Final Project Report

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Abstract

The role of Project 12.01.07, as system federating project for the airport domain, was to develop and maintain the system architecture for the airport domain systems in accordance with the integrated roadmap / master plan. The main goal was to support the development of technical specifications and prototypes to meet the operational needs in a consistent manner within the airport domain and with respect to the overall system of system architecture. In order to develop and maintain the airport architecture, the Project also contributed to the definition of the system enablers of integrated roadmap and to the development of the European ATM Architecture (EATMA) for the airport domain.

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Acronyms

Acronym	Definition
ADD	Architecture Description Document
AMAN	Arrival Manager
ATC	Air Traffic Control
ATM	Air Traffic Management
DMAN	Departure Manager
DS	Data Set
EATMA	European ATM Architecture
EN	Enabler
OI	Operational Improvement
FB	Functional Block
SESAR	Single European Sky ATM Research
SPP	System Primary Project
SJU	Sesar Joint Undertaking
TAD	Technical Architecture Description
TS	Technical Specification

1 Project Overview

Project 12.01.07, as system federating project of the airport domain, was responsible for producing the airport domain systems architecture. The systems identified in the airport domain are the following ones: Aerodrome ATC, Airport Airside Operations, Airport Operations Centre and Sequence Management. The project was responsible for managing the definition and planning of airport system enablers (EN), contributing to system engineering tasks such as reviewing deliverables and participation in release reviews, all in coordination with the system primary projects (SPP) within the domain and with the other federating and transversal projects as necessary.

1.1 Project progress and contribution to the Master Plan

The 12.01.07 project contributed to the maintenance of the integrated roadmap in coordination with system primary projects within the airport domain and with B.04.03 project. In particular, for each Data Set developed in the context of the European ATM Master Plan, the 12.01.07 project played an active role in the definition and update of system enablers to reflect operational improvements update. The coordination with SPP has been focused on the definition of the single EN while the coordination with B.4.3 has been devoted to check how that single building block fits within the overall technical change expected to meet the corresponding operational need expressed in terms of Operational Improvement (OI).

Furthermore, the 12.01.07 project also provided analysis of the requirements allocation to Functional Blocks (FBs) with gaps, coverage and overlaps identification. Project 12.01.07, in fact, reviewed all the Technical Specifications (TSs) from SPPs in order to raise any issue coming from inconsistencies, overlaps or conflicts among technical requirements produced by different SPPs. This analysis together with the ones performed for validation exercises resulted in the update of existing system ENs or the creation of new ones.

Among the 12.01.07 responsibilities within the Data Set (DS) campaigns the following actions are to mention:

•   Definition of new Enabler (title, description, V3 date, links with OIs, FBs, SPPs)

•   Update of existing Enabler in response to changes on operational and/or technical side

The 12.01.07 project worked, in particular, on enablers impacting airport systems such as the system enablers with code AERODROME-ATC-XX and AIRPORT-XX. For the SWIM and the METEO information exchanges, 12.01.07 also worked on some METEO-XX and SWIM-APS-XX enablers. The project contributed to the delivery of all the DS produced in SESAR programme up to the last one delivered in 2016 [11].

The main changes impacting the airport system domains can be summarised as follows:

Automated assistance to controllers for surface movement planning and routing

D-TAXI service for controller-pilot datalink communications (CPDLC) application

Guidance assistance through airfield ground lighting

Virtual block control in low-visibility procedures

Integrated airport safety nets for controllers: conformance monitoring alerts and conflict detection

Enhanced ground controller situational awareness in all weather conditions

Runway status lights (RWSL) to reduces the risk of runway incursions

Enhanced traffic situational awareness for vehicle drivers

Departure manager (DMAN) baseline for integrated Arrival Manager (AMAN) and DMAN

Pre-departure sequencing supported by route planning

Departure management integrating surface management constraints

Flow-based integration of arrival and departure management

Integrated and throughput-optimised sequence of arrivals and departures

ATC and AFIS service in a single low-density aerodrome from a remote controller working position (CWP)

Single remote tower operations for medium traffic volumes

Remote tower for two low-density aerodromes

Remotely-provided air traffic services for contingency situations at aerodromes

A low-cost and simple departure data entry panel for the airport controller working position

Airport operations plan (AOP) and its seamless integration with the network operations plan (NOP)

User-driven prioritisation process (UDPP) departure

Meteorological information exchange

Aeronautical mobile airport communication system (AeroMACS).

1.2 Project achievements

The 12.01.07 project produced the Technical Architecture Document (TAD) for the airport domain which contains the architecture of four domain systems: the Aerodrome ATC, the Airport Airside Operations, the Airport Operation Centre, and the Sequence Management Domain System. The TAD describes the functional breakdown structure of these Domain Systems in terms of Functional Blocks, the description of interfaces between Domain Systems and between Functional Blocks. The FBs, within a domain system, represent the logical decomposition of the system in its logical functionalities according to a set of design principles such as separation of concerns, traceability and consistency. The design principles have been formalised by the B.04.03 project in 2015 [10].

The FB decomposition has been used to structure the technical requirements described in the Technical Specification (TS) documents produced by SPPs. In this perspective the TAD also contains traceability matrixes for the EN to FB and EN to SPP relationships. Project 12.01.07, in fact, reviewed all the TS from SPPs in order to raise any issue coming from inconsistencies, overlaps or conflicts among technical requirements produced by different SPPs. The result of this analysis together with the analysis of validation exercises may lead to the update or the creation of an existing system EN or the creation of new ones.

In the context of the TAD production, the project directly contributed to the modelling activities of the airport domain within the EATMA architecture.

The 12.01.07, as system federating project for the airport systems, was responsible for the issue resolution of conflicts that happened within the airport domain. Furthermore, 12.01.07 project provided its contribution for all those issue involving other domains, in addition to the airport one. In four inter-domain issue [12][13][14] the 12.01.07 project was nominated as member of the issue resolution team and the B.04.03 project played the role of moderator.

Project 12.01.07 also contributed to the delivery of the ADD SESAR 2020 Transition edition for the airport related sections.

1.3 Project Deliverables

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

Reference	Title	Description
12.01.07-D30	SESAR 1 Airport Technical Architecture Description	The document provides an high level functional architecture of the airport domain systems which is used as a structural basis of technical specifications as a means to ensure their consistency

1.4 Contribution to Standardisation

The project did not contribute directly to the definition of any standard due to its federating role in the programme for the airport domain.

1.5 Project Conclusion and Recommendations

The architecture described in the final airport TAD represents the functional decomposition of all the airport systems reflecting the technical changes defined and validated during the SESAR 1 programme.

This architecture is the result of an incremental work performed over the duration of the entire programme that produced three main iterations with corresponding deliverables. These deliverables guided the production of the TSs by the primary projects throughout the entire programme with the aim of guaranteeing consistency and coherency.

The architecture described in the TAD represents a mature starting point for the SESAR 2020 programme. Even if several modifications were introduced during the programme to support, from a technical point of view, the operational improvements introduced in the master plan, some further evolution need to be implemented yet. To this purpose, a dedicated section of the TAD has been created in order to capture the comments received during the external review that express the opportunity for future evolution of the architecture. In particular, the opportunities for further investigation in SESAR 2020 concern the following subjects:

> create a dedicated system for the airport vehicles;

> separate the correlation functionality from the Aerodrome Surveillance FB by isolating it in a dedicated FB.

> replace the current "Aerodrome Safety Nets" and "Conformance Monitoring" FBs with a new FB named "Airport Safety Nets" encompassing all the following three functionalities: i) Runway Monitoring and Conflict Alerting (RMCA); ii) Conformance Monitoring Alerts for Controllers (CMAC); iii)Conflicting ATC Clearances (CATC).

A transversal aspect that will remain an important driver for the future evolution of the airport architecture in SESAR 2020 will be the usage of the service oriented approach (SWIM).

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] 12.01.07, Baseline set of Airport System Requirements and Guideline for Specification, D01, 00.01.01, 01/12/2010

[5] 12.01.07, Step1 Airport System Requirements analysis, D02, 00.02.00, 11/03/2014

[6] 12.01.07, Step1-2nd Iteration- Airport Technical Architecture Description, D21, 00.02.00, 06/12/2013

[7] 12.01.07, Step1-3rd Iteration- Airport Technical Architecture Description, D22, 00.04.00, 12/05/2015

[8] 12.01.07, SESAR 1 Airport Technical Architecture Description, D30, 00.02.00, 30/05/2016

[9] B.04.03, ADD Step 1 V.00.02.02 (2014 edition), D95, 00.02.02, 30/04/2015

[10] B.04.03, ADD Step 2 - 2014 edition, D97, 00.03.01, 06/02/2015

[11] B.01, Integrated Roadmap - DS16 Release Note, D84, 00.01.00, 25/05/2016

[12] B.04.03, Technical Issue Management activity report 2013, D77, 00.01.00, 20/12/2013

[13] B.04.03, Technical Issue Management activity report 2014, D103, 00.01.00, 12/01/2015

[14] B.04.03, Technical Issue Management activity report 2015, D104, 00.00.01, 12/02/2016

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