Final Project Report

Document information	
Project Title	AIM - Aeronautical Information Management
Project Number	13.02.02
Project Manager	FREQUENTIS
Deliverable Name	Final Project Report
Deliverable ID	D28
Edition	00.01.00
Template Version	03.00.04
Task contributors	

ENAV, EUROCONTROL, FREQUENTIS, NORACON, THALES, DFS.

Abstract

AIM is focused on the usage of static and dynamic Aeronautical Information. Central to this project was to validate the usage of data formatted as AIXM5.1 and Digital NOTAM as payload for a SWIM based data exchange.

The main focus was on:

- Digital NOTAM and the encoding of it while using available AIXM5.1 data

- Digital Integrated Briefing, using static and dynamic Aeronautical and Meteorological Data to produce an "enhanced Pre-flight Information Bulletin" - ePIB - for Airspace Users / Pilots

- Creating the tools necessary to support Digital NOTAM encoding and Digital Integrated Briefing

- Creating the specifications and validate the above concepts

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Rational for rejection

None.

Document History

Edition	Date	Status	Author	Justification
00.00.01	30/05/2016	Final draft	███████████	Final Version for Reviews
00.01.00	02/06/2016	Final	███████████	Final for SJU handover

Intellectual Property Rights (foreground)

This deliverable consists of SJU foreground.

Acronyms

Acronym	Definition
ATM	Air Traffic Management
AIFS	Aeronautical Information Feature Service
AIM	Aeronautical Information Management
AINS	Aeronautical Information Notification Service
AIRM	Aeronautical Information Reference Model
AIS	Aeronautical Information Service
AIXM 5.1	Aeronautical Information Exchange Model 5.1
ARO	ATS Reporting Office
DNOTAM	Digital NOTAM
EAD	European AIS Database
EFB	Electronic Flight Bag
FIR	Flight Information Region
IDBS	Integrated Digital Briefing Service
ISRM	Information Service Reference Model
iWXXM	ICAO Meteorological Information Exchange Model
GIS	Geographic Information System
GUI	Graphical User Interface
HMI	Human Machine Interface
MET	Meteorological [Information]
METAR	Aerodrome Routine Meteo Report
NOF	NOTAM Office[r]
NOTAM	NOTice to AirMen
OFA	Operational Focus Area
OGC	Open Geospatial Consortium
OSED	Operational Systems Environment Description

ePIB	enhanced Pre-flight Information Bulletin
PIB	Pre-flight Information Bulletin
SIGMET	SIGnificant METeorological information
SWIM	System Wide Information Management
SWIM TI	SWIM Technical Infrastructure
TAF	Terminal Aerodrome Forecast
TS	Technical Specification
W3C	World Wide Web Consortium
WFS	Web Feature Service
XML	Extensible Mark-up Language

1 Project Overview

The main goal of this project was to validate the concept that modern data exchange formats such as AIXM 5.1, its derivative Digital NOTAM - or DNOTAM, and iWXXM, provide significant improvements to the overall Aeronautical Information Management landscape, and - while introducing some complexity as a result of transitioning from text and binary to structured data formats such as XML, - help significantly improve the quality of information products delivered to Airspace Users and ATM participants.

1.1 Project progress and contribution to the Master Plan

Project SESAR 13.02.02 AIM was focused on two concepts as the main areas of research:

- Digital NOTAM (a derivative of AIXM 5.1)
- Integrated Digital Briefing

The work in the project revolved around validating these concepts and for that produce the operational (OSED) and technical (TS) specifications, as well as the prototypes needed to achieve the validation goals.

Over the duration of the project and due to the length of it, the validation work was split over three validation exercises:

- EXE-13.02.02-VP-460 or EXE460 focused on Digital NOTAM
- EXE-13.02.02-VP-462 or EXE462 focused on Digital Integrated Briefing
- EXE-13.02.02-VP-461 or EXE461 focused on Digital Integrated Briefing, performed in three separate modules by SESAR 13.02.02 and 11.01.05

Digital NOTAM - EXE 460 - maturity V2

The following concepts were validated:

- o Encoding and management of Digital NOTAM information
- o Integration of GIS maps/charts to improve the quality of encoded Digital NOTAM information
- o Usage of AIXM5.1 data services to correlate encoded Digital NOTAM with available static Aeronautical Data

The exercise was performed during the 2nd half of 2013 as a Real-time Simulation, under the supervision of EUROCONTROL, with participation of ENAV and NORACON, and using Digital NOTAM encoding and management prototype applications developed by FREQUENTIS and THALES.

Digital Integrated Briefing - EXE 462 - Release 4 - maturity V2

The following concepts were validated:

- o Retrieving static and dynamic Aeronautical Information, AIXM5.1 and Digital NOTAM
- o Filtering the information based on flight planning information
- o Producing an enhanced Pre-flight Information Bulletin or ePIB
- o Integrating maps/charts in addition to text NOTAM information

- o Displaying Aeronautical and Digital NOTAM information as graphical elements on maps/charts

- o Improved readability of the ePIB vs. text based PIB.

The exercise was performed in December 2014 as a Real-time Simulation, under the supervision of EUROCONTROL, with participation of ENAV and NORACON, using a Digital Integrated Briefing/ePIB HMI/GUI prototype application developed by FREQUENTIS and Digital NOTAM prototype services provided by FREQUENTIS and THALES. The exercise took place at the Fiumicino ARO in Italy and included Airspace Users - airline pilots - that evaluated the produced ePIB.

Digital Integrated Briefing for the pre-flight phase- EXE 461 - Release 5 - maturity V3

This part of the exercise was comprised of the FREQUENTIS module.

The following concepts were validated:

- o Retrieving static and dynamic Aeronautical Information, AIXM5.1 and Digital NOTAM

- o Retrieving Meteorological Information, iWXXM

- o Filtering the information based on flight planning information

- o Demonstrating the feasibility and benefits of implementing an interactive ePIB HMI/GUI with interactive maps/charts

- o Detailed filtering of the ePIB information based on Airspace User demands using the interactive ePIB HMI/GUI

- o Producing an ePIB with integrated maps/charts

- o Display Aeronautical, Digital NOTAM and Meteorological Information as graphical elements on maps/charts

- o Greatly improved readability of the ePIB vs. text based PIB Meteo Information

The SESAR 13.02.02 contributing activities to EXE461 were performed in January 2016 as a Real-time Simulation, under the supervision of EUROCONTROL, with participation of ENAV and NORACON, and using a Digital Integrated Briefing/ePIB interactive HMI/GUI prototype application developed by FREQUENTIS, which accessed Digital NOTAM prototype services provided by FREQUENTIS and THALES, an AIXM 5.1 based Aeronautical Information Feature Service - using a clone of EAD's data - and an iWXXM Meteorological Information prototype service provided by FREQUENTIS. The exercise took place in a simulated ARO environment provided by FREQUENTIS with four separate workstations. It included Airspace Users - airline pilots - that evaluated the ePIB and the interactive HMI/GUI.

All exercises are linked to OFA ENB 02.01.02 - Aeronautical Information Management - AIM.

The project contributed to Solution #34 - Digital Integrated Briefing.

One last note on project SESAR 13.02.02 is its configuration as both an operational and a system project with experts from both sides working together.

Digital Integrated Briefing for the in-flight phase- EXE 461 - Release 5 - maturity V2

As the coordinating project of OFA ENB 02.01.02 AIM, project SESAR 13.02.02 was responsible for integrating the results of SESAR 11.01.05 contribution to EXE 461 which addressed the in-flight phase of the Digital Integrated Briefing into the Validation Report for the entire EXE 461.

This part of the exercise was comprised of the HONEYWELL and SABRE modules.

More detailed information on the validated concepts, results, achievements, conclusions and recommendations, on this part of EXE 461 can be found in [16] and the Final Project Report of SESAR 11.01.05.

Operational Improvements and Enablers

The following lists the Operational Improvement steps and the Enablers linked to Solution #34 Digital Integrated Briefing.

The Operational Improvement steps and the Enablers used in this document are with reference to the Integrated Roadmap DS-15.

Code	Name	Project contribution	Maturity at project start	Maturity at project end
IS-0205	Digital Integrated Briefing for pre-flight phase	Generation of ePIB using AIXM 5.1, DNOTAM, and MET information.	V1	V3
IS-0206	Digital Integrated Briefing during flight execution phase	Generation of ePIB using AIXM 5.1, DNOTAM, and MET information. Prepared for SWIM Global Demo. Please note that this OI was not addressed by the SESAR 13.02.02 FREQUENTIS module in EXE461, and was not a validation goal thereof. The OI is addressed by SESAR 11.01.05 in the other two modules of EXE 461 and the results are visible in the SESAR 13.02.02 EXE 461 Validation Report [16].	V1	V2
IS-0901-A	SWIM for Step 1	Implementation and usage of SWIM compliant services, AIFS(ISRM1.4) and IDBS(ISRM 2.0).	V1	V3
MET-0101	Enhanced MET observations, nowcasts and forecasts provided by ATM-MET systems for Step 1	Implementation of an in-project developed iWXXM, MET service, OGC/WFS compliant, SWIM TI yellow profile compliant, SWIM Ready. Please note that development of such prototype was not one of the goals of SESAR 13.02.02, it was done due to lack of suitable sources thereof.	V1	V2
AIMS-07a	Generation of Enhanced Pre-flight Briefing based on digital data	Generation of ePIB using AIXM 5.1, DNOTAM, and MET information.	TRL6	TRL6
AIMS-19a	Aeronautical Information system is interfaced to receive and distribute aeronautical information electronically to/from ANSPS systems	Provision of AIXM 5.1, DNOTAM representing static and dynamic Aeronautical Information.	TRL6	TRL6
AIMS-06	Ground-Ground Aeronautical	Service provision compliant with SWIM TI yellow profile	TRL2	TRL6

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	Information Services provision			
SWIM-STD-01	ATM Information Reference Model	Service provision compliant with SWIM AIRM referenced data exchange models	TRL2	TRL6
SWIM-INFR-05a	General SWIM Services infrastructure Support and Connectivity	Service provision compliant with SWIM TI yellow profile	TRL2	TRL6
SWIM-APS-02a	Consumption of Aeronautical Information services for Step 1	The ePIB prototype application is a consumer of the provided AIFS and MET Services provided in a SWIM Compliant(AIFS), and SWIM Ready(MET) manner	TRL2	TRL6
METEO-04b	Generate and provide MET information services relevant for Airport and final approach related operations, Step 1	Implementation of an in-project developed iWXXM MET service, providing METAR and TAF in iWXXM format. Please note that development of such prototype was not one of the goals of SESAR 13.02.02, it was done due to lack of suitable sources thereof.	TRL2	TRL4
METEO-05b	Generate and provide MET information relevant for TMA and En-route related operations, Step 1	Implementation of an in-project developed iWXXM MET service, providing SIGMET/AIRMET in iWXXM format. Please note that development of such prototype was not one of the goals of SESAR 13.02.02, it was done due to lack of suitable sources thereof.	TRL2	TRL4

1.2 Project achievements

Documentation

Throughout its lifetime the project has produced compelling documentation in the form of Operational Services and Environment Specifications, Technical Specifications, Validation Plans and Reports among others for the two main areas of research.

Digital NOTAM

In order to fulfil the requirements imposed by the EXE460 validation goals for this research area, the industry partners THALES and FREQUENTIS managed to produce functional prototypes capable of supporting a NOTAM officer - NOF - to encode Digital NOTAM albeit in a limited fashion. The THALES prototype focused on encoding an "Airport/Heliport Closure" event. The FREQUENTIS prototype focused on encoding a "New Obstacle" event. Both prototypes featured graphical feedback elements, the encoded information could be presented to the operator in a graphical form on a map/chart on the screen. Both prototypes were provided as a web based application/service.

The work performed managed to validate many aspects of the Digital NOTAM concept and evaluate the usability of the HMI/GUIs developed for this purpose.

Due to the fact that Digital NOTAM is comprised of much more detailed information than its classical text based NOTAM counterpart, the prototypes have managed to demonstrate that HMI/GUIs for encoding Digital NOTAM can be designed and implemented to support the large variety of types of events that can be encoded in Digital NOTAM format.

The acting NOFs participating in the project could be convinced of the usability of such developments and as a consequence, the validation leads were able to collect valuable recommendations for further developments.

From a technical data usage point of view, the project managed to demonstrate that the encoded Digital NOTAM can be easily associated with aeronautical feature data (available in AIXM 5.1 format), which opens the door for a variety of applications, among which Digital Integrated Briefing is one of the most preeminent examples in terms of benefits to it.

Aside of this, the project managed to verify early prototypes for encoding Digital NOTAM events, which can have extensive geometries attached to them and impossible to encode as classical text based NOTAM with its message length limitations.

The validation of the Digital NOTAM concept was an important pre-requisite for the work that followed. The planning and execution of the exercise was done by EUROCONTROL with ENAV's and NORACON's participation.

Digital Integrated Briefing

The work in this area of research was much more complex, due to the fact that there were no precedents to this aside of the classical text based PIB that is still in use.

As such, the work was split over the two remaining validation exercises EXE462 and EXE461 - with the former executed about a year after the first.

For these, FREQUENTIS managed to produce a functional ePIB prototype that in the end helped achieve most of the validation goals set for these two exercises. In addition to this, both THALES and FREQUENTIS extended their earlier Digital NOTAM prototype work to be used as SWIM compliant services implementing the Aeronautical Information Feature Service specification available in ISRM.

While not featuring the deployment of a fully interactive HMI/GUI yet, EXE462 showed that it is possible to use aeronautical information available in AIXM5.1 and Digital NOTAM format and produce an enhanced Pre-flight Information Bulletin - or ePIB - compiled as a collection of text and graphical information referencing each other.

During this first phase it was necessary to demonstrate the capability to accomplish the minimum necessary for compiling and composing a useable ePIB for a given flight plan.

First it was important to use the data of a flight plan and extract the necessary filtering information - time and geographical parameters - and use it to compose filters to be used in the retrieval of the briefing information.

Next it was paramount to provide AIXM 5.1 and Digital NOTAM in a SWIM compliant format. This called for implementing the services as AIFS/WFS instances complying with the SWIM TI Yellow Profile. This enabled using OGC compatible filters to filter the feature information available, thus using the AIXM 5.1 and Digital NOTAM OGC compliant filtering capabilities to their full extent.

The next step was to integrate graphical capabilities to produce the maps/charts for the ePIB using Digital NOTAM and AIXM 5.1 data combined with openly available geospatial tile data - as seen in the widely spread commercial mapping applications from major IT companies - with focus on getting the graphical representation of aeronautical features - e.g. runways, geo-borders of FIRs - right.

As next, it was important to split all the available information for the ePIB into phased of flight such as departure, terminal area, en-route, arrival, emergency and provide text and graphical information for each phase.

At this point an instance had to be implemented that could use all the above and compose an ePIB based on a template study provided by the operational side of the project.

Last but not least, a minimum HMI had to be provided to allow the user to access the system, select a flight plan, perform some customization of the resulting briefing package, launch the generation of it and retrieve the final ePIB

All these technical goals were accomplished successfully. In addition to that, EXE462's execution was planned and organized by EUROCONTROL and was held at ENAV's facilities and with its support at Fiumicino International Airport, with participants from eight different countries and two time zones. EUROCONTROL also led the compilation of the validation results into the final validation report for the exercise.

The second phase covered by EXE461 had to continue where EXE462 has left off.

Immediately after the conclusion of EXE462 it has become more and more evident that a compelling interactive HMI/GUI for the ePIB prototype application was needed.

Due to the fact that between the initiation of work on EXE462 until the validation execution more than a year has elapsed, the available open source technology has evolved and also due to technical issues related to the order in which the information was previously retrieved, an almost complete rewrite of the underlying prototype software had to be performed in order to implement a HMI/GUI with interactive maps/charts and text information in order to improve the customization possibilities and offer the user a navigable preview of the ePIB to be generated.

First, a proposal prototype had to be developed as soon as possible, so it could be used as a starting platform for developing the final version to be used in EXE461. FREQUENTIS took the liberty to create that prototype proposal and present a crude version of it within a month after the execution of the previous exercise.

During this process, it became obvious that in order to prevent extensive data round-trips between the web-browser based client and the web application server and improve performance, the entire data for the ePIB had to be available on the client. This was a 180 degree turn from the previous solution. Yet, although it came at a lessons learned cost, this demonstrated that complex aeronautical data can be processed efficiently on the client-side using currently available web-browser based frameworks while still preserving SWIM compliance.

Although not the object of SESAR 13.02.02, in order to accomplish the validation goals of integrating iWXXM Meteorological Information, and due to difficulties encountered in finding suitable sources of data that were subscription/contract free, the project implemented its own generic MET Service, serving real-time METAR, TAF and SIGMET in iWXXM format converted from various openly available MET data sources.

During the entire development process, the Airspace Users and project partners were invited in regular analysis sessions where they were given the opportunity to suggest improvements to the prototype.

As a result, the prototype used in EXE461 offered extensive ePIB customization capabilities, interactive maps/charts, and text information, and content navigability based on phases of flight. This represented a quantum leap from the previous almost non-customizable version of EXE462.

The AIFS were again provided by THALES and FREQUENTIS.

All these were successful achievements of SESAR 13.02.02 before the execution of EXE461.

The planning of the exercise execution was again done by EUROCONTROL with ENAV's and NORACON's participation. The organization and facilities were provided by FREQUENTIS.

In sum EXE462 and EXE461 have managed to demonstrate a complex SWIM services orchestration and validated most if not all of SESAR 13.02.02 objectives related to Digital Integrated Briefing.

Post Validation Activities

After careful consideration, FREQUENTIS decided to contribute its SESAR 13.02.02 work to the SWIM Global Demonstration 2016, in order to help further disseminate the information on achieved goals and overall results within the ATM community. For that, it entered into collaboration with HONEYWELL, which contributed its own work in SESAR 09.19.

Right after the conclusion of EXE461's execution, the ePIB prototype has been brought back into development mode in order to implement the findings collected during the validation execution.

In addition to that, FREQUENTIS' ePIB prototype was further developed into the Integrated Digital Briefing Service - or IDBS - in order to provide the ePIB in a SWIM compliant mode to Honeywell's EFB appliance developed in SESAR 09.19. Additionally to the pre-flight briefing phase, the in-flight phase updates were also supported.

This development demonstrates the prototype's capabilities to act as both a ground-ground and air-ground provider of pre- and in-flight briefing data.

Also THALES decided to contribute its SESAR 13.02.02 work to the SWIM Global Demonstration 2016.

In the frame of the demonstration, their Digital NOTAM prototype was used in an interoperable environment to encode Digital NOTAM as well as to gather information from various NOTAM sources using their AIFS. Their prototype made all the information it offers available as AIFS and AINS to various applications such as Fleet Manager, Flow Management Position and Approach/Airport Supervision.

The THALES Digital NOTAM prototype has been enhanced to provide a wide range of Digital NOTAM types, which now includes "Airport/Heliport Closure", "Runway Closure", "Navigation Aid Unserviceable", "Ad-hoc Special Activity Area", "Published Airspace Activation", "Published Special Activity Area" and "Other".

All in all, the integrated contributions of FREQUENTIS and THALES to the SWIM Global Demonstration were labelled a great success. The prototypes of both companies performed flawlessly during the demonstration of the integrated operational scenarios. In addition to that each company has successfully showcased their respective prototypes during multiple group sessions that included all guests present at the event in Rome.

1.3 Project Deliverables

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

Reference	Title	Description
D01	Step 1 OSED	Initial OSED, 13.02.02, Digital NOTAM, Digital Integrated Briefing
D02	FB-2.11 TS	Initial Technical Specification, FB-2.11, 13.02.02, Digital NOTAM
D40	FB-2.12 TS	Initial Technical Specification, FB-2.12, 13.02.02, Digital Integrated Briefing
D03	Contribution to WP13 TAD	Contribution to WP13 TAD Digital NOTAM and Digital Integrated Briefing, Functional Blocks and Enablers
D06	Verification Plan for the Digital NOTAM prototype	Verification Plan for EXE460 Digital NOTAM
D07	Verification Report for S#1 Digital NOTAM	Verification Report for EXE460 Digital NOTAM
D10	Step 2 OSED	Operational Service and Environment Description for R4 EXE-13.02.02-VP-462, Digital Integrated Briefing
D17	R4 EXE 462 VALP	Validation plan for R4 EXE-13.02.02-VP-462,

		Digital Integrated Briefing
D18	R4 EXE 462 VALR	Validation report for R4 EXE-13.02.02-VP-462, Digital Integrated Briefing
D19	R5 EXE 461 OSED	Operational Service and Environment Description for R5 EXE-13.02.02-VP-461, Digital Integrated Briefing
D21	R5 EXE 461 TS	Technical Specification for R5 EXE-13.02.02-VP-461, Digital Integrated Briefing
D26	R5 EXE 461 VALP	Validation plan for R5 EXE-13.02.02-VP-461, Digital Integrated Briefing
D27	R5 EXE 461 VALR	Validation report for R5 EXE-13.02.02-VP-461, Digital Integrated Briefing
D118	R5 EXE 461 OSED Update after execution and assessment of EXE 461	Final Operational Service and Environment Description for 13.02.02, for Digital NOTAM and Digital Integrated Briefing
D120	R5 EXE 461 TS Update after execution and assessment of EXE 461	Final Technical Specification for EXE-13.02.02-VP-461, for 13.02.02, for Digital NOTAM and Digital Integrated Briefing
D200	Note on contribution to SWIM Global Demonstration	Note and report on contribution to SWIM Global Demo 2016, Integrated Digital Briefing Service, G-G/A-G

1.4 Contribution to Standardisation

The work in the project did not produce standards on its own, but it contributed to standardisation in several ways:

In SESAR it worked together with projects in work package SESAR 08.01 and SESAR 08.03 to address AIRM and ISRM needs. In particular, it developed a new service named Integrated Digital Briefing Service - IDBS - and proposed its introduction into ISRM 2.0 which as of this writing is almost completed. It also signalled the need for a further generic, iWXXM capable MET service.

Outside SESAR it validated the introduction of AIXM 5.1 and Digital NOTAM standards to SWIM compliant services.

Another way the project was concerned with standardisation is the SWIM compliant implementation of the services provided/used. For that it adhered to SESAR/SWIM internal compliancy requirements as well as external open standards requirements such as ones defined by OGC and W3C and so it did its part in validating SWIM itself as a well-established standards following instance.

1.5 Project Conclusion and Recommendations

Digital NOTAM

NOTAM operators found that the functionality necessary for encoding/creating the Airport Closure events was sufficient, which the functionality for encoding/creating the New Obstacle Event should be improved.

Operational improvements in the NOTAM production with fewer errors and enhanced standardisation of the NOTAM free text, facilitated by the Digital NOTAM encoding tools were acknowledged.

It was however from a NOTAM operator's perspective regarded as necessary that the digital NOTAM tools should automatically generate the complete NOTAM format (including the Q-line and all information items) in order to reduce the necessity for manual input and corrections, which in return would improve current operations on data quality and usability.

The Airspace Users acknowledged improvements in their situational awareness of the NOTAM information, achieved through the graphical view of the event, facilitated by the digital encoding by the digital NOTAM prototypes. Operations improvements for the end-user of digital aeronautical data are envisaged once viewing tools are available that are able to digest the AIXM 5.1 output.

The following recommendations are provided, based on the validation exercise results:

- o Improvements on automatic generation of the NOTAM text are required, in order to facilitate the generation of the complete NOTAM format and minimise manual input/corrections on the auto-generated NOTAM output.

- o Improvements of the HMI functionality of the Digital NOTAM prototypes based on NOTAM operator's findings are required. The assessment for which improvements are to be made to which prototype, must be done on a case by case basis. Separate evaluation is performed for the two different digital NOTAM prototypes, and separate results and feed-back are recorded.

Digital Integrated Briefing

EXE-13.02.02-VP-461 addressed the topics of human performance and improving the pilot's situational awareness during all phases of flight.

This was done by the use of enhanced digital briefing services developed for this purpose, the integration of digital aeronautical data available in AIXM5.1, Digital NOTAM and iWXXM formats, and the use of interactive briefing software for producing the "enhanced Pre-flight Briefing Bulletin" - ePIB.

While SESAR 13.02.02 contribution to EXE 461 covered only the pre-flight phase, the combined efforts of SESAR 13.02.02 and SESAR 11.01.05 made covering of all phases of flights and the compilation of the validation results in one single report [16] possible.

The following aspects were demonstrated and validated by SESAR 13.02.02 in EXE 461:

- o Reduced pre-flight briefing / flight preparation time

- o Reduced workload during the pre-flight phase

- o Simplified detection and apprehension of AIS and MET event information

- o The feasibility of implementing a graphically enhanced interactive briefing HMI/GUI

- o Relatively short training/ramp-up time for the users of the interactive briefing HMI/GUI

All this has contributed to raise the maturity of OI IS-0205 "Generation of ePIB using AIXM 5.1, DNOTAM, and MET information" to the V3 level.

Additionally through the post-validation activities and involvement in the SWIM Global Demonstration 2016, SESAR 13.02.02 managed to also demonstrate the feasibility to extend the developed Digital Integrated Briefing prototype to cover the in-flight briefing phases by helping to design and implementing the Integrated Digital Briefing Service - IDBS.

The work done by SESAR 13.02.02 in EXE 461 and the post-validation activities also addressed the maturity level of the implemented services in regard to IS-0901-A "SWIM for Step 1". The services AIFS - static Aeronautical Features and Digital NOTAM - and IDBS achieved the V3 maturity level in this regard while the in-project developed generic MET Service can be regarded as SWIM Ready and its maturity level set at V2.

Although the validation activities proved that Digital Integrated Briefing fulfils the expected human performance improvements and improved situation awareness, many recommendations on how to further improve the Digital Integrated Briefing prototype ePIB application were captured during the execution of the exercise.

The following summarises areas for improvement:

- o Provision of more aeronautical and MET information.
- o Improvements in filtering of information and on parameters for customising the briefing
- o Improvements in display of information and maps (layout, symbols)
- o Improvements in functionality and HMI design of the briefing prototype
- o Input provided on useful combinations of graphics and text information in briefing
- o Input provided on the value of pilot training of the briefing application and familiarisation of new products and information, to fully explore reduced briefing times.

More detailed information on this can be found in [16].

Many of the recommendations above have already been implemented during the post-validation activities in preparation for the SWIM Global Demonstration 2016.

A final conclusion

Project SESAR 13.02.02 has been executed as a joint Operations and Systems project. As such it made a very good use of having experts from both worlds collaborating under the same roof. The main benefits of this were the ease of maintaining oversight, reduced number of dependencies, and a much closer collaboration.

The project has fulfilled its stated validation goals and contributed to set the stage for modernizing the way information is provided during the pre- and in-flight phases, and as such it paved the way for a smooth transition from text based to digitally and graphically enhanced briefing by introducing modern data formats and standardized services offered in a SWIM compliant way.

As such, the project can be considered a stepping stone towards the future of pilot briefing.

2 References

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