



Final Project Report

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Task contributors

[LEONARDO FINMECCANICA.](#)

Abstract

This document is the closure report of SESAR project 12.06.07 "AMAN, SMAN and DMAN fully integrated into CDM processes". The project, starting from the Operational Requirements, defined the technical specification used for the development of two different prototypes. The prototypes was tested, verified and validated with the objective to demonstrate the improvement derived from the use of AMAN, DMAN and A- SMGCS (ASDI).

Authoring & Approval

Prepared By - Authors of the document.		
Name & Company	Position & Title	Date
[REDACTED] LEONARDO FINMECCANICA	[REDACTED]	<21/04/2016>

Reviewed By - Reviewers internal to the project.		
Name & Company	Position & Title	Date
[REDACTED] INDRA	[REDACTED]	22/04/2016
[REDACTED] INDRA		22/04/2016
[REDACTED] EUROCONTROL		22/04/2016
[REDACTED] /LEONARDO FINMECCANICA		22/04/2016

Reviewed By - Other SESAR projects, Airspace Users, staff association, military, Industrial Support, other organisations.		
Name & Company	Position & Title	Date
[REDACTED] INDRA	[REDACTED]	27/04/2016
[REDACTED] LEONARDO FINMECCANICA		27/04/2016
[REDACTED] LEONARDO FINMECCANICA		27/05/2016
[REDACTED] INDRA		27/05/2016 (Silent)

Approved for submission to the SJU By - Representatives of the company involved in the project.		
Name & Company	Position & Title	Date
[REDACTED] INDRA	[REDACTED]	27/05/2016
[REDACTED] EUROCONTROL		27/05/2016
[REDACTED] FINMECCANICA		27/05/2016

Rejected By - Representatives of the company involved in the project.		
Name & Company	Position & Title	Date
<Name / Company>	<Position / Title>	<DD/MM/YYYY>

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Acronyms

Acronym	Definition
A-CDM	Airport Collaborative Decision Making
AMAN	Arrival MANager
ANSP	Air Navigation Service Provider
AOP	Airport Operation Plan
APOC	AirPort Operating Centre
ATC	Air Traffic Control
ATM	Air Traffic Management
ASDI	AMAN, SMAN and DMAN Integrated
A-SMGCS	Advanced – Surveillance Monitoring Guidance Control System
DMAN	Departure MANager
IWIS	Integrated Weather Information System
RMAN	Runway MANager
SESAR	Single European Sky ATM Research
SESAR 20	Next Wave of the European ATM Research and Innovation Programme, based on the European ATM Master Plan
SJU	SESAR Joint Undertaking
SMAN	Surface MANager
TAD	Technical Architecture Description
WP	Work Package

1 Project Overview

The 12.06.07 project developed the innovative tool AMAN, A-SMGCS and DMAN integrated (ASDI) into CDM processes with particular attention to the communications between the ATC systems and the AOP/A-CDM platform. The functionalities developed, tested and validated in the project are Information Exchange and Airport Performance Monitoring.

1.1 Project progress and contribution to the Master Plan

The scope of this project was to define, develop and validate the operational concept related to integration of A-SMGCS, AMAN and DMAN services in the Collaborative Decision Making process. The objective of the integration was to support the controller to optimise the traffic flow at the airport exploiting the following functionalities:

- managing the traffic flow at the airport,
- optimising the runway occupancy,
- minimising the taxi-time,
- avoiding conflict situation.

The integration of A-SMGCS with AMAN and DMAN provided accurate taxi time by automatic or semiautomatic planning of ground trajectories, from runway to the stand selected for the aircraft in arrivals and an accurate take off sequence for departures.

At the beginning of the project (Phase 1, 03/10/2011 to 29/03/2013) the partners focused on analysing the System Requirements using limited input from Airport Operational Wprk Package (WP 6); producing an initial architectural analysis and a first prototype release with basic capabilities. Furthermore during the next step (Phase2 29/03/2013 to 18/03/2016), the project refined the prototypes with new inputs from WP6

The exercises related to project P12.06.07, that implemented the operational and technical requirements, are:

- " Integrated Validation of the DCB Monitoring & Management Process" validation exercise using 12.06.07 INDRA Phase 2 prototype
- " Close out Airport Integration through SWIM" validation exercise using 12.06.07 FINMECCANICA Phase 2 prototype;
- " APOC Performance Monitoring & Management" validation exercise using 12.06.07 INDRA Phase 2 prototype.

The solution addressed by the project is Solution #21- Airport Operations Plan and AOP-NOP Seamless Integration objectives.

The main focus of 12.06.07 has been put in defining and applying a common and advanced verification methodology. The verification process intends to ensure that all prototypes developed in project 12.06.07 phase 2 correctly implement the system requirements defined in Phase 2 System Specifications.

Since all prototypes are developed on different platforms, the common verification strategy describes generic test cases that are independent of the respective prototypes and platforms. For each individual prototype these generic test cases are customized with respect to its development and test platform in a specific verification strategy for each prototype.

The test cases usually provide data input to the system in order to initiate a specific process and determine whether the output matches the given specifications. Thus, each test case will include a

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detailed description of the inputs to be provided to the system, and its expected behaviour as a reaction to them, including a description of the expected outputs.

The contribution of this project to the ATM Master Plan was by developing the enablers (Ref. [22] Integrated Roadmap Dataset 15 of the Master Plan, aligned with the released Edition 2015 of the Master Plan, December, 2015), described in the following table:

OI/EN Code	Name	Project contribution	Maturity at project start	Maturity at project end
AIRPORT-35a	Airport CDM (level 4 - CDM integrated with passenger process)	Technical specification and development of prototypes to support Airport CDM (level 4 - CDM integrated with passenger process)	TRL 4	TRL 6
AERODROME -ATC-05	Surface movement information processing enhancements to support Total Airport DCB and collaborative airport planning	Technical Specification and development of prototypes to support Total Airport DCB and collaborative airport planning	TRL 3	TRL 5
AERODROME -ATC-10a	Enhanced arrival/departure sequence with external aerodrome and CDM	Technical Specification and development of prototypes to support Enhanced arrival/departure sequence with external aerodrome and CDM	TRL 3	TRL 5
AIRPORT-40	Airport Performance Monitoring System	System supporting Airport Operations Monitoring through performance driver indicators, resource availability and utilisation to ensure the full predictability required to support integration of airports into the ATM network.	TRL 4	TRL 6

1.2 Project achievements

The implementation of the enhanced tools that perform bidirectional interfaces between an integrated AMAN&DMAN&A-SMGCS system and systems that drive CDM process can improve the airport performance, both in term of optimisation of the sequencing of the flights and in term of optimization of turn around operations.

The main achievement of 12.06.07 project is to show that Information Exchanged from/to (2-way) different ATC systems and AOP/A-CDM Platform and the evaluation of performance indicator help the users (in particular Air Traffic Controller and Supervisors) to better manage the airport.

The improved information exchange allow to improve the situation awareness of the operator, while the evaluation of performance indicators support the operator in the identification of an anomalous

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situation that can depend from meteorological event or from restriction on the runway (such as maintenance, etc.).

The information provided by ASDI (together with Runway Manager - RMAN) were found useful by the Airport Tower Supervisor in suggesting the best runway configuration to reduce any airport capacity shortage. Therefore the tools are useful in providing an overall view of the airport's traffic movements and in making strategic decisions.

The output of 12.06.07 can be further used both for the development of support tools for the controller/supervisor both as baseline for further developed in SESAR 2020, in particular in PJ03a (Integrated Surface Management) and PJ04 (Total Airport Management).

1.3 Project Deliverables

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

Reference	Title	Description
D15	System Requirements definition for Phase 2	This document included all the requirements deriving from the operational requirement that were than used as technical specification for development of the prototypes related to the Project 12.06.07
D19	Common verification plan for Phase 2	This document included the common approach (for all the prototypes) for the verification of the requirements defined in the technical specification document
D20	System requirements consolidation deliverable	This document described summarizes the output of the project including the modification of the requirements after the validation exercise results

1.4 Contribution to Standardisation

This paragraph is not Applicable because project 12.06.07 did not include standardization activities.

1.5 Project Conclusion and Recommendations

12.06.07 project has accommodated the AMAN, A-SMGCS and DMAN fully integrated into CDM processes to a number of SESAR incoming functionalities within the Aerodrome ATC systems. The project has analysed periodically the status and content of other SESAR projects and has considered many new inputs leading to the update of the ASDI and Performance Monitoring technical specifications.

Furthermore, the software prototypes developed by this project have all been used in V3 integrated validation exercises, where the ASDI and Performance Monitoring was integrated with other subsystems such as Runway Management (12.02.01 project) and IWIS (12.07.05 project). In terms of further research, the ASDI will have to adapt to future needs in Aerodrome ATC.

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The project also helped to validate the use of SWIM as communication network, because it can easily connect different systems (including A-CDM). The integration with the airport tools can further improve ASDI that can become a key tool for the airport management.

Needs to be defined and ASDI to be further developed during coming SESAR2020 projects (in particular in the PJ03a and PJ04).

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