



Final Project Report

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Abstract

This document is the final report of SESAR project 12.07.05 "Improved weather information systems", which summarizes the work done and the achievements of the project along its lifecycle. The aim of this project was to provide an integrated solution to manage and display meteorological and aeronautical information, to support the ATCOs. The set of requirements has been revised and updated in an iterative process, according to the three phases defined in the Project Initiation Report.t

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Acronyms

Acronym	Definition
AFTN	Aeronautical Fixed Telecommunication Network
AIS	Aeronautical Information Service
AMAN	Arrival Manager
ARR	Arrival
A-SMGCS	Advanced Surface Movement Guidance and Control System
ATC	Air Traffic Control
ATM	Air Traffic Management
AWOS	Automated Weather Observing System
CDM	Collaborative Decision-Making
CWP	Controller Working Position
DEP	Departure
DMAN	Departure Manager
IWIS	Improved weather information systems
MET	Meteo
OFA	Operational Focus Area
RWY	Runway
SESAR	Single European Sky ATM Research
SMAN	Surface Manager
SWIM	System Wide Information Management
TMA	Terminal Manoeuvring Area

1 Project Overview

The project aim was to improve the handling of the weather information thanks to the Aerodrome Weather Information Management.

The Aerodrome Weather Information Management implemented functionality for the improvement of the weather information in terms of :

- Reception, collection and processing of weather data (AFTN/AIS/MET Bulletins, AWOS Data);
- Notifications, warning and alarms of weather data relevant for CDM (Collaborative Decision-Making);
- Evaluation of the impact on airport ARR (Arrival) and DEP (Departure) capacity of weather data; The purpose of Aerodrome Weather Information Management is the prediction of weather impact on airport capacity in terms of both, arrivals and departures, taking also into account runway layout and traffic demand scenarios. The system is intended to provide decision support to Demand and Capacity Balancing (DCB). Nevertheless, the ATCOs have the final responsibility to decide if the available capacity nowcasted shall be relied on.
- Dispatching the collected and computed data to inform via SWIM (System Wide Information Management) the interested stakeholders and other SESAR (Single European Sky ATM Research) prototypes (e.g. 12.2.1: RWY (Runway) Management tool).

1.1 Project progress and contribution to the Master Plan

The project has been organised in three iterative phases. Each of them used operational inputs to produce technical specifications and one or more prototypes.

The output of each phase has been used as input for the following in order to ever improve the quality of work.

The project contributed with its prototype to several validation exercises from 2012 to 2015 conducted by the operational projects within Operational Focus Area Airport Operations Management to validate the concepts on weather information.

The prototypes were involved in several validation exercises of both V2 and V3 maturity level (in accordance with the methodology E-OCVM), using Real Time Simulation method, in particular:

V2 exercise held in 2012 in Rome about MET (Meteo) information (including required MET data and ICAO bulletins), MET alerts generated and targets relevance in the management of adverse weather conditions and makes them available via SWIM and possibility to adjust the thresholds related to MET alerts.

V3 exercise held in March 2016 in Milan Malpensa. V3 has to be considered as an integrated validation with the target to set up an Airport Collaborative Decision Making (A-CDM) concept by sharing through SWIM the information provided by AMAN (Arrival Manager), DMAN (Departure Manager), SMAN (Surface Manager) (including Runway Manager). In addition, all the involved stakeholders are intended to be supported during the decision making process by the display of arrival/departure capacity forecast and of the weather observation and forecast (i.e. MET Service). Being a follow-up of the others integrated validation is expected to focus on the improvement of the representation of the current weather situation in terms of:

- Providing improved meteorological observation and forecast products;
- Comparing present meteorological phenomena against given rules/thresholds to raise in case of violations alerts and warnings;
- Visualisation of the given weather information for the involved stakeholder.

The following are the Enablers that have been addressed.

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Code	Name	Project contribution	Maturity at project start	Maturity at project end
METEO-01	Integrates and delivers Weather information owned by ATM (Air Traffic Management) ground systems	Technical specification and development of prototypes about a tool that manages information weather	TRL 3	TRL 6
METEO-03	Provision and monitoring of accurate real-time weather information	Technical specification and development of prototypes about a tool that monitors the real-time weather information	TRL 3	TRL 6
METEO-04b	Generate and provide MET information relevant for Airport and TMA (Terminal Manoeuvring Area) related operations, Step 1	Technical specification and development of prototypes about a tool to provide MET information relevant for Airport and TMA.	TRL 3	TRL 6

The validation objectives investigated during the execution of the validation activities are defined in the following SESAR Solutions:

Solution #21 - Airport Operations Plan and AOP-NOP Seamless Integration objectives

Solution #35 - MET objectives

1.2 Project achievements

Main objectives achieved by the project were to establish and implement an Aerodrome Weather Information Management including procedures, processes and resources necessary to provide meteorological information to be supplied to the following users: Forecast Operators, Flight Crew Members And Air Traffic Services Units.

The aim of P12.07.05 was to provide an Aerodrome Weather Information Management able to:

Assist ATCs with new functionalities and tools to ease their workload and enable decision making processes (Meteo Service information will strongly assist them covering runways and providing wide-area surveillance);
Allow Meteorological Service to better support ATCs;
Allow Meteorological Service to provide information for a complete view of operations in airports.

Aerodrome Weather Information Management, developed in P12.07.05, improved the representation of the current weather situation in terms of:

Providing improved meteorological observation and forecast products;
Comparing present meteorological phenomena against given rules/thresholds to raise in case of violations alerts and warnings;
Visualisation of the given weather information for the involved stakeholder.
Weather forecast by providing all the involved stakeholders with long term forecast (e.g. 7 days).

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The Aerodrome Weather Information Management, thanks to the availability of accurate MET information (including observations and nowcast) allows to:
Improve the predictability resulting from a better efficiency of both planning and DCB management processes.

Consolidate both the Manage and Monitor Airport Performance services. Predictability of those processes will benefit from the.

The availability of MET services to all relevant stakeholders is intended to be guaranteed through the implementation of SWIM Technical Infrastructure (i.e. ENB02.01.01 SWIM).

1.3 Project Deliverables

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

Reference	Title	Description
D11	Phase 3 – Improved Weather Information System Requirements	The objective of this document is to describe the Technical Requirements (functional and non-functional) that specify the development and the implementation of the Improved Weather Information System (IWIS) during the final phase (phase 3) of the project. This is an update of the Phase 1 and Phase 2 deliverables (12.07.05-D02 and 12.07.05-D05), based on the analysis of the updated and new requirements from Operational Project 6.5.5 and functional and non-functional requirements from 12.1.7
D17	Final Improved Weather Information System Requirements	Update of D11 with the aim of identifying which technical requirements can be considered as V3 validated at the end of SESAR.

1.4 Contribution to Standardisation

One of the aims of the project 12.07.05 was to implement the requirements in order to contribute to the standardization for meteorological data.

The material currently generated by the Operational Focus Area Airport Operations Management (OSED, SPR, INTEROP) has not yet been recognised into standards and norms (e.g. EUROCAE) although it is likely that in the near future this process will start as the various SESAR Solutions reach V3 maturity and progress forward into deployment.

1.5 Project Conclusion and Recommendations

12.07.05 project has accommodated the Improved Weather Information Systems 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 Aerodrome Weather Information Management technical specifications.

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Furthermore, the software prototypes developed by this project have all been used in V3 integrated validation exercises, where the Aerodrome Weather Information Management has fed subsystems such as Runway and Taxiway Usage Management (12.02.01 and 12.02.02 projects).

12.07.05 prototype in the last validation activity to dispatch via SWIM collected weather data used the following SWIM Services documented as follows :

- METAR
- TAF
- SNOW TAM
- AirportMETobservation
- AirportMETforecast
- ICAOMETlocalreport

making them available to various stakeholders and other SESAR prototypes.

In terms of further research, the Aerodrome Weather Information Management have to adapt to future needs in Aerodrome ATC. Needs to be defined and Aerodrome Weather Information Management to be developed during coming SESAR2020 projects (in particular in the PJ02 and PJ04).

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