Final Project Report

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Abstract

The SESAR Step 1 Airport User Driven Prioritization Process is a collaborative decision-making concept primarily used in a situation of constrained airport capacity and to handle Airspace Users' requests for prioritization of flights as an input to the airport's departure sequencing processes, according to their business interests in the planning and execution timeframes.

Project 12.06.08 main objective was to define the technical specifications for the development and verification of an Airport UDPP tool integrated with pre-industrial prototypes supplied by other Airport Systems projects, namely the Airport Operations Plan (AOP) and Runway Manager (RMAN) supporting the V3 validation exercise regarding Airport Demand and Capacity Balancing concept.

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Rational for rejection
None.

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00.01.00	18/03/2016	Final		Final document delivered
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00.01.03	27/05/2016	Final		Final document after SJU comments during the closure Gate

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Acronyms

Acronym	Definition
A-DCB	Airport Demand and Capacity Balancing
AMAN	Arrival Manager
A-UDPP	Airport User Driven Prioritization Process
AOP	Airport Operations Plan
APOC	Airport Operations Centre
AUs	Airspace Users
ATM	Air Traffic Management
BPFS	Best Planned First Served
CAST	Airport Terminal Simulator
CDM	Collaborative Decision Making
DCB	Demand and Capacity Balancing
DFlex	Departure Flexibility (UDPP tool)
DMAN	Departure Manager
FOBT	Forecasted Off Block Time
FOC	Flight Operations Centre
FPFS	First Planned First Served
FSFS	First Scheduled First Served
FTOT	Forecasted Take Off Time
OFA	Operational Focus Area
OSED	Operational Service and Environment Definition
RMAN	Runway Manager
SESAR	Single European Sky ATM Research
SJU	SESAR Joint Undertaking
TOBT	Target Off Block Time
TTOT	Target Take Off Time

UDPP	User Driven Prioritization Process

1 Project Overview

The main objective of the Primary Project P12.06.08 "Introduction of the UDPP and collaborative departure sequence" was to define the technical specifications needed for the development and verification of a prototype enabling Airspace Users (AUs) to communicate their flight priorities to the integrated Airport Runway Demand and Capacity Balancing process developed in the Operational Focus Area OFA05.01.01 (Airport Operations Management), while adhering to the requirements defined in the User Driven Prioritization Process (UDPP) concept developed separately in OFA05.03.06 (as detailed in the UDPP OSED Interim Step 1 V3 document [9]).

1.1 Project progress and contribution to the Master Plan

Project 12.06.08 has been focused on the definition of technical requirements for the development of Demand and Capacity Balancing (DCB) Monitoring Tools used in the Airport Operations Centre (APOC), which combine capacity constraints detected at the airport with the principles and rules defined in the User Driven Prioritization Process (UDPP) concept for flight prioritization.

The lifecycle of the project has been based in a typical Top-Down V-model in one phase, starting with the definition of the technical specifications according to the related operational requirements and following with the prototype development and verification before the validation.

The final schedule was compressed using the Fast Tracking management technique, doing in parallel critical path activities to fulfil project milestones without changing scope. There was also necessary to use the Crashing technique by adding extra resources during the last year.

The project was closely involved in the definition of the V3 validation exercise regarding Airport DCB to clarify the scope and responsibility of the prototype in the exercise, analysing the relationships with other involved prototypes and the simulation platform itself.

The technical specifications were aligned to support the validation exercise and the prototype was integrated with AOP and RMAN prototypes in the simulation environment.

At the end of January 2016 the prototype was successfully used during the execution of a V3 Validation Exercise at AT-One's premises in Braunschweig, Germany.

The project was responsible for the following Enablers referenced in the Integrated Roadmap Dataset DS14 [10] and it contributed to the maturity of the related Operational Improvements through the definition of the technical specifications, development of the prototype and consecutive validation exercise:

EN Code	Name	Project contribution	Maturity at project start	Maturity at project end
AIRPORT-05	Airport UDPP integrated with AOP Monitoring	Contribution to the Operational Improvement AO-0804 (Collaborative Airport Performance Management). Definition of the technical specifications and development of the system interfaces with the Airport Operational Plan prototype to receive relevant flight information (included original Runway Manager forecasted departure sequences) and send back the result of the	TRL3	TRL6

		changes proposed by the Airspace Users during the UDPP process according with their preferences and needs. This is part of the Decision Support tools and procedures that facilitate the collaborative decision making involving all airport stakeholders.		
AIRPORT-06	UDPP Departure on A-CDM Airport system	Contribution to the Operational Improvements AO-0813 (Enhanced Collaborative Airport Performance Management) and AUO-0103 (UDPP-Departure). Definition of the technical specifications and development of the algorithms allowing operational stakeholders representing Airspace Users to change the priority order of their flights in the Airport DCB time horizon, taken as reference the original forecasted departure sequence calculated by the Runway Manager and integrated in the Airport Operational Plan as part of the collaborative decision making process included in the APOC.	TRL3	TRL6

Taking into account the Operational Improvements supported, the technical specifications document developed by the project contributed to the SESAR Solution #21 'Airport Operations Plan and AOP-NOP Seamless Integration'.

1.2 Project achievements

In order to fulfil the project objectives, the definition and implementation of the Airport UDPP tool has been based on the definition and development of algorithms able to modify the original DCB forecasted departure sequence according with the rules and principles defined for UDPP.

It is important to note that the Airport UDPP tool was designed from a 'what-if' perspective, i.e. all changes made by Airspace Users for flights managed by the prototype are not integrated in the Airport Operations Plan (AOP) until they are accepted by all involved stakeholders as the result of a collaborative decision-making process. In particular, decisions regarding flight cancellations must be able to be performed by Airspace Users in their own systems (FOCs). The Airport UDPP tool shows the predicted results of these choices, but isn't responsible for such cancellations.

Therefore, the technical specification carried out by the project included supports functions as the following:

- Alerts calculation to indicate any unexpected behaviour or data incoherence;
- Audit Trail allowing a Post Analysis of the actions taken and the results.

The validation activities supported by the project is expected to prove that Airspace Users have the potential to prioritize flights (as part of an integrated Airport DCB process) without negatively influencing the airport's capacity and performance (the relevant Validation Report is in the process of being produced at the time of writing).

1.3 Project Deliverables

The following table presents the relevant deliverables that have been produced by the project.

Reference	Title	Description
D19	Final Technical Specification	This document describes the Final Technical Specifications and requirements for developing the Airport UDPP tool (A-UDPP), referred to as UDPP – Departure in the P07.06.04 UDPP OSED Interim Step 1 V3 [9], in support of the pre-industrial prototypes AOP and RMAN used during the validation exercise EXE-06.03.01-VP-010. The sub-systems interacting with A-UDPP are also identified in the document, with particular emphasis on the Functional Block structure used in SESAR. This document is the result of the review of deliverable D02 (Technical Specifications) once all the supported Validation Exercises were completed.

1.4 Contribution to Standardisation

Along the lifecycle of the project, no standardisation activity related to the UDPP concept in the scope of the project has been identified.

1.5 Project Conclusion and Recommendations

Airport UDPP is an enhancement of the Airport-CDM process, where all stakeholders contribute to the decision-making process which ultimately produces a flight departure sequence taking into account the business interests of Airspace Users and without a negative impact on airport performance.

The A-UDPP Tool developed in P12.06.08 allows Airspace Users to propose the priority of their flights within the Airport-DCB time horizon (several hours before departure). This is a clear advantage compared with other Airport UDPP Step 1 tools (e.g. DFlex) where only flights in the pre-departure sequence are included (commonly only two hours before departure).

Airspace Users receive the maximum benefit of Airport UDPP when the departure sequencing process is based on the 'First-Scheduled, First Served' (FSFS) principle. When it is based on the 'First Planned First Served' (FPFS) principle or based on the 'Best Planned First Served' (BPFS) principle, the Airport UDPP will ultimately provide less benefit.

The resulting prototype is not currently being used in a live airport environment, but there is an opportunity in the SESAR 2020 Programme (expected in project PJ07) to continue evolving the UDPP concept and to consolidate it as part of airport operations in collaboration with the Network Dynamic DCB process and Airspace Users' interests. Future research and development work should include the improvement of UDPP tools according with the evolution of the UDPP concept:

- Including UDPP processes as an integrated part of the Airport DCB process, adding its principles and rules to the current constraints and requirements to determine flight distribution over runways and forecasted (arrival/departure) sequences;

- Expanding UDPP for arrival flight management;
- Developing a UDPP Step 2 prioritisation scheme, allowing anticipative mitigation strategies to be proposed by Airspace Users as early as possible in the pre-tactical phase;
- Using SWIM services for the integration of the involved systems;
- Integrating Network Dynamic DCB and Airspace User FOCs to achieve a full UDPP process; and
- Involving sequencing tools (AMAN/DMAN) to close the loop and validate the feasibility of the UDPP results as an input to the Final Arrival/Departure Sequences.

2 References

[1] SESAR Programme Management Plan, Edition 03.00.01

[2] European ATM Master Plan

[3] Multilateral Framework Agreement (“MFA”) signed between the SJU, EUROCONTROL and its 15 selected members on August 11, 2009, amended on 14 June 2010, 19 October 2010 and 2 July 2012

[4] Introduction of the UDPP and collaborative departure sequence, Technical Specification, D02, 00.01.00, 07/08/2015

[5] Introduction of the UDPP and collaborative departure sequence, Verification Plan, D11, 00.01.00, 09/11/2015

[6] Introduction of the UDPP and collaborative departure sequence, Prototype Availability Note, D09, 00.01.00, 20/11/2015

[7] Introduction of the UDPP and collaborative departure sequence, Verification Report, D15, 00.01.00, 10/12/2015

[8] Introduction of the UDPP and collaborative departure sequence, Final Technical Specification, D19, 00.01.00, 18/03/2016

[9] UDPP, UDPP OSED Interim Step 1 V3, D32, 00.01.03, 25/09/2013

[10] WPB.01 Integrated Roadmap - DS14 Release Note, D82, 00.01.00, 01/07/2015

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