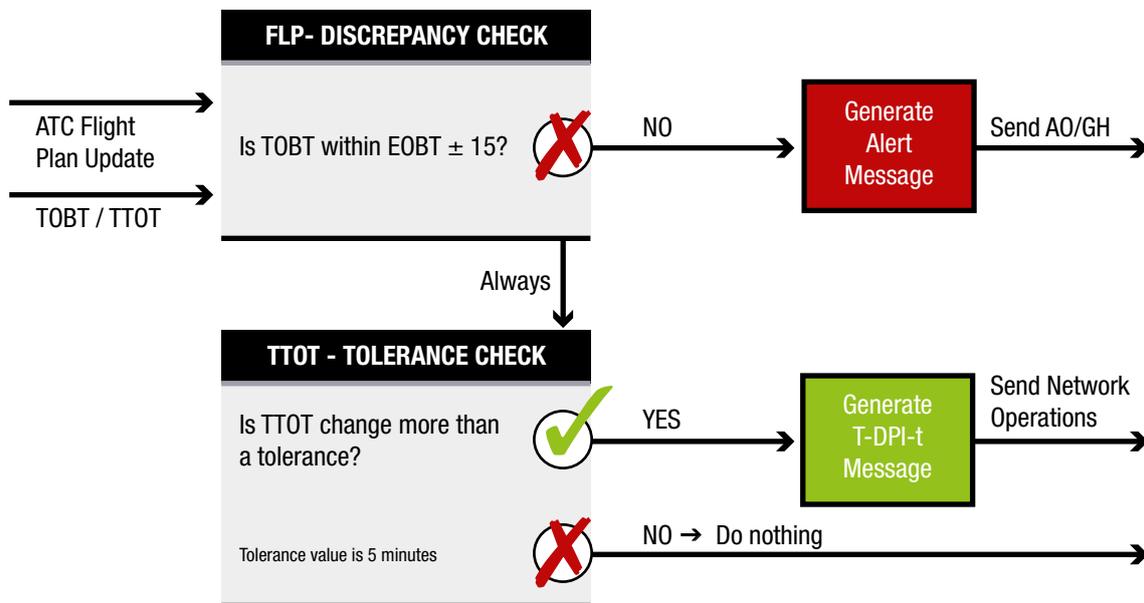
1. Milestone 3 can take place before Milestone 2 in the case of a flight that has departed from outstation before EOBT – 2 hrs. In this case either an E-DPI or no DPI is generated.
2. Other sources of information e.g. ACARS, MVT message may be inputs (check Aircraft Registration e.g. for Stand and Gate)
3. For long haul flights ELDT can be provided by calculation, using the ATOT from outstation and EET from ATC Flight Plan
4. A local procedure could be applied to alert for non-airborne status.
5. Depending on ELDT other airport processes may be triggered for necessary recalculation (e.g. Stand and Gate Management).

## Milestone 4/5 Process: Local Radar Update / Final Approach

Both milestones 4 and 5 are **Highly Recommended** whenever they are applicable to a flight.

### Objective

To commence the TOBT process and check whether the AO/GH TOBT is consistent with the ATC Flight Plan. Network Operations is informed when the TTOT changes by more than the agreed TTOT tolerance.



### Description

This check is highly recommended to be performed to verify feasibility of the ATC Flight Plan given the updated TOBT. The TTOT tolerance is respected before Network Operations is informed of updated TTOT.

### Trigger

This process is triggered by the detection of the flight by radar in either FIR, TMA, or on Final Approach.

### Pre-condition

Milestones 1 and 2 or 3 have been completed. The detection by Local Radar or Final Approach is the trigger to update the ELDT for the inbound flight, which automatically generates or updates TOBT. The AO/GH can also generate or update the TOBT manually based on the latest information.

### **Input**

ATC Flight Plan (or an update) and both TOBT and TTOT.

### **Process**

As soon as TOBT is available, the TOBT is highly recommended to be checked against the ATC Flight Plan EOBT  $\pm$  15 minutes. In case the TOBT prediction is not within the tolerance the AO/GH is recommended to be informed. A TTOT update is checked against the TTOT tolerance value before Network Operations is informed about a changed TTOT.

### **Output**

A T-DPI-c message is sent to Network Operations only when the TTOT changes by more than the TTOT tolerance or if the SID, aircraft type or registration is modified. If the FPL discrepancy check fails, an alert message is recommended to be generated and sent to the AO/GH.

### **Response to messages**

#### **AO/GH**

Submit a Delay/Change message or cancel and re-file the ATC Flight Plan to resolve the discrepancies, or modify TOBT.

#### **Network Operations**

The Network Operations may update the flight profile, generate, update or cancel the CTOT according to the new TTOT and SID.

### **Consequences of no action following alert messages**

In case the flight is non-regulated it is recommended to be accepted into the ATC Pre-departure Sequence on the basis of the later calculated TOBT. In case the flight is regulated an updated or cancelled CTOT may be received and the flight will be sequenced accordingly. Also a non-regulated flight may become regulated.

### **Remarks**

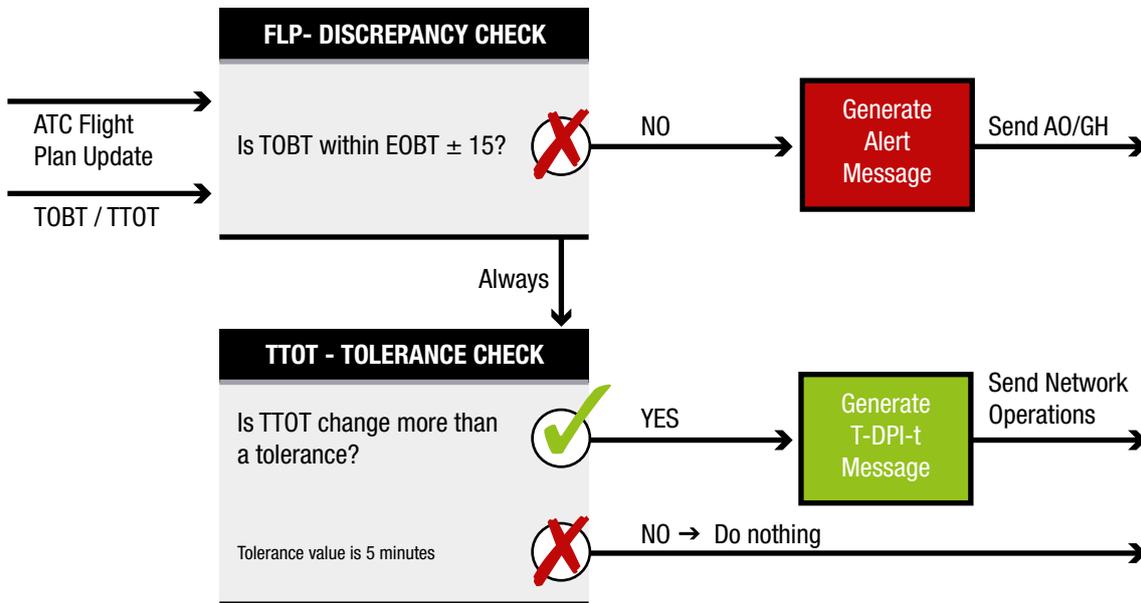
1. The TOBT is initially generated automatically, however, the AO/GH must update the TOBT based on the latest information or confirm in the case where it is correct.
2. Aircraft which have a long layover or are being towed will not trigger this process via local radar. For these flights the process shall not apply. A comparable trigger point has to be defined within the local procedure, e.g. leaving the preceding parking position or x minutes prior to EOBT.
3. If AMAN or DMAN applications are available they can be used for local calculations.
4. Milestone 5 should be the latest point where a first TOBT is highly recommended to be given by the AO/GH.

**Milestone 6-8 Process: Landed, In-blocks, Ground Handling Started**

The Milestones 6 and 7 are Highly Recommended when applicable. Milestone 8 is **Recommended**.

**Objective**

To check whether the AO/GH TOBT is consistent with the ATC Flight Plan. Network Operations is informed when the TTOT changes by more than the agreed TTOT tolerance.



**Description**

This check is highly recommended to be performed to verify feasibility of the ATC Flight Plan given the updated TOBT or ATC Flight Plan. A TTOT tolerance is respected before Network Operations is informed on updated TTOT.

**Trigger**

This process is triggered by

- Actual Landing Time: ALDT,
- Actual In Blocks Time: AIBT,
- Actual Commence of Ground Handling: ACGT

**Input**

ATC Flight Plan (or an update) and both TOBT and TTOT.

### **Pre-condition**

Milestone 1 to 5 have been completed prior to milestone 6

Milestone 1-6 have been completed prior to milestone 7

Milestone 1-7 have been completed prior to milestone 8

### **Process**

The TOBT is highly recommended to be checked against the ATC Flight Plan EOBT  $\pm$  15 minutes. In case the TOBT prediction is not within the tolerance the AO/GH is recommended to be informed. A TTOT update is checked against the TTOT tolerance value before Network Operations is informed about a changed TTOT.

### **Output**

A T-DPI-c message is sent to Network Operations only when the TTOT changes by more than the TTOT tolerance or if the SID, aircraft type or registration is modified. If the FPL discrepancy check fails, an alert message is recommended to be generated and sent to the AO/GH.

### **Response to messages**

#### **AO/GH**

Submit a Delay / Change message or cancel and refile the ATC Flight Plan to resolve the discrepancies, or modify TOBT.

#### **Network Operations**

The Network Operations may update the flight profile, generate, update or cancel an existing CTOT according to the new TTOT and SID.

### **Consequences of no action following alert messages**

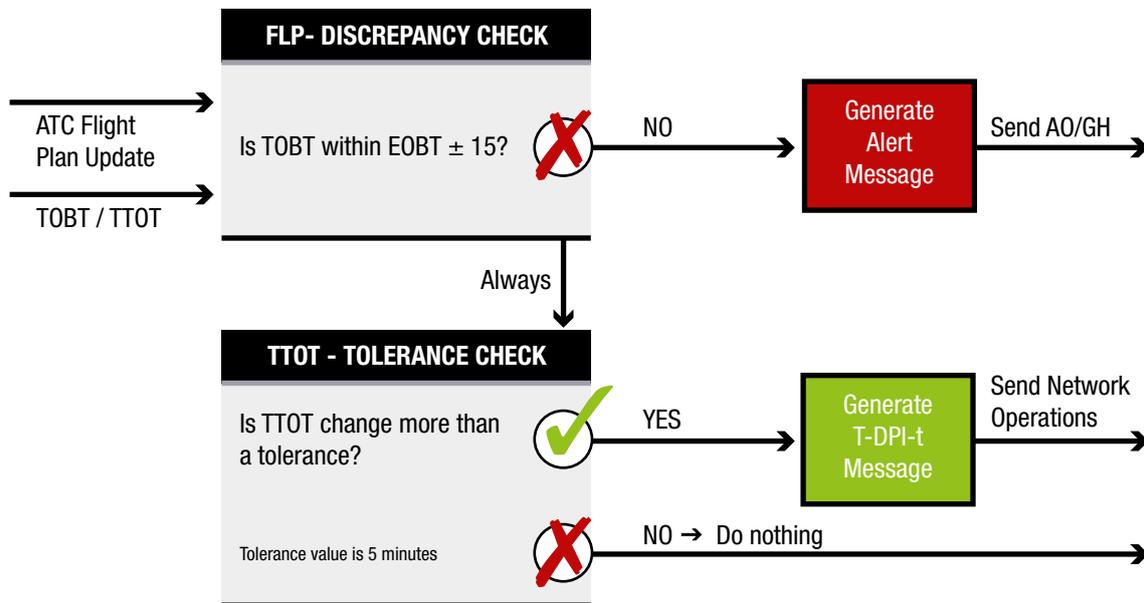
In case the flight is non-regulated it is recommended to be accepted into the ATC Pre-departure Sequence on the basis of the later calculated TOBT. In case the flight is regulated an updated or cancelled CTOT may be received and the flight will be sequenced accordingly. Also a non-regulated flight may become regulated.

**Milestone 9 Process: TOBT Confirmation Prior to TSAT Issue**

This Milestone is **Recommended**.

**Objective**

To check whether the AO/GH TOBT is consistent with the ATC Flight Plan. Network Operations is informed when the TTOT changes by more than the agreed TTOT tolerance.



**Description**

This check is recommended to be performed at a predefined time (local parameter) to confirm TOBT prior to TSAT issue and verify feasibility of the ATC Flight Plan estimates given the updated TOBT. A TTOT tolerance is respected before Network Operations is informed on updated TTOT.

This Milestone Process is actually constantly applicable in the CDM platform, as soon as a TOBT is available. However the confirmed TOBT prior to TSAT has special status, where AO/GH check the quality of TOBT before TSAT issue.

**Trigger**

This process is triggered by a new TOBT or TTOT update. No need to confirm an existing TOBT if it has been manually modified before.

**Input**

ATC Flight Plan (or an update) and both TOBT and TTOT.

### **Pre-condition**

Milestone 1-3 have been completed as a minimum.

### **Process**

The TOBT is recommended to be checked against the ATC Flight Plan EOBT  $\pm$  15 minutes. In case the TOBT prediction is not within this tolerance AO/GH is recommended to be informed. TTOT update is checked against the TTOT-tolerance value before Network Operations is informed about a changed TTOT.

### **Output**

A T-DPI-c message is sent to Network Operations only when the TTOT changes by more than the TTOT tolerance or if the SID, aircraft type or registration is modified. If the FPL discrepancy check fails, an alert message should be generated and sent to the AO/GH.

### **Response to messages**

#### **AO/GH**

Submit a Delay / Change message or cancel and re-file the ATC Flight Plan to resolve the discrepancies, or modify TOBT.

#### **Network Operations**

The Network Operations may update the flight profile, generate, update or cancel the CTOT according to the new TTOT and SID.

### **Consequences of no action following alert messages**

In case the flight is non-regulated it is recommended to be accepted into the ATC Pre-departure Sequence on the basis of the later calculated TOBT. In case the flight is regulated an updated or cancelled CTOT may be received and the flight will be sequenced accordingly. Also a non-regulated flight may become regulated.

## Milestone 10 Process: TSAT Issued

This Milestone is Highly **Recommended**.

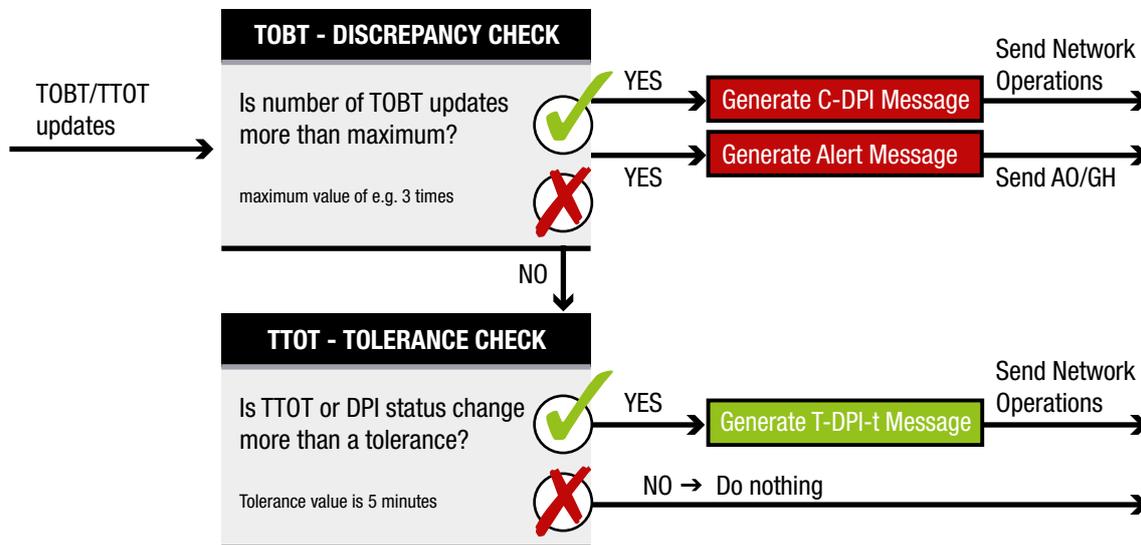
### Objective

First step: to inform all relevant partners of the TSAT that has been allocated to the flight.

The Network Operations is informed by a T-DPI-s for non regulated flights.



Second step: to check whether the number of TOBT updates exceeds a tolerance defined locally, after TSAT has been issued.



### Description

First: The TSAT will indicate to the partners the time when the Start Up Approval can be expected. Network Operations is highly recommended to be informed with a T-DPI-s for non regulated flights. No check is performed.

Second: A check is highly recommended to be performed to see the number of TOBT updates after TSAT has been issued. In case the number of TOBT updates exceeds a threshold, then the TOBT input is recommended to be processed according to local procedure.

### **Trigger**

This process is triggered by

- A defined time (local parameter) before TOBT
- TOBT update after TSAT issue

### **Pre-condition**

Milestones 1-9 have been completed.

### **Input**

TOBT, number of TOBT updates after TSAT, and TTOT.

### **Process**

TSAT will be calculated at a pre-defined time (local parameter) before TOBT. This TSAT is highly recommended to be issued (distributed) to the concerned CDM Partners. When the TOBT is updated the amount of updates is highly recommended to be checked against a maximum of allowed changes (local parameter). The AO/GH is informed when the maximum number of updates is obtained. Network Operations is informed when TOBT is deleted.

### **Output**

TSAT is highly recommended to be available on the CDM Platform. A T-DPI-s message is sent to Network Operations including any updates following changes to TTOT, SID etc. for non regulated flights. For Regulated flights the T-DPI-s will be based on a local trigger any time after TSAT generation (e.g. TSAT-10 or start up given). In case of too many TOBT updates an alert message is recommended to be generated and sent to the AO/GH.

### **Response to Messages**

#### **AO/GH**

Update your TOBT and if necessary submit a Delay message or cancel and re-file the ATC Flight Plan.

#### **Network Operations**

The Network Operations may update the flight profile, generate, update or cancel the CTOT according to the new TTOT and SID. In case of C-DPI, remove all previous received T-DPI information and fall back on latest available ATC Flight Plan information, maintaining latest Variable Taxi Time and SID.

#### **Consequences of no action following alert messages**

The flight may be re-sequenced according to local procedure until a new TOBT is sent.

When the TOBT is deleted, the flight will be taken out of the sequence.

#### **Remark**

The TTOT is taken by Network Management Operations as a "No slot before" time.

## Milestone 11 Process: Boarding Started

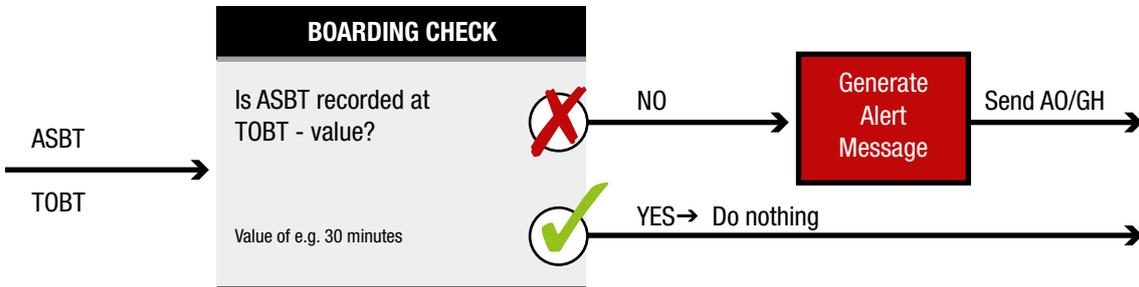
This Milestone is **Recommended**.

### Objective

First step: to inform all relevant Airport CDM Partners of Actual Start Boarding Time (ASBT).



Second step: to check whether the number of TOBT updates exceeds a tolerance defined locally, after TSAT has been issued.



### Description

Inform of Actual Start Boarding Time (ASBT) when it occurs. At a certain time before TOBT (local variable e.g. corresponding to aircraft type) a check is recommended to be performed to check the boarding status.

### Trigger

This process is triggered by a time variable <value> minutes before TOBT.

### Pre-condition

Milestones 1 to 10 have been completed. TOBT is available.

**Input**

The boarding status [yes, no] or ASBT and TOBT.

**Process**

ASBT is recorded in the Airport CDM Platform once passengers are boarding the plane. The AO/GH will be alerted that boarding has not commenced at a time (local variable) prior to TOBT and therefore the TOBT may not be respected.

**Output**

An alert message is recommended to be generated to the AO/GH, or no action in case boarding proceeds as planned.

**Response to messages****AO/GH**

Update TOBT if required.

**Consequences of no action following alert messages**

The flight may risk violation of the TOBT and not be ready at TSAT.

**Remarks**

1. This process is not triggered by the milestone event, but at a time before TOBT that boarding should have started.

## Milestone 12 Process: Aircraft Ready

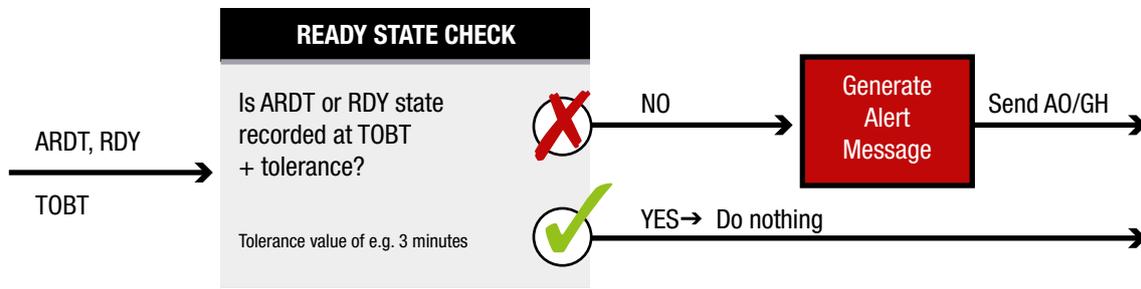
This Milestone is **Recommended**.

### Objective

First step: to inform all relevant Airport CDM Partners of Actual Ready Time (ARDT) in the Airport CDM Platform and that the aircraft is ready for start up / push-back.



Second step: To inform the AO/GH that TOBT has passed and the Airport CDM Platform has not yet received ARDT or Ready Status (RDY).



### Description

Inform of ARDT or RDY confirming that the flight follows the indicated TOBT. At TOBT + tolerance the AO/GH are informed that TOBT has passed and there has not been a ready status message yet.

### Trigger

This process is triggered by an input to the Airport CDM Platform.

### Pre-condition

Milestones 1 to 11 have been completed.

### Input

TOBT, ARDT or Aircraft RDY status from local process (e.g. flight crew or ATC automation).

**Process**

Aircraft ready status RDY or ARDT is recorded in the Airport CDM Platform (possibly via related systems like TWR FDPS, Pre-Departure Sequencer, AO, etc.). At TOBT + tolerance an alert to the AO/GH is recommended to be generated when such status or ARDT is not received.

**Output**

Inform the aircraft ready status to Clearance Delivery and other partners. An alert to the AO/GH is recommended to be generated when such status or ARDT is not received.

**Consequences of no action following alert messages**

To be defined locally

**Milestone 13 Process: Start Up Requested**

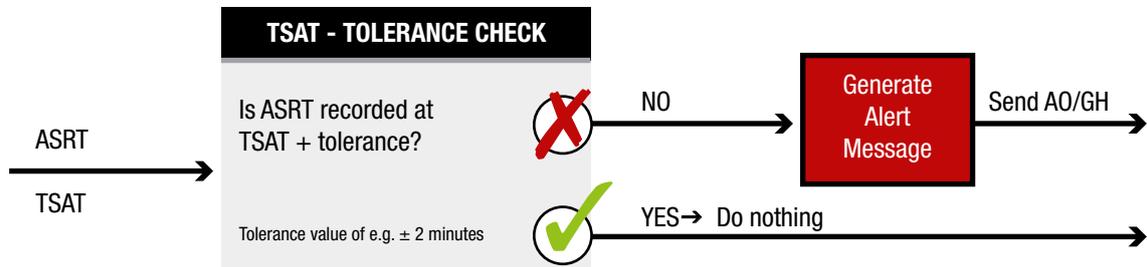
This Milestone is **Recommended**.

**Objective**

First step: to inform all relevant Airport CDM Partners of Actual Start up Request Time (ASRT) in the Airport CDM Platform.



Second step: to alert all relevant Airport CDM Partners when no start up has been requested inside the locally agreed TSAT tolerance window.



**Description**

Inform of ASRT when it occurs. If the start up request is not made by TSAT + tolerance, the AO/GH is informed that no start up has been requested, and is recommended to update TOBT.

**Trigger**

Timestamp when the tolerance window has passed at TSAT.

**Pre-condition**

Milestones 1-12 have been completed. TSAT is assigned.

**Input**

ASRT and TSAT + tolerance

**Process**

ASRT is recorded in the Airport CDM Platform after the request for start up is made. At TSAT + tolerance a check is made to detect if the request for start up is missing.

**Output**

Output is an indication to Clearance Delivery that TSAT has passed and it is recommended to generate an alert message to the AO /GH, or no action in case start up request has been made as planned.

**Response to messages****AO/GH**

Update of TOBT

**Consequences of no action following alert messages**

A C-DPI recommended to be sent to Network Operations if the flight is removed from the pre-departure sequence and the TOBT is deleted.

**Remarks:**

1. The start up request can be made either via R/T or Data link.

## Milestone 14 Process: Start Up Approved

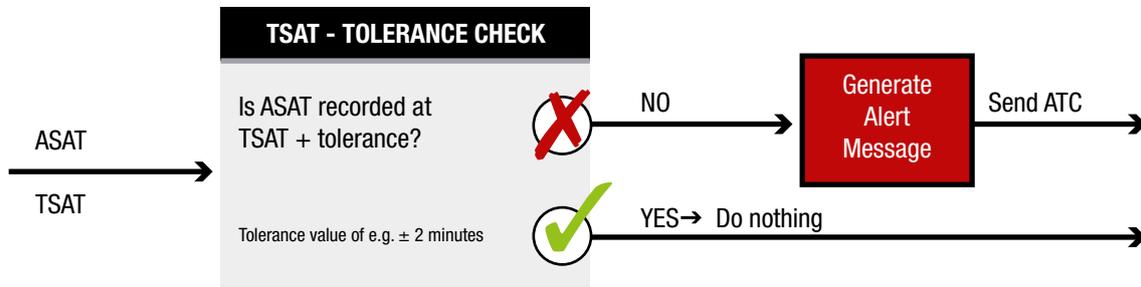
This Milestone is **Recommended** (may be considered Highly Recommended where sequencing applications are available, e.g. DMAN).

### Objective

First step: to inform all relevant Airport CDM Partners of Actual Start up Approval Time (ASAT) in the Airport CDM Platform and that the aircraft has received start up approval / push-back clearance.



Second step: to check if ASAT is in accordance to TSAT and to alert all relevant Airport CDM Partners when no start up has been granted.



### Description

Inform of ASAT when it occurs. In case the start up approval is not granted at TSAT + tolerance, all relevant partners are recommended to be informed. The flight will be re-sequenced.

### Trigger

Start up request by flight crew (voice or DCL) or a locally defined time around TSAT if Milestone Process 13 is omitted.

### Pre-condition

Milestones 1-13 have been completed.

### Input

ASAT and TSAT + tolerance

**Process**

ASAT is recorded in the Airport CDM Platform after the clearance for start up is made. At TSAT + tolerance a check is made to detect if the clearance for start up is missing.

**Output**

ASAT is recorded in the Airport CDM Platform and distributed, or an alert message is recommended to be sent to all relevant partners.

**Response to messages****ATC**

ATC is recommended to provide start up Approval or flight is recommended to be re-sequenced to assign new TSAT.

**Consequences of no action following alert messages**

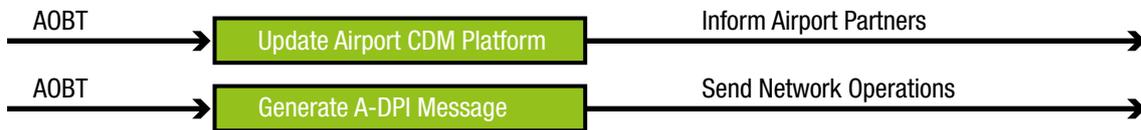
Not Applicable

**Milestone 15 Process: Off-Block**

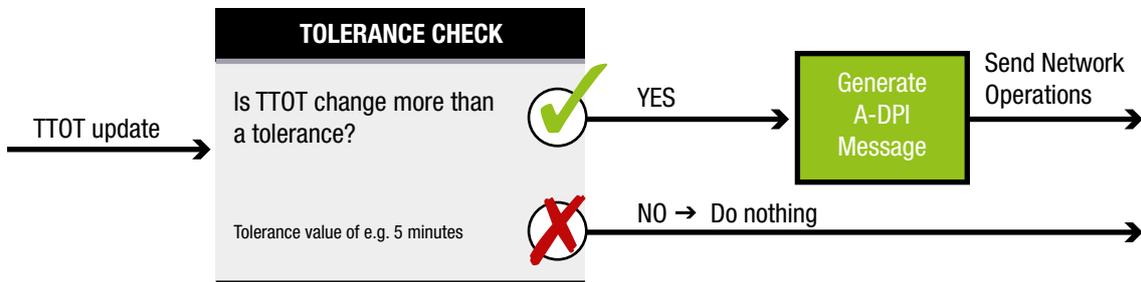
This Milestone is **Highly Recommended**.

**Objective**

First step: to inform all relevant Airport CDM Partners of Actual Off-Block Time (AOBT) in the Airport CDM Platform and that the aircraft has commenced push-back / taxi from parking position.



Second step: to check if TTOT changes by more than the agreed tolerance and inform Network Operations.



**Description**

Inform of AOBT when it occurs. AOBT always triggers an A-DPI message to Network Operations or in the case of remote holding at a defined time prior to TTOT. After a first A-DPI is sent this check is highly recommended to be performed to check TTOT updates against the TTOT tolerance before Network Operations is informed, with a new A-DPI, of the updated TTOT.

**Trigger**

This process is triggered by AOBT detection.

**Pre-condition**

Milestones 1-14 have been completed.

**Input**

AOBT is detected and input into the Airport CDM Platform. TTOT is calculated from AOBT + EXOT automatically.

### **Process**

AOBT is recorded in the Airport CDM Platform after push-back is detected. A-DPI is highly recommended to be generated and sent to the Network Operations. Any subsequent update of TTOT is highly recommended to be checked against the TTOT tolerance to determine whether a new A-DPI shall be sent to the Network Operations.

### **Output**

A-DPI message is always sent to Network Operations and subsequent A-DPI is sent when the TTOT changes by more than the TTOT tolerance.

### **Response to Messages**

#### **Network Operations**

Freeze CTOT.

### **Consequences of No Action following Alert Messages**

Not Applicable.

### **Remark**

1. A-SMGCS can be used to detect actual taxi movement instead of a manually input of AOBT. This automation of movement detection can provide an improved TTOT accuracy in the A-DPI.
2. In the case where an aircraft is off-blocks and has returned to stand or holding remotely to resolve a problem, local procedures is highly recommended to be defined to establish who is responsible to generate C-DPI or update of the TTOT.

## Milestone 16 Process: Take Off

This Milestone is **Highly Recommended**.

### Objective

To inform all relevant Airport CDM Partners about the actual take off.



### Description

An airborne message is generated and the flight is removed from the departure sequence.

### Trigger

This process is triggered by Tower FDPS, A-SMGCS/ Radar detection or ACARS.

### Pre-condition

Milestones 1-15 have been completed

### Input

Actual Take Off Time.

### Process

Generate airborne status.

### Output

Airport partners are informed with an airborne message.

### Response to Messages

Not applicable

### Consequences of No Action following Alert Messages

Not applicable.

### Remarks

According to existing procedure between ANSPs and Network Operations, a First System Activation (FSA) message is highly recommended to be generated via radar data.

**Intentionally left blank**

## 2.2 AIRPORT CDM ALERT MESSAGES

### Introduction

This document serves the purpose of standardisation of Alert Messages initiated during the Generic CDM Procedures of the Turn-Round Milestone process. If standardisation is not applied, the risk may be that the Aircraft Operator/Ground Handler (AO/GH) receive different alert messages at different airports, and confusion may occur. The alert messages are recommended and can be sent any time but they are generally linked to specific milestones, subject to local implementation decisions.

### Hierarchy of Discussion (below the three topics are elaborated):

1. Description of messages
2. Content structure
3. Actual content

### 1. Description of Messages

The messages below are sent to the appropriate Airport CDM Partners, via the Airport CDM Information Sharing (ACIS) Platform. Most of them are sent to the AO/GH in order to take action either locally or remotely. However other partners can also be informed.

### CDM Messages Codes and Titles

ID	Code	Description	Link with Network Management Operations DPI ERRor Reply Messages*	Applicable on Milestone Process
1.	CDM01	No Airport Slot Available, or Slot already correlated	N/A	1
2.	CDM02	SOBT vs. EOBT discrepancy	N/A	1
3.	CDM03	Aircraft Type discrepancy	DPI ARCTYP inconsistent with ARCTYP from flight plan	1-14
4.	CDM04	Aircraft Registration discrepancy	DPI Registration inconsistent with registration from flight plan No Registration available in flight plan	1-14
5.	CDM05	First Destination discrepancy	N/A	1
6.	CDM06	Non-Airborne Alert	N/A	3
7.	CDM07	EIBT + MTTT discrepancy with EOBT	N/A	2-3
8.	CDM08	EOBT Compliance Alert	DPI OBT Inconsistent with EOBT from IFPS	3-11
9.	CDM09	Boarding Not Started	N/A	11
10.	CDM10	TOBT Rejected or Deleted	N/A	9-14
11.	CDM11	Flight not Compliant with TOBT/TSAT	N/A	12-13
12.	CDM12	TSAT not respected by ATC	N/A	13
13.	CDM13	No ATC Flight Plan Available	Not existing flight	1-14
14.	CDM14	Automatic TOBT Generation not Possible	N/A	4-9

\* Ref Document – CFMU Flight Progress Messages V1.500

## 1. CDM01 - No Airport Slot Available, or slot already correlated

### Applicable on Milestone Process 1

- Message sent to AO/GH when the FPL can not be correlated with an existing Airport Slot.

## 2. CDM02 - SOBT vs. EOBT discrepancy

### Applicable on Milestone Process 1

- Message to AO/GH where Initial EOBT falls outside of permitted SOBT window (local slot allocation rules will dictate parameters).

*Example: If the SOBT is 2100 and the FPL EOBT is greater or less than 2100 then local rules may dictate whether the flight can proceed. In this case if the EOBT was changed to 0030 then the Airside Operations / Airport Slot Coordination may have to approve it, as it falls on the next day. (Local rules to be applied)*

*Note: Local procedures may include a discrepancy check as well between SIBT and EIBT for arrival flights*

## 3. CDM03 - Aircraft Type discrepancy

### Applicable on Milestone Processes 1-14

- Message to AO/GH and Airport Operator
- Where the Airport Database and the ATC Flight Plan have different aircraft type then an alert is raised.
- Where the Airport Database identifies a discrepancy with another source, e.g. movement message or FUM, then an alert is raised.
- If a type change occurs and the FPL shows for example B772 and the airport system is showing B744. It is up to the AO/GH to confirm which data is correct and either re-file the FPL or get the Airport Database updated through local procedures.

## 4. CDM04 - Aircraft Registration discrepancy

### Applicable on Milestone Processes 1-14

- Message to AO/GH and Airport Operator
- Where the Airport Database identifies a discrepancy with another source, e.g. movement message or FUM, then an alert is raised.
- If the registration of the inbound aircraft does not match the planned aircraft rotation, this alert is raised.

## 5. CDM05 - First Destination discrepancy

### Applicable on Milestone Process 1

- Message to AO/GH if discrepancy not resolved locally at the airport.
- First destination discrepancy can occur between Airport Operator information and FPL due to operational reasons, such as fuel stops or diversions.

## 6. CDM06 - Non-Airborne Alert

### Applicable on Milestone Process 3

- Message to AO/GH
- This message could be useful for a long haul flight that did not take off from outstation based on ETOT outstation + EET from ATC Flight Plan compared to EIBT at DEST (tolerance can set locally)\*.

\*The calculation will be non-applicable when FUM messages are received.

## 7. CDM07 - EIBT + MTTT discrepancy with EOBT

### Applicable on Milestone Processes 2 and 3

- Message to AO/GH to warn that inbound flight EIBT and turn-round MTTT is later than EOBT +15 minutes, and could affect outbound leg.

## 8. CDM08 - EOBT Compliance Alert

### Applicable on Milestone Processes 3 -11

- Message to AO/GH when confirmed TOBT is outside EOBT ± 15 minutes window.

## 9. CDM09 - Boarding Not Started

Applicable on Milestone Process 11

- Message to AO/GH to alert them that boarding has not started at a time parameter agreed locally before TOBT and therefore TOBT may not be achieved. AO/GH will take action as defined in local procedures

## 10. CDM10 - TOBT Rejected or Deleted

### Applicable on Milestone Process 9 or later

- Message to AO/GH when the TOBT has been deleted, e.g. to inform remote airline operations, or in case when the maximum number of TOBT updates is exceeded.

## 11. CDM11 - Flight Not Compliant with TOBT / TSAT

### Applicable on Milestone Processes 12 and 13

- Message to AO/GH when the flight is not ready at TOBT (+ local parameter)
- Message to AO/GH when the flight has not started or pushed at TSAT (+ local parameter)

*Note. This alert will be subject to local / international procedures for how Ground / Apron Control positions operate with reference to start up /or start and push etc.*

## 12. CDM12 – TSAT not respected by ATC

### Applicable on Milestone Process 13

- Message to ATC when the flight not started or pushed at TSAT (+ local parameter)

*Note. This alert will be subject to local / international procedures for how Ground / Apron Control positions operate with reference to start up /or start and push etc.*

## 13. CDM13 - No ATC Flight Plan Available

### Applicable at anytime during the milestones process

- In case the AO cancels the ATC FPL even when Ground handling / turn-round takes place (e.g. change of route or EOBT in the FPL)

## 14. CDM14 - Automatic TOBT Generation not Possible

### Applicable on Milestone Process 4-9

- Message to AO/GH when the first TOBT cannot be automatically generated because TOBT + taxi time EXOT is later then CTOT.

*Note: Only applicable when TOBT is generated automatically and TOBT + EXOT would be after the slot tolerance window (CTOT + 10 min). AO/GH have to decide if CTOT is feasible (e.g. skip cleaning of the Aft) and set the TOBT manually. Otherwise the T-DPI-t out of the TOBT + EXOT is later then CTOT would lead to a new CTOT (potentially delayed).*

*Not applicable when the first TOBT is given manually by AO/GH*

## 2. Content structure

### High Level Message Structure

1. **Flight Identification / alert code / timestamp / origin**
  - a. Flight ID is both ATC call sign and flight number
  - b. Alert Code is the alert message identification
  - c. Timestamp is time and date of event
  - d. Origin is both IATA and ICAO codes
2. **Inconsistency detection**
3. **Action to take**
4. **Note referring to in action consequences**
  - a. Notes are mentioned outside message, subject to local procedures

## 3. Actual Content

This section contains examples of the above categories.

### 1. CDM01 - No Airport Slot available, or Slot already correlated

#### **Flt ID/CDM01/Timestamp/ADEP**

Airport Slot SOBT not available or Slot already correlated.  
Immediate update of ATC Flight Plan EOBT or request new Airport Slot.

*Sample Note: The Airport CDM process may be suspended until reception of your rectification.*

### 2. CDM02 - SOBT vs EOBT discrepancy

#### **FLT ID/CDM02/Timestamp/ADEP**

ATC Flight Plan EOBT is not consistent with Airport Slot SOBT.  
Immediate update of Airport Slot or ATC Flight Plan EOBT needed.

*Sample Note: The Airport CDM process may be suspended until reception of your rectification.*

### 3. CDM03 - Aircraft Type discrepancy

#### **FLT ID/CDM03/Timestamp/ADEP**

Aircraft Type inconsistency between ATC Flight Plan and Airport Database.  
Immediate update of ATC Flight Plan or Airport Database needed.

*Sample Note: The Airport CDM process will not be suspended but start up / push-back clearance may not be granted until discrepancy is resolved.*

#### 4. CDM04 - Aircraft Registration discrepancy

**FLT ID/CDM04/Timestamp/ADEP**

Aircraft Registration inconsistency between ATC Flight Plan and Airport Database.  
Immediate update of ATC Flight Plan or Airport Database needed.

*Sample Note: The Airport CDM process will not be suspended but start up / push-back clearance may not be granted until discrepancy is resolved.*

#### 5. CDM05 - Destination discrepancy

**FLT ID/CDM05/Timestamp**

Destination inconsistency between ATC Flight Plan and Airport Database.  
Immediate update of ATC Flight Plan or Airport Database needed.

*Sample Note: The Airport CDM process will not be suspended but start up / push-back clearance may not be granted until discrepancy is resolved.*

#### 6. CDM06 - Non-Airborne Alert

**FLT ID/CDM06/Timestamp/ADEP**

No information that inbound flight is airborne, SIBT / EIBT might not be respected. Check outbound flight and ATC Flight Plan and update if required.

*Sample Note: This is an advisory alert only and this flight requires monitoring as the outbound flight maybe delayed.*

#### 7. CDM07 - EIBT + MTTT discrepancy with EOBT

**FLT ID/CDM07/Timestamp/ADEP**

EIBT of inbound FLT ID + MTTT is not consistent with outbound ATC Flight Plan EOBT. Check outbound flight and ATC Flight Plan and update if required.

*Sample Note: This is an advisory alert only and this flight requires monitoring as the outbound flight maybe delayed.*

## 8. CDM08 - EOBT Compliance Alert

### **FLT ID/CDM08/Timestamp/ADEP**

Received TOBT is out of ATC Flight Plan EOBT tolerance window.  
Immediate update of ATC Flight Plan EOBT needed.

*Sample Note: The Airport CDM process will not be suspended but start up / push-back clearance may not be granted until discrepancy is resolved.*

## 9. CDM09 - Boarding Not Started

### **FLT ID/CDM09/Timestamp/ADEP**

At TOBT – <local parameter> boarding was not initiated.  
Update TOBT if needed

*Sample Note: The Airport CDM process will not be suspended but start up / push-back clearance may not be granted until discrepancy is resolved.*

## 10. CDM10 – TOBT Rejected or Deleted

### **FLT ID/CDM10/Timestamp/ADEP**

TOBT was rejected or deleted. A new TOBT is required.

*Sample Note: The Airport CDM process may be suspended until reception of your rectification.*

## 11. CDM11 - Flight not compliant with TOBT / TSAT

### **FLT ID/CDM11/Timestamp/ADEP**

Flight not compliant with TOBT/ TSAT. This flight will be re-sequenced on receipt of new TOBT

*Sample Note: The Airport CDM process may be suspended until reception of your new TOBT/FPL.*

## 12. CDM12 - TSAT Not Respected by ATC

### **FLT ID/CDM12/Timestamp/ADEP**

At TSAT plus tolerance aircraft has not been granted start up or push-back. This flight needs to be re-sequenced.

*Sample Note:*

### 13. CDM13 - No ATC Flight Plan Available

**FLT ID/CDM13/Timestamp/ADEP**

The ATC Flight Plan is not available. Submission of new ATC Flight Plan needed.

*Sample Note: The Airport CDM process may be suspended until reception of your rectification.*

### 14. CDM14 - Automatic TOBT Generation not possible

**FLT ID/CDM14/Timestamp/ADEP**

The TOBT could not be automatically generated because it does not match with the associated CTOT. Manual input of TOBT required.

*Sample Note: The Airport CDM process may be suspended until reception of your rectification.*

## 2.3 AIRPORT CDM PROCEDURES FOR CLEARANCE DELIVERY & START-UP

These procedures are applicable during the phase when the aircraft is still parked at the gate. For simplicity, no interaction with respect for routing or other services is provided here. Only Airport CDM related interaction between flight deck (pilot) and ground (ATC, CDM platform or Pre Departure Sequencer) is detailed.

The Pre-departure phase procedures are detailed in 3 scenarios followed by CDM operational requirements which will form input for technical standardization for data link applications, with existing or new technology, and ICAO operational procedures for CDM Airports.

The actors in the following scenarios are Flight crew and ATC, where ATC is responsible for generating TSAT and TTOT, possibly by means of an automated pre-departure sequencer.

Different time or event references may be applicable for different communication channels, since local procedures may be different for R/T than for datalink. Also, ACARS as present day datalink may differ from future ATN datalink, which is taken into account in the operational requirements in this appendix.

## Scenario 1 – Departure Clearance & Start-Up Approval issued together

### Operational Scenario Description

ATC delivers departure/en-route clearance and start-up approval at once via datalink or R/T, or a combination of both, after flight deck request.

### Trigger

Time stamp TOBT – local parameter

### Pre-condition

TSAT issued based on TOBT.

### Procedure

The time references are indicative and may differ for different airlines or airports. The right column explains if datalink only, R-T, or both mediums can be used for one particular step in the procedure.

Step	Responsible	Reason	Time / Event references	Data link / R/T
<b>Departure / En-route &amp; Start-up Clearance</b>				
1	ATC	TSAT issued to flight TTOT optional	TOBT - ~20 min	Data link
2	Flight crew	Request Departure / En-Route Clearance & Start-Up Approval	TSAT - ~20 min TSAT - ~10 min	Data link R/T
3	ATC	Departure / En-Route Clearance & Start Up Approval	TSAT - ~20 min TSAT - ~10 min	Data link R/T
4	Flight crew	Acknowledgement of Departure / En-Route Clearance & Start Up Approval	TSAT - ~20 min TSAT - ~10 min	Data link R/T
<b>Push-back / Taxi Clearance (as applicable)</b>				
5	Flight crew	Request Push-back Approval / Taxi clearance	TSAT ± tolerance	R/T
6	ATC/Apron	Push-back Approval / Taxi clearance approved	TSAT ± tolerance	R/T
7	Flight crew	Acknowledgement and commence of Push-back / Taxi	TSAT ± tolerance	R/T

## ATTACHMENT 2 Procedures & Processes

### Scenario 2 – Departure Clearance & Start-Up Approval issued separately

#### Operational Scenario Description

ATC delivers departure/en-route clearance and start-up approval separately via datalink or R/T, or a combination of both, after flight deck request.

This scenario can also be applicable when Start-up and Push-back Approval are issued together.

#### Pre-condition

TSAT issued based on TOBT.

#### Trigger

Time stamp TOBT – local parameter

#### Procedure

The time references are indicative and may differ for different airlines or airports. The right column explains if datalink only, R-T, or both mediums can be used for one particular step in the procedure.

Step	Responsible	Reason	Time / Event references	Data link / R/T
<b>Departure / En route Clearance</b>				
1	ATC	TSAT issued to flight TTOT optional	TOBT - ~20 min	Data link
2	Flight crew	Request Departure / En-Route Clearance	TOBT - ~20 min TSAT - ~10 min	Data link R/T
3	ATC	Departure Clearance and TSAT issued to flight TTOT optional	TOBT - ~20 min TSAT - ~10 min	Data link R/T
4	Flight crew	Acknowledgement of Departure Clearance and TSAT issued to flight TTOT optional	TOBT - ~20 min TSAT - ~10 min	Data link R/T
<b>Start Up Clearance</b>				
5	Flight crew	Pilot requests Start Up clearance	TSAT ± tolerance	Data link & R/T
6	ATC/Apron	ATC issues Start Up clearance	TSAT ± tolerance	Data link & R/T
7	Flight crew	Confirmation of Start Up clearance	TSAT ± tolerance	Data link & R/T
<b>Push-back / Taxi Clearance (as applicable)</b>				
8	Flight crew	Request Push-back / Taxi clearance	TSAT ± tolerance	R/T
9	ATC/Apron	Push-back / Taxi clearance approved	TSAT ± tolerance	R/T
10	Flight crew	Confirmation and commence of Push-back / Taxi	TSAT ± tolerance	R/T

\* = TTOT is not implemented through preformatted text into the DCL or D-TAXI

## Operational Requirements for Scenario 1 & 2

For all messages requirements, TTOT is an optional parameter to insert, based on local procedures.

### 1. Initial contact via datalink (TOBT ~ 20 minutes)

- This requirement is applicable for long term datalink improvement (ATN)
- The CDM platform through the Pre-departure Sequencer issues a TSAT to the aircraft at flight crew logon

#### Airport CDM Start-Up Procedure: CDM Operational Requirement 001

At flight logon to the network, the CDM platform shall trigger an uplink message to be sent to the flight crew, containing TSAT and TTOT (optional) for the receiving flight.

CPDLC associated format:

“EXPECT START UP AT TSAT (time)

“EXPECT TAKE OFF AT TTOT (time)

### 2. Departure Clearance (DCL) service via datalink

- This requirement is applicable for short term datalink improvement (ACARS)
- This requirement is applicable for long term datalink improvement (ATN)
- Flight crew sends downlink message, requesting Departure Clearance
- ATC Clearance Delivery sends uplink message: DCL, TSAT and TTOT (optional)
- Flight crew : Acknowledgement

#### Airport CDM Start-Up Procedure: CDM Operational Requirement 002

Time indicators TSAT/TTOT (optional) shall be included in the actual clearance message in the existing DCL service to the flight deck, when available in the Airport CDM platform.

CPDLC associated format:

“EXPECT START UP AT TSAT (time)”

“EXPECT TAKE OFF AT TTOT (time)” (optional)

## ATTACHMENT 2

### Procedures & Processes

#### 3. General uplink of TSAT and TTOT

- This requirement is applicable for short term datalink improvement (ACARS)
- This requirement is applicable for long term datalink improvement (ATN)
- ATC sends uplink message TSAT and TTOT (optional)

#### Airport CDM Start Up Procedure: CDM Operational Requirement 003

At any time prior to Actual Off-Block, ATC or the Pre-departure Sequencer shall be able to uplink TSAT and TTOT (optional)

Format:

“EXPECT START UP AT TSAT (time)”

“EXPECT TAKE OFF AT TTOT (time)” (optional)

#### 4. General uplink of TSAT and TTOT update

- This requirement is applicable for short term datalink improvement (ACARS)
- This requirement is applicable for long term datalink improvement (ATN)

#### Airport CDM Start-Up Procedure: CDM Operational Requirement 004

At any time prior to Actual Off-Block, ATC or the Pre-departure Sequencer shall be able to uplink REVISED Departure Clearance /TSAT/TTOT (optional)

Format:

“REVISED SID (new SID)”

“REVISED RUNWAY IN USE (new runway)”

“REVISED EXPECTED START UP AT TSAT (time)”

“REVISED EXPECTED TAKE OFF AT TTOT (time)” (optional)

#### 5. Start-Up Request service via datalink (optional)

- This requirement is applicable for short term datalink improvement (ACARS)
- This requirement is applicable for long term datalink improvement (ATN)
- Pilot sends downlink message with request of Start-Up

#### Airport CDM Start-Up Procedure: CDM Operational Requirement 005

The pilot shall be able to downlink the start-up request.

Format:

“REQUEST START UP”

## 6. Start-Up Approval service via datalink

- This requirement is applicable for short term datalink improvement (ACARS)
- This requirement is applicable for long term datalink improvement (ATN)
- ATC sends uplink message with Start-Up Approval

### Airport CDM Start-Up Procedure: CDM Operational Requirement 006

ATC shall be able to uplink the start-up approval.

Format:

“START UP APPROVED”

## 7. Start-Up Approval service via datalink; applicable to give the approval at due time (e.g. when start up approval requested very early), most likely at TSAT.

- This requirement is applicable for short term datalink improvement (ACARS)
- This requirement is applicable for long term datalink improvement (ATN)
- ATC sends uplink message with Start-Up Approval

### Airport CDM Start-Up Procedure: CDM Operational Requirement 007

ATC shall be able to uplink the start-up approval at TSAT or revised time.

Format:

“START UP APPROVED AT (time)”

### Operational AIP Requirements for Scenario 1

#### Airport CDM Start-Up Procedure: AIP Operational Requirement 008

Departure Clearance shall be requested ~20 minutes before TOBT ± tolerance.

Format:

“REQUEST FOR DEPARTURE CLEARANCE”

#### Airport CDM Start-Up Procedure: AIP Operational Requirement 009

Start-Up Approval will be provided together with the Departure Clearance

### Operational AIP Requirements for Scenario 2

#### Airport CDM Start-Up Procedure: AIP Operational Requirement 010

Departure Clearance shall be requested ~20 minutes before TOBT ± tolerance.

Format:

“REQUEST FOR DEPARTURE CLEARANCE”

#### Airport CDM Start-Up Procedure: AIP Operational Requirement 011

Start-Up Approval shall not be provided together with the Departure Clearance.

### Scenario 3 – Flight Crew Downlink of TOBT

#### Operational Scenario Description

The flight crew has a last minute delay which requires an update of the TOBT. As communication to ground handler or OCC takes time, the pilot has the possibility to update TOBT via datalink directly. The Airport CDM platform handles the TOBT update as any other, and the Pre-departure Sequencer responds as normal to any TOBT update.

This TOBT update by the flight crew is considered as any other update, hence under the responsibility of the Airline Operator.

#### Pre-condition

AOBT has not occurred.

#### Trigger

Datalink message by the flight crew, at any time.

#### Procedure

The time references are indicative and may differ for different airlines or airports. The right column explains if datalink only, R-T, or both mediums can be used for one particular step in the procedure.

Step	Responsible	Reason	Time / Event references	Data link / R/T
TOBT update from Flight Deck				
1	Flight Crew	TOBT update to CDM platform	Not later than TSAT + tolerance	Data link
2	Sequencer	TSAT update issued to flight TTOT optional	Not later than TSAT + tolerance	Data link

Scenario 1 or scenario 2 to follow after this scenario 3.

### Operational Requirements for Scenario 3

#### Pilot updates TOBT via datalink (before AOBT)

This message should be sent at any time the pilot has information that justifies an update of TOBT.

- This requirement is applicable for long term datalink improvement (ATN)
- Pilot sends downlink message: READY FOR START UP AT TOBT (time)
- The CDM platform automatically records (time) as TOBT update
- The CDM platform through the pre-departure sequencer issues a TSAT and optionally TTOT to the flight
- ATC Clearance Delivery uplink message: EXPECT START UP AT TSAT (time), EXPECT TAKE OFF AT TTOT (time)

#### Airport CDM Start-Up Procedure: CDM Operational Requirement 012

In exceptional cases and no later than TSAT + tolerance, the pilot shall be able to downlink TOBT to the CDM platform.

Format:

“READY FOR START UP AT TOBT (time)”

#### Airport CDM Start-Up Procedure: CDM Operational Requirement 013

In exceptional cases and no later than TSAT + tolerance, the pilot shall be able to downlink TOBT to the CDM platform.

Format:

“READY FOR START UP AT TOBT (time)”

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# ATTACHMENT 3

## Sample Documents

### 3.1 SAMPLE AIRPORT CDM MEMORANDUM OF UNDERSTANDING

#### Objectives of MoU

The main objectives are:

- To ensure technical mechanisms allowing the information sharing
- To implement procedures increasing the traffic predictability
- To promote the information exchange between the local Airport CDM project and the Network Operations
- To set up monitoring mechanisms processing the proposals for improvements

#### Partners Obligations

It is very important to clarify the general obligations of all airport partners towards the project, such as:

- To ensure active participation, recognising the project leadership
- To cooperate in all functional specifications
- To ensure the interaction between their systems and the local Airport CDM Platform
- To provide the necessary information to the platform and ensure its quality
- To guarantee a representative along the different phases of the project to support and control its development, as well as the implementation of the adopted solutions

#### Confidentiality Clauses

In this section of the MoU the clauses of confidentiality must be defined, according to the national laws and regulations, in order to create a feeling of trust amongst all airport partners.

#### Validity

The MoU must establish the validity period and describe the renewal process.

#### 3.1.1 Overview and scope

This document provides recommended generic elements that could be included in a Memorandum of Understanding (MoU) and Confidentiality Agreements at local airport level. Such agreements would be beneficial prior to the commencement of any Airport Collaborative Decision Making (CDM) implementation, in order to safeguard the sharing of data.

This document has limited scope with a basic Description of the Airport CDM Functional Requirements for 'Confidentiality Agreements' to be used by Airport Authorities, ATM, Aircraft Operators, Ground Handling and other service providers.

#### 3.1.2 MoU & Confidentiality Agreements

##### Safeguard Data Sharing

###### Recommended

- Parties entering into data sharing activities formalise written agreements to safeguard their own interests
- All parties must always class data as commercially sensitive to its respective owner
- It must also be clear that any confidential data obtained during the programme will remain subject to the terms of the agreement in perpetuity
- No data can be disclosed to any third party

##### Safeguard Data Quality

###### Recommended

Accuracy, quality and delivery of all data must be maintained and agreed by all parties entering into agreements

## **Maintaining Stakeholder Confidence**

### **Recommended**

- Parties must have clear benefits and agreed objectives for the sharing of data
- Transparency between parties will safeguard confidence and guarantee long term commitment
- Regular meetings should be coordinated between all parties to discuss achieved benefits or losses
- Sufficient flexibility to the agreements for data enhancements and / or mitigation against shortfalls

## **Ownership and Leadership of Information**

### **System**

#### **Recommended**

- Centrally managed by a single entity
- All parties from the outset must agree with whom this responsibility lies
- Airport Operator, ATC, Aircraft Operator, AOC or a third party as site specific

## **Leadership Responsibility**

### **Recommended**

- Day to day management
- Configuration / de-configuration
- Information system upgrades
- Data sharing rules
- Rules and procedure development
- Coordination of any additional stakeholder buy in
- Distribution & ownership of data (who to see, what and why)
- Ensure that confidentiality is not compromised
- Originators of data will normally be the sole owners of the information

## **Financial Issues**

### **Recommended**

- Must address cost
- Partners will meet their own cost of participating
- AOC or similar body can facilitate

## **Agreement Timescales**

### **Recommended**

- Duration of any agreement must be agreed from the outset

## **Sample Table of Contents**

- Parties
- Background
- Purpose
- Authority
- Definitions
- Scope
- Rights and Responsibilities
- Exclusion of Warranties
- Limitation of Remedies
- Changes and Modifications
- Construction of the Agreement
- Termination of the Agreement
- Effective Date
- Notices
- Point of Contact (POC)
- Signatures
- Audit Requirements

### **3.1.3 Sample text**

#### **Introduction**

Airport CDM involves a wide range of interactions between the various partners who are diverse in nature, both in terms of business interests and organisational characteristics. It is essential that their agreement to work together for the common good is summarised in a Memorandum of Understanding (MoU), to be signed and followed by all the partners.

In the following, a generic example of an Airport CDM MoU is provided which, when completed with the site specific details, can be used by a given Airport CDM project. Use of this model is recommended, as it con-

## ATTACHMENT 3

### Sample Documents

tains or prompts for all the information that has been shown to be essential for the smooth operation of an Airport CDM project.

This sample is designed to provide the framework of cooperation between airport partners. Cooperation between an airport and the Network Operations must also be based on an MoU, the model for which is available from the Network Operations.

#### **Content**

- 1) Description of the project
- 2) Objectives of the MoU
- 3) Partners obligations
- 4) Organisation
- 5) Costs
- 6) Responsibilities of partners providing data
- 7) Confidentiality
- 8) Dispute resolution
- 9) Amendments
- 10) Signatures of contracting partners

#### **Description of the project**

Airport Collaborative Decision Making (CDM) is a concept which aims to improve the throughput of air traffic at airports. This will be achieved by providing all Contracting Partners with accurate, timely and relevant information allowing better decisions to be made.

The main aim of the project is to improve the aircraft turn-round process, ensuring the best possible use of airport infrastructure and resources to the benefit of all Contracting Partners.

The expected benefits include, but are not limited, to:

#### **Airport Operator**

- Reduction in overall delays
- More efficient use of resources
- Improved passenger information
- Environmental benefits
- Optimum usage of infrastructure

#### **Aircraft Operator**

- Increased punctuality
- Early identification of problems
- Improved slot allocation

#### **Air Traffic Control**

- Improved departure sequence planning
- Improved slot adherence

#### **Ground Handlers**

- Optimum use of resources

#### **Network Operations**

Improved slot adherence

The project is supported by EUROCONTROL and will be based on, or be compatible with, the Airport CDM concept.

#### **Objectives of the MoU**

This MoU has been signed by the partners with the following primary aims:

- To create the cooperative framework to implement Airport CDM
- To ensure technical mechanisms allowing common information sharing
- To implement procedures to increase traffic predictability
- To promote the exchange of information between the local Airport CDM project and the Network Operations

- To set up monitoring mechanisms in order to enable the evaluation of improvements and proposals for further optimisation

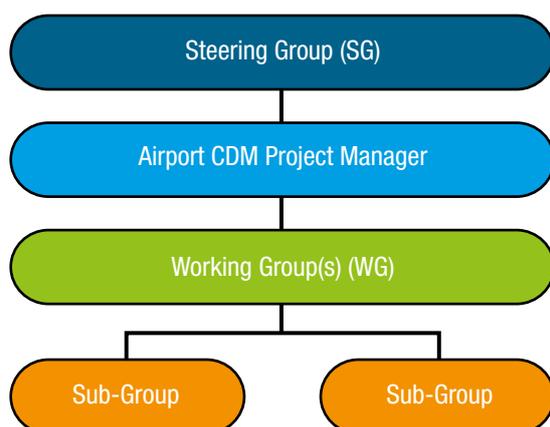
### Obligations of the contracting partners

The Contracting Partners accept the following obligations:

- Ensure active participation in all levels and phases of the project as required
- Support the development / validation of all functional specifications
- Follow the agreed Airport CDM operational procedures and rules
- To share information under the agreed conditions and to act on the shared information

### Organisation

The following project structure has been agreed:



The Steering Group will consist of representatives from the Contracting Partners. (EUROCONTROL may be invited to participate in the Steering Group and should be invited to participate in the Working Group.)

The Steering Group will appoint the Airport CDM Project Manager.

The Terms of Reference for the Steering Group, Working Group and Sub-Groups, as appropriate, are in Attachment XX of this MoU.

### Costs

Costs associated with equipment or resources will be covered by the partner concerned.

This will also apply to any system adaptation or integration unless otherwise agreed.

Where an interface is required between partners, each one will try to minimise the cost impact on the other.

The provision and use of data to and by the Contracting Partners is free of charge.

Partners who are not signatories to this MoU wishing to access data may be allowed to do so with the agreement of the Steering Group. For using data under such a special dispensation, a charge is applicable as described in Attachment YY of this MoU. The charge can be avoided by becoming a signatory of the MoU.

### Responsibilities of Contracting Partners Providing Data

The Contracting Partners shall:

- Enter and maintain in the Airport CDM database, the data for which they are responsible
- Be responsible for the accuracy and timeliness of the data they enter and maintain in the Airport CDM database
- Participate in the Airport CDM data monitoring by using agreed Key Performance Indicators, performing post-operational analysis and making results available to the other Contracting Partners
- Grant other Contracting Partners access to the data contained in the Airport CDM database

## ATTACHMENT 3

### Sample Documents

The detailed arrangements for the provision of data to the Airport CDM database is the subject of Service Level Agreements between the Contracting Partners.

#### **Confidentiality**

The Contracting Partners shall keep confidential all information coming to their knowledge in the course of Airport CDM operations relating to the business associations and transactions of the other partners. This includes technical or commercial arrangements, documents and materials a partner may acquire while working under this MoU, provided however, that this obligation on a contracting partner shall not apply to knowledge or information which is in the public domain.

Contracting Partners shall keep confidential the substance of any report, test, recommendation, or advice which they have given to another contracting partner in connection with the Airport CDM operation.

Contracting Partners may exchange information amongst themselves on the basis of service level agreements and with the Network Operations on the basis of agreements concluded on their behalf by enter name of appointed representative.

(Section to be completed with provisions required / agreed locally)

#### **Dispute resolution**

(Section to be completed with provisions appropriate locally)

#### **Amendments**

Amendment proposals to this MoU, including termination, must be submitted in writing to the Steering Group which will handle such proposals in accordance with the process described in its Terms of Reference.

#### **Signatures of Contracting Partners**

The contracting partners hereby agree that this Memorandum of Understanding shall be effective from (date).

#### **Signatures**

---

The following MoUs are site specific sample documents and can not be strictly duplicated to be used by another airport

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*6/050/2009*

**HELSINKI-VANTAA AIRPORT CDM (AIRPORT COLLABORATIVE DECISION MAKING)  
PROJECT, MEMORANDUM OF UNDERSTANDING**

**1. PARTIES**

Ilmailulaitos - Finavia Helsinki-Vantaa airport P.L 29 01531 Vantaa	Finnair Oyj
SAS / Blue1	Finnish Commuter Airlines Oy
Northport Oy	Oy Nordic Airport Services Ab
Airpro Oy	Servisair Finland Oy
Inter Handling Oy	Oy Air Finland Ltd

**2. BACKGROUND**

Helsinki-Vantaa Airport in collaboration with EUROCONTROL and a variety of companies operating at Helsinki-Vantaa completed two of the four phases of CDM concept between years 2002 and 2004. Since the project initially ceased in the end of 2003 the CDM concept has developed well ahead and some airports around Europe have implemented it into daily operational use.

A wide scale of operational analyses was carried out 2002-2003 and a first model of turn-round process (milestone approach) was generated. As the high fuel price, other economical issues and the environment aspects require further enhancements to the ATC procedures, airport operations and to the airline and de-icing/handling company operations itself Finavia Helsinki-Vantaa has decided to implement the CDM concept to Helsinki-Vantaa airport during the next two years.

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### 3. DESCRIPTION OF THE PROJECT

Airport Collaborative Decision Making (Airport CDM) is a concept which aims to improve the throughput of air traffic at airports. This will be achieved by providing all Contracting Partners with accurate, timely and relevant information allowing better decision making.

The main aim of the project is to improve the aircraft turn-round process, ensuring the best possible use of airport infrastructure and resources to the benefit of all Contracting Partners.

The expected benefits for all the Contracting Partners include, but are not limited, to:

- reduction of overall delays
- increased punctuality
- improved airport and ATM SLOT adherence
- early identification of problems
- possibility to make timely and cost efficient traffic decisions
- more efficient and optimum use of resources (manpower and equipment)
- optimum use of infrastructure
- improved passenger information
- environmental benefits

The project is supported by the EUROCONTROL. Although the project description slightly enlarges the CDM concept defined by Eurocontrol it still compares and is fully compatible to that.

### 4. OBJECTIVES OF THE MoU

This MoU has been signed by the partners with the following primary aims:

- to create the cooperative framework to implement Airport CDM
- to ensure technical mechanisms allowing common information sharing
- to implement procedures to increase air traffic predictability
- to promote the exchange of information between the local Airport CDM project and the CFMU
- to set up a monitoring mechanism in order to enable the evaluation of improvements and proposals for further optimisation

### 5. PARTNERS OBLIGATIONS

The Contracting Partners accept the following obligations:

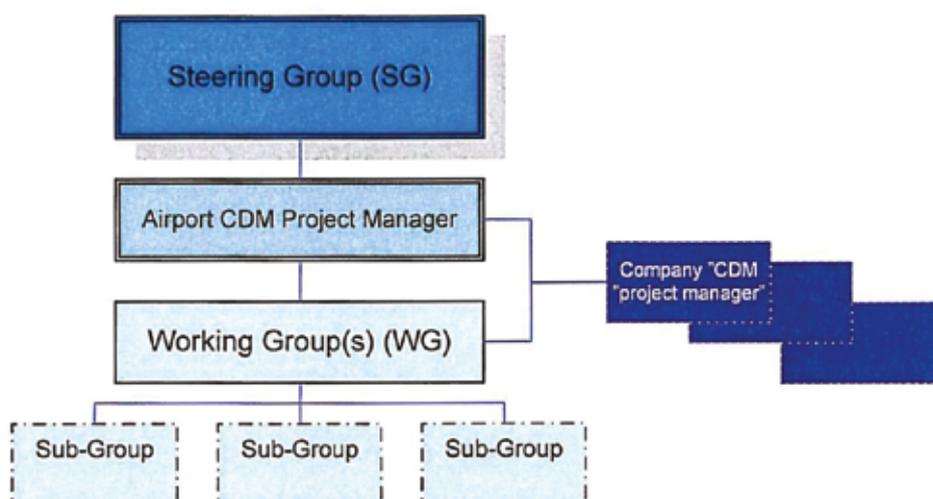
- ensure active and consistent participation in all levels and phases of the project as required
- support the development / validation of all functional specifications

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- act and proceed according to agreed Airport CDM operational rules and procedures
- to share information under the agreed conditions and to act on the shared information

## 6. ORGANISATION

The following project structure has been agreed:



Joining the MoU is open to all of the parties (companies) operating in the air traffic operations at Helsinki-Vantaa who undertake the obligations and responsibilities of this MoU.

### Steering Group

The Steering Group will consist of representatives from the Contracting Partners. EUROCONTROL is invited to the Steering Group as an advisor and to the Working Groups as a reviewer/advisor.

The Steering Group shall - in addition to contracting partners - include one representative from each of Finavia's three business areas. These representatives are not Contracting Partners but have a status of an advisor.

### Roles and responsibilities:

The Steering Group shall follow and steer the project according to project management plan and work breakdown structure approved for the project. Significant financial decisions shall be made subject to the steering group judgement.

**MEMORANDUM OF  
UNDERSTANDING**

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The project manager will have the authorisation to make operational and procedural decision. Project manager reports regularly to the Steering Group for comments and discussion.

The Steering Group decides on the changes to the project management plan. The Steering Group shall make the decision of any amendments of this MoU according to paragraph 11 (Amendments).

Voting rights:

All the contracting partners have one vote each in possible voting situations. The decisions will be made according to the principle of simple majority.

**Airport CDM project manager**

The Finavia will appoint the Airport CDM Project Manager.

Project manager is responsible of the project management and the project as a whole. Project manager works under the control of the Steering Group.

Project manager has the final decision right over the working groups / working sub-groups.

**Company CDM project manager**

Each contracting partner company shall appoint a contact person representing the company in the airport CDM project and in CDM matters.

The more detailed Terms of Reference for the Steering Group, the Working Group and Sub-Working Groups, as appropriate, are in **Attachment 1** of this MoU.

**7. COSTS**

Costs associated with equipment or resources will be covered by the partner(s) concerned. This will also apply to any system adaption or integration unless otherwise agreed.

Where an interface is required between partners, each partner will try to minimise the cost impact on the other.

All partners shall take the requirements of Airport CDM information sharing into account when developing new systems or applications in order to minimise the cost impact to other CDM partners.

The provision to and use of data and by the Contracting Partners is free of charge.

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Partners who are not signatories to this MoU wishing to access data may be allowed to do so under agreement by the Steering Group. For using data under such a special dispensation, a charge is applicable by the decision of the Steering Group.

The charge can be avoided by becoming a signatory of the MoU.

## **8. RESPONSIBILITY OF PARTNERS PROVIDING DATA**

Each member undertakes all reasonable efforts to ensure that any information or data provided by it will be accurate in all respects provided, expressly that no member providing such information or data makes any representations or warranties as to the accuracy or completeness of such information or data.

The contracting partners shall:

- enter and maintain the data for which they are responsible in their own database
- be responsible for the accuracy and timeliness of the data they do provide
- participate in the CDM data monitoring by using agreed Key Performance Indicators, performing post operational analyses and making results available to the other Contracting Partners
- grant other Contracting Partners access to the data contained in CDM environment

The detailed arrangements for the provision of data to the Airport CDM network are the subject of the Service Level Agreements between the Contracting Partners.

## **9. CONFIDENTIALITY**

The Contracting Partners shall keep confidential all information coming into their knowledge in the course of Airport CDM operations relating to the business associations and transactions of the other partners, including technical or commercial arrangements and documents and material a partner may acquire while working under this MoU, provided however, that this obligation on a contracting partner shall not apply to knowledge or information which is in the public domain.

Contracting Partners shall keep confidential the substance of any report, test, recommendation or advice they have given to another contracting partner in connection with the Airport CDM operation.

Contracting Partners may exchange information amongst themselves on the basis of service level agreements and with the CFMU on the basis of agreements concluded on their behalf by project manager.

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## **10. DISPUTE RESOLUTION**

Disputes will be resolved so far as possible in the Steering Group. Any dispute, controversy or claim arising out of or relating to this MoU, or the breach, termination or validity thereof, shall be finally settled by arbitration in accordance with the Rules for Expedited Arbitration of the Arbitration Institute of the Central Chamber of Commerce of Finland.

## **11. AMENDMENTS**

Amendment proposals to this MoU, including termination, must be submitted in writing to the Steering Group which will handle such proposals in accordance with the process described in paragraph 6.

## **12. GOVERNING LAW**

This MoU shall be construed according to and governed by Finnish law.

## **13. PROMULGATION**

This MoU comes into force at the time when at least three of the contracting partners have signed the MoU.

## **14. RESIGNING FROM THE MoU**

The announcement of resigning from this MoU has to be in written form to the steering group at least three months before the intended resigning date. The remaining CDM group will remain justice to the information gathered so far to be used for the CDM purposes. When the information becomes obsolete or when it is not needed any more for CDM purposes the information regarding this particular partner shall be eliminated.

## **15. DISMISSAL FROM THE MoU**

Steering Group shall have the right to dismiss a party from this MoU upon thirty (30) days prior written notice if a Party essentially and repeatedly fails to comply with the terms and conditions of the MoU and the breaching Party fails to remedy such breach within such notice period.

## **16. VALIDITY PERIOD**

This MoU is valid until further notice. The termination of this MoU is subject to project's Steering Group decision.

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**17. SIGNATURES OF CONTRACTING PARTNERS**

The Contracting Partners hereby agree that this Memorandum of Understanding shall be effective from 30.1.2009.

Signatures:



Juha-Pekka Pystynen, Ilmailulaitos – Finavia, Helsinki-Vantaa Airport



Ville Iho, Finnair Oyj



Jaakko Schildt, SAS / Blue1



Jubani Pakari, Finnish Commuter Airlines Oy



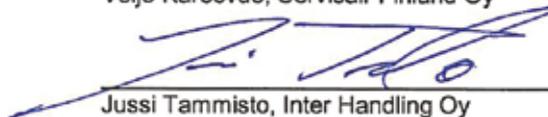
Tomi Viitanen, Oy Air Finland Ltd



Jukka Hämäläinen, Northport Oy



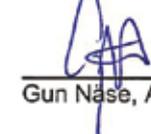
Veijo Karosvuo, Servisair Finland Oy



Jussi Tammisto, Inter Handling Oy



Juha Aaltonen, Oy Nordic Airport Services Ab



Gun Näse, Airpro Oy



## **Terms of Reference (TOR)**

**HELSINKI-VANTAA**

**AIRPORT CDM**

**(MoU attachment 1)**

30.1.2009

**DOCUMENT CHARACTERISTICS**

<b>TITLE</b>		
Terms of Reference (TOR), Helsinki-Vantaa Airport CDM		
<b>Doc. Number :</b>	0.2.1.0	
<b>References.:</b>	Memorandum of Understanding (MoU), Helsinki-Vantaa Airport CDM	
<b>Version:</b>	1.0	
<b>Edition date:</b>	30.1.2009	
<b>Software used:</b>	Ms Word 2003 SP3	
<b>Abstract and key words</b>		
<p>In this TERMS OF REFERENCE are described the terms and the working methods of the Steering Group (SG) and the roles and responsibilities between the Steering group and Project manager (PM). This TERMS OF REFERENCE also generally describes the terms and working methods of the Working Groups (WG) and sub-Working Groups (sub-WG).</p>		
<b>Company CDM Contact person (owner of the document on the first row)</b>	<b>Telephone and e-mail address</b>	<b>Unit / Duty</b>
Timo Suorto	+358 9 8277 3372 +358 40 5071080 timo.suorto@finavia.fi	Airport CDM Project Manager, Finavia, Helsinki-Vantaa Airport / Planning Manager

30.1.2009

### 1. Authority.

The Helsinki-Vantaa Airport CDM project is being established by Finavia based on the EUROCONTROL guidance material of Airport CDM concept. The Memorandum of Understanding (MOU) between contributing partners, signed 30 January 2009, provides for the establishment of the Steering Group and the project itself. This TERMS OF REFERENCE defines the methods of work within the Steering Group (SG) and between the Steering group and Project manager (PM).

This TERMS OF REFERENCE also generally describes the terms and working methods of the Working Groups (WG) and sub-Working Groups (sub-WG).

### 2. Definitions and Acronyms.

#### Definitions

#### Acronyms

CDM	Collaborative Decision Making
WP	Work Package
WG	Working Group
sub-WG	Sub Working Group
TOR	Terms of Reference
GH	Ground Handling
WBS	Work Breakdown Structure

### 3. Purpose of the Steering Group

The purpose of the **Steering Group** is to follow and steer the project according to the project management plan and work breakdown structure approved to the project. The project management plan and the modifications and appendixes to that are approved by the steering group. The work breakdown structure is approved by the steering group on the level of establishing the working groups. From other parts of the WBS the content is in the responsibility of the project manager.

The Steering Group will include activities covering the following areas:

- evaluate the procedural decisions made in the working groups
- monitor the progress and the time schedule of the project
- identify the threats and risk endangering the preparation of the project
- investigate the proposals and suggestions relating to the project made by the project manager or any member from the steering group
- notice, consider and accept the new partners to the MoU

The Steering Group will provide a forum for the exchange of views on the means of utilizing the new technology for the purpose of meeting relevant project objectives.

The purpose of the Steering Group is to provide a framework for the exchange of information, identification of potential sub-project arrangements and to harmonize participant's requirements prior to the formal staffing of any sub-project.

Specific collaborative activities will be carried out in accordance with the MoU subject to applicable laws and regulations.

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*Steering Group* is not intended to replace or inhibit activities under existing international laws, standards or agreements.

#### 4. Structure.

##### *Members:*

The Steering Group consists of representatives from the companies and/or organizations signed the MoU, as principals. Steering Group also involves a representative from the EUROCONTROL and one representative from each of the Finavia's headquarters' three business areas. Other representatives and supporting subject matter experts are invited from the airport, contracting partner companies and EUROCONTROL as appropriate.

Number of the representatives in each company should be kept in one as far as possible.

The importance of consultation with other agencies and organizations is recognized. Representatives from specific technology areas may be invited to participate in technical discussions but will not become members of the Steering Group. They may, however, become members of a working group established for a specific area or project.

##### *Meeting frequency, summons, convener, host and chair:*

Working Group meetings will be held at intervals as mutually agreed by the members, but at least once during each quarter of the year. Convening the meeting is at the responsibility of the chairing party (Finavia, Helsinki-Vantaa Airport). The meeting date needs to be negotiated as far as possible with the Steering Group members. The final date has to be informed to the partners by the e-mail (or any other applicable way) at least one month before the intended meeting. In respect to this notice the meeting will be in presence of quorum.

The meetings are hosted on a rotational basis between the four biggest companies (smaller companies may host a meeting by voluntary bases). The Steering Group meeting is chaired always by Finavia. Minutes will be prepared and provided to Steering Group members and the project manager within two weeks following the meeting. Secretarial support for these meetings will be the responsibility of the chairing party.

##### *How decisions will be made?*

Significant financial decisions affecting some or all of the contracting partners are being made by the steering group. Operational decisions prepared in the working groups and accepted by the project manager may also lead to costs in companies but as long as they are not mandatory or significant in expected amount of money that decision is not required to be rounded through the steering group.

All contracting partners have one vote each in possible voting situations. EUROCONTROL of the representatives from the Finavia's three business areas are not authorized to vote of the decisions.

Voting will always be made in common.

The decisions will be made according to the principle of simple majority.

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**5. Exchange of Information.**

*Steering Group* will ensure that any information provided in accordance with this TERMS OF REFERENCE is used only by the Participants staff and then only for the purpose for which it has been provided. Information will not be disclosed or released to any third party, including contractors, or used for any other purpose without the prior acceptance of the providing Participant.

About providing data and about the confidentiality matters it is agreed in the MoU. Exchanging information internally and externally, reporting procedures, information management etc. is defined in the Project Information management Plan (IMP).

**6. General**

There will not be any transfer of funds between the Participants pursuant to this TERMS OF REFERENCE. In those cases where a separate sub-project is determined to be required, the project manager will make every effort to prepare the necessary documentation and secure the required approvals as expeditiously as possible pursuant to existing programs or agreements.

**7. Terms and Working Methods to the Working Groups and Working sub-Groups**

Each Working Group (WG) has a nominated Working Group leader. Working Group leader has a responsibility of his/her Working Group and its sub-Working Groups.

Working Group leader may at his/her consideration decide how frequently, in which premises and within which groups establish meetings, workshops etc.

About providing data and about all the confidentiality matters it is agreed in the MoU. Exchanging information internally and externally, reporting procedures, information management etc. is defined in the Project Information management Plan (IMP).

Working Group leader may and in certain matters also should be in straight bilateral contact with a company's CDM project manager.

**8. Legal Status.**

This Terms of Reference constitutes an administrative procedure to coordinate Steering Group activities and is an attachment to the Helsinki-Vantaa Airport CDM Memorandum of Understanding. This Terms of Reference, in and of itself, does not create any authority to perform any work, award any contract, exchange information, transfer funds, or otherwise obligate in any way either Participant to make or provide any financial or non-financial contribution to the other Participant for any purpose.

**9. Effective Date**

The Terms of Reference 30.1.2009 for the Helsinki-Vantaa Airport CDM Steering Group becomes effective on the date the Helsinki-Vantaa Airport CDM Memorandum of Understanding will be signed. The TERMS OF REFERENCE remains effect until further notice and its termination is connected to the MoU. This TERMS OF REFERENCE may be amended or modified according to the process described in the MoU paragraph 11.

**WARSAW FREDERIC CHOPIN AIRPORT  
COLLABORATIVE DECISION MAKING (CDM)  
MEMORANDUM OF UNDERSTANDING (MOU)**

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## **1. Project description**

Airport Collaborative Decision Making (Airport CDM) is a concept aimed at improving air traffic flow at aerodromes.

In order to fulfil this objective, the Partners to the MoU must have at their disposal accurate, valid and relevant information allowing them to take the best possible decisions.

The main goal of the project is to facilitate the aircraft turnaround process, enabling the best possible use of aerodrome infrastructure and resources to the benefit of the Partners.

By concluding the MoU the Parties express their willingness and readiness to implement the Airport Collaborative Decision Making at Warsaw Frederic Chopin Airport.

A-CDM implementation is expected to bring a number of benefits, including:

### **Airport Operator**

- Reduction of delays
- A more effective use of resources
- An improved passenger information system
- Environmental benefits
- The optimum use of airport infrastructure

### **Aircraft Operator**

- Improved flight punctuality
- Faster problem identification

- More effective slot allocation

#### **Air Traffic Control Service**

- Improved departure schedule planning
- Improving the timeliness of aircraft movements
- Reduction of delays

#### **Handling Agents**

- Optimum use of resources

#### **CFMU (Central Flow Management Unit)**

- Improving the timeliness of aircraft movements

The project is supported by EUROCONTROL and will be carried out based on, or in accordance with, the concept of Airport Collaborative Decision Making.

## **2. MoU Objectives**

The MoU was signed by the partners mainly with the aim of:

- Creating a framework for cooperation in order to implement Airport CDM.
- Ensuring technical conditions allowing for exchange of information.
- Implementing procedures allowing for increasing air traffic predictability.
- Promoting exchange of information between the local Airport CDM project and CFMU.
- Agreeing the mechanisms of project monitoring with a view to enable an assessment of improvements and proposing further optimisations.

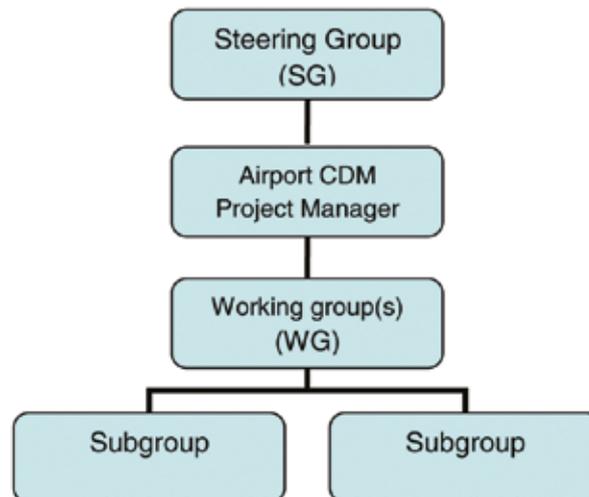
## **3. Obligations of Partners to the MoU**

- Ensuring active participation in the project on all levels and at all stages of the project adequately to the needs.
- Supporting the development / approval of any functional specifications.
- Observing agreed Airport CDM rules and operational procedures.
- Sharing information as jointly agreed and undertaking actions based on this information.

Mutual obligations of the Partners resulting from the procedures and the system platform for the exchange of information developed under this MoU will be established on the date of concluding the Service Level Agreements (SLA), specifying the rights and obligations of the Partners referred to herein, and in point 3 in particular.

## 4. Organisation

The following project structure was agreed:



The Steering Group will be comprised of the representatives of the Partners to the MoU, whereas EUROCONTROL will be invited to participate in the works of the Steering Group and the Working Groups as an observer.

The Steering Group will appoint the Airport CDM Project Manager.

The relevant scopes of requirements and obligations of the Steering Group, Working Groups and Subgroups are included in Appendix no 1 hereto.

The make-up of the Steering Group constitutes Appendix no 2 hereto.

## 5. Costs

Each of the Parties will bear all own expenses in connection with the implementation of the provisions hereof, such as travel expenses, costs of

participation of authorised representatives and costs of purchase of the equipment and resources.

This also includes each customisation or integration of the system, unless agreed otherwise.

In cases where an interface between partners is required, each of them will attempt to minimize the costs incurred by the other partner.

Delivery of data to the Partner Signing the MoU, as well as its use by the Partner Signing the MoU is free of charge.

The Partners that are not parties to this MoU may be granted access to the data upon the Steering Group's approval .

Upon this MoU entry into force, the Partners will be obliged to provide relevant authorisations to the Steering Group members in order for them to take binding financial decisions under Airport CDM Project at Warsaw Airport. Financial decisions in respect of amounts exceeding the amount specified in provided authorisations require the acceptance/approval of an organ authorised to represent the Partner.

## **6. Obligations of the Partners Providing Data**

The Partners to the MoU:

- enter and keep data for which they are responsible in the Warsaw Airport CDM base.
- are responsible for the accuracy and validity of the data entered and kept in the Airport CDM database.
- participate in CDM data monitoring by using the agreed KPI (Key Performance Indicators), preparing the post-operational analysis and making its results available to other Partners.
- make information contained in the Airport CDM database available to other Partners.

Detailed arrangements concerning the submission of data to the Airport CDM database will be the subject of the Service Level Agreements (SLA) concluded between the Partners and will constitute separate appendices to this MoU.

## **7. Confidentiality**

The Partners will keep confidential all information obtained in the course of performance of the project in question, in particular with regards to the business links and transactions of other Partners, including technical and commercial arrangements, as well as documents and materials that the Partner could obtain acting in accordance with this MoU, notwithstanding the generally available knowledge or information.

The Partners declare to keep secret the contents of any report, test, recommendation or advice provided to another Partner to the MoU in connection with the performance of the Airport CDM project.

The Partners to the MoU may exchange information between themselves on the basis of the service level agreements (SLA), and with CFMU, on the basis of agreements concluded on their own behalf by duly authorised representatives.

## **8. Dispute settlement**

All disputes arising from or in connection with this MoU or will be settled amicably by the Parties in the course of negotiations and in good faith.

## **9. Changes**

Proposals concerning any changes to this MoU, including its termination, will be submitted in writing to the Steering Group for consideration in accordance with

the procedure described in the Scope of Steering Group Requirements and Obligations.

Changes to the MoU will be made in writing.

## **10. Effective date**

The Partners to the MoU hereby agree that this MoU will become effective on ...

## **Parties to the Memorandum of Understanding**

### **Lot Ground Services Sp. z o.o.**

Magdalena Mossakowska-Borys – LGS Board Member, COO

.....

Andrzej Młotek - LGS Board Member, CFO

.....

### **Polish Air Navigation Services Agency**

Krzysztof Banaszek – President of the Polish Air Navigation Services Agency

.....

### **“LOT” S.A. Polish Airlines**

Dariusz Nowak – Chairman of the Board - PLL LOT SA General Director

.....

### **‘Polish Airports’ State Enterprise**

Michał Marzec – ‘Polish Airports’ State Enterprise General Director, Warsaw Airport Director

.....

### **Warsaw Airport Services**

Zbigniew Knapczyński – President of Warsaw Airport Services

.....

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## 3.2 AIRPORT CDM IMPLEMENTATION INVENTORY & COMPLIANCE CHECKLIST

### 3.2.1 Introduction

The Airport CDM Implementation Inventory & Compliance Checklist is a quick reference matrix, based on the Implementation Manual.

Its purpose is to describe as accurately as possible the data available per airport partner, indicate possible accuracy variations and identify areas with room for improvement. The table contains the data fields listed in the Airport CDM Implementation Manual and forms a kind of “Inventory”.

(available)  (required)	Each local airport partner completes the corresponding column, indicating with YES or NO if a specific Data Item is available in their operational system in use and if it is actually required for their operation.
-------------------------------	--

The column “Available in airport”, indicates with YES whenever at least one airport partner has the specific Data Item available. When Airport CDM Information Sharing is implemented, the available Data Items will be shared amongst all airport partners.

This Checklist is accompanied with a list of recommendations on how to obtain the Data Items currently not available but REQUIRED for local Airport CDM implementation.

### 3.2.2 Blank inventory & compliance checklist according to Airport CDM Implementation Manual

Data item	ATC	Airport	Airline	GH	Available in XXX	For CDM	Remarks
Common for ARR & DEP flights							
Aircraft Registration						REQUIRED	
Aircraft Type						REQUIRED	
Ground Handling Agent						DESIRABLE	
Aircraft Parking Stand						REQUIRED	
MTTT						REQUIRED	
TOBT						REQUIRED	
Aircraft Status						REQUIRED	
Flight Type						REQUIRED	

ATTACHMENT 3  
Sample Documents

Data item	ATC	Airport	Airline	GH	Available in XXX	For CDM	Remarks
ARR flights							
<b>ICAO callsign</b>						REQUIRED	
<b>IATA callsign</b>						DESIRABLE	
<b>ADEP</b>						REQUIRED	
<b>EET</b>						DESIRABLE	
<b>Airborne Time (from outstation)</b>						REQUIRED	
<b>Landing time</b>						REQUIRED	
ELDT						REQUIRED	
ALDT						REQUIRED	
<b>In-block time</b>						REQUIRED	
EIBT						REQUIRED	
AIBT						REQUIRED	
<b>Variable Taxi-in Time (EXIT)</b>						REQUIRED	

Data item	ATC	Airport	Airline	GH	Available in XXX	For CDM	Remarks
DEP flights							
<b>ICAO callsign</b>						REQUIRED	
<b>IATA callsign</b>						DESIRABLE	
<b>ADES</b>						REQUIRED	
<b>SID</b>						DESIRABLE	
<b>Boarding Gate</b>						DESIRABLE	
<b>Off-block time</b>						REQUIRED	
SOBT						REQUIRED	
EOBT						REQUIRED	
AOBT							
<b>Variable Taxi-out Time (EXOT)</b>						REQUIRED	
<b>Take off Time</b>						REQUIRED	
ETOT						REQUIRED	
ATOT						REQUIRED	
CTOT						REQUIRED	

ATTACHMENT 3  
Sample Documents

Alerts / Warnings	Available in XXX	For CDM	Remarks
<b>FPL Inconsistency</b>		REQUIRED	
<b>Airborne (from outstation)</b>		REQUIRED	
<b>MTTT</b>		REQUIRED	
<b>EOBT inconsistency</b>		REQUIRED	
<b>CTOT inconsistency</b>		REQUIRED	
<b>Boarding</b>		REQUIRED	

Milestones	Available in Airport	For CDM	Remarks
<b>FPL Inconsistency</b>		DESIRABLE	Airport CDM Information Sharing
<b>CTOT allocation</b>		REQUIRED	Airport CDM Information Sharing
<b>ATOT - oustation</b>		REQUIRED	Airport CDM Information Sharing Milestone Approach
<b>FIR entry</b>		DESIRABLE	Airport CDM Information Sharing Milestone Approach
<b>Final</b>		REQUIRED	Airport CDM Information Sharing Milestone Approach
<b>ALDT</b>		REQUIRED	Airport CDM Information Sharing Milestone Approach Variable Taxi Time
<b>AIBT</b>		REQUIRED	Airport CDM Information Sharing Milestone Approach
<b>ACGT (start)</b>		DESIRABLE	Airport CDM Information Sharing Milestone Approach
<b>TOBT (final)</b>		REQUIRED	Airport CDM Information Sharing Milestone Approach Collaborative Management of Flight Updates
<b>TSAT (by ATC)</b>		REQUIRED	Airport CDM Information Sharing Milestone Approach
<b>Start Boarding</b>		REQUIRED	Airport CDM Information Sharing Milestone Approach
<b>ARDT</b>		REQUIRED	Airport CDM Information Sharing Milestone Approach Variable Taxi Time Collaborative Management of Flight Updates
<b>ASRT (start up request)</b>		REQUIRED	Airport CDM Information Sharing Milestone Approach Variable Taxi Time Collaborative Management of Flight Updates
<b>ASAT (start up approval)</b>		REQUIRED	Airport CDM Information Sharing Milestone Approach
<b>AOBT</b>		REQUIRED	Airport CDM Information Sharing Milestone Approach Variable Taxi Time Collaborative Management of Flight Updates
<b>ATOT</b>		REQUIRED	Airport CDM Information Sharing Milestone Approach Variable Taxi Time Collaborative Management of Flight Updates

### 3.3 SAMPLE AIRPORT CDM TEXT FOR AERONAUTICAL INFORMATION PUBLICATION (AIP)

#### **Airport CDM Procedure - Background**

The Airport CDM Start-Up procedure is based on the existing ICAO PANS ATM Start-Up Time Procedures contained in paragraph 7.4.1.1. The corresponding phraseology remains unchanged. Further guidance can be found in the 'Airport CDM Implementation Manual' accessible via:

**[http://www.eurocontrol.int/airports/gallery/content/public/pdf/CDM\\_Implementation\\_Manual.pdf](http://www.eurocontrol.int/airports/gallery/content/public/pdf/CDM_Implementation_Manual.pdf)**

The availability of CDM platform at an aerodrome does not pre-empt Aircraft Operators and Ground handling Agents of their responsibilities of issuing necessary modifications to the filed flight plan. (DLA or CHG)

#### **Airport CDM Partners**

The operational partners who together apply the Airport CDM concept on their airport.

**Airport Operator** – Airport CDM partner often responsible for gate and stand planning. Receives TSAT and TTOT from pre-departure sequencer, amongst inbound and other planning information from other sources.

**Ground Handling Agent** – Airport CDM partner delegated responsible for TOBT input to CDM platform. Receives TSAT and TTOT from pre-departure sequencer.

**Aircraft Operator** – Airport CDM partner overall responsible for TOBT input to CDM platform. Receives TSAT and TTOT from pre-departure sequencer.

**Flight Crew** – Aircraft Operator staff responsible in exceptional cases for TOBT handling based on local procedures. Receives TOBT and TSAT and optionally TTOT from the CDM platform or pre-departure sequencer, and is responsible to act on this information.

**ATC (Departure Clearance position)** – Airport CDM partner responsible to monitor aircraft readiness and TOBT, and act on this information. Assign TSAT and TTOT or revisions via the pre-departure sequencer and act on it.

**Apron Control** – Airport CDM partner responsible to act on TSAT. Receives TOBT and TSAT from the CDM platform or pre-departure sequencer.

#### **Airport CDM Operations**

The Airport partners will provide and act on information that is sent to the Airport CDM platform, and or the Pre-departure Sequencer. These are central enablers for the Airport CDM Operations. The Pre-departure sequencer is addressed as a separate component of the Airport CDM platform (even when in some cases it appears as an integrated functionality of the CDM platform), because it addresses the final responsibility within the role of ATC to consider traffic density and Network Operations constraints.

#### **Airport CDM platform**

The central information database is the technical enabler for the information sharing concept element. All stakeholders have access to the platform. TSAT input is obtained directly from the Pre-departure Sequencer.

### Pre-departure Sequencer

The pre-departure sequencer is the technical enabler under the responsibility of ATC, for the pre-departure sequencing concept element using TOBT and EXOT as input, in order to calculate TSAT and TTOT. These predictions will be fed back to the CDM platform, and can be generated automatically or manually.

#### 1.A Flight Plan Check shall be performed

SOBT/EOBT Aircraft registration shall be made available in the CDM platform. Aircraft Operator or Ground Handling Agent is responsible for timely update of aircraft registration in the CDM platform.

<parameter> hours prior to the Estimated Off Block Time of a flight, checks will be performed to verify the consistency between the ATC Flight Plan, Airport Slot and Airport Flight Data.

<local additional text>

#### 2. Issue of Target Off-Block Time (TOBT)

<parameter> hours/minutes prior to SOBT/EOBT a Target Off-Block Time (TOBT) will be generated based on updated information on the incoming flight and other considerations, in order to create an initial time reference for distribution and to derive further updates.

CDM platform makes TOBT available to ATC sequencer.

<local additional text>

#### 3. Updates of the Target Off-Block Time (TOBT) (Person in charge)

The aircraft operator, or his duly accredited representative, is responsible for the correctness of and compliance with the TOBT. The TOBT is made available by the aircraft operator or ground handler to the stakeholders via the CDM platform.

Whenever aware of information that may affect the value of TOBT, the ground handling agent, the aircraft operator or the Pilot-in-Command (for flights without a ground handling agent) must introduce the new estimation for off block time in the CDM platform.

<local additional text>

#### Sample local text

Until the Target Start up Approval Time (TSAT) has been issued, the TOBT can be updated as often as desired. After the TSAT has been issued, the TOBT may only be updated by a maximum of <parameter> times.

#### 4. Issue of Target Start up Approval Time (TSAT)

<parameter> minutes prior to start-up a Target Start up Approval Time (TSAT) is generated based on the existing Target Off-Block Time (TOBT), the airport traffic considerations and Calculated Take Off Time (CTOT) – if the flight is regulated.

TOBT is the time at which Aircraft Operator, or his duly accredited representative, expect the flight will be ready to commence movement; whereas TSAT is the time at which ATC will grant the start-up.

*Note: ATC shall confirm the TSAT together with the ATC clearance, or separately as required.*

<local additional text>

#### Sample local text

The TSAT may be transmitted using DCL (Departure Clearance Uplink Message).

### 5. Events at TOBT

At TOBT the flight crew shall request start-up, push back or inform ATC of the expected delay.

In the event the time remaining to TSAT is longer than <parameter>, ATC shall inform flight crew when to expect the approval for the start-up.

In case of a delay greater than <parameter> the Aircraft Operator, or his duly accredited representative, shall update the CDM platform accordingly. Based on this updated information a new TSAT will be calculated.

<local additional text>

### 6. Target Start up Approval Time (TSAT)

#### - Acknowledgement Message

##### *Sample text*

When data link is used, the flight crew will receive TSAT and optional Target Take-Off Time (TTOT) via the Departure Clearance message. The flight crew may receive a separate TSAT message with the amended TSAT and optionally the amended Target Take-Off Time (TTOT). On both occasions the flight crew must acknowledge receipt of the amendment.

<local additional text>

### 7. Start-Up and Push-Back

All the preparations required before commencing the movements associated with the departure must be carried out in accordance with Target Start up Approval Time (TSAT) and not in accordance with the Start-up Request.

Should amendments to the TSAT be required after the TSAT has been communicated to the flight crew, ATC shall inform the flight crew accordingly.

If, when receiving the start-up clearance, the flight crew is aware that it will not be feasible to commence movements associated with departure within <parameter> minutes, they must inform ATC.

##### *Sample local text*

Flight crew should be aware that in the absence of a request for push-back or taxi clearance within the <parameter> minutes, the flight's TSAT will be cancelled and a new TOBT must be input into the CDM platform by Aircraft Operator or ground handling agent.

### 8. Coordination with Network Operations

A permanent and fully automatic data exchange with the Network Operations will be established. This data transfer will enable highly accurate early predictions of landing and departure times. Furthermore, this will allow for more accurate and efficient calculation of the CTOT (when applicable) due to the use of local target take-off times.

The following messages are used:

- Flight Update Message (FUM)
- Early Departure Planning Information Message (E-DPI)
- Target Departure Planning Information Message (T-DPI)
- ATC Departure Planning Information Message (A-DPI)

The basic Network Operations procedures continue to apply. The Network Operations will generally take these local target take-off times into consideration, when updating the flights' profiles in its system. In some cases Clearance Delivery position will offer to coordinate a new CTOT (if applicable) in agreement with the pilot.

<local additional text>6

## **9. Contact Partners**

For more information partners can be contacted.

<local additional text>

# ATTACHMENT 4

## Data Elements and Event Triggers

### TRIGGER EVENTS AND THEIR PROCESSING

The trigger events listed in this chapter are those most commonly used. Additional ones (e.g. de-icing) may be defined locally, or some listed here may not be applicable, depending on circumstances.

Agreed and precisely defined events trigger updates to the time estimates and / or aircraft flight status.

All updates are originated by events coming from the different phases of the operation, as aircraft pass through their arrival, ground and departure phases.

A link based on aircraft registration is created between the airport slot, an arriving flight and a departing flight. The aim is to ensure consistency and to identify the impact of the progress of the arriving flight on the related departing flight or vice versa.

Certain arriving flights may not have an associated departing flight or certain departing flights may not have an associated arriving flight (aircraft not scheduled for another flight for some time, aircraft already at the airport, etc.). These flights will also be included, to ensure complete Common Situational Awareness.

Events may originate from:

- External Interfaces
- Internal triggers
- Users, via the HMI

For every event, a configurable priorities list shall be defined, allowing a particular event to be assigned a specific weight, based on its source. Note that the events with the highest weight information will not always arrive first.

When an event is received, its source is identified and noted. The event is then processed as follows:

- If the event has not yet been received, it is processed.
- If the event has already been received, the priority of the event source is examined
- If the priority of the source is the same or higher than the priority of the previous source, the event is processed
- If the priority of the event source is lower than the priority of the previous source, the event is ignored

Event	Description	Action on the CDM operation	(Changes to) Operational Status	Origin
Operation start time	A CDM operation is created when scheduled departure flights are downloaded from the airport database		SCHEDULED	Airport Database
Flight plan activation	Filed flight plan received	Correlate FPL with airport slot Update: <ul style="list-style-type: none"> <li>■ ELDT and EIBT (Arr.)</li> <li>■ EOBT, TOBT and ETOT (Dep.)</li> </ul> <i>DPI process commences (if implemented – please refer to chapter 3.5)</i>	INITIATED (Dep.) No change (Arr.)	IFPS
Flight plan modification	Change in the filed flight plan	Update affected fields		IFPS
CTOT Assignment/Modification	SAM or SRM received	Update: ETOT / CTOT (Dep.) Mark appropriate fields as REGULATED	INITIATED (Dep.) No change (Arr.)  Not changed	Network Operations
Regulation assessment timer	120 min. before EOBT, the flight plan EOBT is received (Network Management Operations SIT1)	Mark Arr. or Dep. Field: <ul style="list-style-type: none"> <li>■ REGULATED at any time before TRS, if a CTOT is received and a new regulation is activated</li> <li>■ NON-REGULATED if CTOT is not received</li> </ul>	Not changed	Network Operations
CTOT cancellation	SLC received	Mark appropriate field as NON-REGULATED	Not changed	Network Operations

**Table 1: Trigger events involved in the evolution of a CDM operation - Common for Arrival and Departure Phase**

## ATTACHMENT 4

### Data Elements and Event Triggers

Event	Description	Action on the CDM operation	(Changes to) Operational Status	Origin
Flight schedule cancellation	Schedule cancellation message received or manual input.	If the operation is in INITIATED status, an inconsistency alert is raised, if a CNL message has not been received.	Operation cancelled in database	Airport info system
Flight plan cancellation	CNL message received.	An inconsistency alert is triggered, if a schedule cancellation message has not been received.	SCHEDULED till a schedule cancellation message is received	IFPS
Flight suspension	FLS received.	Mark operation as SUSPENDED.		Network Operations
Flight de-suspension	DES received.	Delete SUSPENDED mark.	Previous state	Network Operations
Aircraft rotation change	Correlation between arriving and departing flight changes.	Estimate times are reprocessed.	Operational status is reprocessed	Airport info system
				Aircraft Operator / Handling Agent
Resource reallocation	Change in resources allocated to an aircraft (e.g. stand).		Not changed	Airport info system

**Table 2: Trigger events involved in the evolution of a CDM operation - Common for Arrival and Departure Phase**

Event	Description	Action on the CDM operation	(Changes to) Operational Status	Origin
Take off at airport of origin	Airborne time from outstation	ELDT, EIBT updated TOBT, TTOT updated	AIRBORNE	Network Operations  Local ATC MVT
FIR entry / flight under local ATC	Flight enters radar coverage of local ACC or APP of destination airport, where holding and arrival sequencing is taken into account  At a parameter time before ELDT, when the landing sequence is fixed and the ELDT becomes stable	ELDT, EIBT updated TOBT, TTOT updated	FIR  FINAL	Local ATC
Landing	Aircraft touches down	ELDT changes to ALDT, EIBT updated  TOBT, TTOT updated	LANDED	ACARS Local ATC
Arrival in-bloc	Aircraft at parking position, brakes on	EIBT changes to AIBT  TOBT, TTOT updated	IN BLOCK	ACARS Airport system (DGS) Local ATC A-SMGCS Ground Handler

**Table 3: Trigger events involved in the evolution of an Airport CDM operation - Arrival Phase**

## ATTACHMENT 4

### Data Elements and Event Triggers

Event	Description	Action on the CDM operation	(Changes to) Operational Status	Origin
Start Ground handling	ACGT received when aircraft has been parked long term or overnight	Turn-round time updated TOBT, TTOT updated	IN-BLOCK	Aircraft Operator / Ground Handler
Boarding	Boarding of passengers commences		BOARDING	Airport system Aircraft Operator / Ground Handler
TOBT / Turn-round time update	AO / GH enters / confirms TOBT or time to turn-round the aircraft (ETTT )	TOBT, TTOT updated	IN-BLOCK	Aircraft Operator / Ground Handler
Target start up time issue	ATC issue TSAT based on pre-departure sequence	TTOT updated	SEQUENCED	Local ATC
Ready	Aircraft is ready for push back / taxi		READY	Aircraft Operator / Ground Handler
Push back / taxi start	Aircraft starts moving for departure	AOBT recorded TTOT updated	OFF-BLOCK	Airport system (DGS) Local ATC (A-SMGCS) ACARS Aircraft Operator / Ground Handler
Take off	Aircraft is airborne (departed)	ATOT recorded	DEPARTED	ACARS Local ATC

**Table 4: Trigger events involved in the evolution of a CDM operation - Ground & Departure Phases**

Estimate type	Calculation
ETOT (origin)	ETOT is calculated using stored parameters ( $ETOT = EOBT + EXOT$ ) and updated with FUM information
ELDT	ELDT is initially based on schedule data (SIBT-EXIT), then on FPL data, followed by updates from FUM information. When the flight enters the local ACC / ATC area of responsibility, ELDT will be based on the local ATC estimate taking into account holding and arrival sequencing (AMAN)
EIBT	$EIBT = SIBT$ and is updated as $EIBT = E/ALDT + EXIT$
TOBT	Calculated as $TOBT = EIBT + MTTT$ (where $EIBT = E/ALDT + EXIT$ )  N.B. If aircraft parked overnight or long-term, then $TOBT = ACGT + M/ETTT$  When flight status changes to In-block: $TOBT = AIBT + MTTT$  If TOBT is earlier than EOBT, then EOBT value is displayed as TOBT, until updated / confirmed by the Aircraft Operator or Ground Handler. Confirmation can also be triggered automatically based on a time parameter before TOBT.  When TOBT is input manually, it may not be overwritten by the system.
TTOT	When TOBT is available, $TTOT = TOBT + EXOT$  When TSAT is issued, $TTOT = TSAT + EXOT$

**Table 5: Calculation of estimated times**

### Special data

Special data such as weather, runway configuration, etc., must be made available for presentation.

### Historic database

For the purpose of quality control, problem solving and reviews, all data received for display or calculation will be stored in a database and time stamped.

It is strongly recommended that the format of the database be of a commonly used type to facilitate access by analysis tools. Saving of the database on mobile media must also be available.

# ATTACHMENT 4

## Data Elements and Event Triggers

### Data accuracy

The accuracy to be met by the data exchanged is specified in the Airport CDM Functional Requirements Document. The following minimum external data accuracy is required:

Data Type				
Data source	ELDT	TOBT	Stand/ Gate changes	TTOT
Network Operations	± 5 min when flight is airborne (ETFMS available)			
ATC	± 5 min until 20 minutes before landing, thereafter ± 2 min	TOBT, TTOT updated	IN-BLOCK	± 5 min Prior AOBT ± 2 min After AOBT
Airport operations			To be provided not later than 20 min before ELDT	
Aircraft Operator / Ground Handler		± 5 min until 20 minutes before TOBT, thereafter ± 2 min		

**Table 6: Data accuracy requirements**

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# ATTACHMENT 5

## Raising local Airport CDM awareness

5.1 BRUSSELS

5.2 FRANKFURT

5.3 LONDON HEATHROW

5.4 MUNICH

5.5 PARIS CDG

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# Collaborative Decision Making at Brussels Airport

## Information Sheet

November 2006

With the high growth forecast in the aviation industry in the forthcoming years and the recent enhancement to the Air Traffic Control (ATC) en-route network such as Reduced Vertical Separation Minimum (RVSM), airports are expected to become the restricting bottleneck to the overall Air Traffic Management (ATM) system, with delays continuing to spiral unless radical enhancements are achieved.

Collaborative Decision Making (CDM) is one of the new concepts that have been adopted by the ECAC (European Civil Aviation Conference) Transport Ministers in the European Air Traffic Management Strategy for the Years 2000+ (ATM Strategy 2000+). EUROCONTROL, the European Organisation for the Safety of Air Navigation, has been mandated to develop the ATM Strategy 2000+ in the next years, including Airport CDM.

### What is Airport CDM?

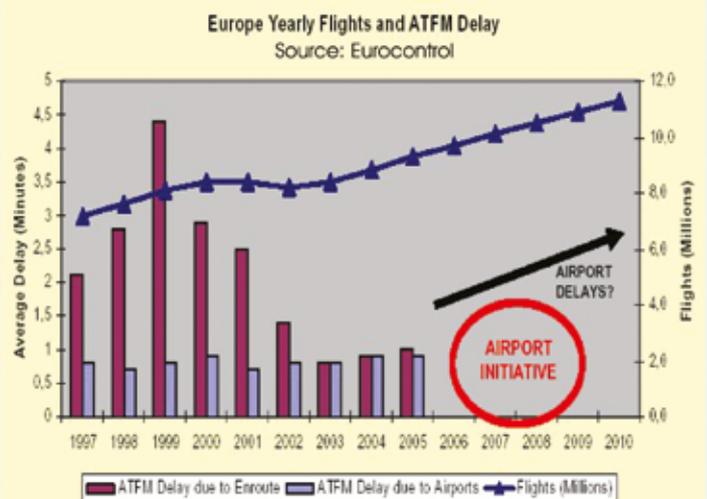
Airport CDM is a concept which aims at improving Air Traffic Flow & Capacity Management (ATFCM) at airports by reducing delays, improving punctuality of events and optimising the utilisation of resources.

Airport CDM allows an airport partner to make the right decisions in collaboration with other airport partners (the airport operator, aircraft operators, ground handlers, the air navigation service provider, the Central Flow Management Unit – CFMU, support services), knowing their preferences and constraints and the actual and predicted situation.

The decision making by the airport partners is facilitated by the sharing of accurate and timely information and by adapted procedures, mechanisms and tools.



Main partners involved in Airport CDM



Evolution of airport delays vs. en-route delays

### Who will benefit from Airport CDM?

All airport partners will benefit from Airport CDM:

- **Aircraft operators:** better adherence to schedule, possibility to express preferences
- **Ground handlers:** improved predictability of turnaround operations, better use of resources
- **Airport operator:** increased departure and arrival punctuality, more efficient use of stands, gates and terminals
- **ATC:** optimised use of airport airside infrastructure, reduced ground congestion
- **CFMU:** better adherence to slot, optimised use of airspace capacity

### What about Brussels Airport?

Brussels Airport was one of the first airports to participate in the Airport CDM trials when the project was launched by EUROCONTROL in 2001.

The airport partners decided to focus initially on the improvement of the turnaround process and the related pre-departure sequencing by introducing the Target Off-Block Time (TOBT) procedure.

### Participants at Brussels Airport?

The key airport partners at Brussels Airport are now participating in the project:

- Belgocontrol, the air navigation service provider

- Brussels Airport Company, the airport operator
- Aircraft operators through the Airline Operators Committee (AOC), SN Brussels Airlines, Thomas Cook and Virgin Express
- Ground handlers, i.e. Aviapartner & Flightcare.

EUROCONTROL is actively participating by providing support to all the airport partners involved.

	CIS	Type	Stand	Dest	RWY	TWY	SID	EOBT	TOBT	TSAT	Delay	COBT	VTT	CTOT-5	HoPS	Status	ACARS
SWP2	Parameter	Work	System	A3	HB	Tower	Clearance	V150C									
3	CSR031	R320	207	LIME 25R 01	SOPK2C	0800	0800	0758	10	0810	0818	L/U					
1	HRH001	R738	201	LIME 25R 01	SOPK2C	0810	0810	0810	11	0820	0823	-T					
2	BTI002	R735		LIME 25R 01	NIK1C	0810	0810	0813	11	0824	5/U						
	DRT65C	RJ1H	151	ENGM 25R 01	NIK1C	0815	0815	0816	10	0827	COO						
	BRC012	DC10	228L	VGZR 25R 01	SOPK2C	0815	0815	0818	11	0828	PRD						
	ELL178	R798	313	EBTH 25R 01	NIK1C	0805	0805	0817									
	DRT42H	R305	147	EPFK 25R 01	NIK1C	0820	0820	0820	10	0831	PRD						
	DRT25C3	RJ1H	107	CPNR 25R 01	SOPK2C	0820	0820	0821	10	0832							
	SAS1502	MD87	143	EKCM 25R 01	NIK1C	0825	0825	0825	10	0835	PRD						
	SUS22T	ATP	431	EKBI 25R 01	NIK1C	0825	0825	0825	11	0837	PRD						
	SUS86Z	D328	432	EKPH 25R 01	NIK1C	0825	0825	0825	11	0838	PRD						
	DRT60F	RJ95	105R	EGMT 25R 01	HELEN2C	0825	0825	0827	10	0840	PRD						
	DRT19H	RJ95	150	EGSB 25R 01	HELEN2C	0825	0830	0830	2	0829	10	0841	PRD				
	DRT44E	RJ1H	228R	EGCC 25R 01	HELEN2C	0830	0830	0831	10	0840	0843	PRD					
	DRT38K	RJ85	140	EGSB 25R 01	NIK1C	0830	0830	0830	12	0844	PRD						
	COB01	R764	240	KEWR 25R 01	DEWUT2C	0830	0830	0833	1	0833	10	0840	PRD				
	RZR151	R319	159	LIML 25R 01	SOPK2C	0835	0835	0835	10	0845	0840	PRD					
	VEK882N	R733	170	LEVQ 25R 01	CIV9C	0830	0830	0837	5	0837	9	0840	PRD				
	DRT3177	RJ85	183	LIME 25R 01	SOPK2C	0835	0835	0838	10	0848	0850	PRD					
	DRT3840	R319	232	DMNN 25R 01	CIV9C	0835	0835	0838	1	0838	10	0851	PRD				
	DRT21H	R462	152R	LIME 25R 01	SOPK2C	0825	0825	0827	2	0829	10	0852	PRD				
	DRT70R	R319	150	LFFT 25R 01	LNO1C	0840	0840	0841	10	0853	PRD						
	DRT28R1	R462	155	EDOI 25R 01	NIK1C	0840	0840	0842	10	0855	PRD						
	DRT3887	RJ85	157R	LFR0 25R 01	CIV9C	0840	0840	0843	10	0856	PRD						
	DRT2925	R319	230R	UDD0 25R 01	NIK1C	0840	0840	0845	10	0857	PRD						
	DRT3021	R733	144	LFP0 25R 01	CIV9C	0840	0840	0845	17	0850	0859	PRD					
	BWR30E	R320	311	EGLL 25R 01	HELEN2C	0845	0845	0847	11	0900	PRD						
	DRT3101	RJ1H	142	LIME 25R 01	ROUSV1C	0845	0845	0847	12	0855	0901	PRE					
	VEK84R	R733	148	LEMD 25R 01	CIV9C	0835	0835	0850	10	0903	0902	PRE					
	BWR221	R145	312	EGNX 25R 01	DEWUT2C	0850	0850	0851	11	0904	PRD						
	DLH001	DH00	432	EGXX 25R 01	SOPK2C	0755	0755	0755	11	0821	PRD						

Airport Movement System includes TOBT & TSAT

## What is the TOBT procedure?

After a test period (2003), the TOBT procedure became operational on the 1<sup>st</sup> of March 2004. An extensive evaluation led the airport partners to adopt an improved procedure in 2005. Being published in the Belgian Aeronautical Information Publication (AIP) it is now systematically applied to each flight departing from Brussels Airport (except VIP and hospital flights).

The TOBT procedure is based on the sharing of information between the aircraft operator / ground handler and ATC about the off-block time:

- 40 to 20 minutes before off blocks, the aircraft operator / ground handler may initiate the dialogue by sending to ATC an target estimate of the time when the aircraft will be ready for start-up (TOBT)
- If no TOBT is received 20 minutes before off blocks, ATC considers EOBT from the flight plan as TOBT by default
- ATC builds a pre-departure sequence using the TOBT of each flight whilst taking into account the ATFM slot for regulated flights
- ATC sends back to all the airport stakeholders an estimate of the time when the flight can expect to receive its start up clearance (TSAT)

- Several updates can be made both by the aircraft operator / ground handler and by ATC, launching again a dialogue
- If the pilot has not contacted ATC 3 minutes, after TSAT, the flight is removed from the pre-departure sequence. It is only re-sequenced when the pilot calls

A TOBT Working Group, composed of representatives of the airport partners and EUROCONTROL, holds regular meetings to work on the continuous improvement of the procedure.

More detailed information about the TOBT procedure can be found in the [TOBT Information Document](#).

## What is next?

Other tools and procedures are planned in order to improve the departure punctuality like variable taxi time calculation, collaborative de-icing procedures, implementation of a Departure Manager (DMAN) and trials with the CFMU for connecting Brussels Airport as CDM airport to the ATM network.

Whatever the objectives in terms of Airport CDM implementation, one has to keep in mind that information sharing is the key to success.

## Information and Contacts

### Airport CDM Generic Information:



Optimized sequencing at Brussels Airport

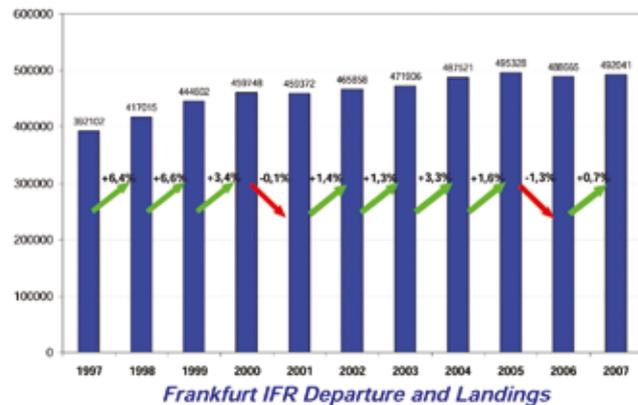
- EUROCONTROL Airport Operations Programme: [www.eurocontrol.int/airports](http://www.eurocontrol.int/airports)
- European Airport CDM Portal: [www.euro-cdm.org](http://www.euro-cdm.org)
- See also the [Airport CDM Applications Guide](#) and the [Airport CDM Implementation Manual](#)

### Brussels Airport Local Contacts:

- Marc MATTHYS – Belgocontrol – ATFCM Expert and Punctuality Coordinator – Chairman of the TOBT Working Group: [mam@belgocontrol.be](mailto:mam@belgocontrol.be)
- Kathleen VERECKEN – Brussels Airport Company – Brussels Airport Operations, Data and Planning Services Manager: [kathleen.verecken@brusselsairport.be](mailto:kathleen.verecken@brusselsairport.be)

## Introduction

With the high growth forecast in the aviation industry in the forthcoming years and the recent enhancements to the Air Traffic Control (ATC) enroute network such as Reduced Vertical Separation Minimum (RVSM), airports are becoming the restricting bottleneck to the overall Air Traffic Management (ATM) system.



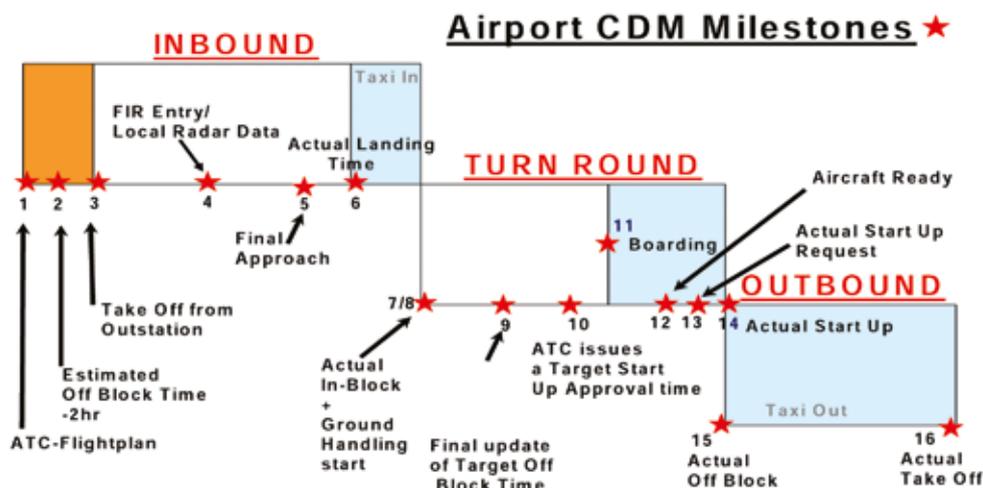
## What is Airport CDM ?

Airport Collaborative Decision Making (A-CDM) is a European initiative based on operational harmonisation (EUROCONTROL), technical standardisation (EUROCAE) and mandate of the European Commission (Community Specification).

Airport CDM is an operational process which aims at improving Air Traffic Flow and Capacity Management (ATFCM) at airports by reducing delays, improving the punctuality of events and optimising the utilisation of resources.

Airport CDM allows an airport partner to make the right decisions in collaboration with other airport partners (the airport operator, aircraft operators, ground handlers, the air navigation service provider, the Central Flow Management Unit – CFMU, support services), knowing their preferences and constraints in regard to the actual and predicted situation.

The decision making by the airport partners is facilitated by sharing of accurate and timely information and by adapted procedures, mechanisms and tools.



The Airport CDM procedure comprises the time period from Estimated Off Block Time (EOBT) -3hr till Take Off, thus the complete turn-round process with its existing sixteen procedure steps (milestones) is considered.

## ***Expected benefits to partners of Airport CDM***

All airport partners will benefit from Airport CDM:

- *Aircraft operators:* better adherence to schedule, possibility to express preferences
- *Ground handlers:* improved predictability of turnaround operations, better use of resources
- *Airport operator:* increased departure and arrival punctuality, more efficient use of stands, gates and terminals
- *ATC:* optimised use of airport airside infrastructure, reduced ground congestions
- *CFMU:* better adherence to slots, optimised use of airspace capacity

## ***What about Frankfurt airport?***

After the mutual agreement on the necessity for an Airport CDM project at Frankfurt Airport, a preparatory workshop was held in May 2008 with attendance of all partners including Eurocontrol. The Kickoff Meeting for the project Airport CDM was held at Frankfurt Airport on May 19th 2008, with participation by the prospective members which consist of the steering committee, the project leaders and the central workgroup, all of whom were either from FRAPORT or DFS. The first results to be agreed upon were the creation of a Memorandum of Understanding (MoU) between FRAPORT and the DFS, as well as a rough planning for the project structure and the execution of the project itself (e.g. GAP analysis). Airport CDM@FRA aims at developing and implementing a corporate Airport Collaborative Decision Making at Frankfurt Airport in accordance with European standards.

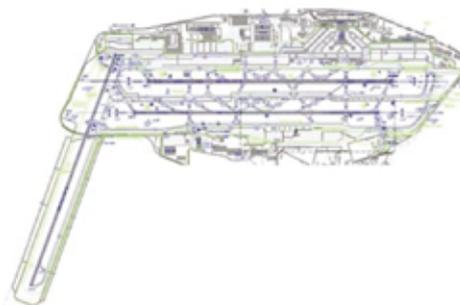
## ***Who is part of the Airport CDM@FRA project team?***

Representatives of the following partners participate in the Airport CDM project team:

- DFS
- Fraport

Eurocontrol is actively participating in the project, providing support to the partners involved.

Stakeholders will be involved via special meetings and project sub groups.



### ***Current activities***

- Project organisation
- Communication to customers
- Execution of GAP Analysis

### ***Next steps***

- Development of Airport CDM Procedure
- Communication to customers
- Specification of operational and technical requirements

## ***Information and contacts***

DFS Deutsche Flugsicherung  
Local CDM Manager  
Klaus Wehle  
[Klaus.Wehle@dfs.de](mailto:Klaus.Wehle@dfs.de)

Fraport AG  
Local CDM Manager  
Stefan Hilger  
[S.Hilger@fraport.de](mailto:S.Hilger@fraport.de)

European Airport CDM Portal: [www.euro-cdm.org](http://www.euro-cdm.org)

## COLLABORATIVE DECISION MAKING (HEATHROW) IMPORTANT OPERATIONAL CHANGES

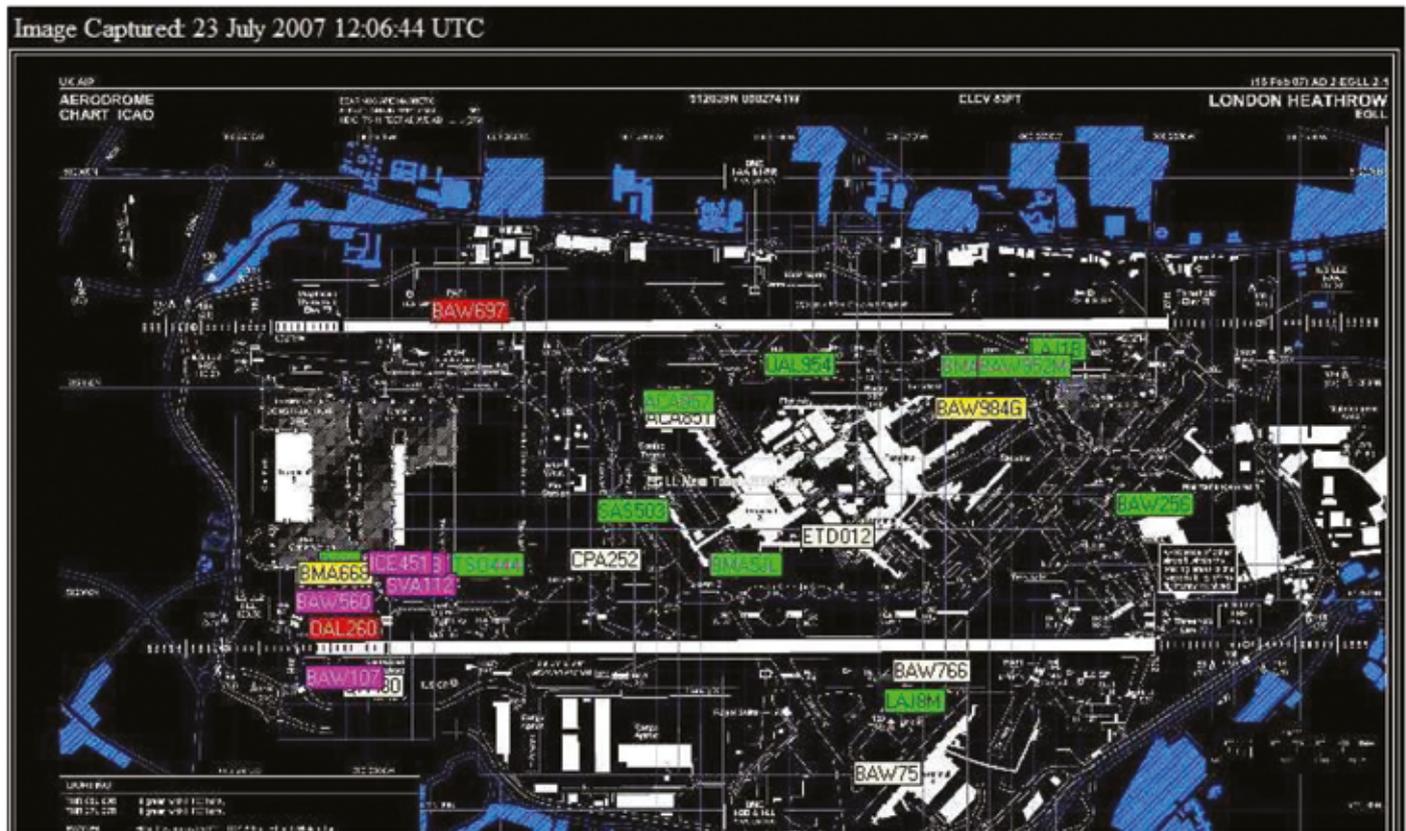
Airlines, Ground Handlers, Airside and Landside operational staff, and Air Traffic Controllers are urged to read this short document as future changes may well affect the way you operate.

### INTRODUCTION

The Heathrow Airport CDM (Collaborative Decision Making) project was launched in September 2003 and several important milestones have been achieved. Recently NATS has improved Estimated Times of Arrival and Actual Times of Landing of Flights by linking ATC systems with Airport systems. Most importantly, the first version of the CDM Portal is now available to Heathrow CDM partners with future enhancements planned for later this year.

The Heathrow CDM project is now entering the second phase of implementation where significant improvements will be made to departure information by early 2008. These changes are only possible with the proactive participation of all airport partners and their willingness to adopt operational working practices to maximise the potential benefits available; improved Heathrow departure information will be shared with the Central Flow Management Unit (CFMU) in Brussels as this will help the CFMU manage the Airspace Network and ATC Slot (CTOT) management more efficiently.

More information about the European CDM initiative can be found at the EUROCONTROL website, [www.euro-cdm.org](http://www.euro-cdm.org) along with previous documentation on Heathrow CDM and other European CDM Airports.



The Situational Awareness Page showing the Ground Situation is available on the internet via the NATS CDM Portal (<https://www.natscdm.co.uk>)

## Accurate Arrival Times

Accurate information concerning the Landing and In Block time of a flight is an important step in the CDM Milestones process, in order that the subsequent Off Block and Take Off time can be predicted and used by all partners to maintain punctuality and efficiency.

Airborne holding durations are calculated at the London Terminal Control Centre and are now displayed via the NATS CDM web page (<https://www.natscdm.co.uk>) as well as being sent directly to Heathrow Airport. With the new ATC Tower becoming operational, actual times such as landing (ALDT), in block (AIBT) and take off (ATOT) now come directly from the Electronic Flights Progress Strips used by the Air Traffic Controllers. In order to display and use this data to best effect, NATS have developed the CDM web page that presently has three services:

**Arrivals Portal (see image below)** – which includes the holding duration and statistics on landing rate and average holding times, Estimated In Block Time (EIBT), previously known as ETA, that includes a variable taxi-in time based on the landing runway and predicted parking stand.

Flight No.	ATC Call Sign	Holding Duration	EIBT	EBT	Runway	Arrival Terminal	Type
BA 727	BAW727	0:09	11:47	11:59	09L	4	A320
BA 831	BAW831	0:10	11:50	11:58	09L	3	A320
BA 361	BAW361	0:09	11:52	12:04	09L	4	A321
AF 1350	AFR1350	0:10	11:53	12:01	09L	2	A320
TK 837	KY837	0:11	11:55	12:03	09L	3	A321
BA 571	BAW571	0:11	11:56	12:00	09L	1	A319
DA 949	DAW949	0:12	11:58	12:02	09L	1	B752
BA 286	BAW286	0:12	11:59	12:04	09L	1	B744
---	LA394	0:13	12:01	---	09L	---	A330
ED 222	DMA222	0:13	12:02	12:06	09L	1	E140
---	2JF222	0:13	12:04	---	09L	---	B754
5K 803	5K803	0:13	12:05	12:13	09L	3	A320
BA 256	BAW256	0:13	12:07	12:19	09L	4	B772
BA 814	LX18	0:13	12:08	12:20	09L	4	A321
UA 954	UAL954	0:13	12:10	12:17	09L	3	B772
BA 140	BAW140	0:09	12:11	12:15	09L	1	A320
BA 897	BAW897	0:09	12:13	12:25	09L	4	A320
---	LG4403	0:11	12:14	---	09L	---	E140
LX 332	SWR332	0:09	12:16	12:22	09L	2	A321
BA 983	BAW983	0:10	12:17	12:21	09L	1	A319
QF 29	QFA29	0:11	12:19	12:21	09L	4	B744
BE 712	BEU712	0:08	12:20	12:24	09L	1	A320
BA 61	BAW61	0:06	12:22	12:34	09L	4	B744
UH 428	UHL428	0:07	12:22	12:30	09L	2	A300
BA 1327	BAW1327	0:07	12:25	12:29	09L	1	A320
---	ACAR12	0:07	12:26	---	09L	---	B763

**Arrivals Reporting Portal** – partners are able to carry out arrival analysis on their flights and download it as a .pdf document.

**Situational Awareness** – This page displays a screen shot of the ATC ground radar (see image overleaf) which updates every 30 seconds and shows the position of all flights moving on the ground, whilst displaying the ATC call-sign. In the autumn, the Situational Awareness page

will become more user friendly with the ability to zoom on specific areas and filter flights; at the same time the CDM web page will also include scheduled times, actual landing times and stand numbers. By the end of 2007 CDM will also much earlier arrival information from the CFMU using radar data and flight profiles to estimate landing times for aircraft destined for Heathrow up to 3 hours prior to landing.

## Enhancing Departure Estimates

The term TOBT (Target Off Block Time) will replace the old ETD and airlines and handling agents will need to keep TOBT up to date with an accuracy of  $\pm 5$ mins. Latterly, TOBT will be used by the CDM platform to generate TSATs (Target Start Up Times) based on constraints such as CFMU Slot, other movements to/from nearby stands and runway capacity. This accurate planning will lead to improved Stand and Gate management and aims to reduce lengthy queues at the departure runway. At the same time the improved estimates will be sent to the CFMU in order to more efficiently manage the allocation of CFMU Slots (CTOTs).

## Display and interaction with CDM data

The CDM Platform will generate alarms to alert Airlines/Ground Handlers of any discrepancy in flight data. Partners will then be prompted to update the flight details accordingly.

All of the CDM data will be fed by NATS back to the BAA IDAHO system and available for display on SIS ensuring commonality of data across the airport.

## The Way Forward

Regular CDM Implementation Group meetings are planned in the coming weeks to develop the Heathrow CDM processes and ensure the smooth implementation that is planned for early 2008 (in time for the introduction of the new Terminal 5).

Further information on CDM can be obtained from,

- Peter Tomlinson (NATS) [Peter.Tomlinson@nats.co.uk](mailto:Peter.Tomlinson@nats.co.uk)
- Colin Wood (BAA) [Colin.Wood@baa.com](mailto:Colin.Wood@baa.com)
- Roger Lane (EUROCONTROL) [roger.lane@eurocontrol.int](mailto:roger.lane@eurocontrol.int)

# THE MUNICH AIRPORT CDM PROJECT

13. May 2007

## Airport CDM Munich – NEWS -

On 7<sup>th</sup> May the final phase of the Airport CDM Trial at Munich Airport will be initiated. The exchange of automated data between Airport CDM MUC and CFMU ETFMS Live System will allow a smooth transition into regular operations at 7<sup>th</sup> June 2007.

## Activities 2007

Operational data exchange trial with CFMU test system	Mar 2007
Visit of EUROCONTROL Director ATM Programmes and Head of Division AOE	Mar 2007
Workshop "Airport CDM" with participants from Airports: VIE, AMS, ZRH, BCN, MAD, LHR	Apr 2007
Workshop aim: Demonstrate the progress of the Munich A-CDM project, inform the participants of the processes and procedures of Airport CDM in reference to the European harmonisation of Airport CDM.	



Delegation of Eurocontrol, DFS and Airport CDM project team Munich



Airport/ATC/Airlines Participants from 6 European Airports at A-CDM workshop MUC

## Airport CDM Munich – Remote Access –

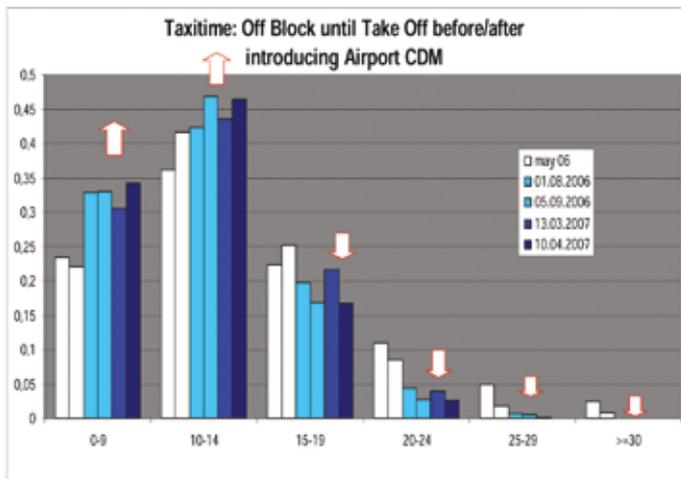
The screenshot shows the 'Sequence Detail (all times in utc)' page of the WEASEL application. The table below represents the data visible in the screenshot.

MAS	Flight	Callsign	SOBT	EOBT	TOBT	TSAT	RMT	POS	ICE	RWY	Detail
<	LH 3682	DLH3XU	07:10	07:20	07:35	07:35	10	223A		26L	Detail
<	LH 480	DLH480	07:20	07:20	07:20	07:36	12	204A		26L	Detail
<	LH 4382	DLH55K	07:40	07:40	07:40	07:41	10	327W		26L	Detail
<	=864347	EFD401	06:45	07:51	07:45	07:45	11	R10		26R	Detail
*	DI 7084	BAG84C	07:55	07:55	07:55	07:55	12	105		26R	Detail
	OEINI	OEINI	08:00	08:00	08:00	08:00	10	R10		26L	Detail
*	DE 852	CFG852	08:25	08:15	08:25	08:25	13	246		26L	Detail
*	RO 316	ROT316	08:25	08:25	08:25	08:25	14	195E		26L	Detail
*	TK 1630	THY1630	08:30	08:30	08:30	08:30	14	115A		26L	Detail
*	DL 131	DAL131	08:05	08:05	08:05	08:36	11	110		26L	Detail
+	AY 804	FIN804M	08:20	08:20	08:20		14	116		26L	Detail
	AZ 441	AZM441	09:50	09:50			16	196E		26L	Detail
	BA 949	BAW949L	09:55	09:55			17	109B		26R	Detail
<	QI 244	CIM244	07:40	07:40	07:40		11	323W		26R	Detail
	AC 847	ACA847	09:40	09:40			16	212A		26R	Detail
	LH 1306	DLH3HY	09:30	09:30			15	321W		26L	Detail
	LH 4096	DLH1MK	08:55	08:55	08:55		17	324W		26L	Detail
+	UA 903	UAL903	09:35	09:35			16	224X		26R	Detail
*	UA 907	UAL907	10:20	10:20			16	223A		26R	Detail
	DE 942	CFG942	10:00	10:00			15	210B		26L	Detail
	LH 3332	DLH4MJ	08:55	08:55	08:55		17	220B		26L	Detail
	KM 305	AMC305	10:40	10:40			15	220B		26L	Detail
	LU 1424	DLU142	09:40	09:40			16	243		26L	Detail

The screenshot above shows the Web application for Sequence-Planning (WEASEL). Depending on access authorization, detailed flight and sequence information are visible, e.g. Remote TOBT change is possible with WEASEL. Access can be requested via [airport-cdm@munich-airport.de](mailto:airport-cdm@munich-airport.de).

## Benefits of Airport CDM

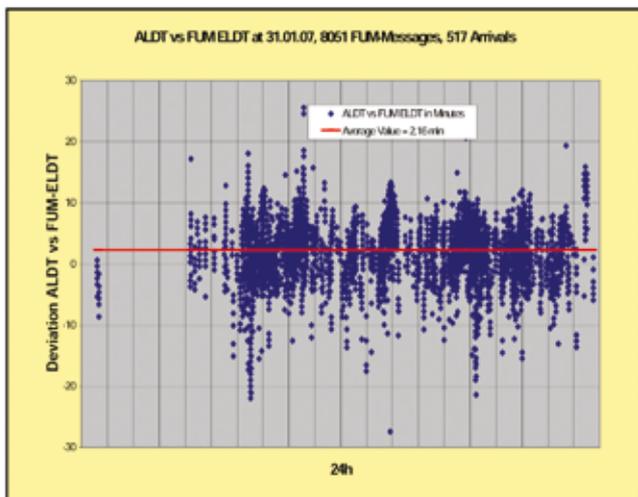
### Taxitime:



The graph above shows the general decrease of taxitimes over a longer trial period, related to the Airport CDM process. Benefits:

- Environment
- Cost
- Workload

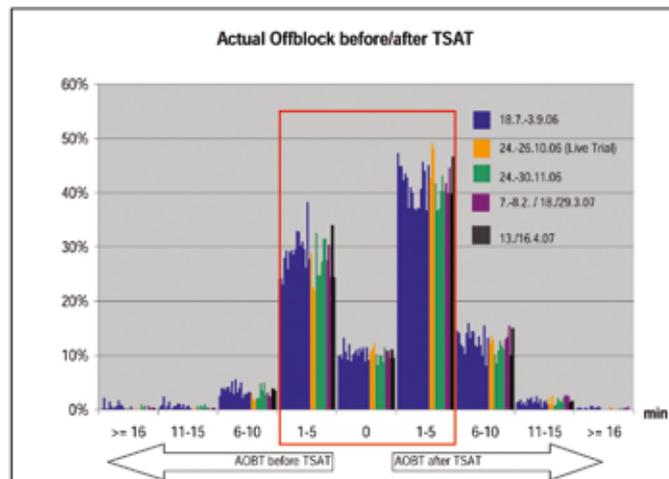
### Flight Update Messages:



The graph above shows the quality of the estimated landing time. Benefits:

- Connection In- and Outbound flight
- Gate and Positioning
- Ground resource Management

### Actual Offblock before / after TSAT:



The graph above shows the adherence to the Airport CDM procedure.

85% of Actual Offblock times are within a +/-5 minutes window around the Target Start Up Approval Time. Benefits:

- Stability of sequences
- Predictability
- Programmability for all relevant operational processes

### Publications

- AIP Germany, Volume II, AD2-EDDM, AD2.20, "Local Traffic Regulation"
- Brief Description "Airport CDM Munich", Version 4.0
- Flight Crew Briefing "Airport CDM Munich", Version 4.0

### What's next?

- Operation with CFMU ETFMS live system
- Transition from project phase into regular Airport CDM operations at 7<sup>th</sup> June 2007

### Information and Contacts

- Peter Kanzler, Head of Apron Control  
[airport-cdm@munich-airport.de](mailto:airport-cdm@munich-airport.de)
- European Airport CDM Portal:  
[www.euro-cdm.org](http://www.euro-cdm.org)
- Munich Airport Website:  
[www.munich-airport.de/cdm](http://www.munich-airport.de/cdm)



Special issue:  
June 2008

CDM@CDG is working on several items:

- **Presequence Planner**

- **Internet CDM Portal**

-Situational Awareness Window

<https://www.cdmcdg.net>  
(new release february 2008)

-CDG specific Météo France Website

- **Information sharing**

- CDM cell in adverse conditions (H24 phone contact)
- Daily CDM phone conference for defined actors (implemented since summer 2008)
- CDM procedures (winter plan)

- **process improvement (deicing...)**

The efficiency of the Presequence planner needs:

- Accurate estimated departure times
- Planned Off Block time and procedure respect by all partners

...for the best use of the existing capacities and help to reduce delays.

## CDG off Block sequence planning

By summer 2009, CDG airport will implement the main part of the CDM project; the Off Block Sequence Planning, based on information sharing about departing flight datas, and calculation of the Off Block hours sequence . This will be linked to CFMU, (European Central Flow Management Unit) .

In the meantime, this management will provide a better ATC slot adherence, and will allow to send reliable informations to CFMU to reduce some marges when comparing estimated load and capacities. A decrease in fuel burn should appear due to shorter taxitime and holding at runways entries.

By 2010, deicing management and airlines operators priorities should allow a second jump in airport capacity use and optimisation in adverse conditions.

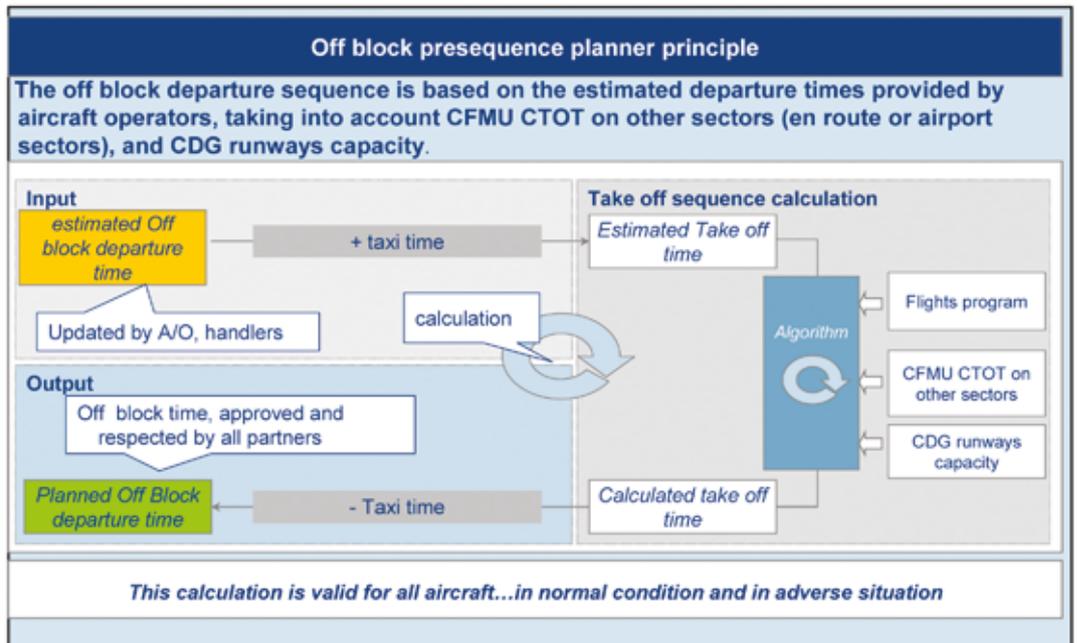
To work properly, the system will have to be fed with accurate off block estimated hours called **TOBT** (Target Off Block Time), given by airline operators, handlers. For each flight a collaborative off block time will be allocated, called **TSAT** (Target Start

up Approval Time). These individuals times will build a presequence list , starting with an early calculation, constantly updated, displayed to all partners and under responsibility of air traffic control.

Benefits are expected in two ways : first a better visibility about the situation for all users and a better forecast of the delays due to airport contingencies. Then the management of the off block times will help to optimise the use of the airport (taxiways, runways feeding, stand allocation).

By establishing an appropriate sequence according to runways capacities, TSAT can replace CFMU slots when departure rate has to be decreased due to local contingencies. Other CFMU slot can exist on other sectors, but CDG situation improvement can allow TSAT to be improved faster, closer to the airlines needs.

CDG is in partner ship with Eurocontrol to implement its Local Departure Management. The main European airports follow the same goal. These local improvements will help to optimize the use of the available european network capacity.



## CDM@CDG2010 Roadmap– presequence planner: a 3 steps implementation

From summer 2008:

### Estimated Departure times quality improvement

CDM actions will be focused on communication around the estimated departure times improvement. All actors will be asked to increase the quality of their forecast . The goal is to feed the airport database with the best and most reliable estimated departure times. They will be integrated into ATC traffic load forecast to be used in parallel with the existing CFMU datas which are not always accurate for departure management, especially in adverse conditions. Such improvement should lead to a better prediction, and increase the efficiency of the airport.

Summer 2009:

### Presequence planner tool

#### Departure planning Information messages with CFMU

CDM@CDG team has already been working for 12 months on the Off Block sequencing tool. Totally connected with ATC, linked to CFMU, the Off Block presequence planner will be implemented by ADP (in partnership with DSN) by summer 2009. Like today, CDG control tower will be in charge of the start up process and off block clearance, with adapted procedures.

2010:

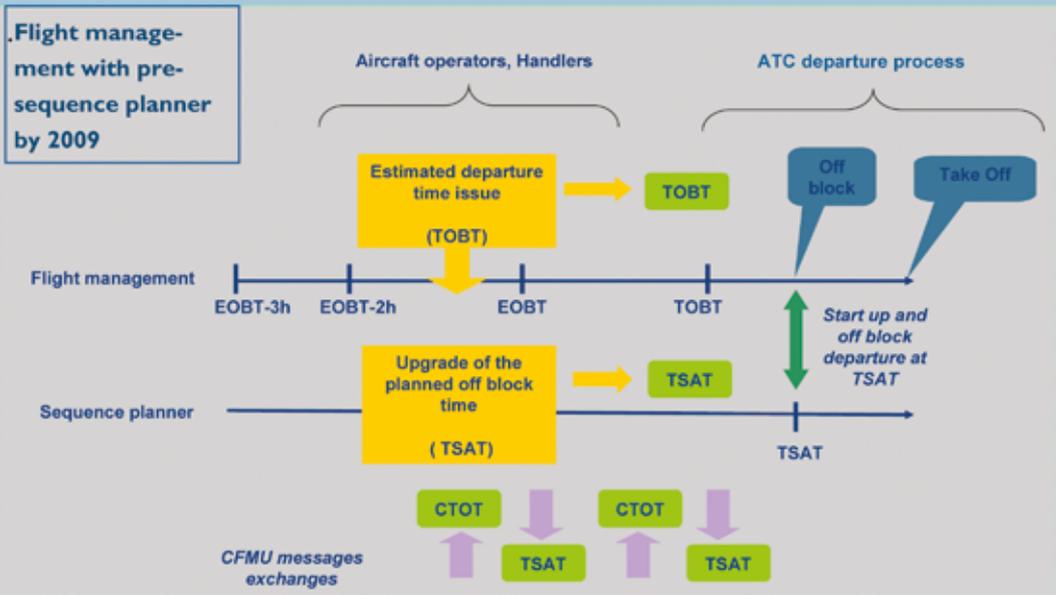
### Deicing manager Airlines priorities

This third step should implement the use of a deicing manager, connected to the presequence planner. Deicing management will allow forecast of deicing demand, planning of deicing bays opening and use, and sequencing. In addition, the sequence will take into account airline priorities (for example departure time exchanges). Rules and process are to be defined yet.

3 workgroups have already worked on the departure process definitions:

- Flight plan information management
- TOBT and TSAT-Management and issues
- Crew/ATC process

CDM@CDG and Euro-control are partners in these works, and involved in the future european standardisation of these processes.



**EOBT:** Estimated Off block Time (departure time provided in flight plan)

**TOBT:** Target Off Block Time (A/O estimated departure time)

**CTOT:** Calculated Take Off Time (ATC slot)

**TSAT:** Target Start up Approval Time (start up and push back time to be respected)

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# ATTACHMENT 6

## DPI Implementation criteria and validation process

### 6.1 FOREWORD

Airport CDM is about airport partners working together more efficiently and transparently in how they share data and act upon them. Airport CDM is seen as the driver and mechanism to efficiently integrate airports with the Air Traffic Management Network by dynamically sharing highly accurate operational data with the Network Operations.

It is of importance that local Airport CDM implementation is based on harmonised and commonly agreed Airport CDM procedures. Lack of harmonisation between airports can have strong negative impact on airline operations and their ground handlers, as well as through a negative effect due to inaccurate data being provided to the ATM network.

#### 6.1.1 The Process

Implementation of Airport CDM is a complex process.

Such a complex process requires clear guidelines so that it will be implemented efficiently and in a cost affective manner for both the CDM airport and EUROCONTROL.

It starts with a local CDM implementation e.g. TOBT and TSAT and is followed by the integration of the Airport into the ATM network by starting data provision to the Network Operations via DPI messages.

The preparations for the integration of an airport into the network can start as soon as the airport is ready to commence Airport CDM implementation. These preparations consist e.g. of information provision, establishment of an implementation plan, development of a DPI ICD document. However, it is important that the Airport CDM procedures and processes are in place at the airport in order to integrate the Airport into the network.

The first step of the actual integration of an airport into the network is the start of the DPI Operational Evaluations (tests). Integration finishes after mutual agreement (Network Operations and local CDM Airport) with taking the DPI messages into operations.

It is important to have clear and transparent "Airport CDM Completeness Criteria" in order to be able to evaluate if the local CDM implementation is sufficiently advanced before the actual integration of the airport into the network starts (in the form of tests).

The CDM Airport shall demonstrate by documented assessment that the below described "Airport CDM Completeness Criteria" have been met.

Airports that are ready will agree with the Network Operations a planning for the Operational Evaluation as described in par. 6.3.2 "DPI Operational Evaluation Phases".

#### 6.1.2 The Objectives

The objectives of having a clear process and clear requirements are to:

##### **Provide future CDM airports with the necessary information:**

- The requirements are needed so that they can be taken into account by the airport in the planning of the CDM implementation project.

##### **Ensure that the provided data is of sufficient accuracy**

- It is important that the CDM airport has sufficiently evaluated the TOT predictions locally before the Operational Evaluations (tests) with Network Operations start.
- It is important that the CDM airport provides reliable TOT predictions before the integration into the network takes place.

### **Prevent that the data provision with the Network Operations commencing too early and the testing phase taking too long**

- It is important that CDM is actually in operation for all flights (with local exceptions e.g. VFR) before more reliable TOT predictions than those obtained from flights plans can be expected.

Achieving these objectives will prevent disappointments at the CDM Airport and will reduce workload for CDM implementation at the CDM Airport and at the Network Operations.

## **6.2 AIRPORT CDM COMPLETENESS CRITERIA**

The completeness criteria listed below apply for the readiness to start transmission and operational evaluation of DPI message to the Network Operations.

All below high level criteria should be met supported by factual data. However more specific implementation criteria shall be implemented with the degree of flexibility foreseen in EUROCONTROL and EUROCAE related documents, and the Community Specifications by the European Commission.

### **6.2.1 Airport CDM Concept Elements**

In general it can be stated that the basic requirement for readiness is that all five Airport CDM concept elements (reference Airport CDM Implementation Manual V3 Dec 2008) need to be implemented with the accuracy requirements as described in par. 6.2.3 in order to prevent that the network suffers from the “learning curve”.

The following major events should be included in the CDM process:

- A. Verification of the flight plan with the airport slot (when coordinated)
- B. Establishment/Issue of the TOBT
- C. Issue of the TSAT
- D. Actual Off-Block

These four events are the main trigger events for the E-DPI, T-DPI-t, T-DPI-s and the A-DPI respectively. The four events are also described in the agreed milestone approach as milestones 1, 2, 10 and 15 respectively.

### **6.2.2 Adherence to Operational Procedures**

It is important that the procedure for the provision of TOBT/TSAT/TTOT in the CDM platform is formally agreed, covered by official arrangements and is well documented e.g. published in the National AIP and Airport Operating instructions.

The transmission of DPI messages to Network Operations has an impact on the flight (e.g. CTOT) and this must be covered by the above mentioned official documents.

### **6.2.3 Accuracy & Coverage of the provided Data**

The airport partners should demonstrate the accuracy level of the prediction data. Specifically this concerns the following parameters:

- Taxi-time accuracy (+/- 5 min)
- TOT based upon TOBT accuracy equal/better than TOT based on EOBT and default taxi-times accuracy
- TOT based upon TSAT accuracy / tolerance (+/- 10 min)
- TOT based upon AOBT accuracy / tolerance (+/- 5 min)

## ATTACHMENT 6

### DPI Implementation criteria and validation process

These accuracy requirements should be obtained for 70% of the DPI messages during normal circumstances i.e. operations without disruptions such as deicing, operating at reduced capacity, for the last / current month of A-CDM Operations.

To indicate that all partners (AOs in particular) are participating to the A-CDM process, the CDM Airport shall provide DPI messages for 95% of the flights (with local exceptions e.g. VFR) during normal operational circumstances, i.e. operations without disruptions such as deicing, operating at reduced capacity,...

#### **6.2.4 Adherence to ATFM Slots**

The Airport partners should demonstrate an adherence of ATFM CTOT slots of 80% in the previous or current month of Airport CDM Operations.

#### **6.2.5 Agreements**

The Airport CDM partners and Network Operations shall prepare:

- A) The Interface Control Document (ICD) with Network Operations which will describe in detail the transmission of Departure Planning Information (DPI) messages.
- B) A Letter of Agreement (LoA) (or annex to an existing LoA) with Network Operations and the ANSP for the transmission of Departure Planning Information (DPI) messages.

The agreements with Network Operations will be prepared before the transmission of DPI messages starts but will be signed after the DPI Operational Evaluation has been finalised, i.e. just before the DPI messages are used operationally by Network Operations.

These documents shall eventually be signed by Network Operations and the CDM airport through the ANSP.

It is important that the CDM Airports appoint one contact person from the management of the A-CDM project side and one single contact person from the operations side to act as focal points with Network Operations.

## 6.3 DPI OPERATIONAL EVALUATION

### **6.3.1 Timing**

The Evaluation of the DPI messages from the initial technical tests until the transfer into operation must follow an agreed planning in accordance with the Operational Evaluation Plan and must take place in a limited period of time around 6 month in order to avoid waste of resources and avoid penalizing other Airports in the queue.

### **6.3.2 DPI Operational Evaluation Phases**

A standard Operational Evaluation plan shall be prepared by Network Operations for the inclusion of the Airport in the DPI procedure.

Operational trials shall be performed to confirm operational suitability followed by a Go/No Go meeting before operational implementation in Network Operations/ETFMS.

The DPI Operational Evaluation process is documented in the "DPI & FUM Implementation Road Map". URB/USD/DPI\_FUM\_Imp\_RM by Network Operations.

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# ATTACHMENT 7

## Airport CDM adverse conditions – impact assessment, processes, and best practices

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## EXECUTIVE SUMMARY

### I. Justification

A consequence of adverse conditions is a fall in capacity in the short or longer term. The aim is to manage these situations more efficiently in order to utilise the remaining capacity efficiently and to recover any available capacity in the shortest time possible.

Improved situational awareness through the sharing of information between all airport partners and the Network Operations is the main driver for this document. Currently, adverse conditions lead to reduced use or even a temporary interruption of airport CDM processes, whereas airport CDM should in fact provide the backbone for operations on the basis of accurate status information for each aircraft.

Airport CDM under adverse conditions should contribute to more automated detection of events, e.g. the commencement and completion of de-icing of aircraft, and lead to more automated inputs to the airport CDM platform in order to allow the updating of planning parameters. Automation of processes should reduce human workload and error, and contribute to accuracy and reliability of aircraft progress information. The human role in adverse conditions, however, should be to verify changes in aircraft status, and to be able at any time to adjust parameters on the basis of operational expertise.

### II. Content

This document was written by the Airport CDM Adverse Conditions Expert Panel between June 2009 and September 2010. It categorises adverse conditions on the basis of Network Operations classifications and carries out an impact assessment for most of these conditions.

The document also provides Operational Processes for Adverse Conditions, which were drawn up following brainstorming discussions between stakeholders and experts. The aim is for the processes to be harmonised by the Airport CDM Procedures Group and included in the Airport CDM Implementation Manual.

The document lastly sets out the best practices of the various stakeholders represented in the Expert Panel. The aim is to share these best practices with the readers of this document so that they can develop local procedures and operations to mitigate the negative impact of adverse conditions.

### III. Conclusion

As each airport is different in terms of culture, climate, lay-out and organisation, local measures to deal with adverse conditions tailored to the local circumstances conditions are essential in order to successfully minimise loss of capacity and scheduling delays. However, since numerous conditions are common to many airports, it is beneficial to harmonise measures with the aim of reducing delays and maintaining overall efficiency. This document provides the means to standardise procedures and processes, while allowing best practices to be shared and terminology to be harmonised.

Standardisation of the terminology and acronyms/abbreviations/initialisms used to describe procedures, processes or conditions is essential in order to ensure that organisations and crews from abroad understand local procedures and conditions. Such harmonisation is only now beginning to emerge and it requires political will and effort. The Airport CDM Adverse Conditions Expert Panel therefore recommends that those working on SESAR work package 6.6.1:

- continue to harmonise the terminology and acronyms/abbreviations/initialisms for procedures, processes, conditions and categories;
- further improve current operational processes and develop new detailed operational processes to increase the airport partners' awareness of current or anticipated operational events;
- develop procedures to deal with pre-departure degradation of sequencing in the event of a deterioration in TSAT prediction reliability. DPI messages may require adaptation with an indication of TSAT accuracy reliability and the adverse conditions applicable at the airport;
- continue to collect best practices and lessons learned in order to share these with stakeholders with the aim of increasing the learning curve at all airports;
- apply the developed methodology in order to derive new impact assessments and operational processes.

With the work ongoing within SESAR and future expert panels, the negative impact of adverse conditions in terms of cost and efficiency can be expected to continue to decrease.

## 1. INTRODUCTION

### 1.1 Purpose

This document is intended to serve as reference material for the identification of adverse condition impact assessments, automated airport CDM processes and best practices at any airport, in order to allow individual airports to prepare for and anticipate adverse conditions which may affect their capacity, operational efficiency or recovery time.

The document builds on, and assumes implementation of, elements of the Airport CDM Concept, as described in the Airport CDM Implementation Manual

(reference document 1). It is to be further developed in the relevant SESAR work packages.

## 2.2 Target readership

This document is primarily targeted at the operational staff and management of airport partners who are responsible for the development of procedures and processes. Those working on SESAR work packages may use this document to further develop related content or documentation.

## 1.3 Justification and background

A consequence of adverse conditions is a fall in capacity in the short or longer term. The aim is to manage these situations more efficiently in order to utilise the remaining capacity efficiently and recover any available capacity in the shortest time possible.

Improved situational awareness through information sharing between all airport partners and the Network Operations is the main driver for this document. Currently, adverse conditions lead to reduced use or even a temporary interruption of airport CDM processes, whereas airport CDM should in fact provide the backbone for operations on the basis of accurate status information for each aircraft.

Airport CDM under adverse conditions should contribute to more automated detection of events, e.g. the commencement and completion of de-icing of aircraft, and lead to more automated inputs to the airport CDM platform in order to allow the updating of planning parameters. Automation of processes should reduce human workload and error, and contribute to accuracy and reliability of aircraft progress information. The human role in adverse conditions, however, should be to verify changes in aircraft status, and to be able at any time to adjust parameters on the basis of operational expertise.

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### Airport CDM adverse conditions – impact assessment, processes, and best practices

#### 1.4 Definitions

This document to a large extent uses the definitions applied in the AEA documentation (reference document 4). Any additions to or departures from these definitions are listed below.

ID	Term	Definition
1.	Adverse Condition	<p>An adverse condition is a situation in which the airside and or land-side conditions at an airport are such that capacity falls and the airport partners need to use specially designed procedures to minimise operational costs and utilise the available capacity efficiently.</p> <ul style="list-style-type: none"><li>■ The ATFCM service is charged with ensuring that ATC capacities are respected and that aircraft operators can operate whenever possible with little or no delay. However, from time to time the normal operating conditions at aerodromes can be affected by events which make compliance with CTOTs almost impossible. Network Operations is able, under most circumstances, to minimise the impact of such events by co-ordinating short term modifications to the normal criteria for CTOTs and/or releasing individual flights by exempting them.</li><li>■ The procedure [...] is meant to accommodate situations where a succession of aircraft are affected by a deterioration in local operating conditions to the extent that CTOTs cannot be met without serious additional workload on the tower and the AOs. It is designed to be in effect for normally no more than two hours but it can be extended if necessary.</li></ul> <p><b>Situations that do NOT qualify</b></p> <ul style="list-style-type: none"><li>■ The fact that normal operations at an aerodrome may make the adherence to CTOTs difficult is not considered as an event which in itself requires special procedures. Such difficulties as may arise in such circumstances are part of normal operations.</li><li>■ Individual aircraft which cannot make their CTOT due to one-off events delaying their taxi/departure are not covered by this procedure. They are to be treated like any other aircraft whose CTOT is about to expire or has expired.</li><li>■ Low Visibility conditions do not qualify as they are managed by the imposition of exceptional conditions (XCD) by the Network Operations, neither do conditions requiring routine de-icing procedures.</li></ul>
2.	De-icing	Procedure by which frost, ice, slush or snow is removed from an aircraft in order to provide clean surfaces.
3.	Local frost prevention	Precautionary procedure which provides against formation of local frost in cold soaked wing tank areas during transit stop.
4.	Local frost removal	Precautionary procedure which removes local frost in cold soaked wing tank areas during transit stop.
5.	Anti-icing	Precautionary procedure which provides against formation of frost or ice and accumulation of snow or slush on treated surfaces of the aircraft for a limited time (holdover time).
6.	Heavy weather conditions	TBD
7.	Medium weather conditions	TBD
8.	Engine ice removal	Procedure by which frost or ice is removed from the fan blades by hot air.
9.	Special events	Larger demand than under normal traffic conditions, outperforming capacity

## 1.5 Acronyms/abbreviations/initialisms

<b>A-DPI</b>	Airport-departure planning information (message)
<b>ACARS</b>	Aircraft Communications, Addressing and Reporting System
<b>ACC</b>	Area control centre
<b>ACZT</b>	Actual commencement of de-icing time
<b>ACGT</b>	Actual commencement of ground handling time
<b>ACRT</b>	Actual commencement of snow removal time
<b>ACT</b>	Activation (message)
<b>ADIT</b>	Actual de-icing time
<b>AEA</b>	Association of European Airlines
<b>AERT</b>	Actual end of snow removal time
<b>AEZT</b>	Actual end of de-icing time
<b>AIBT</b>	Actual in-block time
<b>ALDT</b>	Actual landing time
<b>ARDT</b>	Actual ready time
<b>ASAT</b>	Actual start-up approval time
<b>ASBT</b>	Actual start boarding time
<b>ASRT</b>	Actual start-up request time
<b>AMAN</b>	Arrival Manager
<b>AO</b>	Aircraft operator
<b>ATC</b>	Air traffic control
<b>ATIS</b>	Automatic terminal information service
<b>ATOT</b>	Actual take-off time
<b>C-DPI</b>	Cancel-departure planning information (message)
<b>CFMU</b>	Central Flow Management Unit ( <b>renamed Network Operations</b> )
<b>CTOT</b>	Calculated take-off time (Network Operations)
<b>DCL</b>	Departure clearance
<b>DMAN</b>	Departure Manager
<b>DPI</b>	Departure planning information (message)
<b>E-DPI</b>	Early-departure planning information (message)
<b>ECRT</b>	Estimated commencement of snow removal time
<b>ECZT</b>	Estimated commencement of de-icing time
<b>EDIT</b>	Estimated de-icing time
<b>EERT</b>	Estimated end of snow removal time
<b>EET</b>	Estimated elapsed time
<b>EEZT</b>	Estimated end of de-icing time
<b>EIBT</b>	Estimated in-block time
<b>ELDT</b>	Estimated landing time
<b>EOBT</b>	Estimated off-block time
<b>EXIT</b>	Estimated taxi-in time
<b>EXOT</b>	Estimated taxi-out time

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### Airport CDM adverse conditions – impact assessment, processes, and best practices

<b>FDPS</b>	Flight data processing system
<b>FIDS</b>	Flight information display system
<b>FIR</b>	Flight information region
<b>FPL</b>	Filed flight plan
<b>FSA</b>	First system activation
<b>FUM</b>	Flight update message
<b>GH</b>	Ground handler
<b>MTT</b>	Minimum turnaround time
<b>MVT</b>	Movement message
<b>SOBT</b>	Scheduled off-block time
<b>T-DPI</b>	Target-departure planning information (message)
<b>TMA</b>	Terminal manoeuvring area
<b>TOBT</b>	Target off-block time
<b>TSAT</b>	Target start-up approval time
<b>TTOT</b>	Target take-off time
<b>TWR</b>	Aerodrome control tower
<b>VTT</b>	Variable taxi time
<b>WMO</b>	World meteorological organisation

### 1.6 Reference documents

1. Airport CDM Implementation Manual – Version 4 – April 2009 – Airport CDM Team – EUROCONTROL
2. Total Airport Management – Version 1 – April 2009 – Airport Planning - EUROCONTROL
3. EUROCONTROL airport CDM website: [www.euro-cdm.org](http://www.euro-cdm.org)
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## 2. SCOPE, OBJECTIVES AND METHODOLOGY

### 2.1 Scope

The primary aim of the document is to develop new generic airport CDM procedures, which are considered essential in order to minimise the impact of any reduction in capacity and minimise the length of recovery times. In order to define these procedures, a representative list of potential causes needs to be drawn up, so as to detect any gaps in existing procedures and clarify the need for new ones. The scope of this document is determined by the adverse conditions as used by the Network Operations for the purposes of reporting reasons for ATFM delay, as recommended by the Director of the Operations Meeting.

The scenarios are described in line with a generic methodology, and are divided into four main categories of adverse conditions, each broken down into several sub-categories.

#### **MET**

Weather-related conditions which occur either expectedly or unexpectedly and have a severe impact on airport operations.

- a. De-icing
- b. Thunderstorms/Cb
- c. Heavy rain
- d. Wind
- e. Low ceiling
- f. Snow
- g. Fog/low visibility

It should be noted that bad weather conditions can be further sub-categorised according to the occurrence and severity of the condition. Various levels are defined in AEA or ICAO documentation, such as reference document 4.

#### **AIRPORT**

- a. Aerodrome capacity
- b. Accident/incident
- c. Equipment (non-ATC)
- d. Industrial action (non-ATC)
- e. Environmental problems
- f. Ground OPS problems
- g. Increased security levels
- h. New system procedures
- i. Runway configuration
- j. Staff shortages
- k. Technical failure
- l. Work in progress

#### **ATC**

- a. ATC capacity
- b. ATC staffing
- c. Equipment (ATC)
- d. Industrial action (ATC)

#### **OTHER**

Other related conditions which occur unexpectedly and have a severe impact on airport operations.

- a. Military activity
- b. Special events
- c. ATC routing
- d. Other (undefined)
- e. Sector configuration
- f. System maintenance
- g. Volcanic activity

Various scenarios in each of the categories are described in detail in the following chapters. The description is based on the methodology described in section 2.3.

A secondary aim of this document is to set out the best practices in the listed adverse conditions, with input from European airports. These practices are listed in the annexes.

## ATTACHMENT 7

### Airport CDM adverse conditions – impact assessment, processes, and best practices

## 2.2 Objectives

On the basis of the primary aim to develop leads for new automated processes under adverse conditions, the following objectives can be defined:

1. To collect adverse condition best practices from stakeholders
  2. To determine the operational consequences for each adverse condition
  3. To determine the impact of these consequences on key airport CDM planning parameters
  4. To compare the impact of the various conditions and identify overlaps
  5. To develop generic automated processes on the basis of common impacts
- 3) The impact of the operational consequences on planning, with a differentiation between primary and secondary impact. The list of operational consequences is presented in a table, with an assessment of the impact on planning parameters.
  - 4) A list of responsibilities for action derived from the impact. An explanation of which parameters need to be updated or modified. The default list of responsibilities for action is presented in the table in section 0.
  - 5) A process to ensure that planning parameters are modified and that alerts to airport partners are generated on time. A description of the process defining how the parameters are to be modified and who is to be informed of the change.

## 2.3 Condition description methodology

The chapters below contain the following for each adverse condition described:

- 1) A description of the condition. For each condition there is a description which leads to a set of operational consequences which may become applicable at the airport.
- 2) The operational consequences of each adverse condition. A harmonised list of consequences with explanations is set out for each adverse condition.

The following paragraph lists the key planning parameters which are affected by adverse conditions listed. Most are event clock-time values. Some are durations of a process. All values have tolerances which are based on uncertainty caused by operational factors.

### 2.3.1 Planning parameters

In order to develop processes, an assessment must be made to determine the impact of a certain condition, e.g. weather or crises, on the turnaround planning parameters. The key planning parameters affected are the following airport CDM time parameters:

Initialism/name	Description	Ownership
CTOT	Calculated take-off time	Network Operations
EIBT	Estimated in-block time	Air traffic control
ECZT	Estimated commencement of de-icing time	De-icing handler
EEZT	Estimated end of de-icing time	De-icing handler
EDIT	Estimated de-icing time	De-icing handler

Initialism/name	Description	Ownership
ELDT	Estimated landing time	Air traffic control
TOBT	Target off-block time	Aircraft operator
TSAT	Target start-up approval time	Air traffic control
TTOT	Target take-off time	Air traffic control
VTT	Variable taxi time	Air traffic control/airport
EXOT	Estimated taxi-out time	Air traffic control/airport
EXIT	Estimated taxi-in time	Air traffic control/airport
Condition	Adverse condition status	Air traffic control/airport
MTT	Minimum turnaround time	Ground handler

Duration parameters such as variable taxi time incorporate uncertainty margins which can also be affected. In some cases it is not the duration itself but the uncertainty of the duration which changes. This impact should be reflected when developing new processes.

The impact of the main weather conditions on the above parameters will determine new processes.

Note: Ownership can vary locally and may be delegated to other local partners, e.g. TSAT from air traffic control to the airport, and TOBT from the aircraft operator to the ground handler.

### 2.3.2 Responsibility for action

When an impact is anticipated on the planning process, and in particular the time planning parameters, all actors at the airport have an obligation to take action to adjust their parameters to realistic values, on the basis of standardised processes and in the light of the current or forecast adverse conditions.

For example, taxi times are affected during remote de-icing operations, turnaround times suffer as a result of terminal congestion problems, and runway capacity is

reduced in the event of fog or strong wind conditions. All these conditions require action on the part of the airport partners to modify their parameters as soon as possible.

The action the airport partners need to take on a planning parameter is usually to set or adjust the value. However, some parameters require optimisation once the resource has become a bottleneck in the airport operations. The following set of input actions in the fields of the table should be applied for each adverse condition:

- 1. Set:** Determine a proper value on the basis of experience or statistics
- 2. Adjust:** Modify an existing value on the basis of experience or statistics
- 3. Optimise:** Predict, on the basis of experience or statistics, a value which meets the constraints and preferences set by other partners

Each affected time parameter is legally owned by one partner (see table in section 0) but can be influenced by (receive inputs from) several partners with relevant knowledge. These are therefore set out in a table in order to show which partners have a responsibility to input new prediction values for which planning parameters.

## ATTACHMENT 7

### Airport CDM adverse conditions – impact assessment, processes, and best practices

Parameter	Partner responsible					
	Airline operator	Ground handler	De-icing handler	Airport operator	Air traffic control	Network Operations
	Time parameters					
ELDT					Adjust	
EXIT				Adjust	Adjust	
EIBT					Adjust	
MTT		Set/Adjust	Adjust			
TOBT	Set/Adjust	Set/Adjust				
TSAT					Optimise	
ECZT			Set			
EEZT			Set			
EDIT			Adjust			
EXOT				Adjust	Adjust	
TTOT					Optimise	
CTOT						
	Other parameters					
MET status					Adjust	Adjust

**Table 1: Sample overview of the partners responsible for time parameters affected by adverse conditions**

#### 2.4 Accountability of planning responsibility

In order to ensure that planning is accurate, all partner organisations and their staff must be aware of the obligation to communicate planning updates, especially under adverse conditions. Failure to contribute and take action on the accuracy of predictions will lead to chaotic traffic management situations, as often currently occurs at airports, for example in the case of the volcanic ash cloud over Europe in April 2010. For this reason, all partners and their staff must be held accountable for communication and quality of information with respect to planning and updating of their planning. Responsible behaviour of this kind

will allow the required culture change at both the operational level and the management level of organisations, which is essential in order to draw benefits from airport CDM under adverse conditions.

#### 2.5 Predictability of situations

Section 3.6 of the Airport CDM Implementation Manual describes adverse conditions, which can be either predictable or unpredictable events or situations. Predictable events should be handled with standardised procedures which are already available or will be developed in this document or in the near future by SESAR. Predictable events or situations should therefore have only a minimal impact on operations or in terms of loss of airport capacity.

Unpredictable events, however, should be handled as far as possible as if they were predictable. In other words, operations should be handled using special procedures which are familiar to all operational staff, who should have the appropriate training. Identification of any special situations is possible only through improved communication by airport partners regarding the airport operational status (i.e. the condition applicable at present and in the near future), coordinated via an airport centralised coordination centre. Communication of operational status serves the need for awareness by all partners and operational staff.

The airport CDM partner coordination centre can be an Airport Operations Centre (APOC). It handles the permanent management of airport operations, and representatives of most partners are in a joint room to handle the dynamic status of the airport in a collaborative decision-making process. More details of APOCs can be found in reference document 5.

## 2.6 Dependencies between time parameters

If one time parameter is affected by a particular condition, there is usually a direct knock-on effect on other parameters, which are affected as a consequence. In most cases, the impact on the indirectly affected planning parameters is as great as if not greater than that on the directly affected parameter. For example, if the landing time of a flight is delayed, the TOBT and hence the TTOT are often also delayed.

### 2.6.1 Causal dependence

This is caused by actual events which influence future events owing to delays. An example is shown in Figure 1. It shows how a change in conditions with the appearance of fog can lead to a delay in several parameters, and finally a need to regulate the TSAT, on the basis of the TTOT and TOBT.

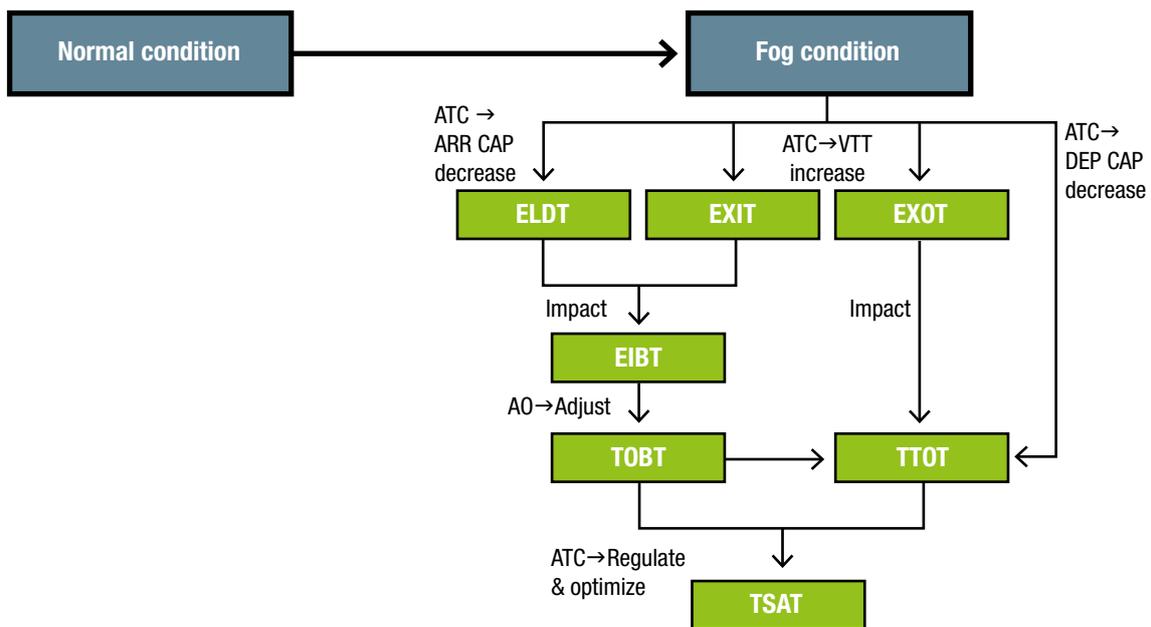


Figure 1: Interdependency of time parameters in fog conditions

Action will be taken by ATC to deal with the new adverse condition which will automatically impact on successive parameters. If the estimated taxi-in time (EXIT) is increased, the EIBT will be put back. This has a resultant impact on the TOBT. A longer estimated taxi-out time (EXOT) also delays the TTOT. The TSAT then needs to be optimised, by means of TTOT sequencing or surface traffic regulation.

To distinguish between a primary and a secondary impact, the letters “P” and “S” in the tables in the following chapter indicate which parameters are directly affected, and which indirectly.

### 2.6.2 Sequence dependence

This type of dependence is the result of sequence planning of one resource which influences the planning of another resource carried out earlier in time. For example, if the runway is the bottleneck, the TTOT planning will be carried out prior to the TSAT calculation. Similarly, the remote de-icing ECZT planning also affects TSAT planning.

An example of sequence planning dependence for the adverse condition of remote de-icing is described and discussed in ANNEX IV.

## 3. MET

This chapter describes adverse condition scenarios and operational consequences which are related to meteorological causes. For each condition scenario, the operational consequences and impact on the airport CDM key parameters are determined.

### 3.1 Aircraft de-icing

#### 3.1.1 Description

When there are freezing conditions and precipitation, de-icing an aircraft is crucial. Frozen contaminants cause critical control surfaces to be rough and uneven, disrupting smooth air flow, greatly degrading the ability of the wing to generate lift and increasing drag. This situation can cause a crash. If large pieces of ice separate when the aircraft is in motion, they can be ingested by engines or hit propellers and cause catastrophic failure. Frozen contaminants can jam control surfaces, preventing them from moving properly. Because of this potentially severe consequence, de-icing is performed at airports where temperatures are likely to drop below freezing point. (Wikipedia)

#### Description of de-icing operational conditions:

- Runway configuration changes occurring more frequently owing to de-icing and anti-icing operations on the runway, apron or taxiway.
- Runway capacity is reduced owing to the reduced numbers of aircraft which can take-off or land because of increased separation values.
- Aircraft stand de-icing and anti-icing become necessary.
- Aircraft apron or remote de-icing and anti-icing become necessary.
- Owing to on stand de-icing and anti-icing, reduced numbers of stands are available.

- There is an increase in communication and coordination between parties and the de-icing companies involved.
- Because of extra de-icing operations, there may be a reduction in staff and equipment availability.
- Turnaround times are increased, affecting push-back times and airline fleet schedules.

#### Remarks

- Local environmental restrictions may apply as a consequence of winter conditions (e.g. de-icing fluids), affecting the VTT, TTOT and CTOT.
- Snow may have similar effects on visibility as fog, but not necessarily lead to LVPs.
- Where stand de-icing is taking place, CTOTs and TSATs should not be improved unnecessarily for short-term gains, since this may affect operational planning.
- In the case of remote de-icing, advancing the CTOT or TSAT does not affect operations and is welcome.
- There is a need to harmonise acronyms for runway closure for snow removal or de-icing.
- Apron de-icing is considered remote de-icing, as the stand has been left, and the TOBT/TSAT and AOBT have passed.
- The ECZT is related to the TSAT and EXOT, and can be influenced by the TTOT or CTOT.

An example of sequence planning dependence for the adverse condition of remote de-icing is described and discussed in ANNEX IV.

Snow conditions and snow removal have been omitted from this section to avoid complications.

Stand de-icing of aircraft constitutes part of the turnaround time, because it takes place at the stand, whereas apron and remote de-icing does not constitute part of turnaround time, just part of variable taxi time (for departures).

In freezing fog and freezing rain, aircraft engines might have to be heated to prevent ice from forming on the fan blades. Normally, this procedure will take place at the stand, even if remote or stand de-icing is the local de-icing procedure.

### 3.1.2 Impact assessment of operational consequences

Table 2 lists the likely consequences in the event of aircraft de-icing conditions, and indicates the impact of each consequence on the main planning parameters.

To distinguish between a primary impact and a secondary impact, the letters “P” and “S” indicate which parameters are directly affected, and which indirectly.

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>De-icing</b>								
On-stand de-icing				P	P	P	P	S	S
Apron and remote de-icing							P		S
Engine heating				P	P	P	P	S	S
	<b>Capacity</b>								
Arrival capacity reduction	P	P	P						
Departure capacity reduction					P	P		P	P
Stand capacity reduction		P	P						
Runway configuration change		P	P					P	S

**Table 2: Operational consequences and their impact on planning parameters**

## 3.2 Thunderstorm

### 3.2.1 Description

A thunderstorm is a weather phenomenon characterised by the presence of lightning (atmospheric discharge of electricity) and thunder (a sonic shock wave caused by the rapid heating and expansion of the air surrounding and within a bolt of lightning) produced from a strongly developed cumulonimbus cloud. Both features occur at the same time, but the thunder is usually heard after the lightning is seen, because light travels faster than sound.

Thunderstorms are a major hazard to aviation as they are usually accompanied by heavy rainfall, strong winds, hail, and sometimes even tornadoes or funnel cloud.

***IATA Airside Management & Safety Document (AHM630): §6.5.1.2 Lightning***

For lightning activity, the notification process may be broken down into 3 phases:

- a. Alert: Lightning activity is detected at a distance in excess of 8 km (5 miles) from your operation.
- b. Stop/suspend activities: Lightning activity is detected within 5 km (3 miles) of your operation.
- c. All clear: Lightning activity has moved beyond 5 km (3 miles) and is heading away from your operation.

The distances referred to above may vary depending on local climatic parameters.

***Local procedures should specify additional details on the actions to be taken, e.g. at Brussels airport:***

- When there is a danger of lightning strike, the meteorological service informs Airside Inspection from the moment there is a danger within a 5-km radius around the airport. The Airport Authority in turn informs the companies by telephone: CAUTION: IMMEDIATE RISK OF THUNDERSTORM AND LIGHTNING STRIKE.
- When the danger is considered to be over (passed), the MET Supervisor informs Airside Inspection by telephone and the companies are notified in the same way as when the danger started: END OF THUNDERSTORM AND LIGHTNING STRIKE WARNING.
- When there is a sustained alarm, the MET Supervisor must give Airside Inspection situation updates every 15 minutes.
- In the event of an alarm, the TWR Supervisor reports “LIGHTNING PROCEDURE IN PROGRESS” on the ATIS, using code LTNG.
- When there is a danger of lightning strike, it is forbidden to carry out the following activities airside:
  - Fuelling aircraft
  - Carrying headsets and using headset connections with aircraft
  - Loading/unloading (including catering)
  - Being out in the open or beneath an aircraft

In addition to the lightning hazard, “thunderstorms/Cb” are very likely to affect impact the runway direction for take-off/landing. A change of runway-in-use may be the result, requiring the departure and arrival sequence to be re-directed.

### 3.2.2 Impact assessment of operational consequences

Operational consequence	Impact on Parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Activation of procedures</b>								
Activation of lightning procedure	P	S	P	P	P	P		P	P
Communication and coordination increase	P	S	P	P	P	P		S	P
	<b>Capacity</b>								
Arrival capacity reduction	P		P	S	S				
Departure capacity reduction			P	S	P	P			P
Runway configuration change	P	S	S	P	P	P		S	P
	<b>Restrictions</b>								
Taxiway restriction		P						P	
Apron restriction				S	P	S			
Stand restriction			P	S	P	S			
	<b>The environment</b>								
Rule violation	P								P

**Table 3: Operational consequences and their impact on planning parameters**

## ATTACHMENT 7

### Airport CDM adverse conditions – impact assessment, processes, and best practices

## 3.3 Heavy rain

### 3.3.1 Description

Precipitation, for example rain, hail, and snow affect aerodynamics and visibility. Some known consequences of heavy rain, with effects on CDM processes, are as follows:

- Reduced runway capacity owing to increased separation values. Prediction of intensity, location, time and duration may contain many uncertain factors, making it difficult to plan accurately.
- Increased chance of holding delays and diversions, and increased risks of incidents.
- Reduced taxiway capacity owing to more cautious manoeuvring of aircraft because of reduced visibility, braking action, etc.
- Increased turnaround times increased, affecting push-back time and airline fleet schedules.
- Increased communication and coordination between parties.

### 3.3.2 Impact Assessment of Operational Consequences

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Procedures activation</b>								
Communication and coordination increase	S	P	P	S	P	P		S	P
	<b>Capacity</b>								
Arrival capacity reduction	P	P	P	S	S				
Ground handling time increase				P	P	S			
Departure capacity reduction			S	S	P	P		P	P
Runway configuration change	P	S	S			P		S	P
	<b>Restrictions</b>								
Taxiway restriction		P						P	
Apron restriction			S	S	P	S			
Stand restriction			S	S	P	S			
	<b>Environmental</b>								
Risk increase	P	S	S					S	P

**Table 4: Operational consequences and their impact on planning parameters**

## 3.4 Wind

### 3.4.1 Description

Wind is a major (limiting) factor for aircraft which are taking off or landing. It has an influence on the decision as to which runway(s) can be used, from the airport operator's, ATC's and the airlines' point of view. Strong winds may also restrict or even render impossible the handling of aircraft during taxi or turnaround processes. In general, wind has a limiting effect on airport capacity and increases risks.

Some known consequences of wind, with effects on CDM processes, are as follows:

- Runway configuration changes.
- Reduction of runway capacity owing to increased separation values, or unsuitability of available runways for current demand (e.g. runway can be used only for landing or take-off, noise abatement limitations, etc.).
- Increased chance of holding delays or diversions, increased risks of incidents. Wind shear, showers in the vicinity of the airport, tail-winds, the passage of weather fronts, etc. will increase likelihood of go-arounds or long landings.
- Reduced directional control of aircraft on runways and taxiways, leading to increased taxi times.
- Increased turnaround times, affecting push-back times and airline fleet schedules.
- Reduced availability of suitable gates/stands. Aircraft may need to be towed to other stand(s).
- Pro-active measures on the ground, having a negative impact on resources, increasing risks, and restricting ground handling.
- Increased communication and coordination between parties.

### 3.4.2 Impact assessment of operational consequences

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Activation of procedures</b>								
Activation of adverse weather procedure	P	S	S			S		S	P
Communication and coordination increase	P	S	S		S	S		S	P
	<b>Capacity</b>								
Arrival capacity reduction	P	S	S	S	S				
Departure capacity reduction				S	S	P		S	P
Ground handling time increase				P	P	S			
Runway configuration change	P	P	S	S	S	P	S	P	P
	<b>Restrictions</b>								
Taxiway restriction		P						P	
Apron restriction		S	P	S	P	S			
Stand restriction		S	P	S	P	S			
Noise abatement impact	P					P			P
	<b>Safety</b>								
Risk increase	P	S		S	S			S	P
	<b>The environment</b>								
Rule violation	P					P			P

**Table 5: Operational consequences and their impact on planning parameters**

## 3.5 Ceiling

### 3.5.1 Description

In aviation and in many meteorological text-books the word “ceiling” is used and this must not be confused with cloud-base. In the official WMO definition, ceiling is defined as the height of the lowest layer of clouds (or obscuring phenomena) below 6000 m (20000 ft) with a minimal coverage of 5/8 (= broken or overcast).

The height of the lowest layer of clouds is decisive for the service rate at airports, which is directly affected by the available landing systems and related infrastructure.

### 3.5.2 Impact assessment of operational consequences

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Procedures activation</b>								
Activation of low-visibility procedure	P	S	S			P	S	S	P
Communication and coordination increase	P				S	P	S	S	P
	<b>De-icing</b>								
On-stand de-icing						P			
Apron and remote de-icing						P			P
Holdover time exceeded						P			P
	<b>Capacity</b>								
Arrival capacity reduction	P								
Departure capacity reduction									P
Runway configuration change	P	S	S			P		S	P
	<b>Restrictions</b>								
Taxiway restriction		P						P	
Apron restriction				S	P				
Stand restriction				S	P				
	<b>The environment</b>								
Rule violation	P								P

Table 6: Operational consequences and their impact on planning parameters

## 3.6 Snow removal and runway/taxiway and stand de-icing or anti-icing

### 3.6.1 Description

The effects of snow removal and runway de-icing or anti-icing procedures can be broken down into the following:

- Runway configuration changes occur more frequently owing to de-icing and anti-icing operations on the runway, apron or taxiway.
- Runway capacity is reduced owing to the reduced number of aircraft which can take-off or land because of increased separation values and different operational limitations on each runway in use.
- Owing to stand de-icing and anti-icing, reduced numbers of stands are available
- There is an increase in communication and coordination between parties and the de-icing companies involved.
- Owing to extra de-icing operations, staff and equipment availability may be reduced.
- Turnaround times are increased, affecting push-back times and airline fleet schedules.

Snow removal from runways (and taxiways) may include rapid exits and/or exits to fulfil the friction requirements for the actual system, while apron and stands may include remote de-icing facilities. Depending on the amount of snowfall, the procedure may also include collection and transportation of snow from the runway.

### 3.6.2 Impact assessment of operational consequences

Table 7 lists the likely consequences in the event of snow or icy conditions on taxiways, runways and stands. The table shows the impact of each consequence on the main planning parameters.

To distinguish between a primary impact and a secondary impact, the letters “P” and “S” indicate which parameters are directly affected, and which indirectly.

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Snow removal or de-icing/anti-icing on manoeuvring area</b>								
Snow removal/de-icing on runways	P	S	S					P	P
Snow removal/de-icing on taxiways		P	P					P	P
Snow removal/de-icing on apron			P					P	S

**Table 7: Operational consequences and their impact on planning parameters**

## ATTACHMENT 7

### Airport CDM adverse conditions – impact assessment, processes, and best practices

## 3.7 Fog and low visibility

### 3.7.1 Description

Visibility, both in the horizontal plane and in the vertical plane, is one of the most important features in aviation, as it has a major impact on air traffic, especially during landing and take-off.

Visibility can be reduced both by meteorological phenomena (precipitation, type of air mass, high humidity, etc.) and by non-meteorological phenomena (pollution, smoke, etc.). Nevertheless, there are special “low-visibility procedures” at most airports, and meteorological services generally issue special warnings if visibility is expected to fall below certain threshold values.

Visibility-reducing weather phenomena:

- **Fog:** horizontal visibility is reduced to less than 1 km. In winter, fog can be composed of ice crystals.
- **Mist:** visibility between 1 and 5 km, with a relative humidity of 80% or more.
- **Haze:** visibility between 1 and 5 km, with a relative humidity of less than 80%.
- **Precipitation:** this is one of the predominant factors in reducing visibility. The reduction in visibility depends largely on the intensity and the type of the precipitation.

### 3.7.2 Impact assessment of operational consequences

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Activation of procedures</b>								
Activation of low-visibility procedure	P	S	S			P	S	S	P
Communication and coordination increase	P				S	P	S	S	P
	<b>De-icing</b>								
On-stand de-icing						P			
Apron and remote de-icing						P			P
Holdover time exceeded						P			P
	<b>Capacity</b>								
Arrival capacity reduction	P								
Departure capacity reduction									P
Runway configuration change	P	S	S			P		S	P
	<b>Restrictions</b>								
Taxiway restriction		P						P	
Apron restriction				S	P				
Stand restriction				S	P				
	<b>The environment</b>								
Rule violation	P								P

Table 8: Operational consequences and their impact on planning parameters

## 4. AIR TRAFFIC CONTROL

This chapter describes adverse condition scenarios and operational consequences which are related to air traffic control causes. For each condition scenario, the operational consequences and impact on the airport CDM key parameters are determined.

### 4.1 Capacity

#### 4.1.1 Description

ATC capacity is based on various constraints. It includes runway capacity, terminal capacity and ATC sector capacity. Runway capacity is usually considered part of ATC capacity, because the runway is operationally owned by ATC, and constraints restricting the use of runways, such as separation minima, are mostly ATC-related.

Adverse conditions which have an impact on ATC capacity include under-staffing (unexpected sick leave,

industrial action – see later in this topic), equipment failure (handled elsewhere in this topic) or severe weather conditions. Reduced ATC capacity may be the result of other adverse conditions or it may be an adverse condition in itself. In this section, the focus is on the latter situation.

An ATC capacity reduction is a situation in which the volume of traffic which ATC is able to handle is reduced. This may happen expectedly or unexpectedly, and may last for a period of time.

#### 4.1.2 Impact assessment of operational consequences

To distinguish between a primary impact and a secondary impact, the letters “P” and “S” in the table indicate which parameters are directly affected, and which indirectly.

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Activation of procedures</b>								
Local traffic regulation activated (departures)						S			P
Network Operations regulation requested	P		S						P
Airline passenger rerouting procedures activated					P	S			S
Ad hoc holding patterns established by the ATC	P		S		S				
Flight deviations decided by the airline or pilot	P		P		S				
Airline flight prioritisation assessment procedures activated	S		S		P	S			
Flight cancellation decisions					P	S			S
Arrival time recalculation and parking plan validity re-assessment		S	P			P		S	
	<b>Capacity</b>								
Arrival capacity reduction	P		S		S				
Departure capacity reduction					S	S			P
	<b>Restrictions</b>								
Parking position restrictions (aircraft parking plan not valid owing to delays, cancellations, etc.)		S	P	S	S	S			
Start-up approval restrictions							P	S	S

Table 9: Operational consequences and their impact on planning parameters

## ATTACHMENT 7

### Airport CDM adverse conditions – impact assessment, processes, and best practices

#### Explanation of impacts

1. Local traffic regulation may be considered, affecting only departing traffic. This is a situation in which Network Operations-based regulation is considered to be excessive but ATC capacity (usually that of the ground controller or local controller) is still expected to be exceeded. Target take-off times (TTOTs) may be deployed in a longer sequence, start-up clearances may be delayed, runway capacity may fall temporarily and less traffic may be allowed onto the movement area at the time.

This has a direct impact on the TTOT if local regulation is carried out via TTOT deployment. It may also have a primary effect on the TSAT, if regulation is carried out via TSAT restriction. These two parameters, however, principally affect one another.

2. If Network Operations traffic regulation is requested owing to ATC staffing problems, this has an effect on both arriving and departing traffic. Network Operations regulation is accepted only if the new published capacity is lower than the predicted demand. The estimated landing times, and hence the estimated in-block times, are delayed, as are the target take-off times depending on the CTOTs.

This consequence for departing traffic has the same effect as local regulation (point 1). The flexibility of the system is worse, because issued CTOTs have to be honoured. The primary effect on the arriving traffic parameters is on the estimated landing time (ELDT). This in turn has as an effect on the estimated (calculated) in-block time. If the time of arrival is delayed owing to regulation, there is a risk that the TOBT may also have to be delayed owing to the MTT.

3. Airline passenger rerouting activities are company-specific. They are based on the economy and on the possibilities of the airline and the airport. Certain flights may have to be cancelled or delayed, or incoming traffic may be delayed. The airline has to make decisions whether to delay flights on purpose or to cancel or prioritise certain flights.
4. Ad-hoc holding patterns are usually established only when some unexpected event occurs. The impact may be short-term or long-term depending on the duration and the reason of the capacity reduction.
5. Flight deviations are decided mainly by the pilot and are from the destination airport. They relate to the flight plan. Flight deviations will be made on the basis of the endurance available or expected delay.
6. Airline flight prioritisation procedures are airline-specific. In optimal conditions, airline-specific flight prioritisation decisions are made in accordance with CDM procedures and principles.
7. Flight cancellations owing to adverse conditions are decided by the airline operators.
8. Arrival time recalculation and parking plan validity re-assessment are both based on changes in scheduled traffic. Both arrivals and departures may be affected. Airlines may delay a flight on purpose in order to embark transfer passengers coming from some other delayed flight.
9. Arrival capacity reduction depends on how many flights ATC is able to handle in a certain period of time. If the demand is higher than the declared ATC capacity, then a reduction can be published. Some delays may still occur even if there is no published capacity reduction.

10. Departure capacity reduction also depends on the number of flights ATC can handle in a certain period of time. If the demand is higher than the declared ATC capacity, then a reduction can be published. Some delays may still occur even if there is no published capacity reduction.

Capacity limitations may occur owing to conditions affecting speed of the traffic flow (wind, fog) or owing to capacity reductions on runways (snow removal, maintenance work, extra runway inspections, etc.). Under-staffing (reduced number of working positions or ATC sectors) may also generate reductions in departure capacity.

11. Parking position restrictions may occur if a delayed departing flight is still occupying the gate at which the next flight is scheduled to arrive.
12. Start-up approval restrictions may occur if ATC is obliged to reduce the number of departing flights.

### 4.1.3 Related adverse conditions

These are situations which may occur in any weather-related conditions as well as in most crisis conditions. ATC staffing or industrial action are examples of related conditions which may have this kind of operational consequence. Below is a list of examples of related adverse conditions:

#### **MET**

- De-icing
- Thunderstorms/CB
- Heavy rain
- Wind
- Ceiling
- Snow
- Fog/low visibility

#### **AIRPORT**

- Accident/incident
- Runway configuration

#### **OTHER**

- Sector configuration
- System maintenance
- Volcanic activity

## 4.2 Staffing

### 4.2.1 Description

ATC capacity is partly based on the number of working positions manned depending on traffic demand. At large busy airports, there might be several TWR/RWY/local controller working positions, each of which has its own area of responsibility. This often means that it is possible to use several runways either dependently or independently.

In the ACC environment, a lack of staff entails a reduction in capacity, since fewer airspace sectors are open. In the airport environment, the impact is practically the same. This condition has nothing to do with the capacity of the runway, apron, stand, etc.. The aim is to describe the impact where there are insufficient ATC staff to deal with traffic demand.

### 4.2.2 Impact assessment of operational consequences

To distinguish between a primary impact and a secondary impact, the letters “P” and “S” in the table indicate which parameters are directly affected, and which indirectly.

### Explanation to Impacts

1. Local traffic regulation may be considered, affecting only departing traffic. This is a situation in which Network Operations-based regulation is considered to be excessive but ATC capacity limit (usually that of the ground controller or local controller) is still expected to be exceeded. Target take-off times (TTOTs) may be deployed in a longer sequence, start-up clearances may be delayed, runway capacity may drop temporarily and less traffic may be allowed onto the movement area at the time.

This has a direct impact on the TTOT if local regulation is carried out via TTOT deployment. It may also have a primary effect on the TSAT, if regulation is carried out via TSAT restriction. These two parameters, however, principally affect one another.

2. If Network Operations traffic regulation is requested due to ATC staffing problems, this has an effect on both arriving and departing traffic. Network Operations regulation is accepted only if the new

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Activation of procedures</b>								
Local traffic regulation activated						S			P
Network Operations regulation requested	P		S		S	S			P
	<b>Capacity</b>								
Arrival capacity reduction	P		S		S				
Departure capacity reduction						P		S	P
ATC frequency congestion		P	S			P		P	S
Runway configuration change	P	S	S			S		S	P
	<b>Restrictions</b>								
Start-up approval restrictions						P			S
Taxi restrictions		P	S					P	
Runway crossing restrictions		P	S					P	S

Table 10: Operational consequences and their impact on planning parameters

published capacity is lower than the predicted demand. The estimated landing times, and hence the estimated in-block times, are delayed, as are the target take-off times depending on the CTOTs.

This consequence for departing traffic has the same effect as local regulation (point 1). The flexibility of the system is worse, because issued CTOTs have to be honoured. The primary effect on the arriving traffic parameters is on the estimated landing time (ELDT). This in turn has as an effect to the estimated (calculated) in-block time. If the time of arrival is delayed due to regulation, there is a risk that the TOBT may also have to be delayed due to the MTT.

3. Arrival capacity reduction for ATC staffing reasons is usually the result of under-staffing. It may also be the result of problematic licence combinations among the controllers on shift, etc. Whatever the case, this may cause a reduction in arrival capacity due to non-optimal runway combination, inability to use optimal working procedures, etc.

This has a primary effect on the estimated landing time (ELDT), which in turn has a (secondary) effect on the estimated in-block time (EIBT). If the time of arrival is delayed due to regulation, there is a risk that the TOBT may also have to be delayed due to the MTT.

4. Departure capacity reduction has basically the same effect as local traffic regulation (see point 1). If it is a question of understaffing, it may be that traffic is not restricted at the gate but that queues are building up on the runway holding area. If, because of an increased workload due to insufficient numbers of working positions, controllers are unable to use the runway at its maximum capacity, a taxi delay may occur during the departure phase. This has a primary effect on the TTOT and/or STAT

parameters and a secondary effect on the EXOT.

5. ATC frequency congestion due to ATC staffing problems is a result of insufficient numbers of working positions.

This may have a primary impact (if any) on the EX-ITs/EXOTs. If controllers have a heavy workload, traffic in the air is usually given priority over traffic on the ground. As a result, taxi clearances may be delayed and taxi times increased. The same applies to the ASAT (not directly to the TSAT unless local or Network Operations regulation is in use).

6. Runway configuration changes may have to be made if ATC has problems with staffing. A sufficient number of runways may not be kept open, or not all of the working procedures may be used (parallel approaches, runways widely separated from one another, etc).

This may have a primary impact on the ELDT and TOBT due to reduced runway capacity, which in turn is a result of the use of fewer numbers of runways, environmental restrictions on the runways which can be used, etc. A runway configuration change is a very local procedure and the impact has to be defined on a case-by-case basis.

7. Reduced ATC capacity may result in start-up approval restrictions.

This has a direct primary impact on TSAT calculation and a secondary impact via the process calculation on the TTOT.

8. Taxi restrictions or runway crossing restrictions for ATC staffing reasons are both due to the fact that the controller has a wider area of responsibility than usual (terms of either work load or area of expertise and experience) and has to work more

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### Airport CDM adverse conditions – impact assessment, processes, and best practices

slowly and take more time than usual to make decisions. Because the work is not so intensive as it might have been in an ideal situation, some delays in taxiing and runway crossing may occur for the sake of safety.

This has a primary impact on EXITs/EXOTs and a secondary impact on EIBTs/TTOTs (ATOTs).

9. There may be runway crossing restrictions due to a limited number of TWR controllers and increased workload. Runway crossing is a critical part of the flight phase for both the pilot and the controller.

#### 4.2.3 Related adverse conditions

These are situations which may occur in any weather-related conditions or in most crisis conditions. ATC industrial action is a similar but identical condition. Below is a list of examples of related adverse conditions:

##### **AIRPORT**

- Aerodrome capacity
- Accident/incident
- Work in progress

##### **ATC**

- ATC capacity
- Industrial action

## 4.3 Equipment

### 4.3.1 Description

These are situations in which some critical ATC equipment related either to airport operations (runway lights, communication systems, radar display, weather display system, electronic flight strip, etc.) or to the ATM network (flight plan processing, AFTN network, etc.) fails.

Because there is such a wide range of different equipment, it is assumed here that the equipment failure is somewhere in the flight plan processing network.

### 4.3.2 Impact assessment of operational consequences

To distinguish between a primary impact and a secondary impact, the letters “P” and “S” in the table indicate which parameters are directly affected, and which indirectly.

#### Explanation to Impacts

1. Activation of manual flight plan processing. If electronic flight plan information and related electronic tools are missing, manual procedures

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Activation of procedures</b>								
Activation of manual flight plan processing	S		S	S	S	P			P
CDM process downgrading	S		S		P	P			P
Activation of traffic regulation	P		S			S			P
	<b>De-icing</b>								
De-icing order information unavailable						S		P	S
De-icing position allocation information missing					P	S		S	S
	<b>Capacity</b>								
Information mismatch	S		S		S	S			S
Non-existence of flight plan information	S		S		S	S			S
CDM information sharing system failure	P	S	P		P	P		S	P
Radar capacity reduced	P		S			S			P
Clearance delivery capacity reduced					S	P			S
Ground surveillance equipment failure		P	S			S		P	S
Local (TWR) controller capacity reduced	P		S			S		S	P
	<b>Restrictions</b>								
Arrival capacity reduction	P		S		S				
Start-up delays						S			P
ATC frequency congestion		P				S		P	P

Table 11: Operational consequences and their impact on planning parameters

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### Airport CDM adverse conditions – impact assessment, processes, and best practices

- and back-up flight plan files have to be brought into use. Manual procedures may for example mean use of paper flight strips instead of electronic flight strips, use of flight parking information instead of FPL information, etc.
- 2.** CDM process downgrading means that the CDM process based on flight-planned flights has to be interrupted.
  - 3.** Activation of traffic regulation. Because of a non-standard situation, the normal ATC/airport capacity cannot be achieved and traffic regulation has to be activated.
  - 4.** De-icing order information unavailable. Because of a loss of flight plan information data, flights can no longer be identified in the CDM/de-icing coordination system and thus the de-icing order information may have been lost (this depends on who carries out the coordination and where the information is stored).
  - 5.** De-icing position allocation information missing. Because of a loss of flight plan information data, flights can no longer be identified in the CDM/ de-icing coordination system and thus the de-icing position allocation information may have been lost (this depends on who carries out the coordination and where the information is stored).
  - 6.** Information mismatch. Because the flight plan information is not currently up to date, there may be a mismatch between various different data sources. If there is uncertainty regarding the information, it cannot necessarily be used by ATC, for gate allocation, etc.
  - 7.** Non-existence of flight plan information. ATC does not receive any information about a new flight and there are no new flights in the ATC or related systems.
  - 8.** CDM information sharing system failure. Because of missing flight plan information, the CDM application is not able to process its tasks but may generate numerous alerts, information discrepancies, etc.
  - 9.** Radar capacity reduced. The radar display system is partly based on the flight plan processing. If the flight plan data disappears, the identification of the flight on the radar screen also disappears.
  - 10.** Clearance delivery capacity reduced. The issuing of ATC clearances is entirely dependent on the flight plan information connected to the ATC system at the time. If flight plan information disappears, it may cause extra work while controllers are trying to find out whether the flight plan actually exists. This may take time and usually requires a lot of communication between the appropriate parties (AIS, pilot, airline operator, etc.).
  - 11.** Ground surveillance equipment failure. Ground surveillance equipment, like the air radar display system, uses flight plan information processing to connect the flight information to the radar data. If flight plan information is lost, only raw radar information can be displayed.
  - 12.** Local (TWR) controller capacity reduced. If a large amount of information usually used to control traffic is missing, then the normal capacity of the local controller will also be dramatically reduced in the interests of safety.
  - 13.** Local (TWR) ATC capacity reduced. If a large amount of information usually used to control traffic is missing, then the normal capacity of the local controller will also be dramatically reduced in the interests of safety.

- 14. Arrival capacity reduction. Arrival capacity may have to be reduced if the equipment making the declared capacity possible is not available.
- 15. Start-up delays. Departure capacity may have to be reduced if the equipment making the declared capacity possible is not available. Start-up delays may be the result of capacity reduction as well as for example non-existence of flight plans.
- 16. ATC frequency congestion. The ATC frequency is still the primary communication tool between pilot and ATC. Data link and other similar solutions are increasingly replacing voice communication. If these new systems or any ATC equipment fails, all parties have to be immediately informed of the direct impact. This usually involves a great deal of radio communication.

### 4.3.3 Related adverse conditions

#### MET

- Thunderstorms/CB (possible initial closure of operations)

#### AIRPORT

- Aerodrome capacity
- Accident/incident
- Equipment (non-ATC)
- New system procedures
- Runway configuration
- Technical failure
- Work in progress

#### ATC

- ATC capacity
- ATC staffing

#### OTHER

- Special events
- System maintenance

## 4.4 Industrial action

### 4.4.1 Description

Industrial action may either stop air traffic operations at an airport or at the very least radically reduce ATC capacity. ATC industrial action may result in staff shortages (with staff on sick leave not being replaced, etc.) or in a worst case scenario give rise to another situation in which all operations are interrupted, for a (usually) specific period of time.

### 4.4.2 Impact assessment of operational consequences

#### Explanation to Impacts

1. Local traffic regulation may be considered, affecting only departing traffic. This is a situation in which Network Operations-based regulation is considered to be excessive but the ATC capacity limit (usually that of the ground controller or local controller) is still expected to be exceeded. Target take-off times (TTOTs) may be deployed in a longer sequence, start-up clearances may be delayed, runway capacity may fall temporarily and less traffic may be allowed onto the movement area at the time.

This has a direct impact on the TTOT if local regulation is carried out via TTOT deployment. It may also have a primary effect on the TSAT, if regulation is carried out via TSAT restriction. These two parameters, however, principally affect one another.

2. If Network Operations traffic regulation is requested due to ATC staffing problems, this has an effect on both arriving and departing traffic. Network Operations regulation is accepted only if the new published capacity is lower than the predicted demand. The estimated landing times,

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### Airport CDM adverse conditions – impact assessment, processes, and best practices

and hence the estimated in-block times, are delayed, as are the target take-off times depending on the CTOTs.

This consequence for departing traffic has the same effect as local regulation (point 1). The flexibility of the system is worse, because issued CTOTs have to be honoured. The primary effect on the arriving traffic parameters is on the estimated landing time (ELDT). This in turn has as an effect on the estimated (calculated) in-block time. If the time of arrival is delayed due to regulation, there is a risk that the TOBT may also have to be delayed due to the MTT.

3. Airline passenger rerouting activities are company-specific. They are based on the economy and on the possibilities of the airline and the airport. Certain flights may have to be cancelled or delayed, or incoming traffic may be delayed. The airline has to make decisions whether to delay flights on purpose or to cancel or prioritise certain flights.
4. Flight deviations are decided mainly by the pilot and are from the destination airport. They relate to the flight plan. Flight deviations will be made on the basis of the endurance available or expected delay.

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Activation of procedures</b>								
Local traffic regulation activated						S			P
Network Operations regulation requested	P		S		S	S			P
Airline passenger rerouting procedures activated					P	S			S
Flight deviations decided by the airline or pilot	P		P		S				
Airline flight prioritisation assessment procedures activated	S		S		P	S			
Flight cancellation decisions					P	S			S
	<b>De-icing</b>								
Arrival time recalculation and parking plan validity re-assessment		S	P			P		S	
	<b>Capacity</b>								
Radar capacity reduced	P		S			S			P
Clearance delivery capacity reduced					S	P			S
Local (TWR) ATC capacity reduced	P		S			S		S	P
	<b>Restrictions</b>								
Arrival capacity reduction	P		S		S				
Start-up delays						S		P	P
ATC frequency congestion		P				S			P

Table 12: Operational consequences and their impact on planning parameters

5. Airline flight prioritisation procedures are airline-specific. In optimal conditions, airline-specific flight prioritisation decisions are made in accordance with CDM procedures and principles.

6. Flight cancellations due to adverse conditions are decided by the airline operators.

7. Arrival time recalculation and parking plan validity re-assessment are both based to the changes in scheduled traffic. Both arrivals and departures may be affected. Airlines may delay a flight on purpose in order to embark transfer passengers coming from some other delayed flight, etc.

#### 8. Radar capacity reduced

The radar display system is partly based on the flight plan processing. If the flight plan data disappears, the identification of the flight on the radar screen also disappears.

#### 9. Clearance delivery capacity reduced

The issuing of ATC clearances is entirely dependent on the flight plan information connected to the ATC system at the time. If flight plan information disappears, it may cause extra amount work while controllers are trying to find out whether the flight plan actually exists. This may take time and usually requires a lot of communication between the appropriate parties (AIS, pilot, airline operator, etc.).

#### 10. Local (TWR) ATC capacity reduced

If a large amount of information usually used to control traffic is missing, then the normal capacity of the local controller will also be dramatically reduced in the interests of safety.

#### 11. Start-up delays

Departure capacity may have to be reduced if the equipment making the declared capacity possible

is not available. Start-up delays may be result of capacity reduction as well as for example non-existence of flight plans.

#### 12. ATC frequency congestion

The ATC frequency is still the primary communication tool between pilot and ATC. Data link and other similar solutions are increasingly replacing voice communication. If these new systems or any ATC equipment fails, all parties have to be immediately informed of the direct impact. This usually involves a great deal of radio communication.

### 4.4.3 Related adverse conditions

#### MET

- Thunderstorms/CB (occasional capacity reduction)

#### AIRPORT

- Aerodrome capacity
- Accident/incident
- Industrial action (non-ATC)
- Ground OPS problems
- Increased security levels
- Staff shortages
- Technical failure

#### ATC

- ATC capacity
- ATC staffing
- Equipment (ATC)

#### OTHER

- Special events
- Other (non-defined)
- Sector configuration
- System maintenance
- Volcanic activity

## 5. AIRPORT

This chapter describes adverse condition scenarios and operational consequences which are related to air traffic control causes. For each condition scenario, the operational consequences and impact on the airport CDM key parameters are determined.

Examples on 3 different airports:

- **Paris CDG:** ATC strikes
- **LHR/LGW:** winter conditions
- **AMS:** persistent fog conditions, strong north-westerly winds

### 5.1 Aerodrome capacity

#### 5.1.1 Description

**Basic elements:** Almost all the items in the impact assessment action list apply, with the exception/adjustment of:

- **Airport:** increased security levels, new system procedures
- **Other:** only special events and system maintenance apply

#### 5.1.2 Impact assessment of operational consequences

#### 5.1.3 Related adverse conditions

- ATC capacity
- Staffing/industrial action
- Met
- Special events

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Activation of procedures</b>								
Communication and coordination increase					P	P			
Activation of incident/accident status					P	P			
	<b>De-icing</b>								
	<b>Capacity</b>								
Arrival capacity reduction	P	P	P		S	S			
Departure capacity reduction				S	S	P	P	P	P
Stand capacity reduction		S	P	S	S				
Runway configuration change	P	S	S				S	S	P
Ground handling time increase					P	S	S		S
	<b>Restrictions</b>								
Taxiway restriction		P	S		S	S		P	S
Apron restriction		S	P	P		S			
Stand restriction			S	P		S			
	<b>Security</b>								
Rule violation				P	S				
Risk increase			S	P	S				

Table 13: Operational consequences and their impact on planning parameters

## 5.2 Accident or incident

### Basic Elements :

- Ground ops problems
- Increased security levels
- Technical failures
- Work in progress
- Emergency status, e.g. B777 crash landing, terminal fire, hijacking/disturbance

### 5.2.2 Related adverse conditions

- Ground ops problems
- Military/police activity
- Increased security levels
- Technical failures

### 5.2.1 Impact assessment of operational consequences

Operational consequence	Impact on parameter									
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT	
	<b>Activation of procedures</b>									
Communication and coordination increase				P	P	S				
Activation of incident/accident status	P			S	P					P
	<b>De-icing</b>									
On-stand de-icing					P	S				
Apron and remote de-icing					S	P				
	<b>Capacity</b>									
Arrival capacity reduction	P									
Departure capacity reduction						P				P
Stand capacity reduction		P	S							
Runway configuration change			P			P	S	P	S	
Ground handling time increase				P	P	S				
Airport terminal capacity reduction				P	S	S				
	<b>Restrictions</b>									
Taxiway restriction		P	S				S	P		
Apron restriction		S	S	P	S					
Stand restriction		S	S	P	P					
ATC resource restriction	P	P							P	P
Handler resource restriction				P	P					
	<b>Safety</b>									
Risk increase		S	S	P	P	P	S			
	<b>Security</b>									
Risk increase			S	P	P					

Table 14: Operational consequences and their impact on planning parameters

### 5.3 Equipment

#### 5.3.1 Description

This adverse condition relates to lack of availability of equipment such as de-icing vehicles, snow sweeping equipment, luggage handling, gate bridges, etc. It does not include technical failure of computer-related systems for planning, FIDS, or ATC systems.

#### 5.3.2 Impact assessment of operational consequences

Lack of equipment availability leads to reduced capacity for flight operations. Either new material has to replace broken equipment, or repair works will delay the activities of flights. The lack of equipment described here applies only where the impact is at the level of the airport as a whole. The impact is mainly on the turnaround process, as the cause is mostly the responsibility of the airport.

Table 15 below indicates possible primary and secondary impacts. To distinguish between a primary impact and a secondary impact, the letters “P” and “S” in the table indicate which parameters are directly affected, and which indirectly.

#### Explanation to Impacts

1. The operational consequence “Communication and coordination increase” has a primary impact on MTTs and TOBTs, as most communication relates to the land-side processes such as boarding, and the turnaround process. Secondary impacts on TSATs and TTOTs are the result of ATC regulation of the surface traffic.
2. The operational consequence “On-stand de-icing” has a primary impact on TOBTs, as de-icing is included in the turnaround process. Secondary impacts on TSATs and TTOTs are a consequence of that primary impact.

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Activation of procedures</b>								
Communication and coordination increase					P	S	P	S	S
	<b>De-icing</b>								
On-stand de-icing					P	S			S
Apron and remote de-icing						S	P	P	S
Holdover time exceeded						S	P	P	S
...									
	<b>Capacity</b>								
Stand capacity reduction			P		S	S			
Ground handling time increase				P	S	S			S
	<b>Safety</b>								
Risk increase					P	P			S
	<b>Security</b>								
Risk increase					P	S			S

Table 15: Operational consequences and their impact on planning parameters

3. The operational consequence “Apron and remote de-icing” has a primary impact on EXOTs, as the de-icing time is included in the taxi time. Secondary impacts on TSATs and TTOTs are a consequence of that primary impact.
4. The operational consequence “Arrival capacity reduction” has a primary impact on ELDTs, as the separation values between aircraft must be increased. There is a secondary impact on EIBTs, as late landings result in late in-block times.
5. The operational consequence “Departure capacity reduction” has a primary impact on TTOTs, as the separation values between aircraft must be increased. There is a secondary impact on TSATs as a consequence of restrictions on the runways and taxiways.
6. The operational consequence “Stand capacity reduction” has a primary impact on EIBTs, as limited numbers of stands are available. There is a secondary impact on TOBTs and TSATs as a consequence of that primary impact.
7. The operational consequence “Ground handling time increase” has a primary impact on MTTs, as the turnaround process takes longer. There is a secondary impact on TOBTs, TSATs and TTOTs, as late landings result in late in-block times, which create a knock-on effect.
8. The operational consequence “Safety risk increase” has a primary impact on TOBTs, as manual checks of system output may need verification and hence require more time. There is a secondary impact on TSATs and TTOTs as a knock-on effect.
9. The operational consequence “Security risk increase” has a primary impact on TOBTs, as secu-

rity measures land-side may require more time. There is a secondary impact on TSATs and TTOTs as a knock-on effect.

### 5.3.3 Related adverse conditions

Other adverse conditions related to this scenario are new system procedures and technical failure.

## 5.4 Industrial action

### 5.4.1 Description

This adverse condition relates to industrial action at airports, airlines, ground handling companies or other service organisations. Industrial action includes strikes or works to rule by staff of any organisation. It does not include ATC industrial action.

### 5.4.2 Impact assessment of operational consequences

Industrial Action will result in reduced availability of airport services such as:

- Apron control
- Ramp handling
- Tarmac bus services (boarding, disembarkation)
- Passenger and baggage handling
- Security control

Table 16 below indicates possible primary and secondary impacts. To distinguish between a primary impact and a secondary impact, the letters “P” and “S” in the table indicate which parameters are directly affected, and which indirectly.

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Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Capacity</b>								
Arrival capacity reduction	P	S	S		S	S		S	S
Departure capacity reduction						P		S	S
Stand capacity reduction	P	S	S		P	S		S	S
Ground handling time increase				P	P	S			S
	<b>Restrictions</b>								
Apron control restriction	P	P	S		S	P			S
Reduced tarmac bus services (passenger disembarkation/boarding)	S	P	S		P	S			S
Security control reduction	S	P	S		P	S			S

**Table 16: Operational consequences and their impact on planning parameters**

#### Explanation to Impacts

1. The operational consequence “Arrival capacity reduction” has a primary impact on ELDTs, as the separation values between aircraft must be increased. There is a secondary impact on EIBTs, as late landings results in late in-block times.
2. The operational consequence “Departure capacity reduction” has a primary impact on TTOTs, as the separation values between aircraft must be increased. There is a secondary impact on TSATs as a consequence of restrictions on the runways and taxiways.
3. The operational consequence “Stand capacity reduction” has a primary impact on EIBTs, as limited numbers of stands are available. There is a secondary impact on TOBTs and TSATs as a consequence of that primary impact.
4. The operational consequence “Ground handling time increase” has a primary impact on MTTs, as the turnaround process takes longer. There is a secondary impact on TOBTs, TSATs and TTOTs,

as late landings result in late in-block times, which creates a knock-on effect.

5. The operational consequence “Apron control restriction” has a primary impact on ELDTs and EXITs, as arrival capacity reduction is the first measure taken as a consequence of reduced apron control availability. There is a secondary impact on EIBTs and outbound parameters as a consequence of that primary impact.
6. Operational Consequence “Stand restriction”

#### 5.4.3 Related adverse conditions

Another adverse condition related to this scenario is staff shortages.

## 5.5 Environmental problems

### 5.5.1 Description

#### Basic Elements :

- Weather
- Regulations, e.g. noise abatement regulations (SIDs, STARs/CDAs, runway availability, etc.)
- Time of day, season
- Bird migration

#### Examples

- **AMS:** restricted use of runways
- **ABC:** bird migration (e.g. geese) depending on the season (sunrise, sunset)
- **XYZ:** weather, de-icing (from 1-step to 2-step de-icing) > delays

### 5.5.3 Related adverse conditions

- Runway configuration
- ATC capacity
- Aerodrome capacity
- Sector configuration
- Volcano activity
- All met parameters applicable

## 5.6 Ground OPS problems

TBD

### 5.5.2 Impact assessment of operational consequences

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Activation of procedures</b>								
Communication and coordination increase	P				S	P			P
...									
	<b>De-icing</b>								
On-stand de-icing						P	S		P
Apron and remote de-icing							P		
Holdover time exceeded									P
...									
	<b>Capacity</b>								
Arrival capacity reduction	P		S						S
Departure capacity reduction						P	S	S	P
Runway configuration change	P	P	S			P	S		P
	<b>Restrictions</b>								
Noise abatement impact	P					P			P
...									
	<b>Safety</b>								
Risk increase					P	S			P
	<b>Security</b>								
	<b>The environmental</b>								
Rule violation	P					P			P
Risk increase	P					S			P

Table 17: Operational consequences and their impact on planning parameters

## ATTACHMENT 7

### Airport CDM adverse conditions – impact assessment, processes, and best practices

## 5.7 Increased security levels

### 5.7.1 Description

Increased security levels at an airport may be due to the following occurrences:

- Bomb scare/threat received
- Unidentified baggage found in terminal
- Evacuation of terminal due to a security alert
- Irregularities, additional restrictions in connection with flights to the US (TSA, ESTA, API data problems)

This may result in tighter/stricter security measures, additional screening and longer processing times at the security checkpoints and/or data processing

Breakdowns of screening equipment, missing passengers at the gate, etc. are covered by other processes.

### 5.7.2 Impact assessment of operational consequences

To distinguish between a primary impact and a secondary impact, the letters “P” and “S” in the table indicate clarify which parameters are directly affected, and which indirectly.

#### Explanation of impacts

- Handling activities may be stopped or delayed in the event of increased security levels at an airport.
- Departing aircraft are delayed, blocking parking space and gates. As a consequence, there is gate congestion, with increased taxi-in times,
- Air traffic control may issue flow control measures to reduce the number of inbound flights and movements.
- Airline schedules are disrupted and terminals may be congested.

### 5.7.3 Related adverse conditions

- Staff shortages, aerodrome capacity

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Activation of procedures</b>								
Activation of increased security level	P	P	S			S		S	S
Communication and coordination increase	<b>Increased security level</b>								
Bomb scare/threat	P	P	S		P	S			S
Unidentified baggage found in terminal	P	P	S		P	S			S
IRR in connection with US flights	P	P	S		P	S			S
	<b>Capacity</b>								
Arrival capacity reduction	P	S	S		S	S		S	S
Departure capacity reduction									
Stand capacity reduction	P	P	S		P	S		S	S
Ground handling time increase					P				

Table 18: Operational consequences and their impact on planning parameters

## 5.8 New system procedures

### 5.8.1 Description

This adverse condition relates to the introduction of new system procedures at an airport. Examples are security enhancements such as new body scanners, new terminal buildings or new baggage sorting systems. Existing procedures or systems such as CDM, DMAN-AMAN or advanced ATC systems are assumed to be already in place, hence they are not part of this scenario.

spent at the airport itself, and therefore has a possible impact on aircraft turnaround times, and hence TOBTs.

New airside system procedures such as use of new gates, aprons, de-icing equipment or information boards may have operational consequences affecting stand or movement capacity.

### 5.8.2 Impact assessment of operational consequences

It always takes time for airport staff, and in some case also passengers, to familiarise themselves with new land-side system procedures. This time is mostly

Table 19 below indicates possible primary and secondary impacts. To distinguish between a primary impact and a secondary impact, the letters “P” and “S” in the table indicate which parameter is directly affected, and which indirectly.

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Activation of procedures</b>								
Activation of low-visibility procedure	P	P	S			S		P	P
Communication and coordination increase				P	P	P	P	S	S
...									
	<b>De-icing</b>								
On-stand de-icing					P	S			S
Apron and remote de-icing						S	P	P	S
Holdover time exceeded						S	P	P	S
...	P								
	<b>Capacity</b>								
Arrival capacity reduction			S						
Departure capacity reduction						S			P
Stand capacity reduction			P		S	S			
Runway configuration change		P	S			S		P	S
Ground handling time increase				P	S	S			S
...									
	<b>Safety</b>								
Risk increase					P	P			S
	<b>Security</b>								
Risk increase					P	S			S

Table 19: Operational consequences and their impact on planning parameters

## ATTACHMENT 7

### Airport CDM adverse conditions – impact assessment, processes, and best practices

#### Explanation of impacts

1. The operational consequence “Activation of low-visibility procedure” has a primary impact on all inbound and outbound surface parameters such as ELDTs and TTOTs. There are secondary impacts on EIBTs and TSATs as a consequence of slower taxi times and TTOT optimisation.
2. The operational consequence “Communication and coordination increase” has a primary impact on MTTs and TOBTs, as most communication relates to land-side processes such as boarding and the turnaround process. Secondary impacts on TSATs and TTOTs are the result of ATC regulation of the surface traffic.
3. The operational consequence “On-stand de-icing” has a primary impact on TOBTs, as de-icing is included in the turnaround process. There are secondary impacts on TSATs and TTOTs as a consequence of that primary impact.
4. The operational consequence “Apron and remote de-icing” has a primary impact on EXOTs, as de-icing times are included in taxi times. There are secondary impacts on TSATs and TTOTs as a consequence of that primary impact.
5. The operational consequence “Holdover time exceeded” has a primary impact on EDITs and EXOTs, as de-icing needs to be repeated. There are secondary impacts on TSATs and TTOTs as a consequence of that primary impact.
6. The operational consequence “Arrival capacity reduction” has a primary impact on ELDTs, as the separation values between aircraft must be increased. There is a secondary impact on EIBTs, as late landing results in late in-block times.
7. The operational consequence “Departure capacity reduction” has a primary impact on TTOTs, as the separation values between aircraft must be increased. There is a secondary impact on TSATs as a consequence of restrictions on runways and taxiways.
8. The operational consequence “Stand capacity reduction” has a primary impact on EIBTs, as limited numbers of stands are available. There are secondary impacts on TOBTs and TSATs as a consequence of that primary impact.
9. The operational consequence “Runway configuration change” has a primary impact on EXOTs as the taxi times change. There are secondary impacts on TSATs and TTOTs as the (pre-)departure sequences also change.
10. The operational consequence “Ground handling time increase” has a primary impact on MTTs as the turnaround process takes longer. There are secondary impacts on TOBTs, TSATs and TTOTs, as late landings result in late in-block times, which creates a knock-on effect.
11. The operational consequence “Safety risk increase” has a primary impact on TOBTs, as manual checks on system output may need verification and hence require more time. There are secondary impacts on TSATs and TTOTs as a knock-on effect.
12. The operational consequence “Security risk increase” has a primary impact on TOBTs, as security measures land-side may require more time. There are secondary impacts on TSATs and TTOTs as a knock-on effect.

#### 5.8.3 Related adverse conditions

Other adverse conditions related to this scenario are equipment (non-ATC) and technical failure.

## 5.9 Runway configuration

### 5.9.1 Description

**Basic elements of the condition :**

- Weather (e.g. snow, thunderstorms)
- Regulations
- Work in progress
- Environmental (e.g. bird migration)

**Examples :**

- **AMS:** runway conflicts inbound/outbound peaks, restricted use of runways
- **CDG:** noise abatement
- **XYZ:** airports with restricted use of runways during low-visibility ops

### 5.9.3 Related adverse conditions

- ATC capacity
- ATC staffing
- Environmental problems
- Work in progress
- Special events
- System maintenance
- All weather elements

### 5.9.2 Impact assessment of operational consequences

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Activation of procedures</b>								
Activation of low-visibility procedure	P	S	S			P	S	S	P
Communication and coordination increase	P				S	P	S	S	P
	<b>De-icing</b>								
On-stand de-icing						P			
Apron and remote de-icing						P			P
Holdover time exceeded						P			P
	<b>Capacity</b>								
Arrival capacity reduction	P								
Departure capacity reduction									P
Runway configuration change	P	S	S			P		S	P
	<b>Restrictions</b>								
Taxiway restriction		P						P	
Apron restriction				S	P				
Stand restriction				S	P				
	<b>The environment</b>								
Rule violation	P								P

Table 20: Operational consequences and their impact on planning parameters

## 5.10 Staff shortages

### 5.10.1 Description

Staff shortages in connection with services provided by an airport operator affect operations at an airport. Reasons for staff shortages include sickness, planning errors and late arrival of staff due to traffic jams, etc.

- Apron control
- Ramp handling
- Tarmac bus services (boarding, disembarkation)
- Passenger and baggage handling
- Security control

The above services may be provided at some airports by other contractors such as ATC, handling agents or 3rd parties. Industrial action (non-ATC) are covered by another process.

### 5.10.2 Impact assessment of operational consequences

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
<b>Staff shortages</b>									
Apron control	P	P	S		S	P			S
Tarmac bus services (passenger disembarkation/boarding)	S	P	S		P	S			S
Security control	S	P	S		P	S			S
<b>Capacity</b>									
Arrival capacity reduction	P	S	S		S	S		S	S
Departure capacity reduction						P		S	S
Stand capacity reduction	P	S	S		P	S		S	S
Ground handling time increase					P	S			S
<b>Restrictions</b>									
Taxiway restriction									
Apron restriction									
Stand restriction									
Resource restriction									

Table 21: Operational consequences and their impact on planning parameters

To distinguish between a primary impact and a secondary impact, the letters “P” and “S” in the table indicate which parameter is directly affected, and which indirectly.

### Explanation of impacts

- Longer taxi-in times and start-up delays may occur in the event of staff shortages in Apron Control.
- Flights may be delayed as a result of missing passengers due to increased waiting times at security and longer transfer times for connecting passengers.
- Air traffic control may issue flow control measures to reduce the number of inbound flights and movements.
- Lack of stands, and gate and ramp congestion may be a further consequence of reduced capacity due to staff shortages.

### 5.10.3 Related adverse conditions

- Aerodrome capacity, increased security levels

## 5.11 Technical failure

### 5.11.1 Description

This adverse condition relates to failure of any system for technical reasons, having operational consequences. Such a failure could involve the black-out of flight information displays, affect the planning system for passengers of a specific airline, or entail the failure of navigation or ATC systems in the tower. Technical failures on a single aircraft are not included, as the impact of one flight on a whole airport is not expected to be large-scale.

### 5.11.2 Impact assessment of operational consequences

Technical failures within an airline or ground handler organisation (for example affecting planning computers) will have impact on turnaround times and hence TOBTs. Technical failures within an airport can have a technical impact on capacity, for example when the surface lighting or ILS fails to work. Inside the terminal building, technical failure may impact on the boarding process, and hence TOBTs. ATC techni-

cal failures have an impact on traffic movements, as manual control may be the best alternative to closing the airport. Table 22 below indicates possible primary and secondary impacts.

To distinguish between a primary impact and a secondary impact, the letters “P” and “S” in the table indicate which parameter is directly affected, and which indirectly.

To distinguish between primary impact and secondary impact, the table contains “P” and “S” to clarify which parameter is directly hit, and which indirectly.

#### Explanation of impacts

1. The operational consequence “Communication and coordination increase” has a primary impact on TOBTs, as most communication relates to land-side processes such as boarding and the turnaround process. Secondary impacts on TSATs and TTOTs are the result of ATC regulation of the surface traffic.

Operational consequence	Impact on parameter								
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT
	<b>Activation of procedures</b>								
Communication and coordination increase					P	S			S
	<b>Capacity</b>								
Arrival capacity reduction	P		S						
Departure capacity reduction						S			P
Runway configuration change						S		P	S
Ground handling time increase					S	S			S
	<b>Safety</b>								
Risk increase					P	S			S
	<b>Security</b>								
Risk increase					P	S			S

Table 22: Operational consequences and their impact on planning parameters

## ATTACHMENT 7

### Airport CDM adverse conditions – impact assessment, processes, and best practices

2. The operational consequence “Arrival capacity reduction” has a primary impact on ELDTs, as the separation values between aircraft must be increased. There is a secondary impact on EIBTs, as late landings result in late in-block times.
3. The operational consequence “Departure capacity reduction” has a primary impact on TTOTs, as the separation values between aircraft must be increased. There is a secondary impact on TSATs as a consequence of restrictions on runways and taxiways.
4. The operational consequence “Runway configuration change” has a primary impact on EXOTs, as the taxi times change. There are secondary impacts on TSATs and TTOTs, as the (pre-)departure sequence also changes.
5. The operational consequence “Ground handling time increase” has a primary impact on MTTs, as the turnaround process takes longer. There are secondary impacts on TOBTs, TSATs and TTOTs, as late landings result in late in-block times, which creates a knock-on effect.
6. The operational consequence “Safety risk increase” has a primary impact on TOBTs, as manual checks on system output may need verification and hence require more time. There are secondary impacts on TSATs and TTOTs as a knock-on effect.
7. The operational consequence “Security risk increase” has a primary impact on TOBTs, as security measures land-side may require more time. There are secondary impacts on TSATs and TTOTs as a knock-on effect.

#### 5.11.3 Related adverse conditions

Other adverse conditions related to this scenario are equipment (non-ATC) and new system procedures.

## 5.12 Work in progress

### Basic elements of the condition.

- Equipment (ATC and non-ATC)
- Runway configuration
- Technical failure
- System maintenance

### Examples :

- **AMS:** renewal of antiskid layer on runway
- **FRA:** removal of rubber deposits
- **CDG:** adjustment of taxiways

## 5.12.2 Related adverse conditions

- Accident/incident
- Ground ops problems
- Technical failure
- System maintenance
- All met elements

### 5.12.1 Impact assessment of operational consequences

Operational consequence	Impact on parameter									
	ELDT	EXIT	EIBT	MTTT	TOBT	TSAT	EDIT	EXOT	TTOT	
	<b>Procedures activation</b>									
Communication and coordination increase	S	P				P		P	S	
...										
	<b>De-icing</b>									
On-stand de-icing						P				
Apron and remote de-icing						P				
...										
	<b>Capacity</b>									
Arrival capacity reduction	P		S							
Departure capacity reduction						P		S	P	
Stand capacity reduction		S	S	P	S					
Runway configuration change	P	S	S			P		S	P	
...										
	<b>Restrictions</b>									
Taxiway restriction		P	S			S		P		
Stand restriction										
...										
	<b>Safety</b>									
Risk increase		P						P		
	<b>Security</b>									
	<b>The environment</b>									
Rule violation	P									P

Table 23: Operational consequences and their impact on planning parameters

## 6. OTHER

### 6.1 Military activity

To be elaborated.

### 6.2 Special events

To be elaborated.

### 6.3 ATC routing

To be elaborated.

### 6.4 Other (non-defined)

To be elaborated.

### 6.5 Sector configuration

To be elaborated.

### 6.6 System maintenance

To be elaborated.

### 6.7 Vulcan activity

To be elaborated.

## 7. CONCLUSION AND RECOMMENDATION

As each airport is different in terms of culture, climate, lay-out and organisation, local measures to deal with adverse conditions tailored to the local circumstances are essential in order to successfully minimise loss of capacity and scheduling delays. However, since numerous conditions are common to many airports, it is beneficial to harmonise measures with the aim of reducing delays and maintaining overall efficiency. This document provides the means to standardise the procedures and processes, while allowing best practices to be shared and terminology to be harmonised.

Standardisation of the terminology and acronyms/abbreviations/initialisms used to describe procedures, processes or conditions is essential in order to ensure that organisations and crews from abroad understand local procedures and conditions. Such harmonisation is only now beginning to emerge and it requires political will and effort. The Airport CDM Adverse Conditions Expert Panel therefore recommends that those working on SESAR work package 6.6.1:

- continue to harmonise the terminology and acronyms/abbreviations/initialisms for procedures, processes, conditions and categories;
- further improve current operational processes and develop new detailed operational processes to increase the airport partners awareness of current or anticipated operational events;
- develop procedures to deal with pre-departure sequencing degradation in the event of a deterioration in TSAT prediction reliability. DPI messages may require adaptation with and indication of TSAT accuracy reliability and the adverse conditions applicable at the airport;
- continue to collect best practices and lessons learned in order to share these with stakeholders with the aim of increasing the learning curve at all airports;
- apply the developed methodology in order to derive new impact assessments and operational processes.

With the work ongoing within SESAR and future expert panels, the negative impact of adverse conditions in terms of cost and efficiency can be expected to continue to decrease.

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ANNEX I: PROCESSES

This Annex proposes seven processes which can be implemented in the short term, and can be considered as an add-on to the Airport CDM Implementation Manual.

**A. Process: Change in airport condition**

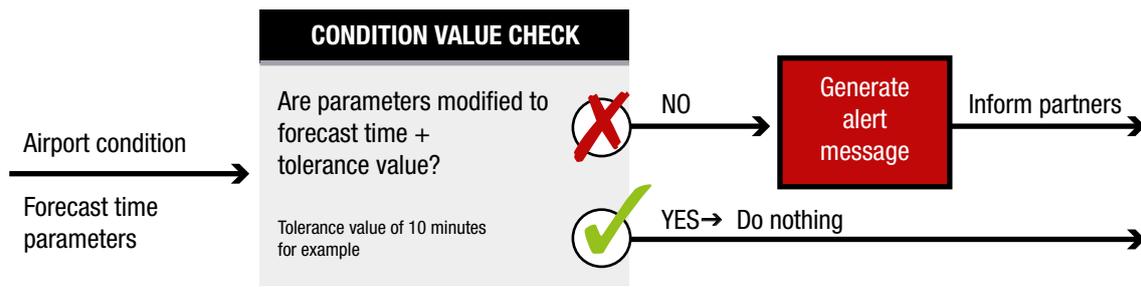
This Process is **highly recommended**.

**Objective**

First step: Inform all relevant airport CDM partners of any change in airport condition in the airport CDM platform.



Second step: Check whether all parameters have been modified in line with the new runway status.



**Description**

Report any new airport condition when it occurs or when it is forecast, such as a change from a normal to an adverse condition, a change from one adverse condition to another, or a change from an adverse to a normal condition. If the relevant parameters are not adjusted to this new condition, all relevant partners should receive an alert, and CDM platform and planning parameters should be updated to the applicable airport condition values.

**Trigger**

- Supervisor activation of new airport condition
- Meteorological forecast report
- Other forecast report, data trigger, or announcement

**Pre-condition**

Normal or adverse condition

### **Input**

Default planning parameter values for each adverse condition

Actual planning parameter values

Time of forecast

Partner reaction tolerance value [minutes]

### **Process**

The new airport condition or forecast is recorded in the airport CDM platform as soon as it is triggered. The process is initiated to broadcast the new airport condition with the time when it is forecast to occur. At a predetermined time following the trigger, a check is made to ensure that planning parameters have been adjusted in line with the new adverse condition.

### **Output**

A message is sent to all relevant partners to inform them of the new airport condition. After the check, an alert message is sent to the relevant airport partners.

### **Response to Messages**

All partners should adjust their planning parameter values to anticipate the new airport condition.

### **Consequences of No Action following Alert Messages**

Default parameters for any airport condition must be set in the Airport CDM platform by the relevant airport partner.

### **Remarks**

1. This is an airport-related process and so applies to all partners.
2. Airport status categories, symbols and acronyms/abbreviations/initialisms should be harmonised.
3. Various airport conditions may be applicable at the same time. This is to be decided locally.
4. Where there is an Airport Operations Centre (APOC) or CDM cell, it can be responsible for determining or forecasting the applicable airport condition.
5. Each partner must define buffer times to allow for longer-than-average delays from the other partners. For example:
  - a. ATC should define a buffer for TSATs with respect to TOBTs.
  - b. De-icing handlers should define an extra buffer to anticipate for extra flight crew safety procedures after de-icing.
  - c. Ground handlers should define an extra buffer to predict TOBTs, if operations cannot be executed as quickly as in normal conditions.
  - d. The Network Operations should allow extra flexibility with respect to TTOTs under de-icing conditions, to anticipate holdover times for safety reasons.

**B. Process: Change in runway status**

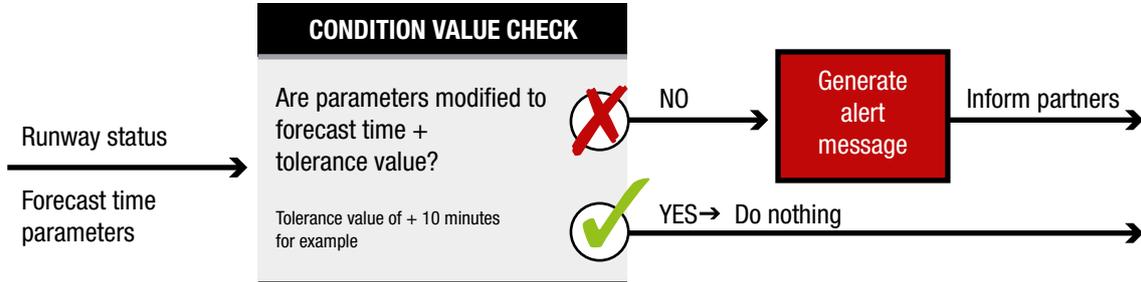
This Process is **highly recommended**

**Objective**

First step: Inform all relevant airport CDM partners of any change in runway status in the airport CDM platform.



Second step: Check whether all parameters have been modified in line with the new runway status.



**Description**

Report any new runway status when it occurs or when it is forecast, such as a change from runway closed to runway open or vice versa. If the relevant parameters are not adjusted to this new condition, all relevant partners should receive an alert, and CDM platform and planning parameters should be updated to the applicable runway status values.

**Trigger**

Supervisor activation of new runway status

**Pre-condition**

Status open or closed

**Input**

- Default planning parameter values for each adverse condition
- Actual planning parameter values
- Time of forecast
- Partner reaction tolerance value [minutes]

**Process**

The new runway status or status prediction is recorded in the airport CDM platform as soon as it is triggered. The process is initiated to broadcast the new runway status and the time when it is predicted to occur. At a predetermined time after the trigger, a check is made to ensure that planning parameters have been adjusted in line with the new status.

**Output**

A message is sent to all relevant partners to inform them of the new runway status. After the check, an alert message is sent to the relevant airport partners.

**Response to Messages**

All partners should adjust the planning parameter values to anticipate the new runway status.

**Consequences if no action is taken following an alert message**

Default parameters for any runway status must be set in the Airport CDM platform by the relevant airport partner.

**Remarks**

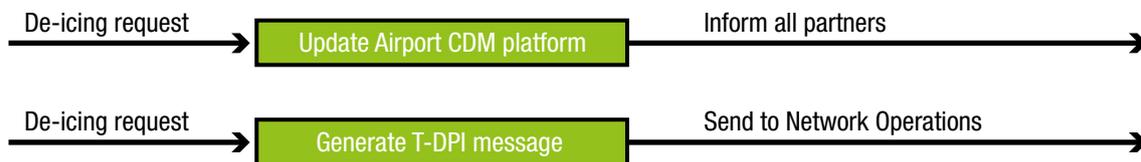
1. This process is an airport-related process and so applies to all partners.
2. Runway status categories, symbols and acronyms/abbreviations/initialisms should be harmonised.
3. Where there is an Airport Operations Centre (APOC) or CDM cell, it can be responsible for determining or forecasting the runway status.
4. Each partner must define buffer times to allow for longer--than average delays from the other partners. For example:
  - a. ATC should define a buffer for TSATs with respect to TOBTs.
  - b. ATC should adjust EXOTs to allow for changing taxi routes.
  - c. Aircraft operators should adjust their EIBTs to allow for changes in runway capacity.
  - d. Ground handlers should adjust their TOBT predictions in line with revised EIBT predictions

**C. Process: Flight crew request for de-icing**

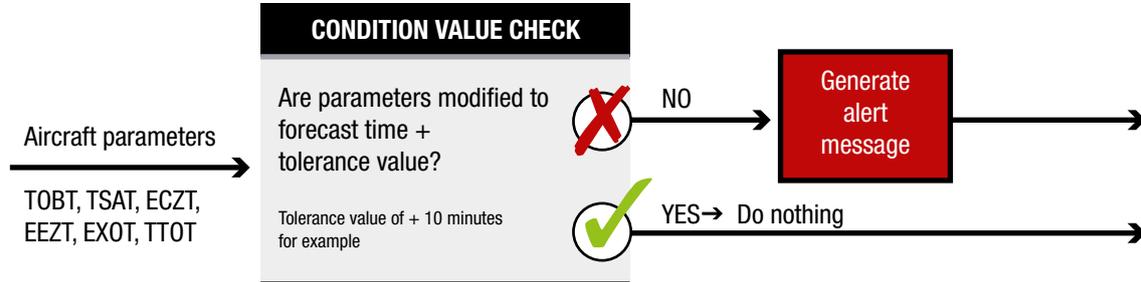
This Process is **highly recommended**

**Objective**

First step: Inform all relevant airport CDM partners and the Network Operations of any request for de-icing by flight crew.



Second step: Check whether all parameters have been modified in line with the de-icing request.



**Description**

Inform the airport partners and the Network Operations of any de-icing request by flight crew in order to anticipate sequencing for de-icing by the de-icing handler, and allow ATC to increase taxi times and adjust push-back or take-off times accordingly.

**Trigger**

Flight crew request by radio or data link

**Pre-condition**

None.

**Input**

Gate location, de-icing type, de-icing location, aircraft type, runway for take-off, holdover time, de-icing company, declared de-icing capacity.  
TOBT, TSAT, TTOT, EXOT, ECZT, EEZT

**Process**

ARZT is recorded in the airport CDM platform after the data-link or radio message is received. At ARZT + tolerance value, a check is made to verify whether parameters ECZT and EEZT have been created and parameters TOBT, TSAT, EXOT and TTOT have been adjusted.

**Output**

A message is sent to all relevant partners to inform them of the need for de-icing as requested by the flight crew. After the check, an alert message is sent to the relevant airport partners.

**Response to messages aircraft operator**

In the case of on-stand de-icing: provide an updated TOBT.

**ATC**

In the case of on-stand de-icing and an updated TOBT: flight should be re-sequenced for take-off in order to assign a new TTOT.

In the case of apron or remote de-icing: the flight should receive an updated EXOT and be re-sequenced for take-off in order to assign a new TTOT.

**De-icing handler**

In the case of either on-stand or apron/remote de-icing: sequence flight for de-icing and provide ECZT and EEZT to CDM platform.

**Consequences of no action following alert messages**

Not applicable

**Remarks**

1. This process is a flight-related process and so applies to specific airport partners.
2. This process can apply both to on-stand de-icing and apron/remote de-icing.
3. A new time parameter may be needed locally to reflect readiness of the flight crew: actual ready for de-icing time (ARZT).

# ATTACHMENT 7

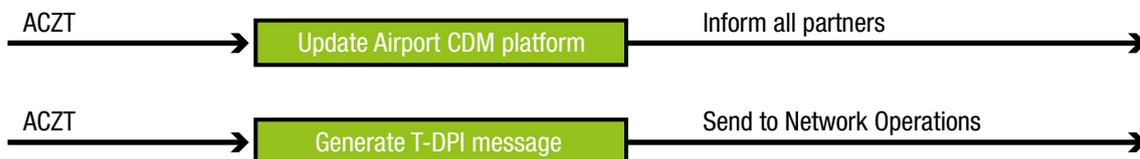
## Airport CDM adverse conditions – impact assessment, processes, and best practices

### D. Process for milestone: Commencement of apron/remote aircraft de-icing

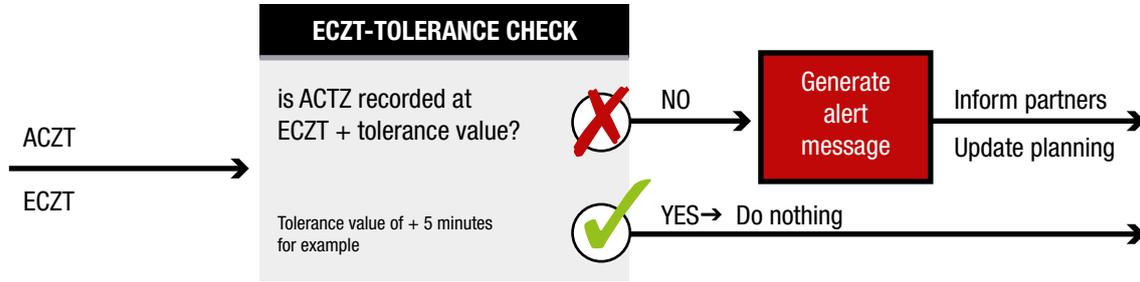
This Process is **highly recommended**

#### Objective

First step: Inform all relevant airport CDM partners of the actual commencement of de-icing time (ACZT) in the airport CDM platform.



Second step: Check whether ACZT is in accordance with estimated commencement of de-icing time (ECZT) and alert all relevant airport CDM partners if de-icing has not started according to plan.



#### Description

Inform airport partners and Network Operations of ACZT when it occurs. In case commencement of de-icing is not started at ECZT + tolerance, all relevant partner should be informed, and the de-icing sequence planning updated. Relevant partners are initially the handling agent, Airline operator, and ATC.

#### Trigger

ACZT: Automated input from de-icing coordinator or vehicle

ECZT + tolerance value passed

#### Pre-condition

Actual off-block time recorded

Taxi clearance recorded

Weather conditions set to winter conditions

Flight crew de-icing request recorded

#### Input

ACZT and ECZT

#### Process

The ACZT is recorded in the airport CDM platform after the de-icing company starts the de-icing operation. At ECZT + tolerance value, a check is made to verify whether the ACZT is recorded or is missing.

### **Output**

A message is sent to all relevant partners to inform them of the ACZT. A T-DPI message is sent to the Network Operations to inform it of the ACZT. After the check, an alert message is sent to the relevant airport partners..

### **Response to Messages**

#### **ATC**

ATC should provide taxi clearance as planned, or the flight should be re-sequenced for push-back or take-off with an adjusted TSAT and TTOT.

#### **AO/GH/de-icing agent**

The flight should be re-sequenced for de-icing in order to assign a new ECZT.

### **Consequences of no action following an alert message**

Not applicable

### **Remarks**

1. This process is a flight-related process and so applies to specific airport partners.
2. The process is not applicable to on-stand de-icing.
3. The EXOT is affected depending on the ECZT and the EEZT
4. Measurement of the fluid flow of the de-icing vehicle is technically possible and is considered an accurate indication for the ACZT and the AEZT.

# ATTACHMENT 7

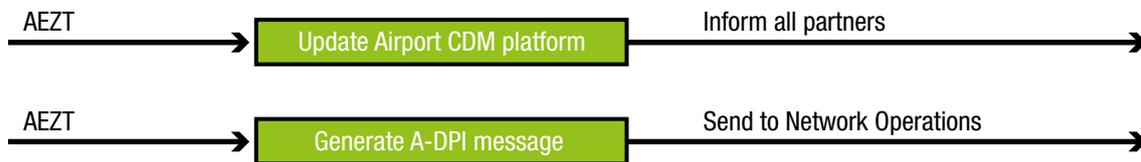
## Airport CDM adverse conditions – impact assessment, processes, and best practices

### E. Process for milestone: End of apron/remote aircraft de-icing

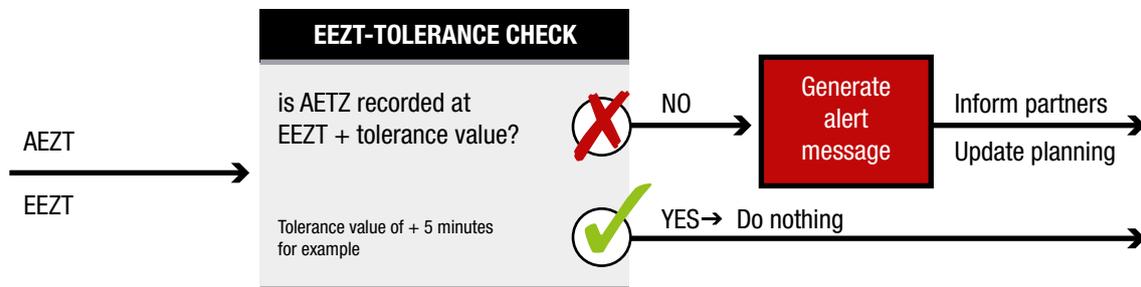
This Process is **highly recommended**

#### Objective

First step: Inform all relevant airport CDM partners and the Network Operations of the actual end of de-icing time (AEZT) in the Airport CDM platform, and that the aircraft has resumed its taxi from the de-icing platform.



Second Step: Check whether the AEZT is in line with the EEZT and alert all relevant airport CDM partners if de-icing has not ended according to plan.



#### Description

Inform the airport partners and the Network Operations of the AEZT when it is available. If de-icing is not completed at EEZT + tolerance value, all relevant partners should be informed and the de-icing sequence planning should be updated. The relevant partners are initially the handling agent, the airline operator and ATC.

#### Trigger

AEZT: Input from de-icing coordinator or vehicle  
EEZT passed.

#### Pre-condition

ACZT

#### Input

AEZT and EEZT

### **Process**

The AEZT is recorded in the airport CDM platform after the de-icing company completes the de-icing operation. At EEZT + tolerance value, a check is made to verify whether the AEZT is recorded or is missing.

### **Output**

A message is sent to all relevant partners to inform them of the AEZT. An A-DPI message is sent to the Network Operations to inform it of the AEZT. After the check, an alert message is sent to the relevant airport partners.

### **Response to messages**

#### **ATC**

The flight should be re-sequenced for take-off in order to assign a new TTOT.

### **Consequences of no action following alert messages**

Not applicable

### **Remarks**

1. This process is a flight-related process and so applies to specific airport partners.
2. The process is not applicable to on-stand de-icing.
3. The EXOT is affected depending on the ECZT and the EEZT
4. Measurement of the fluid flow of the de-icing vehicle is technically possible and is considered a very accurate indication for the ACZT and the AEZT.

# ATTACHMENT 7

## Airport CDM adverse conditions – impact assessment, processes, and best practices

### F. Process: Commencement of snow removal

This Process is **highly recommended**

#### Objective

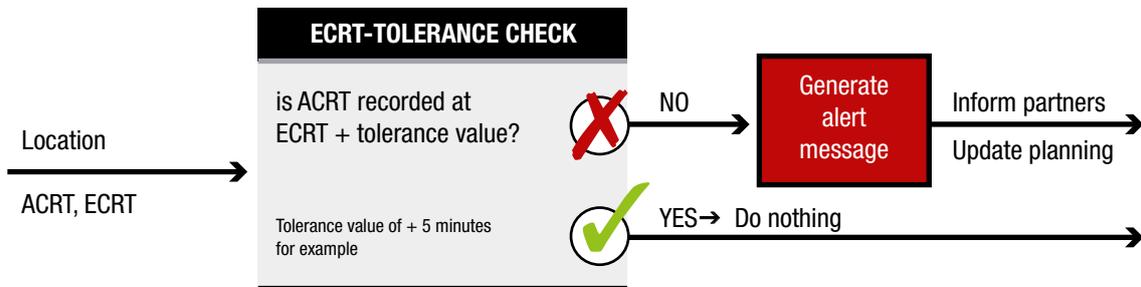
First Step: Inform all relevant airport CDM partners and the Network Operations of the estimated time of commencement of snow removal.



Second Step: inform all relevant airport CDM partners and the Network Operations of the actual commencement of snow removal.



Third Step: Check whether the ACRT is in accordance with the ECRT and alert all relevant airport CDM partners and the Network Operations if snow removal has not commenced as planned.



#### Description

Inform the airport partners and the Network Operations of the estimated and actual times of commencement of snow removal activities at the airport.

#### Trigger

Airport operator input to CDM platform  
ACRT passed

#### Pre-condition

Snow condition as general airport condition  
Snow present at snow removal location

#### Input

Area location (apron, taxiway)  
Actual commencement of snow removal time (ACRT)  
Estimated commencement of snow removal time (ECRT)

**Process**

The ACRT is recorded in the airport CDM platform after the airport operator completes the snow removal operation. At the ECRT + the tolerance value, a check is made to verify whether the ACRT is recorded in the CDM platform or is missing.

**Output**

A message is sent to all relevant partners to inform them of the ACRT. After the check, an alert message is sent to all airport partners.

**Response to messages****ATC**

All affected fights should receive an updated EXOT and be re-sequenced for take-off in order to assign a new TTOT.

**Consequences of no action following an alert message**

Not applicable

**Remark**

This process is an airport-related process and so applies to all partners.

# ATTACHMENT 7

## Airport CDM adverse conditions – impact assessment, processes, and best practices

### G. Process: End of snow removal

This Process is **highly recommended**

#### Objective

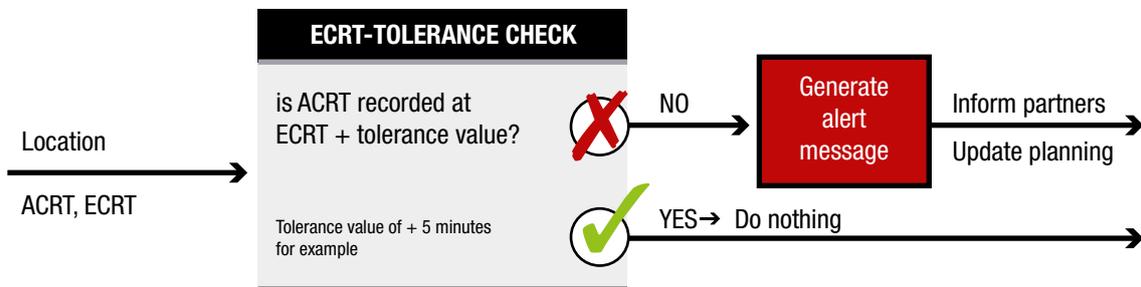
First Step: Inform all relevant airport CDM partners and the Network Operations of the estimated time of completion of snow removal.



Second Step: Inform all relevant airport CDM partners and the Network Operations of the actual end of snow removal.



Third Step: Check whether the AERT is in line with the EERT and alert all relevant airport CDM partners and the Network Operations if snow removal has not been completed as planned.



#### Description

Inform the airport partners and the Network Operations of the estimated and actual times of completion of snow removal activities at the airport.

#### Trigger

Airport operator input to CDM platform  
AERT passed

#### Pre-condition

ACRT

#### Input

Area location (apron, taxiway)  
Actual end of snow removal time (AERT)  
Estimated end of snow removal time (EERT)

### **Process**

The AERT is recorded in the Airport CDM platform after the airport operator completes the snow removal operation. At EERT + tolerance value, a check is made to verify whether the AERT is recorded in the CDM platform or is missing.

### **Output**

A message is sent to all relevant partners to inform them of the AERT. After the check, an alert message is sent to all airport partners.

### **Response to messages**

#### **ATC**

All affected fights should receive an updated EXOT and be re-sequenced for take-off in order to assign a new TTOT.

### **Consequences of no action following an alert message**

Not applicable

### **Remark**

This process is an airport-related process and so applies to all partners.

## ANNEX II: BEST PRACTICES

This chapter describes the best practices currently applied at European airports, focusing on coordination between airport partners and communication procedures which deviate from normal procedures.

### A. Helsinki airport de-icing and anti-icing service

De-icing/anti-icing is carried out on the apron area at the terminal gate and/or stand positions, and at the remote area serving one runway direction (situation as of 2009). Additionally, the airport has some so-called outer apron areas which can be used for de-/anti-icing activities, but operations are limited owing to environmental restrictions. All operational requirements are determined by the airport de-icing/anti-icing requirements.

The basis for any de-icing/anti-icing is that the airline/aircraft contacts the Helsinki de-icing coordinator and indicates the need for de-icing/anti-icing. The coordinator will then, after (or before) consultation with ATC and other relevant stakeholders, allocate a position at the airport where the de-icing/anti-icing operation will take place. The airline/aircraft is then directed to the appropriate service provider for further instructions, noting any necessary ATC communication in between.

Any special request such as engine ice melting, under-wing de-icing, tactile checks and company and/or aircraft manufacturer requirements prior to aircraft movement will be noted, and if necessary the operation will be allocated to a position where this can be performed.

The de-icing/anti-icing is performed by 5 different service providers at the airport (situation as of 2009). The only common procedure is established for the re-

mote area. Apron positions are operated as individual service provider operations without any further communication between the Helsinki coordinator and/or ATC.

The main activity is a so called two-step procedure using Type-I fluid for the de-icing step and Type-IV fluid for the anti-icing step. At the beginning and the end of the winter season (i.e. in September-October and April-May respectively), a one-step procedure using Type-I only is usually performed (mainly for frost contamination cases). It is not common to carry out so-called local frost prevention at arrival and prior to departure, as upper-wing frost cases are no longer very common with current aircraft types at the airport, although the service can be provided. Other special procedures which can be provided include the so-called forced air procedure in which the snow (mainly dry snow) is blown from the surfaces prior to a “normal” de-icing/anti-icing procedure as required. Also a full de-icing/anti-icing operation in the early morning hours may be performed a few hours prior to scheduled departure in order to try to ease the peak departure while de-icing/anti-icing may be required or anticipated.

The most critical element at the airport regarding the whole de-icing/anti-icing process is to have a good clear line of communication with ATC as to which aircraft are departing from which runway and when (order) and how runway cleaning is planned and is pro-

ceeding. Also, the suction trucks need to cooperate, as some de-icing/anti-icing operations are performed at positions where environmental questions need to be noted prior to the start of the de-icing. Apron control of aircraft positioning is an important factor in order to try to ensure a smooth flow of aircraft to and from various positions at the airport. Last but not least are the other service providers which need to be on line and report capacity and progress which affect the remote operations in particular. Weather forecasting and airline requirements also need to be noted.

## B. Oslo Airport De-icing and Anti-icing service

### General

We currently use the following aircraft de-icing chemicals at the airport:

- Hot water for de-icing/defrosting (may be mixed with hot aircraft de-icing fluid type I, depending on the outdoor temperature)
- Hot Type-I aircraft de-icing fluid (ADF) for de-icing/defrosting, mixed with hot water
- Cold Type-II ADF for anti-icing (secondary stage after de-icing)
- Hot Type-II ADF for local frost prevention

We allow only monopropylene glycol for aircraft de-icing for environmental reasons.

The de-icing operations are based on environmental requirements set by the Norwegian environmental authorities, and the EU ground handling directive (96/67/EC).

### Requirements are set by the airport administration

#### Local regulations include:

Regulations and rules for de-icing service providers at OSL

(The regulations include capacity requirements for staff, de-icing vehicles and type of services (de-icing/anti-icing, local frost prevention, mechanical snow removal equipment and fan blade heating), regulations for collaboration between the service providers, and environmental requirements.)

Regulations for remote de-icing operations

Regulations for local frost prevention

Regulations for the de-icing coordinator (iceman)

These regulations include responsibility for and control of traffic on the remote de-icing platforms.

### Location of de-icing operations

Ordinary de-icing and anti-icing operations which give holdover times (HOT) in accordance with international specifications are carried out on four remote de-icing platforms situated at the ends of the two runways (Figure 1). Each platform has a capacity of 4-6 Code-C aircraft (MD 80, Boeing 737, etc). Under heavy snow conditions, two remote platforms can be used at the same time to increase the capacity. **Ordinary de-icing operations at stands or gates are not allowed.**



Figure 1. Remote de-icing platforms at Oslo Airport.

At stands/gates, we allow “local frost prevention”, a local procedure based on hot Type-II (or Type-IV) ADF, with a maximum chemical consumption of 20 litres per aircraft. This procedure does not give any HOTs, and the aircraft have to be inspected for ice and frost before take-off. This procedure can be used only in weather conditions without precipitation. The idea of this procedure is to avoid frost and ice from forming on aircraft while they are parked at stands with cold wings and cold fuel tanks, etc.

#### Storage tanks and heating

The airport/de-icing service providers have one central tank farm with a total storage capacity of approximately 300 m<sup>3</sup> of fluid:

- Three 50-m<sup>3</sup> tanks for hot Type-I fluid
- Two 50-m<sup>3</sup> tanks for hot water
- One 20-m<sup>3</sup> tank for hot Type-II fluid (local frost prevention)
- One 35-m<sup>3</sup> tank for cold Type-II fluid

At the second-busiest platform, there is a smaller tank farm with:

- Hot Type-I fluid
- Hot water
- Cold Type-II fluid

#### De-icing vehicles

Apart from inspection vehicles, all ordinary de-icing vehicles must be of the proportional mixing system type. Special vehicles are used for local frost prevention, and some of the de-icing vehicles also have blowers to remove dry snow.

Ordinary de-icing vehicles (approx. 20) have 3 tanks:

- A hot-water tank
- A de-icing fluid tank (hot Type-I fluid)
- An anti-icing tank (cold Type-II fluid)

#### De-icing methods

The temperature is measured every 15 minutes. On the basis of the actual outdoor temperature, the water-/glycol mixture is set, in accordance with international standards and the current procedure.

The mixing system is in the nozzle.

#### De-icing procedures

- One-step de-icing procedure with Type-I fluid
- Two-step de-icing procedure with Type-I fluid
- Two-step de-icing/anti-icing procedure with Type-I and Type-II fluid

#### De-icing service provider perspective at Oslo Airport

The following parameters are decisive: ambient temperature, amount of snow and ice built up on aircraft, aircraft type and size/severity of current precipitation, de-icing fluid/glycol concentration, aircraft surface temperature, relative humidity, wind direction, equipment, de-icing personnel qualifications, climate-related and weather-related influence, temperature (water and fluid) in the storage tank and vehicles, coordination, forecast radar (live) and of course correct manpower at the right time.

The main factors affecting capacity are snow condition, sweeping on runways and gates and holdover time (the holdover time is the period of time for which ice and snow is prevented from adhering to the surface of an aircraft, i.e. the length of time between application and take-off).

SAS is the largest of the de-anti/icing services at Oslo Gardermoen Airport, operating remote de-icing at four different platforms. Snow removal is performed by blowers or manual sweepers. Frost removal and local frost prevention is carried out on cold-soaked wings. Remote de-icing is the safest, fastest and

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most efficient way of de-icing an aircraft. Engines are running during the de-icing process.

In close radio contact with the cockpit crew, the supervisor has direct contact with the de-icing units. A thorough de-icing treatment is carried out within minutes and the aircraft taxis on for a clean take-off. This minimises the time between treatment and take-off.

Not only is clean snow removed and frost decontamination carried, but frost is also prevented from forming on the aircraft directly at the gate, using two different methods: local frost prevention on cold-soaked wings (in areas of the wing over the main landing gear) on short ground stops, and frost removal for overnight flights. This means that we can prevent frost formation on overnight flights by spraying the wings and stabiliser. The next morning, the flight can leave without delay, saving potential costs and reducing passenger inconvenience. However, these two methods can be applied only in correct weather conditions.

In Oslo, the following de-icing management system is used: **[www.deicing.org](http://www.deicing.org)**.

#### **ATC perspective at Oslo Airport**

In weather conditions during which de-icing of aircraft is necessary, ATC's role is as follows:

When the aircraft is on the parking stand, the pilot-in-command (PIC) will decide whether de-icing is necessary, in conjunction with the relevant ground staff.

On first contact with ATC on frequency 121.6 MHz to obtain airway clearance, the pilot will state whether de-icing is necessary.

The controller will then mark the box on the electronic flight strip (EFS) and select the mode de-icing, and

the box for that purpose turns to the colour blue.

This ensures that the information is forwarded to the de-icing coordinator.

At Gardermoen, ATC will tell the pilot which de-icing platform is in use.

The pilot will also inform the de-icing coordinator, on a dedicated frequency, which treatment he wants on the aircraft.

This ensures that when the aircraft is ready for start-up, everybody in the loop is aware that the aircraft needs de-icing.

When the aircraft is ready to taxi, the pilot will be cleared to taxi to the de-icing platform.

Before taxi clearance is issued, ATC will take into consideration any restrictions (CTOT, EOBT) which may be valid for that specific flight. It may be necessary to re-order the aircraft in the queue, if there is one.

The expressions used to issue taxi clearance to the aircraft is as follows: "Taxi via taxiway N to Alpha South for de-icing, contact de-icing coordinator on frequency 131.85, monitor and contact TWR on frequency 118.3 when de-icing is completed".

As the aircraft is approaching the de-icing platform, the pilot contacts the coordinator and will be assigned a track to use on the platform.

The pilot calls ATC and reports de-icing completed. ATC will then issue taxi clearance to the holding position.

If two aircraft are ready at the same time, it will be necessary to sort out who is going to be number one

and two, on which route they are flying, EOBTs or other applicable restrictions.

When snow clearance is in progress, it may be necessary to hold aircraft at their gates in order to let the snow clearance vehicles do their job.

The focus and aim of this process is to ensure that aircraft needing de-icing are worked on while snow clearance is in progress and are ready for take-off as soon as the runway is re-opened.

In addition to the above, the supervisor in the tower contacts the Met Office the evening before and obtains the forecast for the next day's weather.

In cooperation with the de-icing coordinator, ATC will apply the necessary traffic restrictions. As soon as possible after de-icing has started, the de-icing coordinator will give an estimate of how much time is needed on average for the de-icing of one aircraft. On the basis of that information, the traffic will be adjusted as required.

#### **Aircraft operator perspective at Oslo Airport**

Many decisions taken during adverse conditions are based on assumptions and best guesses, not out of ill will but owing to lack of communication and lack of agreed command lines.

Under normal weather conditions, the turnaround of an aircraft is a study in logistics. When snow, ice and severe delays are included in the equation, the need for CDM will increase radically, to allow airlines to make the right decisions and set priorities based on internal KPIs.

Airlines are of course obliged to communicate their decisions to the public domain as well, in order to ensure complete awareness.

***Below are some examples of why CDM in adverse de-icing conditions is essential for airline operators:***

#### **Sequence:**

Operators must be included in the departure sequence (line-up for de-icing). Often, decisions regarding the line-up sequence will prioritise flights with a CTOT.

This approach is understandable, but not always in line with the operators' wishes. For example, a flight from ENGM to LEAL with a CTOT will have no onward passenger connections to other flights out of LEAL, whereas a flight from ENGM to EDDF with no CTOT could have up to 100 passengers with onward connections out of EDDF. In this case, the operator naturally wants to secure a departure as close to the EOBT as possible, for the ENGM-EDDF flight.

Other reasons for prioritising a flight not affected by a CTOT could be curfews, crew duty hours and use of conditional routeings in filed flight plans.

At ENGM, and only during severe adverse weather conditions, SAS has a local agreement with OSL allowing the tower to update SAS' FPLs if taxi and de-icing times are excessive. In such situations, the tower is seen as the CDM partner with the best overview of when a flight is ready for take-off.

Airports with on-stand de-icing, or a mix of on-stand and remote de-icing, will often add even more pressure to the sequencing process. Below are some examples:

- "You are next in line". Is this in 5 minutes or 20 minutes? If the flight in front of you has been at the airport overnight, ice can be quite thick.
- Who dedicates trucks to which flights? Is it first-come-first-served?

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- If there is sufficient equipment, the bottleneck will move from the de-icing platform to runway or taxiway capacity. Who will prevent excessive line-ups at the runway threshold? This is also evident in the case of snow sweeping.

#### **Fuel Saving:**

The longer a flight can be kept at the gate without its engines running, the more fuel is saved. A well-coordinated traffic flow from gate to de-icing platform will secure minimum excess burn for taxi and line-up.

#### **Recovery:**

In very severe adverse winter conditions, an airport will often request operators to start cancelling flights which they do not intend to operate.

This is in line with what “hub carriers” do, consolidating and concentrating on basic operations.

“Point-to-point” carriers with no obligations to passengers and baggage with onward connections will not have the same incentive to cancel their operations.

As a “hub carrier”, one could wish for a system whereby operators who cancel flights in accordance with an airport’s guidelines are also rewarded with more optimal prioritisation on its remaining operating flights.

#### **Accurate timings:**

In adverse weather conditions the inbound traffic will often suffer as much as the outbound traffic, in terms of delays, diversions and cancellations.

In adverse weather conditions, inbound traffic will often suffer as much as outbound traffic, in terms of delays, diversions and cancellations.

Accurate timings, informing the operators about push-back from gate for de-icing, will allow for better decision-making within the airlines:

- How long can we wait for 30 connecting passengers arriving late from another flight?
- When will the push-back tractor be ready?
- Is there sufficient time for catering lift-up?
- Is it possible to arrange a direct baggage transfer from another late incoming flight?

Any adverse scenario will lead to loss of capacity. From an airline perspective, CDM is seen as a way to secure maximum airport throughput in a degraded situation.

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## C. Airport crisis experience at Amsterdam Schiphol

1. Develop scenarios for all possible disturbances that may have an (adverse) impact on normal airport performance. Initial guidance is the Network Operations delay code list. However, conditions may differ substantially from one airport to another. See item 2 for AMS. In those scenarios, do not describe only what you may expect when something happens, but for all scenarios clearly define:
    - what is included in but also what is excluded from the scenario;
    - a risk assessment and the effects (what if ...?);
    - the airport status
    - who has to take action (responsibility);
    - what measures will be taken;
    - whether a command centre (CDM cell) will be installed, who will be attending, what is expected from participants;
    - CDM cell checklists for all situations;
    - how to communicate (who, by what means and when);
    - what to evaluate after incidents. Celebrate your successes (and communicate), and learn from experiences, whether good or bad, in order to improve performance.
  2. At AMS, five things which we consider of paramount importance in coping with crises are as follows:
    - a) developing scenarios, which are as extensive and complete as possible, so that you do not have to re-invent the wheel when it happens for real;
    - b) setting up a CDM cell as soon as possible (included in the scenario);
    - c) training regularly
    - d) even in crises, being creative and deviating from your plans if this makes sense;
    - e) evaluating and trying to do it (even) better next time.
- Point a)** At AMS, we use the crisis organisation structure even for non-crisis situations which may have major impact on airport performance. This has proven to be very effective, since people know the structure. Even if a scenario has not been fully developed for a given situation, there are always parts of a similar-looking scenario that are useful. This is the best in the given situation, so go from there.
- Crises at AMS are classified generally as follows:**
- Aircraft (= airport in charge)
  - Public order (= police in charge)
  - Fire, emergency (= fire brigade in charge)
- Non-crisis, scenario-based phenomena:**
- Weather disturbances (fog, strong winds, low visibility, lightning)
  - Winter operations (snow, de-icing) – weather, but taken apart from others
  - Technical (baggage, ICT, communication problems)
  - Security
  - Shortage of capacity (infrastructure)
  - Industrial action
  - Passengers (stranded, evacuation, health)
  - Special events
  - Political (volcanic activity and/or closure of airspace for prolonged time – under development)
  - Staffing
  - Safety (bird strikes, infrastructure, dangerous goods, other)
  - Limited airport access (road, rail)
  - Other

**Point b)** At AMS, all but the lowest alarm level automatically activates an Emergency Committee, which acts as a CDM cell. The participants depend on the scenario. Location: Airside Operations (standard for all scenarios). This Emergency Committee (CVO – commissie van overleg) is usually in place within 10 minutes (H24). The focus is not only managing the adverse condition, but once everything is up and running, we concentrate on looking 1, 3, 6, 12 and 24 hours ahead. What if ...? The challenge is to restart operations smoothly. The sooner you start planning and initiate action to restart operations, the better. Do not forget to communicate how and when you will restart. Is planning realistic? Keep an eye on this as time evolves.

**Point c)** This is really important. Desktop exercises may look interesting but they are only a basis. Our training schedule involves all parties, and situations are trained for in real time. If this is not possible, we look for alternatives (other time, location). New techniques, such as simulation offer interesting opportunities. This method is relatively cheap and effective.

Training your own department/personnel is one thing, but the real challenge is multi-discipline training. In real cases, many parties are involved simultaneously. You may expect communication challenges, lack of knowledge, stress, etc. with various parties. Do not wait for the (major) incident to happen but develop proper training scenarios.

**Point d)** in our scenarios, the DOs and DON'Ts are well defined. However, you cannot foresee everything that may happen. All situations are slightly or very different from one another. Those responsible for dealing with the crises must therefore have the freedom to deviate from the scenario if the situation so dictates. Experts are very capable of doing this and of so using their expertise. There must be discussion and evaluation afterwards.

**Point e)** Since people are involved, there is always something that can be improved. Stimulate an open attitude, and do not simply point and shoot. Evaluate the good elements and items that may need improvement.

As long as you respect your counter-partners, are willing to learn from mistakes made, and work actively on outstanding problem in order to perform (even) better next time, there is a good chance you will be able to successfully cope with most crises as they occur.

### **Amsterdam Schiphol best practice**

#### **SnowFlake @ AMS (winter simulation)**

In March 2005, (relatively) serious snowfall at AMS created a chaotic situation at what is usually an efficiently operated airport. Evaluation revealed some major operational problems, e.g.:

- Lack of a common view and of unambiguous operational information
- Insufficient de-icing capacity, and inefficient use of existing means
- Conflicting procedures
- As a result of the above, wrong setting of priorities

This resulted in:

- Delays
- More stranded passengers than necessary
- Loss of overview of aircraft, stands and flight status

It was soon concluded this was unacceptable, and the idea to implement CDM gained momentum and won acceptance. As part of the CDM project kick-off at AMS, the idea emerged to replay the winter situation as described above by means of a real-scale simulation.

The project name chosen was SnowFlake, and its training goal was that "the airport, ATC and KLM (main and home carrier) participants would be able to cope with

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**Figure 2: NARSIM simulator at R&D institute NLR, Amsterdam**

winter conditions in such a way that the disturbance in flight schedules would be reduced to the absolute minimum”.

The simulation platform used was the existing full-size NARSIM tower simulator, based at the NLR (Dutch aerospace laboratory) in the Amsterdam area, enabling the project team to set up realistic scenarios. Participating in the project – and simulation sessions held in October 2005 – were LVNL (ATC), AAS (Airport), KLM (airline), KNMI (the Dutch Met Office) and NLR, and all operational decision-makers and key players were represented in the simulation sessions held, with a total of 35 workstations. Each player had his own dedicated workstation so that he could work in his “own” environment and with his own familiar equipment and systems. Even a link with the (live) airport central information system was established, making it possible to play in a very-close-to-real environment.

The scope of the exercise was reduced by diminishing the number of piers from eight to three, which approximately corresponds to 100 in- and outbound flights in four hours. Also, the scope of the airport as seen from the simulator was 135 degrees, which was sufficient for the scope of the exercise (in a later simulation series, the field of view was extended to 270 degrees). Weather, including snow, aircraft and vehicles, could all be manipulated by dedicated persons in order to maximise the reality factor.

Various sessions were held enabling all parties in the winter operations to participate. During the simulation sessions, observers watched progress and monitored the training goals.

According to the CDM partner participants, the value of SnowFlake was the increased insight gained into the operational processes as a whole during winter

situations. Also, the possibility of interpersonal contacts, i.e. meeting co-workers from other organisations face to face, was highly valued. When it started snowing in December 2005 - after the SnowFlake exercise – the teamwork went better than ever before. The airport remained open, whereas train and car traffic stood still.

In 2006, another simulation project (SnowWhite) was set up with an even bigger set-up, different scenarios and with some improvements learned from the previous project.

#### Supporting documentation:

- SnowWhite (Abma/Hartlieb), 2006  
<https://www.narsim.org/publications/SnowwhiteATM2007.pdf>
- Preventing Snow Blindness (Airport Technology.com)  
<http://www.airport-technology.com/features/feature666/>

#### Lightning Warning System

Since July, 2010 a Lightning Warning System (OWS – Onweer Waarschuwing Systeem) has been operational at AMS. In order to ensure a maximum safety level for ground handling personnel, an interruption of handling operations is declared whenever lightning is observed within a radius of 5 kilometres from the airport centre.

A colour-coding system is used to indicate the risk of lightning strike. These colour codes are:

- **RED** - discharges at/near airport, within a 5-km radius
- **AMBER** - ditto but within a 2nd radius of between 5-10km (warning phase)

- **YELLOW** - outside the 10-km radius, but with a risk that the lightning may enter the amber and/or red zone
- **GREEN** - no lightning in the vicinity of the airport

The airside operations manager (AOM) has a radar display available with zones and colour codes. The Met Office (KNMI) will warn the AOM at the earliest stage when lightning can be expected (with further details), and when lightning is nearing the airport, the Met Office and AOM are in close contact.

When code RED is imminent, the AOM and airport authority will declare a interruption of handling operations via the OWS. The interruption/resumption of normal operations will be declared by the handling organisations. The interruption applies during lightning conditions and entails the following:

1. No activities may be performed at or around any aircraft stand.
2. Chocks may not be placed after arrival of an aircraft at a stand, and therefore:
  - passenger (air)bridge(s) may not be connected to aircraft (the parking brakes of an aircraft are not considered sufficient for the airframes);
  - activities inside the aircraft are unaffected, and so these may proceed;
  - de-icing using equipment in which the operator is working from an enclosed cab is approved;
  - towing is also approved, as long as the driver remains inside an enclosed cab.

The system involves amber (omnidirectional) flashing lights, mounted on the top of the lighting posts of all piers and remote aircraft stands. These lights are located in such a way that anybody on the platform, around aircraft and even inside the cockpit of aircraft can see that the warning lights have been activated.

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In addition, for the first 30 seconds, an audible sign (a warning horn) will sound in order to (further) attract the attention of platform users. After 30 seconds, only the flashing lights will remain active, until handling operations can be resumed. When this is possible, the warning horn will sound again for a further 30 seconds, and then both the flashing lights and the warning horn will be turned off. This is the sign that aircraft handling operations can resume.

This system has been tested in various locations and configurations. Evaluation with all parties involved indicated that a visual warning system (flashing lights) is the most preferred means of declaring an interruption of handling operations, provided that they are placed in such a way as to be visible in all areas.

Audible alarms are to be considered as an extra, but in a typical noisy airport environment, it is very likely that not all people will notice that there is something going on if the audible warning is not accompanied by flashing lights.

In addition to using the OWS, the operational parties will be notified separately by the apron office via an automatic telephone system. However, since many parties are involved, it may take some time to reach all persons by telephone (up to 5 to 10 minutes, depending on the complexity of the organisation).

The real benefit of the OWS is that it is instantly clear to anybody when handling must be stopped and when handling may be resumed. This minimises delay, and ensures the safety of the platform personnel to the best possible level.

On the basis of the experience acquired with the system during the summer of 2010, the feedback has so far been very positive, and it is therefore worthwhile considering its implementation at other airports.

It should also be borne in mind that the frequency and intensity of lighting conditions has shown an upward trend in recent years.

The Schiphol Lightning Warning System aims to alert all ground staff working outdoors on the platforms. Visual warnings alert the whole airport, informing all staff at once of the interruption of handling operations.



Picture of the Lighting Warning System (OWS) at AMS – activation panel on the AOM's desk.

- The left side indicates system status (green bullets)
- On the right-hand side, just below the words "OWS status" in bold is the indication handling allowed.
- On the lower right-hand side, there are two options: "OWS Activate" (activate an interruption of handling operations) and below that "OWS Deactivate" (resumption of handling operations).

When the OAM (de)activates the system, a pop-up screen appears asking him to select Y/N (accept alarm in the lower left-hand corner).

## D. Zurich Airport winter operations

### Organisation of winter operations

Let's have a look at how winter operations are organised and managed at LSZH, where almost 7,000 flights are de-iced every year.

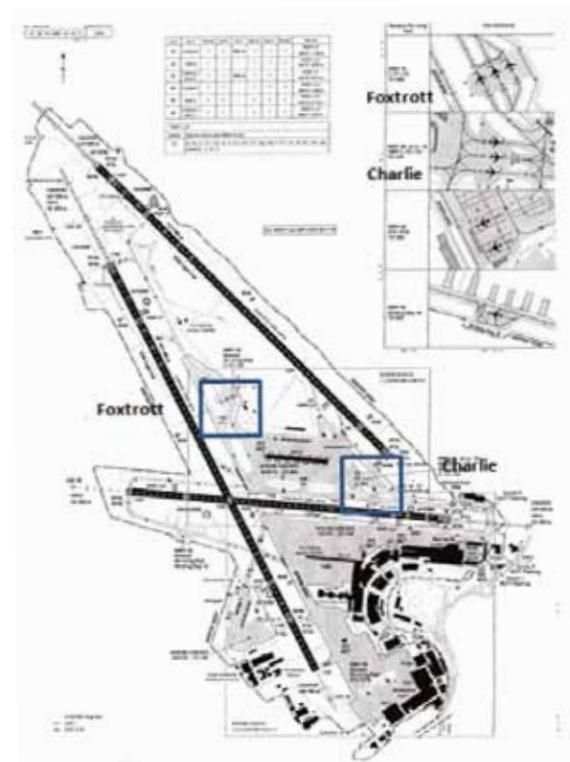
### Infrastructure de-icing

During the mid-90s, planning of the new Mid-field Terminal started, and during the planning process the idea emerged of creating two de-icing pads to allow remote de-icing of aircraft and thus replace the difficult to handle and more time-consuming on-stand process. As a requirement for this so-called "fifth expansion phase" of the airport's infrastructure, the authorities demanded proper processing of all the de-icing fluid run-off in accordance with environmental rules before the new facilities could be opened.

During winter 2001/2002, the new remote de-icing pads (RDPs) "Charlie" and "Foxtrott" were inaugurated. Each pad offers three de-icing lanes, allowing simultaneous treatment of two wide-body aircraft (up to ICAO Code-F) or up to three ICAO Type-C aircraft (B738/A320Fam). Two de-icing trucks, equipped with a closed cab, are assigned to each aircraft to ensure a short processing time. During winter 2009/2010, 76% of traffic was handled via those remote pads.

For the replenishment of the trucks, two centrally located storage facilities direct Type-I and Type-IV de-icing fluid and hot water to filling stations located next to the de-icing pads and to remote refilling facilities used by trucks handling the on-stand de-icing process.

### Location of remote de-icing pads



### De-icing process

Up to 2002, aircraft de-icing was controlled and handled by Swissair. After Swissair's bankruptcy in April 2002, Zurich Airport took over responsibility and the processes under the newly formed De-icing Coordination unit. Although the lead is now with the airport, it is actually a product of cooperation between the airport, Swissport (the ground handler, who physically carries out the de-icing/anti-icing), Swiss International Air Lines (the hub carrier), Skyguide (Swiss air traffic control) and various service providers. Last winter (2009/2010), a second de-icing provider, Nordic Aero, started providing services, which made it necessary to adapt quite a number of established processes.

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How does it work?

In close collaboration with the de-icing providers, Airport Steering, Zurich's airport operations centre, is responsible for the number of available de-icing trucks matching the possible demand for de-icing. Close contact with the meteorologist of the airport branch office of the Swiss Meteorological Office is therefore essential in order to obtain a reliable weather forecast.

As soon as a decision regarding the level of service has been taken between Airport Steering and the de-icing providers on the basis of the weather forecast, the de-icing providers alert their specialised staff, consisting mainly of regular staff who volunteer to be on call during their off-duty time. The required number of trucks must be ready for operation no later than one hour after the alert is given.

In addition to the drivers for the trucks, each pad is staffed by a pad coordinator, and for the assignment of the on-stand de-icing trucks a coordinator joins the Zurich Airport De-icing Coordination Centre which is responsible for organisation of the de-icing operations. At full force, the de-icing fleet consists of 14 trucks for remote de-icing and 4 trucks for on-stand de-icing.

As soon as all "ice-men" (as the driver-operators of the de-icing trucks are called), pad coordinators and the de-icing coordinator are in place, a briefing is held, at which the treatment methods, fluid concentrations and other safety-relevant information are discussed.

Any crew requiring de-icing contacts De-icing Coordination. Here the decision is taken whether the aircraft is to be de-iced at a remote de-icing pad or on its parking stand. The request and decision is entered

into the AIMS airport information system, having an interface to Apron Control's "darts", its departure and arrival management system. The controller sees such a request displayed in the form of a symbol on the flight's electronic strip and can then allocate a planned de-icing lane to the corresponding aircraft.

#### **Zeus helps track the flights**

To help monitor the traffic situation of aircraft waiting in the queue to be de-iced or currently being treated on a lane in one of the RDPs, De-icing Coordination uses the business monitoring system "Zeus" which, on an interactive display, provides a very helpful live oversight. By simply moving the mouse pointer over the plane symbol, a pop-up balloon of information about the flight opens. The Pad Coordinator uses it for active lane management, as does the Swissport De-icing Coordinator when assigning the transponder-equipped de-icing trucks used for on-stand de-icing, facilitating the planning and observing the process.

#### **Coordination between ATC and the airport**

During a phone conference every evening, the Control Tower Duty Manager (ATC) and Airport Steering (the airport) decide, on the basis of the forecast weather for the morning, whether the taxi-out-time needs to be increased from the standard 12 minutes to, for example, 30 minutes in order to prevent missed take-off slots caused by de-icing delays.

#### **De-icing status**

Starting with the lowest degree of de-icing, "De-icing-on-request", with only sporadic calls from departing flights, the next level up is "General De-icing", which is declared as soon as precipitation starts and all departing flights request de-icing. This escalation triggers various changes of parameters within the

systems of Apron Control, Skyguide (ATC) and Flow Control.

The next and highest escalation step would be the declaration of a “CHAMAN” (“CHAotic situation MAN-agement”) operation to EUROCONTROL’s Central Flow Management Unit (Network Operations), which is responsible for an orderly managed traffic flow in Europe. As Zurich is considered a winter airport, it has the possibility, whenever there is an exceptional snow situation, to waive departure slots issued as a consequence of traffic restrictions.

However, this privilege restricts the number of possible departures by about one third in order to avoid traffic jams on departure routes, resulting in the acceptance of 23 departures per hour, without their needing to respect any pre-assigned slot, except in the case of sensitive slotted flights, which are governed by sensitive regulations defined by the Network Operations. A clear advantage of CHAMAN is an undeterred departure after termination of the de-icing process, thus preventing “holdover time problems”.

#### **Winter Operations Coordinator**

On days with heavy snowfall, numerous runway clearings and cleanings will negatively affect airport operations. On such days, a special “Winterops Coordinator” will supervise and coordinate all activities and services connected with flight operations. The idea is to have a “bird’s-eye” view of winter operation processes in order to guarantee a smooth operation. Decisions are taken in a CDM (collaborative decision-making) approach, in order to ensure wide acceptance by the partners involved and affected and to ensure that decisions are based on as much information as possible.

#### **On the remote de-icing pad (RDP)**

Apron Control is responsible for all aircraft movements on the ramp and directs the flights to the assigned de-icing lane where, after the brakes have been applied by the flight crew, the Pad Coordinator takes over. In coordination with the flight crew and the de-icing truck drivers, he gives the OK for the de-icing process to start after giving the flight crew details of the de-icing procedure (ratio of hot water to Type-I de-icing fluid, time of start of application of Type-IV anti-icing fluid). During the de-icing process, the aircraft’s engines are kept running in order to speed up the process once the de-icing has been completed. As soon as the trucks retreat to a safe position, the crew is informed that the treatment has been completed. The crew switches back to Apron Control and taxis out of the pad, while the trucks move up to their initial starting position, ready to receive the next aircraft.

Depending on the quantity of de-icing fluid required, the two de-icing trucks can handle an average 3 to 5 aircraft before they have to refill their tanks (around 10,000 litres of fluid). Refilling takes around 10 minutes.

#### **On-stand de-icing**

Aircraft for which remote de-icing is not allowed (owing to technical requirements, limitations, etc.) are treated on their parking stand. The de-icing truck is dispatched to the respective location by the De-icing Coordinator of the service provider. Since they are transponder-equipped, the trucks can easily be followed on the interactive map of the Zeus system or on the A-SMGCS system of ATC and Apron Control.

#### **Keeping the airport operational**

The Airport Manager, as part of the Airport Authority at LSZH, carries out periodical runway checks and reports the status of the runway, including brak-

## ATTACHMENT 7

### Airport CDM adverse conditions – impact assessment, processes, and best practices

ing conditions, to the control tower. If necessary, he calls up the Winter Services Department, a unit of the airport's Airfield Maintenance Department, which is responsible for snow clearing and the de-icing of slippery surfaces, and tells it to get ready for snow clearing.

Winter Services then alert their standby staff to man the three cleaning groups equipped with heavy-duty snow removal equipment. Their duty is to clear and clean the extensive airport surfaces of snow and ice. The three teams, each equipped with seven Boschung Jetbroom (plough, brush, blowing system), each of which cleans an 8-metre wide strip in one go, start their run after having attended a detailed briefing by the Airport Authority about the order in which the different surfaces have to be cleaned. Before this, a mini phone conference is held between the Airport Manager, the ATC Tower Duty Manager and the Airport Steering Duty Manager or Winter Operation Coordinator to decide in which order the runways are to be cleaned, stating the approximate timings for which a runway will not be available. This information is again disseminated via the airport information and management system (AIMS) and is available on a wide scale to any interested party.

Further steps are regularly coordinated via a "Snow Committee telephone conference", which is called depending on the expected or prevailing weather conditions.

#### **Key to success**

A well coordinated and trained organisation, involving all partners affected by winter operations, is crucial in order to sustain an airport operation which is to remain under positive control despite adverse conditions.

Transparency and understanding of the processes by all parties is important.

With the winter season at LSZH officially starting on 1 October and ending on 30 April, various efforts are made to use the warmer months of the year to prepare for the following winter. To name a few, before the start of the season, all partners and stakeholders involved meet at the end of September, in a so-called "Winter Operation – Outlook meeting", to share new processes, procedure changes, equipment upgrades, etc. Most of the questions raised can be directly answered and cases settled, with all the specialists being present at the meeting.

In May, the same group meets again, this time to look back at the previous winter season. These are excellent opportunities to discuss outstanding problems, share experiences, and decide on areas which might possibly have to be scrutinised in order to improve the process in the forthcoming winter.

Involving all partners, developing procedures together, closely cooperating and exchanging information regularly, making maximum use of the tools available, and continuous improvement of processes guarantees a successful, incident-free winter operation.

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## ANNEX III: CHECKLIST FOR ADVERSE CONDITIONS

### ## 1 - Checklist/Questions STANDARD BRIEFING (max. 10-15 minutes)

#### **MET**

- Expected time, type and duration of adverse weather conditions
- When can we expect changes (improvement/deterioration)?

#### **AIRPORT OPERATOR**

- What is the airport capacity now and what will it be in the next few hours (runways/taxiways/gates)? Specify.
- What if inbound capacity exceeds outbound capacity?
- What is the runway combination now and what will it be in the next few hours?
- (In winter) Which runways will be cleared, when will the operations start and end, and for how long will they remain cleared? Are inbound delays to be expected (ATC)?
- Are alternative stands available for inbound traffic (gates occupied)? If so, which ones? What are the consequences?
- Is the airport accessible (motorways, public transport, car parks, etc.)?
- Are personnel and equipment available?
- Special events/maintenance
- Communication of situation

#### **ATC**

- What are the present inbound capacity and the start and stop times?
- What are the present outbound capacity and the start and stop times?
- Are there any taxi delays? If so, when, where and how long are they?
- Are diversions expected? What are the details (time/type/airline)? What is the policy?
- (In winter) During snow clearing/spraying operations, are temporary inbound/outbound delays expected and what are the times (an indication)?

#### **AIRLINES/HANDLERS**

- What are the in- and outbound delays (slot times)? What is their duration?
- Are slot swaps possible, and if so, which ones? Which flights have (commercial) priority?
- (In winter) What is the de-icing throughput now and for the coming hours?
- (In winter) Is the equipment suitable for runway use and/or are remote spots in use?
- Are personnel and equipment available? If not, where are the bottlenecks and how does this affect EOBTs?
- What is the impact of the disturbance? Is it necessary to impose (airline) network regulation, and if so, what type and when (e.g. pro-active cancellations of low-yield legs, delays of transfer streams, fuel advice (holding delays), etc.)?

At the end of each briefing, the conclusions and/or actions should be summarised by the chairman, and the next briefing time should be agreed.

The capacity forecast (results) outcome should be distributed in writing (by fax/mail) directly afterwards.

## ## 2 - Checklist/Questions SHORT BRIEFING (max. 3-5 minutes)

Use one-liners - do not waste time. Agree on TOP 3 bottlenecks and on actions to deal with them

### MET – if applicable

- Weather update (short) – wind/visibility/precipitation and type/temperature/other
- When can changes be expected (improvement/deterioration)? Specify.

### AIRPORT OPERATOR

- What is the airport capacity at present and in the next few hours (runways/taxiways/stands)?
- (In winter) Which runways will be sprayed/cleared/friction-tested? When will this be done and for how long will it last? What are the consequences for in- and outbound traffic?
- Is the gate capacity sufficient (ICA/EUR)? Is the bus capacity sufficient?
- Is the airport terminal accessible land-side (passengers, baggage, systems)?

### ATC

- Which runways are in use now and which ones will be in the next few hours?
- What is the in- and outbound capacity (per hour)? Where are the bottlenecks?
- What is the cause of any in/outbound delays? When, where and for how long are they to be expected?
- Are diversions to be expected? What is the policy? What are the consequences?

### AIRLINES/HANDLERS

- What are the in- and outbound delays (slot times)?
- What are the holding delays? Specify. Is extra holding fuel required?
- (Winter – de-icing) What is the present throughput and what will it be in the next few hours?
- What are the consequences?
- What is the personnel and equipment situation? What will be the consequences for TOBTs and TSATs?
- Are network measures necessary, and if so, what kind (details)? What is the objective and what will be the effect of these?
- Which are priority flights?

### Summary

Prio	Bottleneck	Action	Responsible
1			
2			
3			

- Summary by chairman (airport) – to be distributed by mail/fax
- Agree on next briefing time and participants

Bottlenecks and effects of actions to be monitored by all CDM briefing partners. Does this help to manage the situation? Is the situation stable, or can we see changes?

## ANNEX IV: REMOTE DE-ICING SEQUENCE PLANNING

### A. Introduction

This annex aims to describe parameters and optimisation scenarios for remote de-icing sequence planning at an airport-CDM-enabled airport. These scenarios propose a transparent process which can be used as a stand-alone automated enabler, or be integrated into pre-departure sequence planning. The last section describes three planning processes based on operational bottlenecks at the airport, and the optimisation which needs to be implemented to maximise throughput at these bottlenecks. Once activated, aircraft de-icing has a serious impact on airport operations and adversely affects the throughput and planning processes.

### B. Justification

Robust and reliable automated planning of remote aircraft de-icing operations is currently the missing link in many outbound planning processes or automated planning support tools. The complexity and unpredictability of de-icing operations often make the process a reactive one, and this can seriously compromise traffic management, thereby reducing capacity and throughput.

With airport CDM implemented at an airport, the remote de-icing planning process should increase predictability (in comparison with the current situation), owing to the availability of reliable target start-up times, variable taxi times, and to the improved and timely knowledge of available capacity and airport resources.

Although many factors and uncertainties in taxi and de-icing times increase the complexity of the planning process, a transparent process can still be determined on the basis of an accurate assessment of the airport's bottlenecks and the impact on planning priority of throughput at these bottlenecks.

### C. Factors complicating the planning processes

There are a number of primary factors which can make accurate predictions of remote de-icing operations more complex:

1. Taxiway layout – distance and taxiway route to/from the de-icing platform
2. Capacity of the de-icing platforms, aircraft throughput
3. Airport bottlenecks: gates, aprons, taxiways, runways or de-icing platforms
4. Number of de-icing companies
5. Availability of resources
6. Duration of de-icing times for each aircraft
7. Human factors and uncertainty
8. Weather (humidity, precipitation, temperature, etc.)
9. De-icing product holdover times

Secondary factors influencing the duration of de-icing operations and the remaining taxi time to the runway:

1. Wind direction during de-icing operations
2. Change of runway configuration and de-icing platform in use
3. Runway closures for snow/ice clearance

#### **D. Optimisation parameters**

In winter conditions, airport bottlenecks must be given priority in order to ensure the optimisation of operational throughput and to maximise available capacity. The usual problem areas are the de-icing throughput (EZCT), apron (TSAT) and runway (TTOT). Any departure management tool should be flexible in order to ensure optimisation of the relevant planning parameters, depending on the conditions at the airport at different times of the day, or under different conditions.

The parameters which place the most constraints on the planning process are:

1. HOT – holdover time
2. TOBT – target off-block time

The key parameters to be optimised are:

1. TSAT for apron optimisation
2. ECZT for remote de-icing optimisation
3. TTOT for runway optimisation

The main time factors influencing optimisation, owing to their uncertainty, are:

1. EDIT – estimated de-icing time (duration)
2. VTT – variable taxi time, or EXOT – estimated taxi-out time
  - a. VTT to platform before de-icing
  - b. VTT to runway after de-icing

The EDIT and VTT entail the greatest level of uncertainty. This uncertainty must be taken into account, because these time affect the reliability of the planning. The factors mentioned in section C have a major impact on the accuracy of these times.

Other relevant factors are based on the lay-out of and conditions at the airport:

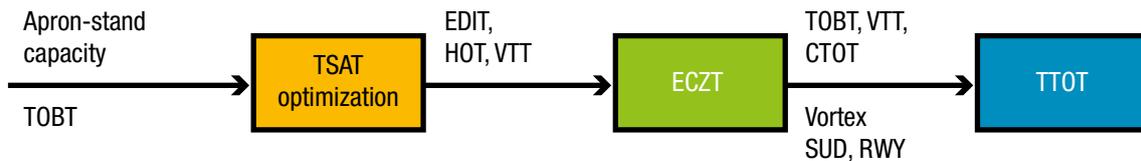
1. Runway capacity (throughput rate)
2. Taxiway capacity (throughput rate)
3. Stand/gate capacity (throughput rate)
4. Apron capacity (throughput rate)
5. De-icing platform capacity (throughput rate)

The available capacity or throughput rates are less dynamic parameters but can still fluctuate, for example when the runway capacity drops. Such drops in capacity of one or multiple resources will lead to new optimisation scenarios.

**E. Optimisation scenarios**

**Apron bottlenecks**

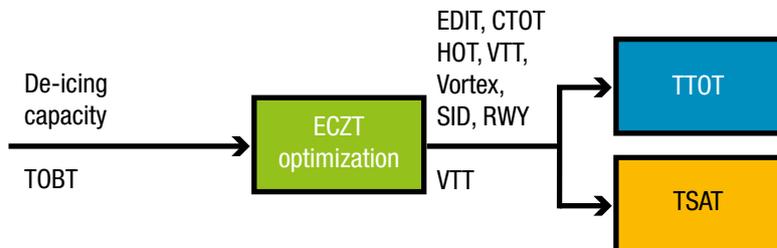
In the case of airports with limited numbers of aircraft parking stands, limited apron space, or a limited taxiway layout, apron optimisation will most probably be applied to the push-back planning, with forward calculation of variable taxi times, de-icing sequence and finally the take-off sequence planning. In this scenario, optimisation is prioritised on the TSAT, before calculation of the consequent start of de-icing (ECZT) and the TTOT. The TOBT and apron/stand capacity are the physical constraints to start from.



**Figure 3: TSAT optimisation priority – forward calculation**

**De-icing bottlenecks**

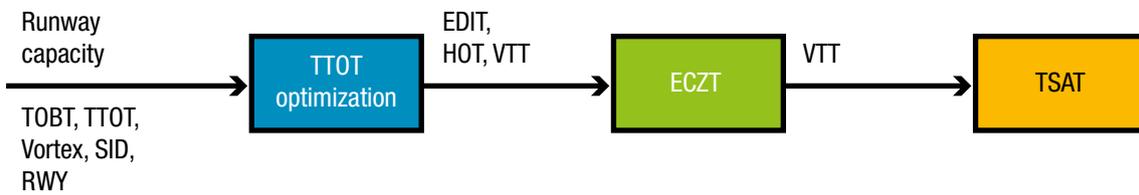
In the case of airports with limited resources or space for de-icing areas, as opposed to runway and stand capacity, airport optimisation changes during icing conditions because of this new bottleneck. In this scenario, de-icing sequence optimisation is prioritised on the ECZT, before calculation of the TSAT and TTOT. The TSAT is then calculated on the basis of the ECZT de-icing sequence planning. The TTOT is calculated on the basis of the VTT and EEZT. The TOBT and de-icing resources and platform capacity are the physical constraints to start from. This becomes more important during precipitation or in snow conditions when aircraft de-icing holdover times are seriously compromised.



**Figure 4: ECZT optimisation priority – forward and backward calculation**

### Runway bottleneck

In the case of airports with limited runway capacity, as opposed to de-icing and stand capacity, the airport optimisation changes to runway sequence planning before push-back planning and de-icing planning. This is the most complex form of planning, since it requires backward calculation with estimates and great uncertainty for taxi times and the de-icing operation affecting the accuracy of the planning. The VTT, HOT and EDIT are the main factors in determining the TSAT and ECZT given the TTOT sequence. The TOBT, runway capacity, and various runway factors such as SIDs, CTOTs and vortex then make the calculation complex.



**Figure 5: TTOT optimization priority – backward calculation**

TTOT optimisation is very uncertain since it lies further in the future, hence the term backward calculation, since the TSAT is derived from the TTOT and ECZT.

# ATTACHMENT 8

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