Network Manager

EUROCONTROL

Advanced ATC TWR Implementation Guide

Edition No.	:	1.900
Edition Issue Date	:	1 October 2023
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Reference	:	APT/USD/AdvAtcTwrImplGuide
Copy No.	:	← stamp here

Document Control

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Approval Table

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Document Identification

Full Title:	Advanced ATC TWR Implementation Guide
Total Number of Pages:	19

Edition History

Edition No.	Edition Issue Date	Author	Reason
1.200	19/03/2015	H. Koolen	Updates for NM Release 19.0
1.210	25/01/2016	H. Koolen	Updates for NM release 19.5
1.300	25/11/2016	H. Koolen	Updates for NM Releases 20.0 and 20.5
1.400	01/08/2017	H. Koolen	Mandatory SID provision
1.500	01/03/2019	H. Koolen	Editorial changes due to NM release 23.0
1.501	13/03/2019	H. Koolen	Editorial changes
1.600	01/07/2020	H. Koolen	Doc Ref change
1.700	01/06/2021	H. Koolen	Release updates for NM Rel 25.0
1.800	15/05/2022	H. Koolen	Release updates for NM Rel 26.0

1.900	01/10/2023	I. Suciu	Release updates for NM Rel 27.0

Review Table

Edition No.	Review type, scope, depth & focus	Reviewers	Date	Conclusion

System Release

System Release:	Edition No.:

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1 Introduction

1.1 Identification

(1) This document forms part of the "ETFMS" documentation.

(2) This document has a document reference of " APT/USD/AdvAtcTwrImplGuide ".

(3) This document has a Title of "Advanced ATC TWR Implementation Guide".

1.2 Purpose

(1) The purpose of this document is to describe the Advanced ATC TWR Airport concept for Airports that wish to explore the possibilities for integrating into the ATM network (NMOC) as an Advanced ATC TWR Airport.

(2) This document describes the concept, the benefits of becoming an Advanced ATC TWR, the pre-requisites and the global DPI interface. Furthermore, it compares Advanced ATC TWR Airports with A-CDM airports, it provides contact details and references to implementation status of other Advanced ATC TWR airports.

1.3 Scope

(1) The intended audience of this document is anybody who would like to know more about the integration of Airports into the ATM Network as Advanced ATC TWR Airports.

2 References

2.1 External

(1) This document makes reference to the following external documents, an external document being defined as a document not produced by the NMOC:

None

2.2 NMOC

(1) NMOC referenced documents **shall** take precedence over any referenced external documents wherever conflict arises between them. The following documents are referenced within this document:

(2) Doc Ref 1: Airport CDM manual – Edition 5.0, dated March 2017.

(3) Doc Ref 2: DPI Implementation Guide, ref APT/USD/DPI_Impl_Guide, edition 2.600, author Hans Koolen, Ioana Suciu, dated 01/10/2023

(4) Doc Ref 3: FUM Implementation Guide, ref APT/USD/FUM_Impl_Guide, edition 2.200, author Hans Koolen, dated 01/10/2023.

(5) Doc Ref 4: DPI and API Implementation RoadMap, ref APT/USD/ DPI_API_Impl_RM, Edition 2.400, author Hans Koolen, Tarja Kettunen, dated 01/10/2023.

3 Introduction

3.1 Objectives

(1) The purpose of the Advanced ATC TWR concept is to allow for a simple way of integration of airports into the ATM network.

(2) It could be used by e.g. small airports that have no plans to implement the Airport CDM process or as a first step towards a full Airport CDM implementation.

3.2 The situation today – the problem

(1) Before take-off the accuracy of the flight data available to the ATM network is based upon the EOBT from the ICAO flight plan and an average taxi-time available in NMOC systems.

(2) It is well known that EOBTs in flight plans are not always updated and that the taxi-time and run-way-in-use in NMOC systems are not always adjusted to the operational situation.

(3) This results in a reduced accuracy of traffic predictions for the network, especially during periods when operations are difficult at the airport of departure.

(4) Flights may suffer from CTOT updates after they started pushback or even taxiing and operations may be disturbed by flight plan updates after the flight has received its clearance.

(5) This may result in extra workload for the TWR controller and extra delays for Aircraft Operators.

3.3 Types of Airports

(1) Currently, the NMOC distinguishes 4 different classifications for the purpose of indicating the level of integration of the airports into the ATM network:

a) Advanced Network Integrated Airports (ANI)
b) CDM Airports
c) Advanced ATC TWR Airports
d) Standard Airports

(2) ANI Airports are airports that have implemented the Collaborative Decision Making process as it is specified in the Airport CDM Implementation Manual (see Doc ref 1) and provide the full set of DPI messages to NMOC.

In addition to the E-DPI, T-DPI-t, T-DPI-s, A-DPI and C-DPI, these airports also provide the P-DPI messages as an output of its Demand Capacity Balancing (DCB) process.

(3) CDM Airport are airports that have implemented the Collaborative Decision Making process as is specified in the Airport CDM Implementation Manual (see Doc ref 1) and provide the full set of DPI messages to NMOC.

(4) Advanced ATC TWR Airports are airports that have not implemented or not fully implemented the Airport CDM process but still would like to integrate into the ATM Network using a limited set of DPI messages.

(5) Standard Airports are not integrated into the network via the transmission of DPI messages to the NMOC.

(6) The provision of Flight Update Messages (FUM) by NMOC to the Airport is independent of this classification. FUM messages may be provided to any airport (of destination) on request.

4 Advanced ATC TWR Airport

4.1 What is it?

(1) The best way for an airport to integrate into the ATM Network is to implement the Airport Collaborative Decision Making (A-CDM) process as specified in the Airport CDM Implementation Manual (Doc ref 1).

(2) However, airports that have no plans to implement the A-CDM process but still wish to integrate into the ATM network may do so as an Advanced ATC TWR Airport. Such an Airport may provide a reduced set of DPI messages with a reduced set of advantages (compared to CDM Airports).

(3) An Advanced ATC TWR Airport provides Target Take-Off-Time (TTOT) estimations as well as Variable Taxi-Times (VTTs) and SIDs to the NMOC. These are provided from the moment that the aircraft leaves the blocks.

4.2 Benefits of becoming an Advanced ATC TWR

(1) The Benefits for an airport to become an Advanced ATC TWR Airport are:

- the CTOT is frozen at the moment the aircraft leaves the blocks
- IFPS no longer accepts flight plan updates (DLA, CHG) messages after the flight has left the blocks
- The TWR may benefit from extended Slot Tolerance Windows (STW) for flight that require de-icing.
- Flight Activation Monitoring (FAM) is based upon the Take-Off-Time received from the airport, which reduces the risk on FLS messages due to “not reported as airborne” in case the flight suffers from a longer ATC Ground delay.

(2) The Benefits for the ATM network are:

- improved Traffic predictability for FMPs in en-route ACCs,
- improved flight plan consistency
- improved situational awareness for AOs when the aircraft is at an outstation via CHMI, NOP portal and NMOC’s data distribution service
- improved estimated landing time estimates for Airports of Destination (ADES) via the NMOC’s data distribution service for airports (FUM message)

4.3 Pre-requisites for becoming an Advanced ATC TWR Airport

(1) In order to qualify for integration into the ATM network as an Advanced ATC TWR Airport the following must be available:

Variable Taxi-Time:
It shall be possible to automatically calculate the taxi-time for every flight. The taxi-time shall at least be dependent on the runway-in-use but preferably also on the stand or parking position.

It shall be possible to globally extend the taxi-time with a number of minutes to cover for operational circumstances (e.g. adverse conditions, closure of taxi-way, etc.) during which taxiing takes longer than normal.
The provided taxi-time shall have an accuracy of average 3min.

Actual Off-Block event:
The Actual Off-Block event shall be available for all flights. Preferably this event should be automatically detected (by e.g. A-SMGCS or Docking Guidance Systems). It would also be acceptable if this event is consistently recorded into the TWR system by controller input as long as it is part of the standard operational procedures.
The off-block event shall be available with an accuracy of +/-5 min.

Standard Instrument Departure:
The assigned SID shall be available for every flight.

Return-to-Stand:
In cases when aircraft has to return back to the stand (due e.g. a technical problem), it is important to inform the network. This information is required to re-enable the acceptance of flight plan updates (e.g. DLA message).
For this reason, the Return-to-Stand shall be input into the TWR system as part of the operational procedures.

Communication with NMOC operations:
The TWR shall be ready to accept calls/questions for individual flights from NMOC, e.g. if an AO wants to file a DLA message after the Airport has informed NMOC that the flight is taxiing.
Such calls will occur very infrequently but may be of great help in providing the best possible service to the Aircraft Operators.

Data Exchange with NMOC:
The airport, usually the ATC TWR system, shall be able to transmit and receive messages via the AFTN network. Alternatively DPI messages can be provided via B2B web services and also Estimated LanDing Times can be received via B2B web services.

(2) If possible the Advanced ATC TWR Airport could also provide the following information for the benefit of the ATM network and its users:

- the confirmed/verified Aircraft type and REGistration
- the Actual Off-Block Time (AOBT) and Date (AOBD)
- the information that the flight will be or has been de-iced

5 Becoming an Advanced ATC TWR Airport

5.1 DPI messages

(1) The integration of an Advanced ATC TWR Airport into the ATM Network actually takes place by the provision of Departure Planning Information (DPI) messages to the NMOC.

(2) There are several types of DPI messages and only CDM Airports provide the full set of DPI messages.

(3) Advanced ATC TWR Airports provide only the ATC-DPI message at the Actual Off-Block Event. Such a DPI message contains an accurate estimation of the taxi-time, the SID and the take-off time (TTOT).

(4) In case a flight returns back to the stand, a Cancel-DPI shall be sent.

(5) Further Implementation details of the DPI messages can be found in the DPI Implementation Guide (see Doc ref 2).

(6) Further implementation details of the FUM messages can be found in the FUM Implementation Guide (see Doc ref 3).

5.2 Implementation support

(1) The NMOC is ready to assist any airport that would like to explore the possibilities of integrating into the ATM Network as an Advanced ATC TWR Airport.

(2) The assistance consists of:

- explanation of the concept
- exploration of the possibilities of becoming an Advanced ATC TWR Airport
- discussing and agreeing the DPI message interface in detail
- agree the implementation planning
- organise & support the integration test phase
- put into operations

(3) For more information, please do not hesitate to contact one of the persons listed in Appendix B – Contact Information.

(4) The Implementation phases are described in detail in the DPI and FUM Implementation Roadmap document (see Doc ref 4)

5.3 How to become an Advanced ATC TWR Airport?

(1) In order to explore the possibilities of integrating into the ATM Network as an Advanced ATC TWR Airport, please contact one of the contact persons as described in Appendix B – Contact information.

5.4 What is the Impact on Operations at the Airport?

(1) Normally there will be no impact on operations at the airport after the DPI message from an Advanced ATC TWR are put into operations by NMOC. The DPI messages will normally be triggered based upon already existing operational procedures.

(2) There are however a few issues to be aware of:

- The AO and Handling Agent shall possibly adjust their working practices for filing DLA or CHG messages. These shall always be filed before the off-block event.
- A return-to-stand may possibly result in an ATFM suspension (FLS message), in order to trigger the AO to update the flight plan.

(3) As part of the preparations for implementation, the data exchange between NMOC and TWR at the airports will most probably have to be recorded in the AIP. This is to make AOs aware of the above mentioned requirements.

6 SESAR reference

(1) The Advanced ATC TWR Concept has been successfully trialled as part of the SESAR project “P12.04.01 – Baseline for Controller Tools”.

(2) The following is an abstract of the report:

> “This document provides the Validation Report for the set of exercises conducted under Single European Sky ATM Research Programme (SESAR) P12.04.01, within the Operational Focus Area “Airport Operation Planning and CDM”. The Service addressed is DCB-0304 “Airport CDM extended to Regional Airports”, and the exercises examined the use of a simple Airport Departure Data Entry Panel (ADDEP) at airports that are not equipped with advanced electronic flight strip capabilities. Two exercises were conducted in a live environment - using Southampton Airport in the UK. These assessed the feasibility of providing simple and low cost ADDEP panels, at smaller airports, and if it would improve the availability and accuracy of departure information provisions for wider stakeholders and result in benefits for network management and traffic load prediction.
> The conclusions reached were that: the ADDEP provision and connectivity is indicated as feasible; and that predicted network management and traffic load prediction benefit expectations were indicated as valid”

(3) Please refer to the project’s close-out report for more details.

7 Advanced ATC TWR Airport versus CDM Airport

7.1 Integration of CDM Airports

(1) As described before, the preferred way from an NMOC perspective for integration of an Airport into the Network is the implementation of the complete Airport CDM process as described in the Airport CDM Implementation Manual (see Doc ref 1).

(2) A full Airport CDM implementation, first of all improves the efficiency of the turn-around process locally at the airport. This is achieved by updating and sharing relevant flight details between the Airport Slot Coordinator, Handling Agents, Airport (e.g. stand allocations) and ATC-TWR.

(3) The A-CDM process results in having more accurate estimates of Off-block times and take-off times that are shared with the Network (NMOC) and which result in an improved view on the expected traffic for the network and all its users.

(4) The Airport CDM process starts approximately 3hrs before off-block and ends at take-off which is also the time frame during which the data exchange between the CDM Airport and NMOC takes place.

7.2 Integration of Advanced ATC TWR Airports

(1) The integration of an airport into the ATM network as an Advanced ATC TWR Airport is mainly done by an information exchange between TWR and NMOC.

(2) It is based upon operational procedures, systems and data elements that are used by ATC TWR.

(3) The availability of variable taxi-time estimations and accurate recording of the off-block event, which are shared with the ATM network, result in an improved view on the expected traffic for the network and all its users.

(4) It starts at push-back (approval) and ends at take-off.

7.3 Detailed Comparison

(1) Please refer to Appendix C – A-CDM ← → Advanced ATC TWR for a detailed comparison of the two ways of integrating into the ATM network.

APPENDIX A: Acronyms and Abbreviations

The following are the definitions of the Acronyms and Abbreviations that are particular to this document and not of a more general nature:

A

AA	ATC Activated (airborne)
Airport CDM	Airport CDM (CDM airport)
ACC	Area Control Center
ADEP	Aerodrome of Departure
ADES	Aerodrome of Destination
AFTN	Aeronautical Fixed Telecommunication Network
AIP	Aeronautical Information Publication
ANI	Advanced Network Integrated (airport)
ANSP	Air Navigation Service Provider
AO	Aircraft Operator
AOBT	Actual Off-Block Time
ARCID	Aircraft Identification
ARCTYP	Aircraft Type (ADEXP)
ATC	Air Traffic Control
ATFCM	Air Traffic Flow and Capacity Management
ATO	Actual Time Over

B, C

CDM	Collaborative Decision Making
CFMU	Central Flow Management Unit
COBT	Computed Off-Block Time (CTOT – TaxiTime)
CPR	Correlated Position Report (surveillance data report)
CTOT	Calculated Take-Off Time

D

DEP	Departure Message
DES	De-suspension (message)
DPI	Departure Planning Information
DTW	Departure Tolerance Window

E

ECAC	European Civil Aviation Conference
EDIT	Estimated De-Icing Time
EFD	ETFMS Flight Data (message)
ELDT	Estimated LanDing Time
ENV	ENVironment
EOBD	Estimated Off-Block Date (off block date provided by IFPS)
EOBT	Estimated Off-Block Time (off block time provided by IFPS)
ETFMS	Enhanced Tactical Flow Management System

ETO	Estimated Time Overhead
ETOT	Estimated Take-Off Time
EXIT	Estimated taxi-In Time
EXOT	Estimated taxi-Out Time

F

FAM	Flight Activation Monitoring
FCM	Flight Confirmation Message
FMP	Flow Management Position
FPL	Flight Plan Message (ICAO format)
FS	Filed Slot Allocated
FSA	First System Activation (flight plan activation message)
FUM	Flight Update Message

G, H

I

IFPLID	Initial Flight Plan Identification

K, L, M

MDI	Minimum Departure Interval

N

NA	Not applicable
NM	Network Manager
NMOC	Network Manager Operations Centre

O

OAT	Operational Air Traffic

P, Q

R

REA	REAdy (message)
RFI	Ready For Improvement
REG	aircraft REGistration

S

SI	Slot Issued
SID	Standard Instrument Departure
SOBT	Scheduled Off Block Time
STAR	Standard Arrival Route
STW	Slot Tolerance Window

T

TOBT	Target Off-Block Time (from AO/Handler)
TSAT	Target Start-up Approval Time
TWR	Tower

U, V, W, X, Y, Z

APPENDIX B: Contact Information

For information, on the process and the requirements to integrate an Airport into the ATM Network, please do not hesitate to contact:

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APPENDIX C: A-CDM ← → Advanced ATC TWR

How to compare the operational benefits between DPI messages from Airport CDM systems and Advanced ATC Tower systems?

Benefit	CDM Airport	Advanced ATC TWR[1]	Achieved via…
Increased efficiency of the turn-around process, including reduction in full-burn, optimization of gate-allocations and efficient use of resources.	Y	N	…local CDM implementation, i.e. NOT via DPI transmission.
Identification of ghost flight plans and increased network predictability at a very early stage (EOBT-3hrs)	Y	N	…the Early DPI message.
Adjustment of CTOT to local taxi-time, dependent on gate/stand due to the availability of a variable taxi-time for each flight	Y	N	…the inclusion of taxi-time in the E-DPI, T-DPI-t, T-DPI-s messages
Adjustment of the CTOT to the local take-of time available from the Airline Operator/Ground Handler (TOBT+ variable taxi-time)	Y	N	…the provision of the TTOT in the T-DPI-t message.
Easier update of the off-block time for the Airline Operator/Ground Handler through provision of the target take-of time (TTOT) based upon the TOBT.	Y	N	…the provision of the TTOT in the T-DPI-t message.
Refinement and provision of the TTOT based on the pre-departure sequence (TSAT). This is to the benefit of Airline Operators and Tower because it may alleviate the need for transmission of DLA (Delay Message) by Tower on behalf of the Airline Operator.	Y	N	…the provision of the TTOT in the T-DPI-s message.
Adjustment of the CTOT to the local available TTOT from the pre-departure sequence (TSAT+ variable taxi-time)	Y	N	…the provision of a TTOT in the T-DPI-s message.
Early provision of REAdy status	Y	N	…the provision of a valid T-DPI-s msg.

[1] Note that Advanced ATC/TWR systems are allowed to only send the ATC-DPI message sub-type.

Improved adherence to ATFM Slots due to provision of local take-of times and taxi-times	Y	N	…the provision of E-DPI, T-DPI-t and T-DPI-s messages.
Reduction of ATFM delay	Y	N	…the provision of T-DPI-t and T-DPI-s messages.
Improved handling of flights during adverse weather conditions	Y	N	…the inclusion of the de-icing flag in the T-DPI-t and T-DPI-s messages and by inclusion of the de-icing time in the taxi-time.
Increased traffic predictability for the network, starting from 3 hrs before off-block onwards	Y	N	…the provision of E-DPI, T-DPI-t and T-DPI-s messages.
Increased traffic predictability for the network, starting from the actual-off-block event onwards	Y	Y	…the provision of the TTOT in the ATC-DPI message.
Freeze the CTOT at the actual off-block event	Y	Y	…the provision of the ATC-DPI msg.
Freeze the flight plan at the actual off-block event	Y	Y	…the provision of the ATC-DPI msg.

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