Final Project Report

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Abstract

This document is the Final Project Report of the SESAR project P12.06.03 'Enhanced MET-systems with CDM. In its course, a Weather Information System for Airport Decision Support (WISADS) has been developed through all V-cycles which integrates/assess and visualizes all weather information relevant for an aerodrome. It summarizes the work and achievements done along the project's lifecycle.

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This deliverable consists of SJU foreground.

Acronyms

Acronym	Definition
A-CDM	Airport-Collaborative Decision Making
AOP	Airport Operations Plan
APOC	Airport Plan Operations Center
ATC	Air Traffic Control
ATM	Air Traffic Management
CDM	Collaborative Decision Making
GUI	Graphical User Interface
GWMS	Ground Weather Monitoring System
HMI	Human Machine Interface
MET	Meteorology
OSED	Operational Service and Environment Definition
OFA	Operational Focus Area
SESAR	Single European Sky ATM Research Programme
SJU	SESAR Joint Undertaking
SJU Work Programme	The programme which addresses all activities of the SESAR Joint Undertaking Agency.
SWIM	System Wide Information Management
TS	Technical Specification
WISADS	Weather Information System for Airport Decision Support

1 Project Overview

P12.06.03 developed a system called Weather Information System for Airport Decision Support (WISADS) which provides processed warnings and alerts via System Wide Information Management (SWIM) to interested users e.g. Airport Operations Plan (AOP) and to 'Controller Working Position' and, secondly, at the same time, it visualizes this alert and warning plus additional weather information directly for the APOC stakeholder in a dedicated display (HMI).

1.1 Project progress and contribution to the Master Plan

The methodology which was used in the project followed three phases:

During V1 the system concept and preliminary design were based on external (outside SESAR) sources. The main input source for the project at this stage was derived from the operational requirements extracted from previous EUROCONTROL documentation related to CDM and adverse weather conditions (Ref. [21][22][23][24][25][26][27]).

During V2 the refinement of the technical specification was then more focussed on the given new operational requirements and operational concept worked out in a collaborative way inside the SESAR program, using the new Operational Focus Area (OFA) 05.01.01 structure. The outcomes and results of this OFA made it necessary to rework and adjust the technical specification of the P12.06.03 project to match the new developed service approach within the OFA e.g. Steering Service, Performance Monitoring, etc. and also the implementation of a so called 'Rules Engine' as a fundamental concept to translate meteorological information to predefined ATM alerts/warnings.

During V3 the finalized technical specification elaborated and organized the refinement of the work done in several tasks during the Phase 2 including the findings during the V2 Validation exercise, summarized in the validation report provided by the operational counterpart project (P06.05.05) and the resulting V3 operational requirements given by the above mentioned Operational Focus Area 'Airport Operation Management', of which this project is part of. This included a rework of interconnectivity, e.g. new interfaces to the provider of meteorological data, new graphical representation of the different meteorological information, e.g. 'no need to touch' HMI, and the finalized provision of required alert/warning schema.

The contribution of this project to the ATM Master Plan was by developing the enablers (Ref. [20] 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:

EN Code	Name	Project contribution	Maturity at project start	Maturity at project end
METEO-03	Provision and monitoring of real-time airport weather information, Step 1	Provision/Visualisation of pre-assessed meteorological observation, nowcast and forecast data to the different APOC stakeholder. This data is represented in a graphical user interface.	V1 TRL2	V3 TRL6
AIRPORT-41	Airport Operations Centre Support Tools	Providing a meteorological decision support for the APOC stakeholder with a permanent assessment of predefined operational rules against given meteorological parameters. In case of a violation of one or more of	V1 TRL2	V3 TRL6

		these rules a predefined alert or warning with a specific severity level is raised.		

V2 Validation: EXE-06.05.05-VP-668 performed 23/06/2014 in Rome, Selex premises in an industrial environment without any interaction in terms of data exchange between the different prototypes.

V3 Validation: EXE-06.03.01-VP-669 performed from 29/02/2016 to 03/03/2016 at Milan Malpensa airport (MXP). During this exercise all involved prototypes were connected via a physical network and data were exchanged in real-time.

With the latter validation exercise it contributed to Release 5, solutions #35 "MET Information Exchange" directly as well as indirectly to #21 „Airport Operations Plan and AOP-NOP Seamless Integration" by providing the required input. It's so called indirectly caused by the fact no AOP were included for this exercise.

1.2 Project achievements

As a result of the project a V3 prototype was developed which served as a graphical decision support tool for the Airport Plan Operations Centre (APOC) stakeholder. Included is a so called 'rules engine' which can be individually configured by the airport authorities (e.g. Steering Committee). This rules engine is used for the assessment of given meteorological parameter and phenomena against given rules and thresholds to provide, in case of a detected violation, specific severity levelled alerts and warnings to the APOC user. Also a classified MET Alert profile is provided following the definition of:

Service Name	Logical Service Name	*Logical Service Origin and Version Number*
AirportMETAlert Service	AirportMETAlertService	*SDD ed. 1.1* *Service ed. 1.0*

The SWIM provision itself isn't part of the project scope.

1.3 Project Deliverables

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

Reference	Title	Description
D14	D14 – TS Refinement	This document is the V3 Technical Specification Refinement for the enhanced MET-systems with CDM (WISADS) within Step 1 SESAR programme. It elaborates and organizes the refinement after the validation exercise in Milano Malpensa 03/2016 and describe the technical requirements, logical architecture, interfaces and the graphical representation which should be implemented into a system.

1.4 Contribution to Standardisation

n.a.

1.5 Project Conclusion and Recommendations

The overall assessment of the prototype functionality during the different validation exercises was positive. The P12.06.03 WISADS prototype was able to handle MET products issued from connected meteorological data sources and perform all its functions based on their content. It was felt quite helpful for the end user, in our case ATM/ATC Experts during the validations to have data from different sensors in place which are consistent in the sense that they had been taken from the same weather situations, e.g. Thunderstorm event: Lightning data, radar data, AWOS data and model data collected at the same time from the same event. In fact it helped the user to assess the overall weather situation and the evolution of this situation in the future in one glance. Concerning the MET information itself, the greatest concern was about the reliability of the forecast, that is, about how to manage the inherent uncertainty connected with it. Although the data are there from the MET side, and can also be automatically assessed and combined with other restrictions like e.g. protected areas, etc. by a given rules engine, it is still an open question how to handle the information of “70% probability that the thunderstorm will occur” by operational staff. The probability itself isn’t foreseen in the operational procedures.

Therefore, this topic needs to be a cornerstone in the future development of impact assessment and advisory procedures and tools and the respective MET services to serve them. To handle probability forecast correctly in the above mentioned future impact assessment on operational side, one has to elaborate first within the individual operational environment a cost function for all relevant meteorological events and after this it is necessary to apply a ‘Cost Benefit Analysis’ to come to a decision if it is worth to react or not to a forecast with a given uncertainty.

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] P12.06.03, D01 - Phase 1 - System Requirements Definition , V00.01.01, 01/10/2014

[5] P12.06.03, D02 - Phase1 - Technical Architecture Analysis, V00.01.01, 01/10/2014

[6] P12.06.03, D03 - Phase1 - Specific Technology Study, V00.01.00, 03/01/2012

[7] P12.06.03, D04 - Phase1 - Safety Assessment Report, V00.01.00, 18/12/2012

[8] P12.06.03, D05-D06 - Phase 1 - Verification Plan, V00.01.00, 23/04/2012

[9] P12.06.03, D07 - Feedback assessment and Basic System Refinement, V00.01.00, 19/03/2013

[10] P12.06.03, D08 - 12.06.03 Prototype Availability Note, V00.01.00, 03/07/2014

[11] P12.06.03, D09 - Specific Verification Strategy, V00.01.00, 17/01/2013

[12] P12.06.03, D10 - Verification test execution, V00.01.00, 20/06/2014

[13] P12.06.03, D11 - Support to V2 Validation, V00.01.00, 10/08/2014

[14] P12.06.03, D12 - V3 Technical Specification Refinement, V00.01.01, 12/05/2015

[15] P12.06.03, D13 - Support to Operational Validation, V00.01.00, 07/03/2016

[16] P12.06.03, D14 - TS Refinement, V00.01.00, 17/03/2016

[17] P12.06.03, D16 - Prototype V3 Availability Note, V00.01.00, 11/12/2015

[18] P12.06.03, D17 - V3 Verification Planning, V00.01.00, 21/08/2015

[19] P12.06.03, D18 - TS Refinement after validation, V00.01.00, 08/12/2015

[20] Integrated Roadmap Dataset 15 of the Master Plan, aligned with the released Edition 2015 of the Master Plan, December, 2015

[21] Airport CDM functional Requirements Document, EUROCONTROL, Edition 4.0, 2009

[22] Airport CDM Operational Concept Document, EUROCONTROL, Edition 3.0, 2006

[23] Minimum Technical Specifications for Airport Collaborative Decision Making (A-CDM) Systems, EUROCAE, Edition 5.0, 2008

[24] Airport CDM Interface Specification, EUROCAE, Edition 0.99, 2008

[25] Airport CDM Adverse Conditions – Impact Assessment, Processes, and Best-practices, EUROCONTROL, 4. Airport CDM Coordination Group, Information paper 2, 2010

[26] CDM in Adverse Conditions, EUROCONTROL, Draft , 2008

[27] CDM in Adverse Conditions Operational Concept, EUROCONTROL, Airport CDM Task Force 10, Information Paper 4, 2005

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