Concept of Operation

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Abstract

One of the principal features of both DMEAN and the SESAR Concept of Operations as defined in the Definition Phase Deliverable D3 is the "Integrated Airport Operations contributing to Capacity Gains". Many airports within Europe are not equipped with advanced Electronic Flight Data Systems (eFDPS) as they lack a suitable business case for such an investment and thus their integration into the ATM network is often limited to the receipt of AFTN messages and the reliance on the confirmation of an aircraft's departure time, as compared to its EOBT, by the ACC's departure monitoring of the flight as it enters radar coverage. Whilst there is a high level of accuracy for the occupancy time within a sector for aircraft that have travelled some distance, the accuracy is far less for those aircraft about to depart from local airfields. This inaccuracy reduces the effectiveness of existing demand capacity balancing techniques used by both CFMU and the Local ACC.

This document describes the concept of operation for a low cost and simple departure data entry panel to be deployed at airfields enabling them to be in electronic communication with CFMU concerning the departure status of aircraft under their control. The universal availability of more accurate departure data will significantly improve the performance of network management improving capacity through the better use of the existing controller staff compliment.

This update is the final release ahead of project closure. It now includes the High Level Operational Requirements used for the project activity.

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Executive summary

One of the principal features of both DMEAN and the SESAR Concept of Operations as defined in the Definition Phase Deliverable D3 is the “Integrated Airport Operations contributing to Capacity Gains”. Many airports within Europe are not equipped with advanced Electronic Flight Data Systems (eFDPS) as they lack a suitable business case for such an investment and thus their integration into the ATM network is often limited to the receipt of AFTN messages and the reliance on the confirmation of an aircraft’s departure time, as compared to its EOBT, by the ACC’s departure monitoring of the flight as it enters radar coverage. Whilst there is a high level of accuracy for the occupancy time within a sector for aircraft that have travelled some distance, the accuracy is far less for those aircraft about to depart from local airfields. This inaccuracy reduces the effectiveness of existing demand capacity balancing techniques used by both CFMU and the Local ACC.

This document describes the concept of operation for a low cost and simple departure data entry panel to be deployed at airfields enabling them to be in electronic communication with CFMU concerning the departure status of aircraft under their control. The universal availability of more accurate departure data will significantly improve the performance of network management improving capacity through the better use of the existing controller staff compliment.

The concept of operations was developed through interviews with network experts within NATS and reviewed by operational staff or their representatives in NATS Services Ltd - the airport ATC services company within the NATS Group.

This update is the final release ahead of project closure, and now includes the High Level Operational Requirements used for the project validation activity.

1 Introduction

1.1 Purpose of the document

This document describes the concept of operation for an Airport Departure Data Entry Panel (ADDEP) that may be deployed at airfields within Europe so as to improve the availability of aircraft pre-departure information to the ATM Network. The first section describes the problem to be overcome. Later sections describe the benefits of improved accuracy to the network both in terms of performance and on the safety of the operation; the high level requirements for the tool in the tower and the stake holder's expectations.

This document was added, as a deliverable, during 12.4.1 project execution. This was in order to document indication of the operational basis used for the 12.4.1 development – as, at that time, no operational project had indicated as expecting to able to provide this within the 12.4.1 development time scale. This document is not intended to be, or to replace, an OSED. However, the content provided here is may be used as a basis for subsequent incorporation into the relevant operational thread items.

1.2 Intended readership

The intended readership of this document are the users of the ADDEP, Network Operations Staff and industry suppliers in order to provide an overview of the request features and the intended operational use and benefits of the panel.

1.3 Background

It has long been recognised that the better integration of airports into the ATM business would be beneficial and the SESAR Concept of Operations as described in Reference 1 recognises this and describes this integration as one of its principal features. The larger airports in Europe can already be described as integrated into the network as they are equipped with advanced automation capabilities using electronic flight data to manage their day to day operations. The availability of accurate data concerning the departure status of an aircraft can easily be shared with CFMU and other stake holders and these systems often for the basis of comprehensive collaborative decision making arrangements.

However, smaller airfields often do not have the financial capability for investing in such electronic flight data systems and are sometimes limited to only paper based tools and as such the inaccuracy of departure information available to the Network can have a significant affect, especially if their departing aircraft enters complex TMA or En-route airspace almost immediately due to the airport's location.

The CFMU at Eurocontrol has undertaken significant work on the use of Departure Planning Information (DPI) [2] messages in order to improve the accuracy of data within the network. This document should be considered in compliance and support of this work, aiming to extend the availability of these messages from a larger population of airfields within Europe.

1.4 Acronyms and Terminology

Term	Definition
ATM:	Air Traffic Management
ACC	Area control Centre
ADDEP	Airport Departure Data Entry Panel
AFTN	Aeronautical Fixed Telephone Network
ATC	Air Traffic Control
ATOT	Actual Take Off Time
CFMU	Central Flow Management Unit
DMEAN	Dynamic Management of European Airspace Network
DPI	Departure Planning Information
E-ATMS	European Air Traffic Management System
EOBT	Estimated Off Block Time
EXIT	Estimated Taxi In Time
IFPS	Integrated Initial ATC Flight Plan Processing system
SESAR	Single European Sky ATM Research Programme
SESAR Programme	The programme which defines the Research and Development activities and Projects for the SJU.
SJU	SESAR Joint Undertaking (Agency of the European Commission)
SJU Work Programme	The programme which addresses all activities of the SESAR Joint Undertaking Agency.
TMA	Terminal Manoeuvring Area
TTOT	Target Take Off Time

2 Concept of Operation

2.1 Description of Problem

The SESAR Concept of Operation recognises that in the development of a performance based approach to the delivery of better ATM within Europe the importance of all partners sharing the same information about aircraft, mainly the trajectory. Timely and accurate information, widely shared amongst all partners in the ATM business, allows for better collaborative decision making, network and operational management. The integration of airports, of whatever size, into the network is critical if accurate information is to be available concerning departures for those operating services at airports or about the departure status of an aircraft to the rest of the network. Data currently used in Air Traffic Flow and Capacity Management (ATFCM) is not always the most accurate. At both a network level and within an ACC, data concerning aircraft already flying within or en-route to a control centre's area of responsibility is known with a high degree of accuracy due to confirmation through the use of surveillance data; whereas for aircraft departing in the area the data is far less certain. Flight plans need to be filed, as a minimum, three hours in advance giving details of the Estimated Off Block Time (EOBT) based upon the operator's scheduled departure time. Depending on circumstances, the difference between the estimated and actual time the aircraft departs can vary by 15 minutes either way. This leads to a considerable degree of inaccuracy of the data within the network. The situation is improved at airports that are equipped with advanced automation tools using electronic flight strips. As the turnaround of the aircraft progresses, these automated tools can provide more accurate DPI messages to CFMU. For airports not equipped with such tools, the earliest that the regional ACC is aware of the impending departure is when the airport's tower requests a clearance and, often, for the actual departure time, when the aircraft enters the Centre's radar coverage activating its flight plan.

This level of uncertainty about departures makes it difficult to judge when a regulation needs to be applied and erring on caution when they need to be applied some two hours in advance, regulations are often applied unnecessarily. It can also impact on sector management, leading to sectors being split for longer that necessary resulting in an inefficient use of the operations room resources, or worse an unexpected overload for a sector leading to a possible safety event.

The premise behind this concept of operation is that if airports are provided with a low cost Departure Data Entry Panel that is easy to use and has a minimal impact upon the operator's work load in the tower, but has the capability to provide accurate electronic pre-departure information to the CFMU then there would be benefit to the efficiency of the network and safety in the operation.

Furthermore, populating the display by taking the list of departures directly from IFPS, the facility creates the opportunity to more directly integrate airport operations into the ATM Business and by knowing in advance of an aircraft's movements, Air Traffic Control becomes Air Traffic Management.

2.1.1 Benefits

The following is a brief list of benefits:

- Better predictability within CFMU systems for demand on a sector leading to:
    - Better decision making concerning when to open or close a sector,
    - Less use of unnecessary regulations,
    - Better use of staff within the control room reducing the need for further controllers due to traffic growth,
    - Help prevent overloads as sudden increases in demand will be rare, and
- Integration of Airports into the ATM business opens up the opportunity for further collaborative decision making by interested parties.

2.2 Concept of Operation

The following concept descriptions are based upon operations within an ATC tower at an airport with one or more runways but not equipped with any form of automated electronic flight data system. The airport is likely to support both commercial air transport aircraft (passenger and cargo) and business aviation with most of the traffic entering controlled airspace on departure.

2.2.1 Operations without the Airport Departure Data Entry Panel

The ATC operator within the tower will be provided with departure details of an aircraft four hours in advance through receipt from IFPS or the ACC of the flight plan pre-departure details submitted by the aircraft operator. The flight details will include call sign, destination aerodrome and EOBT amongst other information.

Following boarding of the aircraft and closure of the aircraft doors the pilot will request approval to start up from the Tower ATC; at some airports ATC will subsequently request a departure clearance for the aircraft from the local ACC, while at others this is not needed because of local agreements allowing “free flow departures” on some or all routes. Following receipt of the departure clearance, the Tower ATC will issue start up approval to the pilot at which point the pilot is able to request push back then taxi clearance to the runway holding point. (The pushback clearance must be requested within ±15 minutes of the EOBT, or else the flight plan must be revised.)

On arrival at the departure point for the runway the Pilot will request clearances to line up on the runway and to depart.

On departing the airfield, the aircraft will enter radar coverage of the ACC and the ATC system may recognise the departure through correlation of the SSR code against the flight plan.

2.2.2 Operations with the Airport Departure Data Entry Panel

The Tower ATC operations staff will be provided with a touch sensitive display screen to communicate pre-departure information directly to CFMU.

As in the case of operating without the entry panel, the ATC operator within the tower will be provided with departure details of an aircraft three hours in advance through receipt from IFPS or the ACC of the flight plan pre-departure details submitted by the aircraft operator. The details of each flight will be displayed within a “flight strip” and these will be organised into separate “bays”, each covering a separate state for the aircraft from “Departure” to “Taxing” to “Cleared for Take Off”. The flight details will include call sign, destination aerodrome and EOBT amongst other information. In this case however, the flight details for the aircraft will also be displayed on the ADDEP within the departure bay.

Following boarding of the aircraft and closure of the aircraft doors the pilot will request approval to start up from the Tower ATC; ATC will subsequently request a departure clearance for the aircraft from the local ACC. Following receipt of the departure clearance, the Tower ATC will issue start up approval to the pilot at which point the pilot is able to request push back then taxi clearance to the runway holding point. At this point the Tower ATC operator will push the “Push Back” button on the ADDEP; this action will initiate the sending of a DPI message to CFMU containing the Target Take Off Time (TTOT) and calculated by summing the Actual Off Block Time (AOBT), in this case the time that the “Push Back” button was pressed, and the standard taxi out time (EXOT) for the airfield. The “flight Strip” on the ADDEP will then move from the Departure Bay to the Taxiing Bay.

The Aircraft will then taxi to the departure point for the runway.

On arrival at the departure point for the runway the Pilot will request clearance to depart. When appropriate the Tower ATC will give the pilot clearance to take off. At this stage the Tower ATC

operator will push the “Cleared for Take Off” button on the ADDEP; this action will initiate the sending of a further DPI message to the CFMU informing both the network managers and ACC of the aircraft’s impending departure.

If at any time during taxing or after it has been cleared for take off the Aircraft needs to either return to the stand or remain on the taxiway, the Tower ATC operator will be able to push the appropriate “Cancel Button”- this will initiate the sending of a Cancel DPI message to CFMU. The Flight Strip for this aircraft will then be returned to the previous bay and depending upon the reason for the aircraft’s return, the Aircraft Operator will either need to send a Delay Message to CFMU or cancel the original Flight Plan by sending a Cancel Message and then file a new flight plan. In the former case the pilot may re-request “Push Back if the problem is resolved. However, if the original Flight Plan is cancelled then the original Flight Strip will be removed from the Departure Bay on receipt of the cancel message from CFMU. A new Flight Strip will be displayed following the successful filing of a new flight plan.

On departing the airfield, the aircraft will enter radar coverage of the ACC and the ATC system may recognise the departure through correlation of the SSR code against the flight plan.

After a predetermined time, the display screen will stop displaying the Flight Data concerning the departed flight; however a facility will be made available to retrieve the data if necessary.

2.3 High Level Operational Requirements

Due to the initial, and ongoing, lack of any specific requirement from a related SESAR Operational Project, the following were assumed and used as the basis for the project 12.4.1 work and validation during 2010 and 2011.

Identifier	REQ-12.04.01-OSED-HLOR.0001
Requirement	The controller workload shall remain stable or possibly decrease

<APPLIES_TO>	<Operational Focus Area>	OFA06.01.01	N/A
Identifier	REQ-12.04.01-OSED-HLOR.0002		
Requirement	The controller focus of attention shall remain unchanged		
	Controller Focus of Attention		

<APPLIES_TO>	<Operational Focus Area>	OFA06.01.01	N/A
Identifier	REQ-12.04.01-OSED-HLOR.0003		
Requirement	The accuracy of departure data the Network Manager receives from regional/small airports shall improve		

<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0010	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0026	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0052	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA06.01.01	N/A

3 References

[1] The ATM Target Concept D3, DLM-0612-001-02-00, September 2007

[2] DPI Implementation Guide, 1.4 , 2010-01-05

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