P07 06 01-D05 Step 1 Validation Report 2016

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This document is the Validation Report addressing those NOP objectives related to the exercises where project P07.06.01 has actively contributed: P13.02.03 VP-749 “AOP/ NOP Integration” and VP-700 “DCB Local Tools” for KPIs for Network Monitoring and MET-NOP Integration topics. In addition, P07.06.01 has identified NOP objectives for two more WP7 exercises: EXE-07.05.04-VP-710 and EXE-07.06.02-VP-713 EFPL, satisfying OFA05.03.07 "Network Operations Planning" and covering OI Step: DCB-0103-A.

The validation exercises and its validation objectives are aligned with the work undertaken by P07.06.01, to evolve the existing NOP by focusing on the following four main areas:

- comprehensive integration of AOP and NOP data
- increased visibility of network performance
- initial integration of weather information
- improved collaboration via tool support

Objectives and results specified by OFA05.01.01 for VP-749 are also part of this report.

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None.

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Intellectual Property Rights (foreground) results

This deliverable consists of SJU foreground.

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Executive summary

This Validation Report addresses the overall validation approach proposed for the Collaborative Network Operations Plan (NOP) and analyses the validation results obtained for the objectives considered in Step 1.

Demand/Capacity Balancing capability is enabled through close collaboration of numerous distributed actors sharing an evolving (or rolling) set of information. This set of information is identified as the Network Operations Plan (NOP). In particular, the NOP:

- supports the creation of this consolidated set of information and manages its consistent, timely and secure provision to relevant actors,
- supports tactical monitoring and management of the regional ATM network in compliance with the prevailing regulatory framework.

Within the European region, a technical NOP service is already provided by the Network Manager. SESAR WP07.06.01 has identified the enhancements needed to support SESAR 1 DCB/DDCB concepts through co-ordination with operational work packages. Subsequently, as a supporting service, WP07.06.01 has relied upon those same operational solutions in combination to provide validation evidence for the NOP enhancements.

Primarily intended to improve European ATM predictability, the SESAR1 enhancements to the NOP technical service can be grouped as:

Enhancement	Conclusions	Maturity
Comprehensive integration of AOP and NOP data (AOP-NOP Integration)	AOP-NOP is a key topic of Solution 20 and subject of a pilot common project PCP (AF#4). Integration of AOP information with the NOP increased significantly Network and Airport predictability as a consequence of improved demand prediction. The benefit was observed as from nine hours ahead in time horizon and four to five legs ahead for aircraft. AOP exchanged departure (extended DPI) and arrival planning information (API) per flight and NOP exchanged ELDT (estimated landed time). This early and dynamic exchange is the key for the predictability gain, in particular supporting the Multi-Airport interaction.	V3 with Acceptable Issues
Increased visibility of network performance (Network Performance KPIs)	NOP provided increased visibility of the network performance to support performance driven operations by use of new KPIs supporting NMOC on-line monitoring. The choice of KPIs proposed and its graphical representation were considered supportive to NMOC on-line monitoring and to the analysis of network disruptions.	V3 with Acceptable Issues
Initial integration of weather information (MET-NOP Integration)	The MET-NOP Integration allowed combining significant weather (SIGMET) forecasts and their evolution together with ATFCM measures (regulations and STAM) and helped identifying areas that required monitoring. The integration of MET-NOP enhances network monitoring and supports collaborative decision making.	V3 with Acceptable Issues
Improved collaboration via tool support:		V3 with Acceptable Issues
- DCB local tools	Local DCB tools were able to determine a Hotspot and co-ordinate STAM via NM B2B Web Services between adjacent ANSPs, keeping NOP in the data-exchange loop.	
- RTSA	ARES were successfully shared with NOP and other actors and a limited number of trajectories were updated accordingly.	
- EFPL	EFPL trajectory and updates, mixed mode ICAO-EFPL updates, have been successfully shared with NOP. The flight performance data in the EFPL is required to achieve predictability improvements in NOP.	

1 Introduction

1.1 Purpose of the document

This document provides the Validation report for Step 1 Collaborative NOP, PAC05 'Integrated and Collaborative Network Management', within its participation in Operational Sub-Packages 'Demand and Capacity Balancing En Route' / OFA 05.03.07 Network Operations Planning. It describes the results of validation exercises defined in D47 - Validation Plan for Step 1 Network Operations Plan 2015 and how they have been conducted.

The document provides the Validation Reports for P07.06.01 contribution to EXE-13.02.03-VP-749 "AOP / NOP Integration" and EXE-13.02.03-VP-700 "DCB Local Tools" (MET-NOP Integration and network KPis).

It also addresses those WP7 Validation Exercises that satisfy OFA05.03.07 and cover requirements specified in P07.06.01 Step1 NOP OSED, on several aspects of collaboration as defined in the concept of the Collaborative NOP (see Executive Summary).

Furthermore, within VP-749, this document also addresses results satisfying OFA05.01.01 objectives related to the participation of Airports in the solution of arrival DCB imbalance situations.

1.2 Intended readership

Participants in the following related SESAR projects can be interested in this Validation Report:

- P07.05.04 Advanced Flexible Use of Airspace
- P07.06.02 Optimised Airspace User Operations
- P07.06.04 UDPP
- P07.06.01 members (ENAIRE, NATS, AENA, EUROCONTROL and INDRA);
- Projects members of the OFA05.01.01;
- P13.02.03, Step1 enhanced DCB.

In particular, the interest for those projects involved in the OFA addressing the following exercises covering DCB-0103-A OI Step:

- EXE-07.05.04-VP-710
- EXE-07.06.02-VP-713
- EXE-13.02.03-VP-700
- EXE-13.02.03-VP-749

P07.06.01 is a transversal Project, which needs to be used by all projects, either addressing procedures based on the Network Operations Plan, or by those whose procedures outputs update the NOP. It is therefore intended to be primarily read by

- The SJU;
- B04.01 to harmonised Network Performance Monitoring activities;
- Those members of Sub-WP 7.2 "Coordination and Consolidation of Operational Concept Definition and Validation" who are in charge of the respective coordination and consolidation, via the Sub-WP 7.2 project management;
- Projects that collect outputs from the validation exercises for consolidation (B.05 & P16.06.0X);
- OFA 05.01.01 (Airport Operations Management), and
- SWP11.02 (MET).

1.3 Structure of the document

This document follows the SJU VALR template version 03.00.00 and it consists of five sections:

Section §1 – *Introduction* offers an overview of the whole document.

Section §2 – *Context of Validation* gives the general background of the validation activities.

Section §3 – *Conduct of Validation Exercises* gives some general information about the conduct of the exercise that is further described in section §**Error! Reference source not found.**.

Section §4 – *Exercise Results* gives consolidated results of the integrated validation activities.

Section §5 – *Conclusions and recommendations* gives the overall conclusions.

Section §6 – *Validation Exercise reports* presents each exercise separately giving in particular the results obtained by each of them.

Section §7 - *References* provides a complete list of the documents used as references.

1.4 Glossary of terms

Term	Definition	Source
Airport Operations Plan	A single, common and collaboratively agreed rolling plan available to all airport stakeholders whose purpose is to provide common situational awareness and to form the basis upon which stakeholder decisions relating to process optimisation can be made. As well as timely and accurate information, the AOP also contains a robust performance monitoring capability which allows the airport processes to be efficiently managed in real-time. Through its 'rolling' nature, the AOP will ensure that mitigation actions taken by each stakeholder will be based on accurate information with the result of their actions being reflected directly back into the AOP.	SESAR Lexicon
Hotspot	It represents potential traffic peaks i.e. periods for which the defined occupancy (OTMV) is exceeded during a certain period of time ▪ The FMP monitors occupancy counts with OTMV criteria to identify a potential hotspot. ▪ The FMP identifies if the peak can be dealt with using STAM Capacity measures: o If a capacity measure is a solution to the traffic overload, the hotspot is not captured to the NOP and the FMP monitors the traffic evolution. o Else, if a capacity measure does not solve the traffic issue, the FMP confirmed the hotspot, capture the overload time period of the hotspot and notifies to the NOP.	
Occupancy Traffic Monitoring Values (OTMV)	Occupancy counts (Capacity) calibration parameter for each sector to reflect workload of executive and planner controller • Peak The peak represents the maximum number of flights that could be handled by a sector. When the Count > Peak, it indicates a hotspot • Sustain	SESAR D303 STEP1 OSED

Term	Definition	Source
	The Sustain represents an acceptable number of flights that could be handled by a sector under specific circumstance, in particular if the duration of the overload is not too long. When the Count > Sustain and Count < Peak, it indicates a potential hotspot • Overload duration The Overload duration represents the maximum duration beyond which a potential hotspot should be considered in case of Count > Sustain • Duration of counting In general the duration of counting for occupancy counts correlate directly with the amount of workload of the different controller positions (i.e. number of strips on the strip board: flights on frequency and flights soon to be on frequency)	
Network Operations Plan	A set of information and actions derived and reached collaboratively both relevant to, and serving as a reference for, the management of the Pan-European network in different timeframes for all ATM stakeholders, which includes, but is not limited to, targets, objectives, how to achieve them, anticipated impact. The NOP has a dynamic and rolling lifecycle starting in the strategic phase and progressively updated up to and including the execution and post-operations phases. It supports and reflects the result of the collaborative ATM planning process: at each phase, stakeholders collaborate at developing a common view of the planned network situation, allowing each of them to take informed decisions considering the network effect and the Network Manager to ensure the overall coordination of individual decisions needed to support network performance.	SESAR Lexicon
4DWxCube	The 4DWxCube is a (virtual) repository of shared consistent and translated meteorological information, produced by multiple METSPs and made available to ATM stakeholders via its SWIM compliant MET-GATE.	WP11.02.01

1.5 Acronyms and Terminology

Term	Definition
4DWxCube	Four Dimensional Weather Cube
A/C	Aircraft
AAMS	Advanced Airspace Management System
ACC	Area Control Centre
A-CDM	Airport-Collaborative Decision Making

Term	Definition
ADD	Architecture Definition Document
ADEP	Aerodrome of Departure
ADES	Aerodrome of Destination
ADEXP	ATS Data Exchange Presentation (ATS Data Exchange Protocol Format)
A-DPI	Airport-Departure Planning Information
AENA	Aeropuertos Españoles y Navegación Aérea
AFUA	Advanced Flexible Use of Airspace
AIBT	Actual In-Block Time
AIM	Air Traffic Flow and Capacity Management Information Message
AIMA	Airport Impact Assessment
AIR	Airborn (flight status)
AIXM	Aeronautical Information eXchange Model
ALDT	Actual LanDing Time
AMC	Airspace Management Cell
ANSP	Air Navigation Service Provider
AO	Airline Operator
AOC	Airline Operations and Control Centre
AoI	Area of Interest
AOLO	Aircraft Operators Liaison Officer
AOP	Airport Operations Plan
API	Application Programming Interface
APOC	Airport Operations Centre
APP	Approach Control (Office/Service)
APT	Airport
ARCID	Aircraft Identification
ARCTYP	Aircraft Type
ARES	Airspace reservation

Term	Definition
ASM	Airspace Management
ASMSS	Airspace Management Support System
ATA	Actual Time of Arrival
ATC	Air Traffic Control
ATCO	Air Traffic Controller
ATFCM	Air Traffic Flow and Capacity Management
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATMS	Air Traffic Management Service
ATO	Actual Time Over
ATOT	Actual Take-Off Time
ATS	Air Traffic Services
ATSU	Air Traffic Services Unit
ATV	Airport Transit View
AU	Airspace User
AUO	Airspace User Operations
AUP	Airspace Users Plan
B2B	Business-to-Business
B2C	Business-to-Consumer
BAA	British Airways
BE	Belgium
CADF	ECAC Centralized Airspace Data Function
CAP	Capacity
CASA	Computer Assisted Slot Allocation
CAT	Data Category
CDM	Collaborative Decision Making
CDR	Conditional Route

Term	Definition
CFMU	EUROCONTROL Central Flow Management Unit
CFSP	Computerized Flight plan Service Provider
CHG	Change message
CHMI	CFMU Human Machine Interface
CIAM	Collaboration Interface for Airspace Management
CM	Configuration Management
CMAC	Civil-Military ATM Coordination
CO2	Carbon Dioxide
COM	Communication
CPR	Correlated Position Report
CRIDA	Reference Center for Research, Development and Innovation in ATM
CRT	Cathode Ray Tube (Monitor)
CTA	Controlled Time of Arrival
CTFM	Current Tactical Flight Model
CTOT	Calculated Take-Off Time
DCB	Demand Capacity Balancing
DCT	Direct Route
DD	Detailed Design
dDCB	dynamic DCB
DFS	Deutsche Flugsicherung GmbH
DGAC	Direction Générale de l'Aviation Civile
DLA	Delay or Delay Message
DOD	Detailed Operational Description
DPI	Departure Planning Information
DSNA	Direction des Services de Navigation Aérienne
E-ATMS	European Air Traffic Management System
EAUP	European Airspace Use Plan

Term	Definition
EC	European Commission
ECAC	European Civil Aviation Conference
EET	Estimated Elapsed Time
EFPL	Extended Flight Plan
EGLL	ICAO code for London Heathrow airport
EHAM	ICAO code for Amsterdam Schiphol airport
EIBT	Estimated In Blocks Time
ELDT	Estimated Landing Time
ENV	NM Environment System
EOBD	Estimated Off Block Date
EOBT	Estimated Off Block Time
E-OCVM	European Operational Concept Validation Methodology
ETA	Estimated Time of Arrival
ETFMS	Enhanced Tactical Flow Management System
ETO	Estimated Time Over
ETOT	Estimated Take Off Time
EU	European Union
EUROCONTROL	European Organization for the Safety of Air Navigation
EUUP	European Updated airspace Use Plan
FAM	Flight Activation Monitoring
FBZ	FPL Buffer Zone
FDP	Flight Data Processing
FIR	Flight Information Region
FIZ	Flight Information Zone
FL	Flight Level
FM	Flow Manager
FMP	Flow Management Position

Term	Definition
FMTP	Flight Message Transfer Protocol
FOC	Flight Operations Centre
FPL	Flight Plan
FRA	Free Route Airspace
FSA	First System Activation message
FUA	Flexible Use of Airspace
FUM	Flight Update Message
HMI	Human Machine Interface
HP	Hewlett Packard Company
HQ	Eurocontrol Headquarters
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
ID	Identifier
IFPL	IFPS Internal Flight Plan
IFPLID	Initial Flight Plan Identifier
IFPS	Integrated Initial Flight Plan Processing System
IFR	Instrument Flight Rules
INTEROP	Interoperability Requirements Document
iOAT	Improved Operational Air Traffic
IRS	Interface Requirements Specification
KPA	Key Performance Area
KPI	Key Performance Indicator
LARA	Local And sub-Regional Airspace Management support system
LT	Local Time
LTM	Local Traffic Manager
MADAP	Maastricht Data Processing and Display System
M-CDM	Measure Collaborative Decision Making

Term	Definition
MDA	Moldova
MET	Meteorology
MIL	Military
MILO	Military Liaison Officer (NM)
MMI	Man-Machine Interface
MTA	Message Transfer Agent (X.400)
MTTT	Minimum Turn Round Time
MUAC	Maastricht Upper Area Control Centre
MVPA	Military Variable Profile Area
N/A	Not Applicable or Not Available or Not Assigned
NATS	National Air Traffic Services (UK)
NEFRA	North European Free Route Airspace Program
NEST	Network Strategic Tool
NIMS	Network Information Management System
NM	Network Manager
NMOC	Network Manager Operation Center
NMVP	NM Validation Platform
NOP	Network Operations Plan
OAT	Operational Air Traffic
OC	Operation Center
OCVM	Operational Concept Validation Methodology
OFA	Operational Focus Areas
OI	Operational Improvement
OPLOG	ETFMS Operational Log
OPS	Operations
OSED	Operational Service and Environment Description
OTMV	Occupancy Traffic Monitoring Values

Term	Definition
P&S	Processes and Services
PFD	Planned Flight Data
PI	Performance Indicator
PM	Project Management
PTR	Profile Tuning Restriction
PUT	Product Under Test
RAD	Route Availability Document
RBT	Reference Business Trajectory
REG	Aircraft Registration
REQ	Requirement
RR	Routeing Scheme Route
RTS	Real-time Simulation
RTSA	Real Time Status of Airspace
RWYARR	Runway Identifier of the assigned
RWYDEP	Runway identifier of the assigned runway
SBT	Shared Business Trajectory
SCN	Scenario
SE	South-East
SEQ	Sequence
SESAR	Single European Sky ATM Research Programme
SESAR Programme	The programme which defines the Research and Development activities and Projects for the SJU.
SIBT	Scheduled In-Block Time
SID	Standard Instrument Departure Route
SJU	SESAR Joint Undertaking (Agency of the European Commission)
SJU Work Programme	The programme which addresses all activities of the SESAR Joint Undertaking Agency.
SLDT	Scheduled Landing Time

Term	Definition
SMT	Share Mission Trajectory
SOBT	Scheduled Off-block Time
SPR	Safety and Performance Requirements
SRM	Slot Revision Message
STAM	Short-Term ATFCM Measures
STAR	Standard Instrument Terminal Arrival Route
SUP	Supplement
SUT	System Under Test
SUUP	Special UUP
SWIM	System Wide Information Management
T_DPI	Target DPI
TACT	Tactical System (predecessor of ETFMS)
TAD	Technical Architecture Description
TDI	Target Time Deviation
TITLE	Message Name
TLDT	Target Landing Time
TMA	Terminal Manoeuvring Area
TOBT	Target Off Block Time
TOC	Top Of Climb
TOD	Top Of Descend
TONB	Take Off Not before
TP	Trajectory Prediction
TRA	Temporary Reserved Area
TRAMON	Traffic monitoring
TSA	Temporary Segregated Area
TSAT	Target Start-Up Approval Time
TT	Target-Time

Term	Definition
TTA	Target Time of Arrival
TTD	Target Time of Departure
TTG	Time To Gain
TTL	Time To Loose
TTM	Target Time Management
TTO	Target Time Over
TTOT	Target Take Off Time
TV	Traffic Volumes
TWR	Air Traffic Control Tower
UC	Use Case
UDPP	User Driven Prioritisation Process
UIR	Upper Flight Information Region
UK	The United Kingdom
UTC	Coordinated Universal Time
UUP	Updated Airspace Use Plan
VALP	Validation Plan
VALR	Validation Report
VALS	Validation Strategy
VAN	Value Added Network
VP	Verification Plan
VPA	Variable Profile Area
VR	Verification Report
VS	Verification Strategy
WEF	With Effect From
WOC	Wing Operations Centre
WP	Work Package
WX	Weather

2 Context of the Validation

This section provides the general background of the overall validation foreseen in Step1 for those WP7 exercises covering DCB-0103-A OI Step. It mainly addresses P07.06.01 active contribution to P13.02.03VALP; exercises VP-749 and VP-700.

The validations activities were defined in document 07.06.01-D47 Step1.

Results from the following Validation Exercises addressing DCB-010OI Step, are analysed in this VALR:

- EXE-07.05.04-VP-710
- EXE-07.06.02-VP-713
- EXE-13.02.03-VP-700
- EXE-13.02.03-VP-749

2.1 Concept Overview

The Collaborative NOP (NOP) represents a view, at any moment in time, of the expected demand on the ATM Network on a particular day and the resources available across the network, together with a set of agreed actions to accommodate this demand, to mitigate known constraints and to optimize ATM Network performance.

The NOP has a dynamic and rolling lifecycle starting in the long-term planning phase and progressively updated up to and including the execution and post-flight phases. It supports and reflects the results of the collaborative ATM planning process.

The NOP facilitates and supports all ATM stakeholders to take informed decisions considering the network effect and supports the Network Manager, responsible for the overall coordination of individual decisions and actions needed to accommodate the demand and optimize network performance.

The NOP is the common view of the Network situation, knowing that the information the ATM Stakeholder has access to, depends on its role and associated access rights, adapted to its operational needs (different security levels).

The following tables describe and summarise the scope of 07.06.01. Project Validation exercises.

Validation Exercise ID and Title	**EXE-13.02.03-VP-700: Advanced Short Term ATFCM including Network Supervision and interface with Local Tools** **Exclusively P07.06.01 contribution part : Network Key Performance Indicators**
Leading organization	Leading organization for VP-700 is EUROCONTROL This sub part of exercise lead by ENAIRE
Validation exercise objectives	**OBJ-07.06.01-VALP-GEN1.0100.-** Assess that any change in stakeholders operational plans can be transmitted to the NOP and the Network Plan can be updated accordingly. **OBJ-07.06.01-VALP-GEN1.0200.-** Assess that all partners involved in operations can have easy access to any NOP change with potential impact on their operations. **OBJ-07.06.01-VALP-0700.1010.-** To assess if the Network is able to monitor, assess and record in real time en-route capacity and demand changes due to STAM up-to-date information on selected flights **OBJ-07.06.01-VALP-0700.1020.-** To assess if the Network is able to monitor and record changes in flight profiles due to level capping and re-routing measures when applying STAM. **OBJ-07.06.01-VALP-0700.1030.-** To assess if the Network is able to monitor and record departure and arrival deviation of flights from their initially planned schedules, as well as the causes of deviation, to

<table>
<tr><th>Validation Exercise ID and Title</th><th>EXE-13.02.03-VP-700: Advanced Short Term ATFCM including Network Supervision and interface with Local Tools
Exclusively P07.06.01 contribution part : Network Key Performance Indicators</th></tr>
<tr><td></td><td>assess their departure and arrival punctuality index.
OBJ-07.06.01-VALP-0700.1040.- To assess if the Network is able to monitor and record departure and arrival deviations of flights from their initially planned schedules, as well as the causes of deviation, to assess their block-to-block variability and arrival and departure On-Time Performance.
OBJ-07.06.01-VALP-PERF.7100: Assess the operational use of a representative set of KPIs to assist network monitoring in execution
OBJ-07.06.01-VALP-PERF.7200.- Assess the benefit of the trend analysis to assess the execution phase evolution (i.e. along the day) and comparison of trends with parallel periods (i.e. day before or a similar day in a similar context).
OBJ-07.06.01-VALP-PERF.7300.- Assess the benefit of extending FMP monitor with the occupancy load factors (different colours for different thresholds) to better assess the DCB network situation.
OBJ-07.06.01-VALP-PERF.7400.- Assess the adequacy of set of measurements to assist in the post analysis of network performance.</td></tr>
<tr><td>Rationale</td><td>Applying STAM procedures to solve hotspot situations may bring performance benefits at local level as compared to CASA procedures. Nevertheless, it is important to validate that local measures do not imply degradation in global Network performance unless critical for safety.
Assessment at Network level on how local measures may impact upstream and downstream affected traffic needs to be also validated.</td></tr>
<tr><td>Supporting DOD / Operational Scenario / Use Cases</td><td>SWP07.02 DOD/Operational Scenarios:
- Medium/ Sort Term Planning Scenario
SWP07.02 DOD/ Operational Scenarios / Use Cases:
UC-NP-13 Assess Complexity and Sector Workload.
UC-NP-14 Define / Update Sector / Airport Capacities.
UC-NP-15 Capture and Maintain Capacity Data.
UC-NP-17 Monitor Declared Capacity Values:
UC-NP-21 Collaboratively Agree and Implement Airspace Configuration.
UC-NP-25 Publish and Update Airspace Configuration.
- Execution Scenario
SWP07.02 DOD/ Operational Scenarios / Use Cases.
UC-NE-01 Monitor the Application of DCB/dDCB measures.
UC-NE-04 Monitor deviation between Agreed and Actual Flight Profile.
UC-NE-07 Detection of Demand Capacity Imbalances (Hot Spots).
UC-NE-09 Analysis and Preparation of the STAM Solution for Flow Measures.
UC-NE-10 Coordination of the STAM Solution.
UC-NE-11 Implement STAM Solution.
UC-NE-12 Escalation to Network Manager.</td></tr>
</table>

Validation Exercise ID and Title	**EXE-13.02.03-VP-700: Advanced Short Term ATFCM including Network Supervision and interface with Local Tools** **Exclusively P07.06.01 contribution part : Network Key Performance Indicators**
	UC-NE-13 Dynamically Updating the NOP. **UC-NE-30** Post-OPS Analysis of Network adherence to Operational Performance KPIs. **UC-NE-31** Network Impact Assessment of dDCB Measures proposed by LTM. **UC-NE-32** Network Impact Assessment of Airports AOP Changes.
OFA addressed	**OFA05.03.04** Enhanced ATFCM Processes. **OFA05.03.07** Network Operations Planning.
OI steps addressed	**CM-0103-** Automatic Support for Traffic Complexity Assessment **DCB-0103-A** Collaborative NOP for Step1 **DCB-308** Advance Short Term ATFCM **MET-0101** Enhanced MET observations, nowcasts and forecasts provided by ATM-MET systems for Step 1
Enablers addressed	**REG-0518:** Regulatory Provisions for the harmonised deployment of network collaborative management
Applicable Operational Context	Network
Expected results per KPA	Positive impact on Capacity, Quality of Service and Safety
Validation Technique	Shadow Mode
Dependent Validation Exercises	EXE-07.03.02-VP-522

Table 1: VP-700 Concept Overview

Validation Exercise ID and Title	**EXE-07.05.04-VP-710 REAL TIME AIRSPACE STATUS DATA EXCHANGE** **RTS on the integration of ASM, ATC and ATFCM processes for automated RTSA update in B2B via AIXM and ADEXP formats**
Leading organization	EUROCONTROL
Validation exercise objectives	The exercise will demonstrate the feasibility of updating the real time airspace status automatically into the NM systems, delivering a closed loop CDM process between ASM Support Systems, NM systems and ATC system. The main objective is to validate the expected benefit from the exchange of real time ASM information for the Military, ATC, NM and AO stakeholders. This data should be ideally taken to make better use of available capacity.
Rationale	Support automation of DCB process
Supporting DOD / Operational Scenario / Use Case	Supporting DOD: 07.02 - Network Operations DOD . Operational Scenario: Planning the Flexible Use of Airspace. Use cases:

Validation Exercise ID and Title	**EXE-07.05.04-VP-710 REAL TIME AIRSPACE STATUS DATA EXCHANGE** **RTS on the integration of ASM, ATC and ATFCM processes for automated RTSA update in B2B via AIXM and ADEXP formats**
	- **UC-NP-23** Publish and Update Airspace Configuration: - **UC-NE-09** Dynamically adapt Airspace Configurations; - **UC-NE-10** Update Airspace Status in Real Time
OFA addressed	OFA05.03.01 AIRSPACE MANAGEMENT AND AFUA
OI steps addressed	**AOM-0202-A** Automated Support for strategic, pre-tactical and tactical Civil/ Military coordination in airspace management (ASM) **AOM-0206-A** Flexible and modular ARES in accordance with the VPA design principle **DCB 0103-A** Collaborative NOP for Step 1.
Enablers addressed (under development)	***AAMS-06b:*** ASM support systems enhanced to exchange static data and airspace usage data with NM systems in AIXM format. **AAMS-06c:** Local ASM Tools to be updated to support Transmission of VPA-related data from local ASM tool to the NM. ***AAMS-09a**:* NM systems enhanced to exchange static data and airspace usage data with ASM support systems in AIXM format. **AAMS-1:** ASM support systems enhanced to exchange real-time airspace status updates. **ER APP ATC 77:** ATC systems enhanced to exchange real time (tactical) airspace status data with ASM support system. **MIL-0501:**Specifications for the interoperability of military ground systems with SWIM. **MIL-0502:**Support MIL-0501 with ground-ground COM interface for interconnection of military systems to PENS. **NIMS-42:**NM systems enhanced to receive, process and display real-time tactical (ASM level III) airspace usage information. **PRO-011:**ASM Procedures to ensure that the change in airspace availability is promulgated through SWIM and reflected in the NOP. **PRO-024:**ASM Procedures related to real-time (tactical) ASM level III information exchange. **SWIM-APS-01a:** Provision of Aeronautical services for Step 1. **SWIM-APS-02a:** Consumption of Aeronautical Information services for Step 1. **SWIM-APS-04:** Consumption of ATFCM Information Services for Step 1. **SWIM-INFR-05a:** General SWIM Services infrastructure Support and Connectivity.
Applicable Operational Context	Airspace Management and Advanced Flexible Use of Airspace

Validation Exercise ID and Title	**EXE-07.05.04-VP-710 REAL TIME AIRSPACE STATUS DATA EXCHANGE** **RTS on the integration of ASM, ATC and ATFCM processes for automated RTSA update in B2B via AIXM and ADEXP formats**
Expected results per KPA	Safety: Through automation and shared situational awareness reduce human error as improvement to safety. Environment Fuel Efficiency: Support NM with real time ASM related information to improve DCB process in order to make maximum use of available airspace and minimise additional fuel burn. Real time information improves AO route planning. Airspace Capacity En route: Support NM and AO with real time ASM related information to improve DCB process.
Validation Technique	RTS using EUROCONTROL NMVP platform (shadow mode), DFS iCAS IBP and MUAC IBP
Dependent Validation Exercises	EXE-07.05.02-VP-015 EXE-07.05.02-VP-016 EXE-07.05.02-VP-017 EXE-07.05.02-VP-717

Table 2: VP-710 Concept Overview

Validation Exercise ID and Title	EXE-07.06.02-VP-713: Enhance Current Flight Planning Processes (III) – V3/V2/V1
Leading organization	EUROCONTROL
Validation exercise objectives	• **E-OCVM V3**: Validate in operational conditions (e.g. shadow mode, EFPLs sent for "real flights" by Airspace users) of the operational feasibility of the use of EFPL in NM Flight Plan Validation and DCB processes. • **E-OCVM V2**: Refinement of operational concepts and supporting enablers in order to make the FOC able to create a 4D Trajectory that can directly be used (w/o further changes) by NM.
Rationale	Enrichment of the current Flight Plan filing process in Short Term Planning Phase allowing Flight Plan originators to provide calculated 4D Trajectory and aircraft performance specific to the flight (Part 3)
Supporting DOD / Operational Scenario / Use Case	07.06.02 OSED Step1 - §2.1 & §2.2.2 & §6.2
OFA addressed	**OFA03.01.04**: Business and Mission Trajectory
OI steps addressed	**AUO-0203-A**: Shared Business/Mission Trajectory (SBT/SMT) in Step 1 **AUO-0223** Harmonised and improved integration of airspace and ATC constraints/procedures in trajectories calculated by FOCs and NM **DCB-0103-A**: Collaborative NOP for Step 1
Enablers addressed	**NIMS-21A**: Initial Flight Planning management enhanced to support 4D for Step 1. **AOC-ATM-20**: Sharing of trajectory data between AOC/WOC and the ATM world using B2B web services.

	ER-APP-ATC-82: Enhance FDP to use Shared Business/Mission Trajectory (SBT/SMT). **SWIM-APS-03a**: Provision of ATFCM Information Services for Step 1. **SWIM-APS-04a**: Consumption of ATFCM Information Services for Step 1.
Applicable Operational Context	Flight Planning Operations ATC/DCB Operations Flight Operations
Expected results per KPA	**Capacity**: - Improved network capacity management due to better traffic predictability. - Reduced capacity buffers. **Efficiency:** - Executed trajectory closer to AO's preferences. - Lower delays due to better management of network capacity management. - Executed trajectory closer to AO's preferences due to the better knowledge of flight intent. **Cost effectiveness:** - Reduced workload for flight plan originators and IFPS operators due to flight data misinterpretation that need manual correction. - Fewer occurrences of Flight Plan rejections requiring FPL refilling. **Safety:** - Increased safety in ATSU due to better traffic predictability.
Validation Technique	Shadow mode + fast time simulation
Dependent Validation Exercises	EXE-07.06.02-VP-311 EXE-07.06.02-VP-616

Table 3: VP-713 Concept Overview

Validation Exercise ID and Title	**EXE-13.02.03-VP-749: TTA / TTO Management. Exclusively P07.06.01 contribution part : AOP / NOP Integration"**
Leading organization	EUROCONTROL

Validation Exercise ID and Title	**EXE-13.02.03-VP-749: TTA / TTO Management. Exclusively P07.06.01 contribution part : AOP / NOP Integration"**
Validation exercise objectives	**OBJ-07.06.01-VALP-0749.0100** Assess the improved network predictability due to sharing of departure and arrival flight information in a timely manner. **OBJ-07.06.01-VALP-0749.0200** Asses that the rolling exchange of data between AOP and NOP improves predictability of both AOP, NOP. **OBJ-07.06.01-VALP-0749.0300** Asses that the rolling exchange of data between AOP and NOP improves DCB process of both AOP, NOP. **OBJ-07.06.01-VALP-0749.0400** Asses that the rolling exchange of data between AOP-NOP improves situation awareness of AOP, NOP and of any NOP stakeholder. **OBJ-07.06.01-VALP-0749.0500** Assess the improved network predictability due to sharing of knock-on effect of late arrivals on the next rotation. **OBJ-07.06.01-VALP-0749.0600** Assess the performance improvements of Airport DCB processes due to better quality of network predictions for both arrivals and departures. **OBJ-07.06.01-VALP-0749.0700** Assess the performance improvements of Airport resource planning due to better quality of network predictions for both arrivals and departures. **OBJ-07.06.01-VALP-0749.800** Assess that the computer-to-computer exchange of data between AOP and NOP will improve the timely and systematic exchange and will reduce the manual operations and telephone coordination required today to exchange the information and to update the systems. **OBJ-07.06.01-VALP-0749.900** Assess that the integration of Airports in the arrival management process improves airports arrival predictability and punctuality.
Rationale	In the general concept of the future ATM system there is a strong need for integration of airport and network operations. This integration focuses on timely exchange of relevant airport and network information, resulting in a common situational awareness and improving both network and airport planning activities and operational performance.
Supporting DOD / Operational Scenario / Use Case	SWP07.02 DOD/Operational Scenarios - Short Term Planning Scenario SWP07.02 DOD/Use Cases: **UC-NE-04** Monitor Deviation between Agreed and Actual Flight Profile **UC-NE-07** Detection of Demand Capacity Imbalances (Hot Spots) **UC-NE-13** Dynamically Updating the NOP

Validation Exercise ID and Title	EXE-13.02.03-VP-749: TTA / TTO Management. Exclusively P07.06.01 contribution part : AOP / NOP Integration"
	UC-NE-24 Exchange of API and DPI **UC-NE-25** Turn around delay, delayed outbound flight **UC-NE-27** Airport traffic distribution adjustment **UC-NE-28** Dissemination of Flight Progress information – Flight suspension from AOP DPI process **UC-NE-32** Network Impact Assessment of Airports AOP Changes
OFA addressed	OFA05.03.07 "Network Operations Planning" OFA05.01.01 "Airport Operations"
OI steps addressed	**DCB-0103-A:** Collaborative NOP for Step1 **DCB-0208** DCB in a Trajectory Management Context **DCB-0310** Improved Efficiency in the management of Airport and ATFCM Planning **AO-0801-A** Collaborative Airport Planning
Enablers addressed	**Airport-38** ATFCM –Extended Data Interface **NIMS 13b** Enhance Short Term ATFM measures **NIMS 25** Integration of Airports CDM data into Network **PRO-028** Procedures to support AOP-NOP **REG-0518** Regulatory Provisions for the harmonised deployment of network collaborative management **SWIM APS 04a** Consumption of ATFCM Information Services for Step 1 **SWIM INFR 05a** General SWIM Service Inf. Support and Connectivity **SWIM-NET-01a**SWIM Network Point of Presence **SWIM-SUPT-01a** SWIM Supporting Registry Provisions
Applicable Operational Context	Network
Expected results per KPA	Positive impact on Predictability
Validation Technique	Shadow Mode
Dependent Validation Exercises	

Table 4: VP-749 Concept Overview

2.2 Summary of Validation Exercises

2.2.1 Summary of Expected Exercises outcomes

Due to the transversal nature of Network Operations Plan, besides P07.06.01 active participation in exercises listed under P12.02.03, this Validation Report also addresses those WP7 Validation Exercises that satisfy OFA05.03.07 objectives in support of DCB-0103-A OI Step and cover requirements specified in P07.06.01 Step1 NOP OSED

The exercises addressed in this report focused on several aspects of the concept of the Collaborative NOP developed in the OSED Step 1

- Validate that any change in stakeholders operational plans can be transmitted to the NOP and the Network Plan can be updated accordingly.
- Validate that all partners involved in operations can have easy access to any NOP data with potential impact on their operations.
- Validate that all stakeholders share the same data so that the collaborative decision making of airport and network management is enhanced.
- Facilitate Network Performance Monitoring, supporting Primary Projects in the assessment of their performance objectives.

These expected outcomes have an impact on a group of different stakeholders involved:

Stakeholder	Why it matters to stakeholder	Performance expectations	Exercise Identifier
Airspace users	Expect to have an improved prediction, through the use of management techniques close to the real time operations. Expect to have a better involvement in the decision making process through information exchange and negotiation. Expect to have less delay, through a better exploitation of short term network opportunities. Expect to have more flexibility on the take-off time if they respect the target time of arrival.	Collaborative as opposed to imposed network management solutions align better to operator/flight business model optimisation criteria.	EXE-13.02.03-VP-700 EXE-13.02.03-VP-749
	Direct impact on AUs business performance.	Expect to improve efficiency due to potential cost reduction through availability of more routes. Expect to have evidence of the Environmental improvements reducing the emissions through the use of more optimum routes/trajectories. Expect to have evidence of a significant improvement of quality of service allowing Airspace users to determine their trajectories closest to their business needs which take into account ATM constraints.	EXE-07.05.04-VP-710 EXE-07.06.02-VP-713
Airports	Expect to improve predictability ensuring better tactical planning and traffic ordering and surface movement and stand management efficiency. This will also enable the optimisation of the network usage thanks to better collaboration and sharing of up to date data between actors.	Enhanced adherence/compliance for punctuality of arrivals and departures. Enhanced awareness of AU pre-departure flight status. More accurate awareness of in-flight profile status/prediction. More timely awareness of AU flight priority. Greater shared and timely	EXE-13.02.03-VP-700 EXE-13.02.03-VP-749

Stakeholder	Why it matters to stakeholder	Performance expectations	Exercise Identifier
		awareness of network constraints/issues (impact assessment).	
ANSP	Expect to have an increment of capacity and to improve the use of existing capacity by a close working relationship between ANSPs/FMP and NM, which would monitor both the real demand and the effective capacity of sectors having taken into account the complexity of the expected traffic situation.	Enhanced monitoring and prediction of traffic demand Enhanced awareness of available capacity of sectors having taken into account the complexity of the expected traffic situation. Enhanced network situation awareness. Enhanced awareness of short-term network opportunities, e.g. MDA availability/ neighbouring ACCs. Improved confidence in predictive accuracy and coordination/decision support tools Improved efficiency of hotspot resolution.	EXE-13.02.03-VP-700 EXE-13.02.03-VP-749
	Direct impact on business performance by Increase situational awareness between ATCO, SUP, FMP and NM, as well as external partners	Improve efficiency of airspace use. Increase Airspace Capacity.	EXE-07.05.04-VP-710 EXE-07.06.02-VP-713
Military	Direct impact on military operations performance.	Expect evidence of improvement for flexibility of military operations through coordinated allocation of modular areas.	Military
Network manager	Expect to have a significant increment of efficiency and improve quality of service through the use of flow management techniques close to the real time operations with direct impact on tactical capacity management, occupancy count and tactical action on traffic.	Enhanced monitoring and prediction of traffic demand. Enhanced awareness of available capacity of sectors having taken into account the complexity of the expected traffic situation. Enhanced information exchange (timeliness/content), negotiation and implementation of a decision-making process between all actors (NM, FMP, AU, Airports). Enhanced network situation awareness. Enhanced awareness of short-term network opportunities, e.g. MDA availability/neighbouring ACCs. Improved communication and coordination of STAM with the necessary new support tools.	EXE-13.02.03-VP-700 EXE-13.02.03-VP-749

Stakeholder	Why it matters to stakeholder	Performance expectations	Exercise Identifier
	Direct impact on Network Performance	Promote use of the airspace / capacity as soon as it is made available; More accurate ATFCM measures taken due to ASM/ATFCM operations based on real use of airspace, not only on intentions; Input to Post Ops Analysis and KPA/KPI enabling the ASM/ATFCM strategic and pre-tactical phases improvement; Pan European Situation Awareness of airspace utilisation.	EXE-07.05.04-VP-710
		Expect to confirm the benefits of the flight performance data compared to the current situation in ops. Expect to increase Airspace Capacity through collaborative refinement of trajectories. Expect to improve Predictability ensuring better planning. Expect to optimise the network usage, due to better collaboration and sharing of up to date data between actors.	EXE-07.06.02-VP-713
SJU **European Commission**	Expect to have evidence on the benefits promised by the proposed concept.		EXE-13.02.03-VP-700 EXE-13.02.03-VP-749 EXE-07.05.04-VP-710 EXE-07.06.02-VP-713

Table 5: Expected outcomes of the exercises per stakeholder

2.2.2 Benefit mechanisms investigated

Refer to the following Primary Projects Validation Plans for details on Benefit Mechanisms:

- SESAR P07.05.04 D48 S1 FAM VALP v00.03.00 [19]
- SESAR P13.02.03 D342 VALP S1 R5 00.01.03 [20]
- 07.06.02-D88 -Step 1 Business Trajectory Validation Plan for VP713 [23]

2.2.3 Summary of Validation Objectives and success criteria

[OBJ]

Identifier	OBJ-07.06.01-VALP-GEN1.0100
Objective	Assess that any change in stakeholders operational plans can be transmitted to the NOP and the Network Plan can be updated accordingly
Title	Feasibility

Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0006	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0010	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3041	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-GEN1.0101	The Network Manager is able to capture operational plan updates originated by stakeholders based on their Real Time knowledge of Airspace Status
CRT-07.06.01-VALP-GEN1.0102	The Network Operational Plan is updated in Real Time by the NM upon reception of planning updates originated by stakeholders and a new Network DCB assessment is performed
CRT-07.06.01-VALP-GEN1.0103	The Network Manager is able to capture EFPL 4D trajectory information originated by AU and update the NOP accordingly
CRT-07.06.01-VALP-GEN1.0104	The NOP has been successfully updated when operating in global mixed mode; i.e.; EFPLs and ICAO update messages. Supports OBJ-07.06.02-VALP-713A-2050. Satisfied by CRT-07.06.02-VALP-713A.1072.
CRT-07.06.01-VALP-GEN1.0105	The Network Operational Plan is updated in Real Time upon reception of planning updates originated by stakeholders regarding hotspot detection, STAM analysis, coordination, preparation and implementation using STAM / regulation related B2B services (flow services)
CRT-07.06.01-VALP-GEN1.0106	AOP changes produced at Airports are captured by the NMOC in Real Time and used to update the NOP accordingly.

[OBJ]

Identifier	OBJ-07.06.01-VALP-GEN1.0200
Objective	Assess that all partners involved in operations can have easy access to any NOP data having potential impact on their operations.
Title	Feasibility
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0003	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0006	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0007	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0010	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-NFR1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0001	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-GEN1.0201	Partners involved in operations are able to timely re-plan their operation due to changes in airspace availability updated in the NOP
CRT-07.06.01-VALP-GEN1.0202	Roles and tasks related to changes in airspace status are well known and accepted by all actors involved
CRT-07.06.01-VALP-GEN1.0203	NOP publishes the necessary data and updates for the AU to build their 4D trajectory (for example publication of PTRs and RAD)
CRT-07.06.01-VALP-GEN1.0204	The NOP supports the mixed mode of operations by publishing (via SWIM-B2B and or in the situation display) AO4D flight trajectories, ICAO flight plans and derived NM calculated trajectories
CRT-07.06.01-VALP-GEN1.0205	NOP provides confidentiality of commercially sensitive data (Flight Performance data and ToW). Satisfied by CRT-07.06.02-VALP-713A.1091
CRT-07.06.01-VALP-GEN1.0206	Partners involved in operations can obtain the necessary information from the NOP with the STAM / regulation related B2B services (flow services) to allow them to timely re-plan their operation in case of DCB imbalances using their local tools
CRT-07.06.01-VALP-GEN1.0207	Roles and tasks related to changes in airspace Demand Capacity imbalances and the proposed corrective actions are well known and accepted by all actors involved
CRT-07.06.01-VALP-GEN1.0208	Positive feedback from operational users from the NOP updates affecting Airports operations, used to update AOPs by the impacted Airports

[OBJ]

Identifier	OBJ-07.06.01-VALP-GEN1.0300
Objective	To assess that all stakeholders share the same data so that the collaborative decision making of airspace management is enhanced.
Title	Common Situational Awareness
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0001	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0011	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-NFR1.0003	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-GEN1.0301	There is evidence of improvement provided by all the stakeholders in their sharing and accessibility to the totality of required information in ACC, ASM and Network systems environment
CRT-07.06.01-VALP-GEN1.0302	The process, procedures and roles are clear, stable, usable and are well accepted by the involved actors
CRT-07.06.01-VALP-GEN1.0303	NOP updates produced by AOP updates are simultaneously accessed by every affected ATM stakeholder within the Network

[OBJ]

Identifier	OBJ-07.06.01-VALP-AFUA.0100

Objective	To assess if the Network is able to monitor and assess in real time en-route capacity changes due to RTSA up-to-date information on additional airspace provided by opening of the ARES to other airspace users
Title	Airspace capacity changes based on RTSA information
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-NFR1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0004	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-AFUA.0101	RTSA data exchange is monitored by the Network and changes in airspace capacity are assessed and updated in terms of number of IFR flights able to enter a given airspace volume (ATC sectors, UIR/FIR area) made available by AFUA.

[OBJ]

Identifier	OBJ-07.06.01-VALP-AFUA.0200
Objective	To assess if the Network is able to monitor and record changes in the key performance drivers of environment, due to an increase in flight efficiency, thanks to the ability to better match airspace allocation to actual user needs
Title	Environment performance drivers
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-NFR1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0050	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3054	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-AFUA.0201	The NM is able to record actual trajectories crossing times over restricted airspace areas to measure actual flown time when implementing VPA, RTSA concept and planned time flown in reference scenario.
CRT-07.06.01-VALP-AFUA.0202	The NM is able to record new flight extensions (reduced EETs in traffic flow) measured when implementing VPAs and the initially expected in the Reference scenario.

[OBJ]

Identifier	OBJ-07.06.01-VALP-AFUA.0300
Objective	To assess if the Network is able to monitor and assess new flexibility opportunities for Airspace Users due to increased civil-military cooperation and coordination
Title	Civil-military cooperation and coordination
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-ASM1.0030	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-ASM1.0040	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-NFR1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0050	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3054	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-AFUA.0301	Airspace Users are able to timely obtain RTSA updated information to evaluate re-planning opportunities of their operations
CRT-07.06.01-VALP-AFUA.0302	Airspace Users obtain acceptance to their re-planning requests upon their evaluation of arising opportunities from ARES status changes

[OBJ]

Identifier	OBJ-07.06.01-VALP-EFPL.0100
Objective	Assess that EFPL 4D trajectory information contributes to the elaboration of the Network Operation Plan with improved traffic predictability.
Title	Support to Network Predictability
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0006	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0010	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0023	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-EFPL.0101	Assess the level of contribution to the predictability of each element of the EFPL. Satisfied by CRT-07.06.02-VALP-713A.2011

CRT-07.06.01-VALP-EFPL.0102	The 4D trajectories, calculated by DCB, taking into account last update information are closer to the flown trajectories. Satisfied by CRT-07.06.02-VALP-713A.2031

[OBJ]

Identifier	OBJ-07.06.01-VALP-EFPL.0200
Objective	Assess that EFPL 4D trajectory information contributes to the elaboration of the Network Operation Plan with improved DCB assessment /predictions
Title	Support to Network Predictability
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-DCB1.0040	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-DCB1.0060	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0006	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3041	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-EFPL.0201	The NOP has received 4D trajectory information from an EFPL, which has been used to better assess traffic demand (with entry traffic counts, Occupancy counts and Flight Lists) supporting the Network Manager in the enhancement of DCB assessment. Satisfied by CRT-07.06.02-VALP-713A.2052
CRT-07.06.01-VALP-EFPL.0202	The impact of EFPL (compared to ICAO FPL) on delays is acceptable or delays are reduced. Satisfied by CRT-07.06.02-VALP-713A.2062
CRT-07.06.01-VALP-EFPL.0203	The impact of EFPL (compared to ICAO FPL) on the number of flights impacted by regulations is acceptable. Satisfied by CRT-07.06.02-VALP-713A.0261

[OBJ]

Identifier	OBJ-07.06.01-VALP-0700.1010
Objective	To assess if the Network is able to monitor, assess and record in real time en-route capacity and demand changes due to STAM up-to-date information on selected flights
Title	Capacity Monitoring and Assessment
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0016	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0010	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-0700.1010	The Network can assess and record the declared Capacity values (OTMV) of a restricted sector with no STAM measures applied
CRT-07.06.01-VALP-0700.1011	The Network can record both entry counts and occupancy counts managed by the restricted sector when STAM measures are applied

[OBJ]

Identifier	OBJ-07.06.01-VALP-0700.1020
Objective	To assess if the Network is able to monitor and record changes in flight profiles due to level capping, and re-routing control measures when applying STAM
Title	Fuel Efficiency Monitoring
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0016	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0010	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-0700.1020	The Network is able to assess and record a new profile affected by level capping to flights affected by STAM measures
CRT-07.06.01-VALP-0700.1021	The Network is able to assess and record flight time / miles extension to flights affected by STAM measures

[OBJ]

Identifier	OBJ-07.06.01-VALP-0700.1030
Objective	To assess if the Network is able to monitor and record departure and arrival deviation of flights from their initially planned schedules, as well as the causes of deviation, (e.g. delay message, regulation, STAM…) to assess their departure and arrival punctuality index
Title	Punctuality Monitoring
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0016	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0010	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-0700.1030	The Network is able to assess and record ATFM departure delays of affected flights by STAM measures
CRT-07.06.01-VALP-0700.1031	The Network is able to assess and record deviation in departure times from their initially planned values to flights affected by STAM measures
CRT-07.06.01-VALP-0700.1032	The Network is able to assess and record deviation in arrival times from their initially planned values to flights affected by STAM measures

[OBJ]

Identifier	OBJ-07.06.01-VALP-0700.1040
Objective	To assess if the Network is able to monitor and record departure and arrival deviations of flights from their initially planned schedules, as well as the causes of deviation, to assess their block-to-block variability and arrival and departure On-Time Performance
Title	Predictability Monitoring
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0016	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0010	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-0700.1040	The Network is able to assess and record variability in departure times from their initially planned values to flights affected by STAM measures
CRT-07.06.01-VALP-0700.1041	The Network is able to assess and record variability in arrival times from their initially planned values to flights by affected STAM measures

[OBJ]

Identifier	OBJ-07.06.01-VALP-PERF.7100
Objective	Asses the operational use of a representative set of KPIs to assist network monitoring in execution.
Title	Operational use of KPIs during execution
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0001	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0003	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0020	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0021	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0022	N/A

<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0023	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-PERF.7100	Positive operational feedback about the support to network monitoring and supervision provided by the KPI dashboard.
CRT-07.06.01-VALP-PERF.7101	Predictability/Variability of traffic counts depending on the status of A/C at data extraction time (ground, off-block, airborne) has been assessed with the KPI tool
CRT-07.06.01-VALP-PERF.7102	Adherence at Entry sector (in FL and Time) has been assessed with the KPI tool
CRT-07.06.01-VALP-PERF.7103	The KPI dashboard helped identifying on-line deviations, imbalance situations and performance changes that were further analysed through the recorded data to confirm the performance evolution during trial execution.
CRT-07.06.01-VALP-PERF.7104	Predictability/Variability of traffic counts depending on traffic demand category has been assessed with the KPI tool
CRT-07.06.01-VALP-PERF.7105	Analysis of the traffic counts according to the classification of flights on-time/ late/early has been performed with the KPI tool

[OBJ]

Identifier	OBJ-07.06.01-VALP-PERF.7200
Objective	Asses the benefit of the trend analysis to assess the evolution during execution (i.e. along the day) and comparison of trends with parallel periods (i.e. day before or a similar day in a similar context).
Title	Performance evolution in trend representation
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0001	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0001	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0020	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0021	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0022	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-PERF.7200	Reliability of the occupancy counts in function of participating A/C is assessed , based on the "Inflow, Outflow and Stable" flight proportion of the occupancy count has been analysed with the KPI tool

CRT-07.06.01-VALP-PERF.7201	Positive operational feedback by NMOC about the use of trend analysis to assess the evolution during execution
CRT-07.06.01-VALP-PERF.7202	Comparative Load Status Evolution for entry load in a sector to assess the load evolution of a day compared to a previous general behaviour; e.g.D-1 or D-7 has been analysed with the KPI tool
CRT-07.06.01-VALP-PERF.7203	The reliability of departure data from airports depending on their sample time and source is used (DPIs, ATFM, FPL) has been analysed with the KPI tool

[OBJ]

Identifier	OBJ-07.06.01-VALP-PERF.7300
Objective	Asses the benefit of extending FMP monitor with the occupancy load factors (different colours for different thresholds) to better assess the DCB network situation.
Title	NM DCB Process Improvements
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0001	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-NFR1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0001	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0020	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-PERF.7300	The FMP monitor enhanced with the occupancy load allows to monitor the DCB network situation with more finesse during the tactical phase or eventually in short time planning phase or simulation
CRT-07.06.01-VALP-PERF.7301	The proportion of flights that are inflow, outflow and stable in the occupancy count has been assessed with the KPI tool
CRT-07.06.01-VALP-PERF.7302	A graphical representation of the predicted occupancy counts, showing the origin of A/C status data is used by the NM to obtain enhanced awareness of occupancy counts stability
CRT-07.06.01-VALP-PERF.7303	A graphical representation of the predicted occupancy counts, showing the origin of A/C status data is used by the NM to obtain enhanced awareness of occupancy counts predictability and stability

[OBJ]

Identifier	OBJ-07.06.01-VALP-PERF.7400
Objective	Asses the adequacy of set of measurements to assist in the post analysis of network performance
Title	Measurements to support post analysis
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance

<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0007	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-NFR1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-NFR1.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0010	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-PERF.7400	The selected measurements have been acknowledged by NM as being more accurate and complete and allow identifying in the post analysis phase the behaviour of the network in the performance areas. Especially in the area of predictability and efficiency and in the context of STAM (examples: Nr. of flights affected, delay attribution per flight, total Nr. of measures implemented, total Nr. of hotspots identified and resolved , delta miles or delta fuel consumption for affected flights)

[OBJ]

Identifier	OBJ-07.06.01-VALP-MET1.7100
Objective	Assess that the diffusion of the significant WX and its consideration in support of STAM measures is operationally feasible. Significant WX forecast data supports the implementation of STAM in preventing to introduce a weather risk i.e. by placing flights at (high) risk of being affected by significant WX.
Title	Operational feasibility of consideration of weather in the STAM process
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-MET1.0010	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-MET1.0030	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-MET1.0040	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-MET1.0041	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0304.3141	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-MET1.7100	Positive operational feedbacks about WX dissemination and significant WX consideration when creating STAM proposals.
CRT-07.06.01-VALP-MET1.7101	4DWxCube graphical presentation increases weather awareness and provides enough granularities to detect if weather avoidance is considered/achieved when creating STAM

[OBJ]

Identifier	OBJ-07.06.01-VALP-MET1.7200

Objective	Assessment of the roles and responsibilities of the actors involved in the WX management in STAM application. In particular the role of NMOC as monitoring and in the escalation process.
Title	Roles and responsibility of WX management in STAM application
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0015	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-MET1.0010	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-MET1.0041	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-NFR1.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0001	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0304.3021	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3041	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-MET1.7200	Roles and responsibilities have been determined to be clear and consistent by all concerned actors. In particular NMOC role

[OBJ]

Identifier	OBJ-07.06.01-VALP-MET1.7300
Objective	Assessment of the feasibility of a RR (or eventually a delay) considering significant WX when proposing RR to resolve a hotspot.
Title	Operational feasibility of consideration of weather in the STAM process
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0015	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-MET1.0010	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-MET1.0041	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0010	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0304.3234	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-MET1.7300	Positive operational feedback about the feasibility of considering the impact of significant weather when creating/applying the STAM measure (RR or eventually delay or flight level capping) to resolve a hotspot.
CRT-07.06.01-VALP-MET1.7301	Correspondence between the NMOC created monitored areas- WXAoIs- (sensitive to DCB imbalances and with significant weather forecasted) and related measures consequently implemented

[OBJ]

Identifier	OBJ-07.06.01-VALP-MET1.7400
Objective	Assess that the integration of Weather information into DCB procedures as from D-1 in support of the creation and the updating of the network operational plan, improves weather forecast impact assessment on Traffic Volume Capacity
Title	Impact of Weather information on Traffic Volume Capacity Assessment
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0015	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-MET1.0010	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-MET1.0041	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0010	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
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[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-MET1.7400	Correspondence between the NMOC created monitored areas- WXAoIs - (sensitive to DCB imbalances and with significant weather forecasted) and related measures consequently implemented
CRT-07.06.01-VALP-MET1.7401	Significant weather phenomena (turbulence / Convection / Icing) integrated with DCB improves the identification with more anticipation, of possible capacity shortfalls and imbalances.

[OBJ]

Identifier	OBJ-07.06.01-VALP-0749.0100
Objective	Assess the improved network predictability due to sharing of departure and arrival flight information in a timely manner.
Title	Exchange of DPI and API
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-AOP1.0050	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-AOP1.0051	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0010	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0023	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>

[OBJ Suc]

Identifier	Success Criterion

CRT-07.06.01-VALP-0749.0100	Flight data updated and profiles calculated with the DPI and API information in short term planning are closer to the actual flown profiles and actual flight data (in and off block times, take-off and landing time estimates, de-icing status, terminal procedures, runway configurations, taxi times and flight data status)

[OBJ]

Identifier	OBJ-07.06.01-VALP-0749.0200
Objective	Asses that the rolling exchange of data between AOP and NOP improves predictability of both AOP, NOP
Title	Rolling exchange of DPI and API–Predictability
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.01.01	N/A
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-AOP1.0040	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-AOP1.0050	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-AOP1.0051	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0010	N/A
<COVERS>	<OI Step>	AO-0801-A	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>
<SATISFIES>	<V&V Objective><V&V Objective>	OBJ-06.02-VALS-0050.0008	<Partial>
<SATISFIES>	<V&V Objective><V&V Objective>	OBJ-06.02-VALS-0050.0025	<Partial>
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3100.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3100.0005	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0005	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0006	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0009	N/A

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-0749.0200	With the new rolling data exchange, flight data and profiles in NOP reflect at any moment (including the early tactical phase which is not currently covered) the airport environment, resources and assignment (terminal procedures, runways and departure times TTOT/TSAT) better than in the time driven current manner implemented in A-CDM
CRT-07.06.01-VALP-0749.0201	With the new rolling data exchange, the traffic counts in NOP for the participating airports provide more accurate values at any moment of the traffic load (comparing estimated vs. actual traffic load). This enhancement in Network traffic demand accuracy improves Network predictability and the allows to make better use of available capacity

CRT-07.06.01-VALP-0749.0202	NOP enhanced rolling up-to-date information, is sent back to all impacted AOPs in a more accurate and timely manner, due to AOPs interlinked trajectory information used in the rolling NOP updating process. This enhancement in airport traffic demand accuracy improves Airport predictability and the use of available Airport capacity.
CRT-07.06.01-VALP-0749.0203	The accuracy of the information provided is improved

[OBJ]

Identifier	OBJ-07.06.01-VALP-0749.0300
Objective	Asses that the rolling exchange of data between AOP and NOP improves DCB process of both AOP and NOP
Title	Rolling exchange of DPI and API–DCB
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Operational Focus Area>	OFA05.01.01	N/A
<ALLOCATED TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-AOP1.0010	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-AOP1.0050	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0010	N/A
<COVERS>	<OI Step>	AO-0801-A	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3114	<Partial>
<SATISFIES>	<V&V Objective><V&V Objective>	OBJ-06.02-VALS-0050.0008	<Partial>
<SATISFIES>	<V&V Objective><V&V Objective>	OBJ-06.02-VALS-0050.0025	<Partial>
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3100.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3100.0005	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0005	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0006	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0009	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.03-OSED-1200.0140	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.03-OSED-1300.0010	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.03-OSED-1300.0050	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.03-OSED-1300.0060	N/A

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-0749.0300	With the new rolling data exchange Network Punctuality is enhanced as the delay per flight is reduced compared to the reference scenario (OPS)
CRT-07.06.01-VALP-0749.0301	With the new rolling data exchange, anticipated knowledge of arrival traffic demand improves the allocation of airport resources, thus making better use of available Airport Capacity

[OBJ]

Identifier	OBJ-07.06.01-VALP-0749.0400
Objective	Asses that the rolling exchange of data between AOP-NOP improves situation awareness of AOP, NOP and of any NOP stakeholder, allowing them to anticipate and perform mitigation actions to recover from traffic disruptions
Title	Rolling exchange of DPI and API - Situation awareness
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Operational Focus Area>	OFA05.01.01	N/A
<ALLOCATED TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-AOP1.0010	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-AOP1.0020	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0010	N/A
<COVERS>	<OI Step>	AO-0801-A	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective><V&V Objective>	OBJ-06.02-VALS-0050.0008	<Partial>
<SATISFIES>	<V&V Objective><V&V Objective>	OBJ-06.02-VALS-0050.0025	<Partial>
<COVERS>	<ATMS Requirement>	REQ-08.03.06-OSED-GENR.0010	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3100.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3100.0005	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0005	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0006	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0009	N/A

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-0749.0400	Actions to recover from traffic disruptions are taken with greater anticipation due to continuously crossed AOP-NOP updating of flight data and profiles changes - in and off block times, take-off and landing time estimates, de-icing status, terminal procedures, runway configurations, taxi times flight data status, ATV status, Turn-around information, IATA identification are exchanged on real time and updated in the AOP and NOP (B2B and B2C). The effect of anticipating decisions is observed to reduce delays (improve punctuality) and recover deviations of flight profiles (increased Flight Efficiency)

[OBJ]

Identifier	OBJ-07.06.01-VALP-0749.0500
Objective	Assess the improved network predictability due to sharing of knock-on effects of late arrivals on the next rotation
Title	ATV sharing between AOP and NOP
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance

<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-AOP1.0040	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-AOP1.0060	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0010	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-PRF1.0022	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-0749.0500	Aircraft Time Departure information (DPI) is more accurately and timely updated when using Turn-around impact information (rotations). This anticipated knowledge of true demand (increased Predictability) by the NOP will enable the enhancement in the use of available Airspace Capacity
CRT-07.06.01-VALP-0749.0501	NOP is able to anticipate landing time estimates (ELDT) to Airports with increased accuracy due to Knock-on effect management. This increase in arrival predictability will enable a more efficient use of available Airport Capacity (which include both landside and airside assets)
CRT-07.06.01-VALP-0749.0502	The link between two CDM airports is feasible, resulting in more accurate and timely information interchanged, thus extending the accuracy time scope (predictability) to over three hours (depending on the number of Airports linked)
CRT-07.06.01-VALP-0749.0503	Reactionary delays are reduced, increasing departure Punctuality and Network Predictability

[OBJ]

Identifier	OBJ-07.06.01-VALP-0749.0600
Objective	Assess the performance improvements of Airport DCB processes due to better quality of network predictions for both arrivals and departures
Title	Airport DCB Process Improvements
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.01.01	N/A
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0006	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0007	N/A
<COVERS>	<OI Step>	AO-0801-A	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3054	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3114	<Partial>
<SATISFIES>	<V&V Objective><V&V Objective>	OBJ-06.02-VALS-0050.0008	<Partial>
<SATISFIES>	<V&V Objective><V&V Objective>	OBJ-06.02-VALS-0050.0025	<Partial>

<COVERS>	<ATMS Requirement>	REQ-08.03.06-OSED-GENR.0010	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3100.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3100.0005	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0005	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0006	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0009	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.03-OSED-1200.0140	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.03-OSED-1300.0010	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.03-OSED-1300.0050	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.03-OSED-1300.0060	N/A

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-0749.0600	Overall delay reduction for flights between airports participating to the exercise; i.e.: increased Punctuality
CRT-07.06.01-VALP-0749.0601	The objective will be successfully achieved if it contributes to a reduction of differences between Actual and planned RBT duration (in minutes) by reducing variability in estimated operational capacity (Predictability), thus reducing uncertainty(PRE) in the allocation of Airport available resources (Capacity)
CRT-07.06.01-VALP-0749.0602	The objective will be successfully achieved if it contributes to improve the departure sequencing (Capacity), reducing Taxi-out variance (improved taxi-out Predictability).
CRT-07.06.01-VALP-0749.0603	The objective will be successfully achieved if it contributes to an increase in IFR movements per airspace volume per unit time (most challenging En-Route environment) (Capacity.
CRT-07.06.01-VALP-0749.0604	The objective will be successfully achieved if it contributes to an increase in IFR movements per airspace volume per unit time (most challenging TMA environment) (Capacity).
CRT-07.06.01-VALP-0749.0605	The objective will be successfully achieved if it contributes to a reduction in the average fuel burn per flight (ENV-Fuel EFF)

[OBJ]

Identifier	OBJ-07.06.01-VALP-0749.0700
Objective	Assess the performance improvements of Airport resource planning due to better quality of network predictions for both arrivals and departures
Title	Airport resource planning Improvements
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Operational Focus Area>	OFA05.01.01	N/A
<ALLOCATED TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0006	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0007	N/A
<COVERS>	<OI Step>	AO-0801-A	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
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<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3054	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>

<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>
<SATISFIES>	<V&V Objective><V&V Objective>	OBJ-06.02-VALS-0050.0008	<Partial>
<SATISFIES>	<V&V Objective><V&V Objective>	OBJ-06.02-VALS-0050.0025	<Partial>
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3100.0004	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3100.0005	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0002	N/A
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<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0006	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0009	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.03-OSED-2300.0040	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.03-OSED-5000.0010	N/A

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-0749.0700	The objective will be successfully achieved if it contributes to a reduction of differences between Actual and planned RBT duration (in minutes) by reducing variability in estimated operational capacity (Predictability) thus reducing uncertainty (Predictability) in the allocation of Airport available resources (Capacity).
CRT-07.06.01-VALP-0749.0701	The objective will be successfully achieved if it contributes to improve the departure sequencing (Capacity), reducing Taxi out variance (improved taxi-out Predictability).
CRT-07.06.01-VALP-0749.0702	Overall delay reduction for flights between airports participating to the exercise; that is increasing Punctuality

[OBJ]

Identifier	OBJ-07.06.01-VALP-0749.0800
Objective	Assess that the computer-to-computer exchange of data between AOP and NOP will improve the timely and systematic exchange and will reduce the manual operations and telephone coordination required today to exchange the information and to update the systems
Title	Data exchange improvements and manual effort and coordination reduction
Status	<In Progress>

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.01.01	N/A
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0002	N/A
<COVERS>	<ATMS Requirement>	REQ-07.06.01-OSED-GEN1.0014	N/A
<COVERS>	<OI Step>	AO-0801-A	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3054	<Partial>
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<SATISFIES>	<V&V Objective><V&V Objective>	OBJ-06.02-VALS-0050.0008	<Partial>
<SATISFIES>	<V&V Objective><V&V Objective>	OBJ-06.02-VALS-0050.0025	<Partial>
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0005	N/A
<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0006	N/A

<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3130.0009	N/A

[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-0749.0800	Confirm that there is no housekeeping effort required by NMOC to keep in the NOP displays (CHMI and NOP portal) the runway configurations and capacity data showing the most up to date values and in consistency with AOP.

[OBJ]

Identifier	OBJ-07.06.01-VALP-0749.0900
Objective	Assess that the integration of Airports in the arrival management process improves airports arrival predictability and punctuality
Title	Airport Arrival Performance
Status	

[OBJ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.01.01	N/A
<ALLOCATED_TO>	<Operational Focus Area>	OFA05.03.07	N/A
<ALLOCATED_TO>	<Project>	07.06.01	N/A
<COVERS>	<OI Step>	AO-0801-A	N/A
<COVERS>	<OI Step>	DCB-0103-A	N/A
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3031	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3081	<Partial>
<SATISFIES>	<V&V Objective>	OBJ-07.02-VALS-0307.3091	<Partial>
<SATISFIES>	<V&V Objective><V&V Objective>	OBJ-06.02-VALS-0050.0008	<Partial>
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<COVERS>	<ATMS Requirement>	REQ-06.05.01-OSED-3100.0004	N/A
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[OBJ Suc]

Identifier	Success Criterion
CRT-07.06.01-VALP-0749.0900	The number of scheduled flights arriving as planned (no delay) is increased
CRT-07.06.01-VALP-0749.0901	Total reactionary delay of delayed flights is reduced

2.2.3.1 Choice of metrics and indicators

The following table summarises P07.06.01 Objectives and associated Metrics and Indicators, organised by Exercise, Objective and associated Success Criteria, with indication of links to Primary Project metrics, when available.

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	Exercise
OBJ-07.06.01-VALP-GEN1.0100	Assess that any change in stakeholders operational plans can be transmitted to the NOP and the Network Plan can be updated accordingly	**CRT-07.06.01-VALP-GEN1.0101**	The Network Manager is able to capture operational plan updates originated by stakeholders based on their Real Time knowledge of Airspace Status	**MG.1**: Number of Network airspace updates due to stakeholders trajectory updates	**EXE-07.05.04-VP-710**
		CRT-07.06.01-VALP-GEN1.0102	The Network Operational Plan is updated in Real Time by the NM upon reception of planning updates originated by stakeholders and a new Network DCB assessment is performed	**MG.2:** Number of Network DCB updates due to stakeholders trajectory updates	
		CRT-07.06.01-VALP-GEN1.0103	The Network Manager is able to capture EFPL 4D trajectory information originated by AU and update the NOP accordingly	**MGef1/1061**: Number of EFPL messages and updates	**EXE-07.06.02-VP-713**
		CRT-07.06.01-VALP-GEN1.0104	The NOP has been successfully updated when operating in global mix mode; i.e.; EFPLs and ICAO update messages. Supports OBJ-07.06.02-VALP-713A-2050. Satisfied by CRT-07.06.02-VALP-713A.1072	**QGef2/1071:** On-line feedback from IFPS operators related the efficient support of the HMI to mixed mode: EFPL+ ICAO FPL **QGef3/1072**: Positive feedback from IFPS operators on the feasibility to manage ICAO update messages when working in mixed mode	
		CRT-07.06.01-VALP-GEN1.0105	The Network Operational Plan is updated in Real Time upon reception of planning updates originated by stakeholders regarding hotspot detection, STAM analysis, coordination, preparation and implementation via STAM/regulation related B2B services (flow services)	**G_{STAM} 01** Number of Occupancy Counts detected per imbalanced Traffic volume **G_{STAM} 02** Number of Hot Spots created by FMPs **G_{STAM} 03** Number of STAM measure created and updates	**EXE-13.02.03-VP-700**
		CRT-07.06.01-VALP-GEN1.0106	AOP changes produced at Airports are captured by the NMOC in Real Time and used to update the NOP accordingly	**Mgen1.01:**Flight Data from AOP: actual and estimates times for departures and arrivals- in and off block times , take-off and landing, taxi times. ATV (Aircraft Transit View) status	**EXE-13.02.03-VP-749**
OBJ-07.06.01-VALP-GEN1.0200		**CRT-07.06.01-VALP-GEN1.0201**	Partners involved in operations are able to timely re-plan their operation due to changes in airspace availability updated in the NOP.	**MG. 3:** Number of trajectory updates **(MC.60.1)**	**EXE-07.05.04-VP-710**

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	Exercise
OBJ-07.06.01-VALP-GEN1.0200	Assess that all partners involved in operations can have easy access to any NOP data with potential impact on their operations.	**CRT-07.06.01-VALP-GEN1.0202**	Roles and tasks related to changes in airspace status are well known and accepted by all actors involved	**MG.4** Number of stakeholders involved and feedbacks **(MA.20.1)**	**EXE-07.05.04-VP-710**
		CRT-07.06.01-VALP-GEN1.0203	NOP publishes the necessary data and updates for the AU to build their 4D trajectory (for example publication of PTRs and RAD	**QGef4**:Positive feedback from operational users on the published data to build their 4D trajectories	**EXE-07.06.02-VP-713**
		CRT-07.06.01-VALP-GEN1.0204	The NOP supports the Mixed mode of operations by publishing (via SWIM-B2B and or in the situation display) AO 4D flight trajectories, ICAO flight plans and derived NM calculated trajectories	**QGef5:**Positive feedback from the NM on the support of the NOP to Mixed mode of operations	
		CRT-07.06.01-VALP-GEN1.0205	NOP provides confidentiality of commercially sensitive data (Flight Performance data and ToW). Satisfied by CRT-07.06.02-VALP-713A-1091	**QGef6/1091:** Positive feedback from Aircraft operators for updated information on NM HMIs (CHMI Portal)	
		CRT-07.06.01-VALP-GEN1.0206	Partners involved in operations can obtain the necessary information from the NOP with the STAM / regulation related B2B services (flow services) to allow them to timely re-plan their operation in case of DCB imbalances using their local tools	**G_{STAM} 04** Number of STAM proposals received (draft) **G_{STAM} 05** Number of STAM measures accepted (implemented)	**EXE-13.02.03-VP-700**
		CRT-07.06.01-VALP-GEN1.0207	Roles and tasks related to changes in airspace Demand Capacity imbalances and the proposed corrective actions are well known and accepted by all actors involved	**G_{STAM} 06** Local or coordinated STAM	
		CRT-07.06.01-VALP-GEN1.0208	Updates affecting Airports operations are used to update AOPs by the impacted Airports	**Mgen2.01**: Flight Data exchanged in current FUM message i.e. ELDT, CTOT, NM flight status (slot-allocated, suspended, TACT-activated, airborne), etc. Target at fix and targets at landing. Data received	**EXE-13.02.03-VP-749**

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	Exercise
OBJ-07.06.01-VALP-GEN1.0300	Assess that all stakeholders share the same data so that the collaborative decision making of airspace management is enhanced.	**CRT-07.06.01-VALP-GEN1.0301**	There is evidence of improvement provided by all the stakeholders in their sharing and accessibility to the totality of required information in ACC, ASM and Network systems environment	**MG.4** Number of stakeholders involved and feedbacks (**MA.20.1**)	**EXE-07.05.04-VP-710**
		CRT-07.06.01-VALP-GEN1.0302	The process, procedures and roles are clear, stable, usable and are well accepted by the involved actors	**QG.3:** Role and tasks are well known and accepted by all actors (**MA.20.2**)	
		CRT-07.06.01-VALP-GEN1.0303	NOP updates produced by AOP updates are simultaneously accessed by every affected ATM stakeholder within the Network	**Mgen1.01** Flight Data from AOP: actual and estimates times for departures and arrivals- in and off block times , take-off and landing, taxi times **Mgen2.01** Flight Data exchanged in current FUM message Target at fix and targets at landing	**EXE-13.02.03-VP-749**
		EXE-07.06.02-VP-710			
OBJ-07.06.01-VALP-AFUA.0100	To assess if the Network is able to monitor and assess in real time en-route capacity changes due to RTSA up to date information on additional airspace provided by opening of the ARES to other airspace users	**CRT-07.06.01-VALP-AFUA.0101**	RTSA data exchange is monitored by the Network and changes in airspace capacity are assessed and updated in terms of number of IFR flights able to enter a given airspace volume (ATC sectors, UIR/FIR area) made available by AFUA.	**MP 1:** Number of extra IFR flights (traffic counts) able to enter a given airspace volume provided by AFUA **(MC.21.1)** • Initial Traffic Load due to activation of ARES • Final Traffic load due to AFUA measures	**EXE-07.05.04-VP-710**
OBJ-07.06.01-VALP-AFUA.0200	To assess if the Network is able to monitor and record changes in the key performance drivers of environment, due to an increase in flight efficiency, thanks to the ability to better match airspace allocation to actual user needs	**CRT-07.06.01-VALP-AFUA.0201**	RTSA data exchange is monitored by the Network and changes in airspace capacity are assessed and updated in terms of number of IFR flights able to enter a given airspace volume (ATC sectors, UIR/FIR area) made available by AFUA.	**MP.2:** Time crossed in the released ARES(difference of time between the first entry in the ARES and the last exit of the ARES **(MC.60.4)** **MP.3:** Time flown in the released ARES (total duration of occupation considering all the time of each flight entered in the ARES) **(MC.60.6)**	
		CRT-07.06.01-VALP-	The NM is able to record new flight extensions (reduced EETs in traffic flow) measured when	**MP 4:** Fuel consumption for civil (divergence between demand before	

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	Exercise
		AFUA.0202	implementing VPAs and the initially expected in the Reference scenario	RTSA update and after) **(MC.70.3)** **MP.5**: Fuel consumption for mil. (average per flight) **(MC.70.4)**	
OBJ-07.06.01-VALP-AFUA.0300	To assess if the Network is able to monitor and assess new flexibility opportunities for Airspace Users due to increased civil-military cooperation and coordination	**CRT-07.06.01-VALP-AFUA.0301**	Airspace Users are able to timely obtain RTSA updated information to evaluate re-planning opportunities of their operations	**MP.6**: Number of trajectory updates **(MC.60.1)**	
		CRT-07.06.01-VALP-AFUA.0302	Airspace Users obtain acceptance to their re-planning requests upon their evaluation of arising opportunities from ARES status changes	**MP.7**: Number of access on demand deliver to non-scheduled flight **(MC.60.2)** **MP.8**: number of military flights accommodated on short or ad-hoc requirements **(MC.60.3)** **MC.9**: number of flight entry in the released ARES (planned compare to used) **(MC.60.4)**	
		EXE-07.06.02-VP-713			
OBJ-07.06.01-VALP-EFPL.0100	Assess that EFPL 4D trajectory information contributes to the elaboration of the Network Operation Plan with improved traffic predictability	**CRT-07.06.01-VALP-EFPL.0101**	Assess the level of contribution to the predictability of each element of the EFPL. Satisfied by CRT-07.06.02-VALP-713A-2011	**Mef2/2011**: Compare T_{EFP}LDCBwoTOW with Tflown **Mef3/2011**: Compare T_{EFP}LDCBwoCDP with Tflown	**EXE-07.06.02-VP-713**
		CRT-07.06.01-VALP-EFPL.0102	The 4D trajectories, calculated by DCB, taking into account last update information are closer to the flown trajectories. Satisfied by CRT-07.06.02-VALP-713A-2031\n	**Mef1/2031** Compare T_{EFPL}DCB_full with Tflown	
OBJ-07.06.01-VALP-EFPL.0200	Assess that EFPL 4D trajectory information contributes to the elaboration of the Network Operation Plan with improved DCB assessment/predictions	**CRT-07.06.01-VALP-EFPL.0201**	The NOP has received 4D trajectory information from an EFPL, which has been used to better assess traffic demand (with entry traffic counts, Occupancy counts and Flight Lists) supporting the Network Manager in the enhancement of DCB assessment. Satisfied by CRT-07.06.02-VALP-713A-2052\n	**Mef4/2052**: Entry/Occupancy counts in ICAO FPL= Entry/Occupancy counts in Mixed mode	**EXE-07.06.02-VP-713**
		CRT-07.06.01-VALP-EFPL.0202	The impact of EFPL (compared to ICAO FPL) on delays is acceptable or delays are reduced. Satisfied by CRT-07.06.02-VALP-713A-2062\n	**Mef5/2062**: Number of flights that EFPL Delays and ICAO FPL Delays are different	

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	Exercise
		CRT-07.06.01-VALP-EFPL.0203	The impact of EFPL (compared to ICAO FPL) on the number of flights impacted by regulations is acceptable. Satisfied by CRT-07.06.02-VALP-713A-0261	**Mef6/0261**:Number of EFPL Flights versus number of FPL flights impacted by regulations	
		EXE-13.02.03-VP-700			
OBJ-07.06.01-VALP-0700.1010	To assess if the Network is able to monitor, assess and record in real time en-route capacity and demand changes due STAM up to date information on selected flights	**CRT-07.06.01-VALP-0700.1010**	The Network can assess and record the declared Capacity values (OTMV) of a restricted sector with no STAM measures applied	**S$_{STAM}$ 01** Number and type (entry/occupancy) of count queries Supporting KPIs: Occupancy/Entry Load Comparison- Occupancy Variability Comparative Load Status Evolution	**EXE-13.02.03-VP-700**
		CRT-07.06.01-VALP-0700.1011	The Network can record both entry counts and occupancy counts managed by the restricted sector when STAM measures are applied	**G$_{STAM}$ 01** Number of Occupancy Counts detected per imbalanced Traffic volume **G$_{STAM}$ 02** Number of Hot Spots created by FMPs	
OBJ-07.06.01-VALP-0700.1020	To assess if the Network is able to monitor and record changes in flight profiles due to level capping and re-routing measures when applying STAM	**CRT-07.06.01-VALP-0700.1020**	The Network is able to assess and record new profile affected by level capping to flights affected STAM measures	**S$_{STAM}$ 02** Total additional time flown (minutes) Supporting KPIs: Adherence at entry Sector Adherence to flight duration (Time Over Variability or Delay)	**EXE-13.02.03-VP-700**
		CRT-07.06.01-VALP-0700.1021	The Network is able to assess and record flight time / miles extension to flights affected by STAM measures		
OBJ-07.06.01-VALP-0700.1030	To assess if the Network is able to monitor and record departure and arrival deviation of flights from their initially planned schedules, as well as the causes of deviation (e.g. delay message, regulation, STAM…), , to assess their departure and arrival punctuality index	**CRT-07.06.01-VALP-0700.1030**	The Network is able to assess and record ATFM departure delays of affected flights by STAM measures	**S$_{STAM}$ 03:** Average delay and type (ATFM, APT) for airport (arrival and departure) traffic **S$_{STAM}$ 05**: Percentage of affected traffic departing ON-TIME Supporting KPIs: Location Time Predictability Airport Traffic Demand and Delays Nature	**EXE-13.02.03-VP-700**
		CRT-07.06.01-VALP-0700.1031	The Network is able to assess and record deviation in departure times from their initially planned to affected flights by STAM measures		
		CRT-07.06.01-VALP-0700.1032	The Network is able to assess and record deviation in arrival times from their initially planned to affected flights by STAM measures	**S$_{STAM}$ 04:** Percentage of affected traffic arriving ON-TIME	

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	Exercise
OBJ-07.06.01-VALP-0700.1040	To assess if the Network is able to monitor and record departure and arrival deviations of flights from their initially planned schedules, as well as the causes of deviation, to assess their block-to-block variability and arrival and departure On-Time Performance	**CRT-07.06.01-VALP-0700.1040**	The Network is able to assess and record variability in departure times from their initially planned to affected flights by STAM measures	**S_{STAM} 07** Departure variability (ON-TIME Departure Performance)	**EXE-13.02.03-VP-700**
		CRT-07.06.01-VALP-0700.1041	The Network is able to assess and record variability in arrival times from their initially planned to affected flights by STAM measures	**S_{STAM} 06** Arrival variability (ON-TIME Arrival performance)	
OBJ-07.06.01-VALP-PERF.7100	Asses the operational use of a representative set of KPIs to assist network monitoring in execution	**CRT-07.06.01-VALP-PERF.7100**	Positive operational feedback about the support to network monitoring and supervision provided by the KPI dashboard	**S_{KPI} 01** Type and frequency of use of the different KPIs (only considered the open of the graph and not the auto-refresh) **S_{KPI} 02** Operational evaluation on the use of the KPIs	**EXE-13.02.03-VP-700**
		CRT-07.06.01-VALP-PERF.7101	Predictability/Variability of traffic counts depending on the status of A/C at data extraction time (ground, off-block, airborne) has been assessed with the KPI tool		
		CRT-07.06.01-VALP-PERF.7102	Adherence at Entry sector (in FL and Time) has been assessed with the KPI tool		
		CRT-07.06.01-VALP-PERF.7103	The KPI dashboard helped identifying on-line deviations, imbalance situations and performance changes, which changes were further analysed through the recorded data to confirm the performance evolution during trial execution.		
OBJ-07.06.01-VALP-PERF.7100	Asses the operational use of a representative set of KPIs to assist network monitoring in execution	**CRT-07.06.01-VALP-PERF.7104**	Predictability/Variability of traffic counts depending on traffic demand category has been assessed with the KPI tool	**S_{KPI} 01** Type and frequency of use of the different KPIs (only considered the open of the graph and not the auto-refresh) **S_{KPI} 02** Operational evaluation on the use of the KPIs	**EXE-13.02.03-VP-700**
		CRT-07.06.01-VALP-PERF.7105	Analysis of the traffic counts according to the classification of flights on-time/ late/early has been performed with the KPI tool		
OBJ-07.06.01-VALP-PERF.7200	Asses the benefit of the trend analysis to assess the evolution during execution (i.e. along the	**CRT-07.06.01-VALP-PERF.7200**	Reliability of the occupancy counts in function of participating A/C is assessed , based on the "Inflow, Outflow and stable" flight proportion of the occupancy count has been analysed with the	**S_{KPI} 03** Frequency of use of the KPIs (for Occupancy Count Variability Predictability and Comparative Load	**EXE-13.02.03-VP-700**

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	Exercise
	day) and comparison of trends with parallel periods (i.e. day before or a similar day in a similar context).		KPI tool	Status Evolution)	
		CRT-07.06.01-VALP-PERF.7201	Positive operational feedback by NMOC about the use of trend analysis to assess the evolution during execution	**S$_{KPI}$ 02** Operational evaluation on the use of the KPIs	
		CRT-07.06.01-VALP-PERF.7202	Comparative Load Status Evolution for entry load in a sector to assess the load evolution of a day compared to a previous general behaviour; e.g.D-1 or D-7 has been analysed with the KPI tool		
		CRT-07.06.01-VALP-PERF.7203	The reliability of departure data from airports depending on their sample time and source is used (DPIs, ATFM, FPL) has been analysed with the KPI tool		
OBJ-07.06.01-VALP-PERF.7300	Asses the benefit of extending FMP monitor with the occupancy load factors (different colours for different thresholds) to better assess the DCB network situation	**CRT-07.06.01-VALP-PERF.7300**	The FMP monitor enhanced with the occupancy load allows to monitor the DCB network situation with more finesse during the tactical phase or eventually in short time planning phase or simulation	**S$_{KPI}$ 03** (for Count Variability Predictability, Comparative Load Status Evolution, Location Time Predictability, Occupancy Count Predictability depending on traffic Flux and Occupancy Count Predictability depending on A/C origin) **S$_{KPI}$ 02** Operational evaluation on the use of the KPIs	**EXE-13.02.03-VP-700**
		CRT-07.06.01-VALP-PERF.7301	The proportion of flights that are inflow, outflow and stable in the occupancy count has been assessed with the KPI tool		
		CRT-07.06.01-VALP-PERF.7302	A graphical representation of the predicted occupancy counts, showing the origin of A/C status data is used by the NM to obtain enhanced awareness of occupancy counts stability		
		CRT-07.06.01-VALP-PERF.7303	A graphical representation of the predicted occupancy counts, showing the origin of A/C status data is used by the NM to obtain enhanced awareness of occupancy counts predictability and stability		
OBJ-07.06.01-VALP-PERF.7300	Asses the adequacy of set of measurements to assist in the post analysis of network performance	**CRT-07.06.01-VALP-PERF.7400**	The selected measurements have been identified by NM as more accurate and complete to allow identifying in post analysis the behaviour of the network in the performance areas. Especially in the area of predictability and efficiency and in the context of STAM (examples Nr. of flights	Resolution of hotspots **S$_{KPI}$ 03** Number of hotspots used in a STAM measure vs. total **S$_{KPI}$ 04** Number of STAM measures abandoned vs. implemented	**EXE-13.02.03-VP-700**

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	Exercise
			affected, delay attribution per flight, total Nr. of measures implemented, total Nr. of hotspots identified and resolved , delta miles or delta fuel consumption for affected flights …)		
OBJ-07.06.01-VALP-MET1.7100	Assess that the diffusion of the significant WX and its consideration in support of STAM measures is operationally feasible. Significant WX forecast data supports the implementation of STAM in preventing to introduce a weather risk i.e. by placing flights at (high) risk of being affected by significant WX.	**CRT-07.06.01-VALP-MET1.7100**	Positive operational feedbacks about WX dissemination and significant WX consideration when creating STAM proposals.	S_{MET} **04** Operational feedbacks about WX dissemination	**EXE-13.02.03-VP-700**
		CRT-07.06.01-VALP-MET1.7101	4DWxCube graphical presentation increases weather awareness and provides enough granularities to detect if weather avoidance is considered/achieved when creating STAM	S_{MET} **01** Number of WXAoI created in the sector S_{MET} **02** Number of WXAoI converted into Hot Spots VP-700 S_{MET} **03** Elapsed time between the WXAoI creation and hotspot creation, when applies	
OBJ-07.06.01-VALP-MET1.7200	Assessment of the roles and responsibilities of the actors involved in the WX management in STAM application. In particular the role of NMOC as monitoring and in the escalation process.	**CRT-07.06.01-VALP-MET1.7200**	Roles and responsibilities have been determined to be clear and consistent by all concerned actors. In particular NMOC role	S_{MET} **05** Operational feedbacks about roles and responsibilities being clear and consistent	**EXE-13.02.03-VP-700**
OBJ-07.06.01-VALP-MET1.7300	Assessment of the feasibility of considering the impact of significant weather when creating/applying a STAM measure (RR or eventually delay or flight level capping) to resolve a hotspot. (high) risk of being affected by significant WX.	**CRT-07.06.01-VALP-MET1.7300**	Positive operational feedbacks about the feasibility of considering the impact of significant weather when creating/applying the STAM measure (RR or eventually delay or flight level capping) to resolve a hotspot.	S_{MET} **04** Operational feedbacks about WX integration	**EXE-13.02.03-VP-700**
		CRT-07.06.01-VALP-MET1.7301	Correspondence between the NMOC created monitored areas- WXAoIs- (sensitive to DCB imbalances and with significant weather forecasted) and related measures consequently implemented	S_{MET} **07** Duration of forecasted Weather phenomena versus actual duration	

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	Exercise
OBJ-07.06.01-VALP-MET1.7400	Assess that the integration of Weather information into DCB procedures as from D-1 in support of the creation and the updating of the network operational plan, improves weather forecast, enhancing its impact assessment on Traffic Volume Capacity values	**CRT-07.06.01-VALP-MET1.7400**	Correspondence between the NMOC created monitored areas- WXAoIs - (sensitive to DCB imbalances and with significant weather forecasted) and related measures consequently implemented	**S_{MET} 07** Duration of forecasted Weather phenomena versus actual duration	**EXE-13.02.03-VP-700**
		CRT-07.06.01-VALP-MET1.7401	Significant weather phenomena (turbulence / Convection / Icing) integrated with DCB improves the identification with more anticipation, of possible capacity shortfalls and imbalances.	**S_{MET} 04** Operational feedbacks about WX integration	
		EXE-13.02.03-VP-749			
OBJ-07.06.01-VALP-0749.0100	Assess the improved network predictability due to sharing of departure and arrival flight information in a timely manner.	**CRT-07.06.01-VALP-0749.0100**	Flight data updated and profiles calculated with the DPI and API information in short term planning are closer to the actual flown profiles and actual flight data.(In and off block times , take-off and landing estimates, de-icing, terminal procedures, runways, taxi times flight data status …	**Maop1.01:** Trends for ETO stabilisation Take off time estimate vs. actual departure. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have a ETO in the +/3 min (estimate vs. actual) **Maop1.02:** Trends for ELDT stabilisation Landing time estimate vs. actual. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have an ELDT in the +/- 3 min (estimate vs. actual) **Maop1.03:** Trends for Nr. of DPI messages sent For a given airport. Compare using trends in OPS and with AOP-NOP logic, the frequency of DPI messages (#mgs/hour), the time before the EOBT the e-DPI and DPI messages are sent (EOBT-Xmin).	**EXE-13.02.03-VP-749**
	Asses that the rolling exchange of data between AOP and NOP improves	**CRT-07.06.01-VALP-0749.0200**	With the new rolling data exchange, flight data and profiles in NOP reflect at any moment (including the early tactical phase which is not	**Maop1.01** Trends for ETO stabilisation Take off time estimate vs. actual departure. Compare using trends in OPS	**EXE-13.02.03-VP-749**

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	Exercise
	predictability of both AOP, NOP		currently covered) the airport environment, resources and assignment (terminal procedures, runways and departure times TTOT/TSAT) better than in the time driven current manner implemented in A-CDM	and with AOP-NOP logic, the leading time required in average to have a ETO in the +/3 min (estimate vs. actual)	
OBJ-07.06.01-VALP-0749.0200		**CRT-07.06.01-VALP-0749.0201**	With the new rolling data exchange the traffic counts in NOP for the airports participating provide better values at any moment of the traffic load (comparing estimated vs. actual traffic load). This enhancement in Network traffic demand accuracy improves Network predictability and the use of available capacity	**Maop1.01** Trends for ETO stabilisation Take off time estimate vs. actual departure. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have a ETO in the +/3 min (estimate vs. actual) **Mapt.01** Average (EIBT-AIBT) for flight status vs reference scenario **Mapt.02** Average (ETO-ATO) at last en-route fix for flight status vs reference scenario	
OBJ-07.06.01-VALP-0749.0200		**CRT-07.06.01-VALP-0749.0202**	NOP enhanced rolling up to date information, is sent back to all impacted AOPs in a more accurate and timely manner, due to AOPs interlinked trajectory information used in the rolling NOP updating process. This enhancement in airport traffic demand accuracy improves Airport predictability and the use of Airport available capacity	**Maop1.01** Trends for ETO stabilisation Take off time estimate vs. actual departure. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have a ETO in the +/3 min (estimate vs. actual) **Mapt.01** Average (EIBT-AIBT) for flight status vs reference scenario **Mapt.02** Average (ETO-ATO) at last en-route fix for flight status vs reference scenario	
OBJ-07.06.01-VALP-0749.0300	Asses that the rolling exchange of data between AOP and NOP improves DCB process of both AOP, NOP	**CRT-07.06.01-VALP-0749.0300**	With the new rolling data exchange Network Punctuality is enhanced as the delay per flight is reduced compared to the reference scenario (OPS)	**Maop3.01**: Trends for Traffic Counts at departure and arrival airports stabilisation Entry traffic counts estimate vs. actual. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have a count	**EXE-13.02.03-VP-749**
		CRT-07.06.01-VALP-0749.0301	With the new rolling data exchange, anticipated knowledge of arrival traffic demand improves the allocation of airport resources, thus making better use of Airport available Capacity		

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	Exercise
				value in the +/- 10% (estimate vs. actual)	
OBJ-07.06.01-VALP-0749.0400	Asses that the rolling exchange of data between AOP-NOP improves situation awareness of AOP, NOP and of any NOP stakeholder	**CRT-07.06.01-VALP-0749.0400**	Actions to recover from traffic disruptions are taken with greater anticipation due to continuously crossed AOP-NOP updating of flight data and profiles changes - in and off block times, take-off and landing estimates, de-icing, terminal procedures, runways, taxi times flight data status, ATV status, Turn-around information, IATA identification are exchanged on real time and updated in the AOP and NOP (B2B and B2C). The effect of anticipating decisions is observed to reduce delays (improve punctuality) and recover deviations of flight profiles (increased Flight Efficiency)	**Maop3.01**: Airport Demand information at AOP and NOP do not differ during execution Compare Airport arrival and departure rolling demand (Number of flights/rolling hour) The time scope of departure demand accuracy, is extended • AIBT-EIBT (EIBTs predicted from -4 hours to - 20 minute from arrival) shared by AOP and NOP • AOBT-TOBT (TOBTs predicted from -4 hours to - 20 minutes from departure) shared by AOP and NOP	EXE-13.02.03-VP-749
OBJ-07.06.01-VALP-0749.0500	Assess the improved network predictability due to sharing of knock-on effect of late arrivals on the next rotation	**CRT-07.06.01-VALP-0749.0500**	Aircraft Time Departure information (DPI) is more accurately and timely updated when using Turn-around impact information. This anticipated knowledge of true demand (increased Predictability) by the NOP will enable the enhancement in the use of Airspace available Capacity	**Maop5.01**: Trends for ELDT stabilisation (see VALP-0749.0700) to apply to for the AOP of arrival and AOPs of next legs	**EXE-13.02.03-VP-749**
		CRT-07.06.01-VALP-0749.0501	NOP is able to anticipate landing time estimates (ELDT) to Airports with increased accuracy due to Knock-on effect management. This increase in arrival predictability will enable a more efficient use of Airport available Capacity	**Maop5.01**: Trends for ELDT stabilisation (see VALP-0749.0700) to apply to for the AOP of arrival and AOPs of next legs	
		CRT-07.06.01-VALP-0749.0502	The link between two CDM airports is feasible, resulting in more accurate and timely information interchanged, thus extending the accuracy time scope (predictability) to over three hours (depending on the number of Airports linked)		
		CRT-07.06.01-VALP-0749.0503	Reactionary delays are reduced, increasing departure Punctuality and Network Predictability		
OBJ-	Assess the performance	**CRT-07.06.01-**	Overall delay reduction for flights between	**Maop6.01:** Trends for Traffic Counts at	**EXE-**

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	Exercise
07.06.01-VALP-0749.0600	improvements of Airport DCB processes due to better quality of network predictions for both arrivals and departures	VALP-0749.0600	airports participating to the exercise; i.e.: increased Punctuality	departure and arrival airports stabilisation	13.02.03-VP-749
		CRT-07.06.01-VALP-0749.0601	The objective will be successfully achieved if it contributes to a reduction of differences between Actual and planned RBT duration (in minutes) by reducing variability in estimated operational capacity (PRE), thus reducing uncertainty(PRE) in the allocation of Airport available resources (CAP)	**Maop6.02:** Entry traffic counts estimate vs. actual. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have a count value in the +/- 10% (estimate vs. actual)	
		CRT-07.06.01-VALP-0749.0602	The objective will be successfully achieved if it contributes to improve the departure sequencing (CAP), reducing Taxi-out variance (improved taxi-out Predictability).		
		CRT-07.06.01-VALP-0749.0603	The objective will be successfully achieved if it contributes to an increase in IFR movements per airspace volume per unit time (most challenging En-Route environment) (CAP).		
		CRT-07.06.01-VALP-0749.0604	The objective will be successfully achieved if it contributes to an increase in IFR movements per airspace volume per unit time (most challenging TMA environment) (CAP).		
		CRT-07.06.01-VALP-0749.0605	The objective will be successfully achieved if it contributes to a reduction in the average fuel burn per flight (ENV-Fuel EFF)		
OBJ-07.06.01-VALP-0749.0700	Assess the performance improvements of Airport resource planning due to better quality of network predictions for both arrivals and departures	CRT-07.06.01-VALP-0749.0700	The objective will be successfully achieved if it contributes to a reduction of differences between Actual and planned RBT duration (in minutes) by reducing variability in estimated operational capacity (PRE) thus reducing uncertainty (PRE) in the allocation of Airport available resources (CAP) .	**Maop7.01:** Trends for ELDT stabilisation Landing time estimate vs. actual. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have an ELDT in the +/- 3 min (estimate vs. actual)	EXE-13.02.03-VP-749
		CRT-07.06.01-VALP-0749.0701	The objective will be successfully achieved if it contributes to improve the departure sequencing (CAP), reducing Taxi out variance (improved taxi-out Predictability).		
		CRT-07.06.01-VALP-	Overall delay reduction for flights between airports participating to the exercise; that is increasing Punctuality\n		

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	Exercise
		0749.0702			
OBJ-07.06.01-VALP-0749.0800	Assess that the computer-to-computer exchange of data between AOP and NOP will improve the timely and systematic exchange and will reduce the manual operations and telephone coordination required today to exchange the information and to update the systems	**CRT-07.06.01-VALP-0749.0800**	No extra man effort in maintaining AOP / NOP consistency	**Maop11.01:** AOPOC and NMOC subjective assessment	**EXE-13.02.03-VP-749**
OBJ-07.06.01-VALP-0749.0900	Assess that the integration of Airports in the arrival management process improves airports arrival predictability and punctuality	**CRT-07.06.01-VALP-0749.0900**	The number of scheduled flights arriving as planned (no delay) is increased	**Mapt.03** Number of flights with (AIBT-SIBT)<5 minutes vs number of flight with (AIBT-SIBT)<5 minutes in reference scenario	**EXE-13.02.03-VP-749**
		CRT-07.06.01-VALP-0749.0901	Total reactionary delay of delayed flights is reduced	**Maopt.04** Total departure delay (AOBT-SOBT) for flights with AIBT-SOB>5 vs reference scenario	

2.2.4 Summary of Validation Scenarios

In the following tables are reported the scenarios used in the different exercises as defined in 07.06.01-D47 VALP [15]. Further details about these scenarios are provided in sections 6.1.2.3.3 (VP-700), (VP-710), 6.3.2.2.1 (VP-713) and (VP-749)

Scenario ID	Scenarios Description
SCN-07.06.01-VALP-0003.0000	Handling Airport Weather Phenomena
SCN-07.06.01-VALP-0004.0000	Handling En Route Weather Phenomena
SCN-07.06.01-VALP-NOP4.4000	Daily Plan Monitoring-Network Performance Monitoring and Supervision-No imbalance Detection
SCN-07.06.01-VALP-NOP4.5000	Daily Plan Monitoring and DCB Imbalance-Network Performance Monitoring and Supervision-Imbalance Detection
SCN-07.06.01-VALP-0700.0110	Airborne Flight Level Cap and NMOC Network Impact Assessment
SCN-07.06.01-VALP-0700.0120	STAM Ground Delay and NMOC Network Impact Assessment
SCN-07.06.01-VALP-0700.0130	Horizontal Rerouting impacted by Significant Wx
SCN-07.06.01-VALP-0700.0140	Flight Level Cap impacted by Significant Wx

Table 6: Validation Scenarios for VP-700

Scenario ID	Scenarios Description
SCN-07.05.04-VALP-BR01.0030	Status Quo for ATC/ASM/NM interface
SCN-07.05.04-VALP-B001.0030	Airspace use with automated RTSA data exchange combined with VPA
SCN-07.05.04-VALP-B001.0040	ASM Support Systems RTSA Information Exchange

Table 7: Validation Scenarios for VP-710

Scenario ID	Scenarios Description
Reference Scenario SCN-07.06.02-VALP-713A.0002	Airspace Users send ICAO Flight Plans that are processed on the NMVP Platform in order to build the reference scenario in the same environment as the solutions scenarios and make thinks comparable. The ICAO FPL will be used as reference for Flight Planning. This is the reference scenario which the solution scenarios has been assessed to.
Solution Scenario: Full SCN-07.06.02-VALP-713A.0010	Airspace Users send EFPL and NM calculates 4D trajectories based on all EFPL information (AO4D trajectory, ToW, Performance Data) taking into account LOAs PTRs. This solution scenario enabled to assess the global benefit of the EFPL with regard to the current ICAO based process.
Solution Mixed Mode SCN-07.06.02-VALP-713A.0050	All ICAO FPLs from the Operational environment are taken into account; and when a corresponding EFPL exists the ICAO FPL is substituted by the EFPL. This scenario allows having the entire traffic (not only the traffic related to the AUs participating to Validation). It is required to validate mixed mode of operations and the impact on regulations. This solution scenario enabled to assess a **mixed mode** of operations (EFPL & ICAO together).

Table 8: Validation Scenarios for VP-713

Scenario ID	Scenarios Description
SCN-07.06.01-VALP-0004.0000	AOP-NOP Integration
SCN-13.02.03-VALP-0749.0100	Solution Scenario: Live Traffic and operational events in a Shadow environment. Flights having TTA or TTOT allocated by the Shadow

Scenario ID	Scenarios Description
	system are time shifted by a special simulation component
SCN-13.02.03-VALP-0749.0200	Reference Scenario: Corresponding Operational Traffic and events

Table 9: Validation Scenarios for VP-749

2.2.5 Summary of Assumptions

Identifier	Title	Type of Assumption	Description	Justification	Flight Phase	KPA Impacted	Source	Value(s)	Owner	Impact on Assessment
ASS-13.02.03-VP700-ENAIRE-001	STAM Measures – Capacity Management	Procedures in place	Airspace configuration is supposed to have been optimised through capacity management measures so as the detected hotspot can only be solved through demand management measures.	N/A.	Planning Phase	N/A	13.02.03 VP-700 VALP	N/A	13.02.03	Medium
ASS-13.02.03-VP700-ENAIRE-002	Observed Traffic	Traffic Characteristics (traffic level)	Observed traffic figures are the actual ones experienced in the involved ACCs during the exercise execution days.	Due to the nature of the validation techniques using actual traffic (live trial / shadow mode), it is not poss ble to use the traffic corresponding to Step 1 FOC.	N/A	All	Traffic data from local and NM systems	To be determined after the execution of each sub-exercise.	13.02.03	High
ASS-13.02.03-VP700-ENAIRE-003	CHMI Availability	Ground Tools/Technology	The CHMI will be available to compare the information provided by the supporting tools.	N/A.	Planning Phase	N/A	13.02.03 OSED	N/A	13.02.03	Low
ASS-13.02.03-VP700-ENAIRE-004	Reference Scenario for STAM concept supported by local tools	Procedures in place	VP-522 validated STAM concept without the use of local tools.	VP-700 will analyse the added value of the use of local tools to support STAM processes.	Planning Phase	N/A	13.02.03 VP-700 VALP	N/A	13.02.03	Low
ASS-07.06.02-713A-0001	EFPL data consistency		Within an EFPL, the whole data set is supposed to be consistent.	Inconsistencies would mean that the AU system producing the EFPL is faulty, and would introduce biases in exercises' results (e.g. by generating artificially high rejection rates in the validation process).		Operational & Technical feasibility	Expert opinion			Medium

Identifier	Title	Type of Assumption	Description	Justification	Flight Phase	KPA Impacted	Source	Value(s)	Owner	Impact on Assessment
ASS-07.06.02-713A-0002	Navigational data consistency		Within AU and NM systems, the whole data set is supposed to be consistent.	Inconsistencies would mean that the EFPL provided by the AU cannot be assessed by NM systems.		Operational & Technical feasibility	Expert opinion			Medium

Table 10: VP-700 Validation Assumptions

Identifier	Title	Type of Assumption	Description	Justification	Flight Phase	KPA Impacted	Source	Value(s)	Owner	Impact on Assessment
ASS-13.02.03-V749.001	NMVP/OPS Synchronisation	Tools/Technology	The NMVP will receive Flight data from the OPS System and will be synchronized as much as technically feasible	Operational events shall trigger the Shadow mode AOP system. The OPS system serves as Reference Scenario for AOP/NOP Integration Validation Objectives.	Planning And Execution Phases		13.02.03 VP-749 VALP	N/A	13.02.03	Medium
ASS-13.02.03-V749.002	Capacity Values on NMVP	Tools/Technology	It is possible to have different OTMV Values on the NMVP than on the OPS System	The Exercise is performed in May, and there might not be sufficient DCB imbalances to treat during the exercise.	Planning		13.02.03 VP-749 VALP	N/A	13.02.03	Medium
ASS-13.02.03-V749.003	Simulated Flights	Tools/Technology	The fact that flights on a TTA and flights departing from participating airports are time shifted by a simulator component is transparent to all other sub systems of the Validation Platform.	All other systems and even human actors shall "believe" that target times are processed by the ATC system.	Execution Phase		13.02.03 VP-749 VALP	N/A	13.02.03	High

Table 11: VP-749 Validation Assumptions

2.2.6 Choice of methods and techniques

Refer to Primary Projects Validation Reports for detailed information:

- 13.02.03 D383 VALR S1 R5 STAM" for VP-700
- "07.05.04-D52-Validation Report AFUA S1 Edition 00.01.01" for VP-710
- "07.06.02-D55 -Step 1 Business Trajectory Validation Report for VP713"
- "D383 VALR S1 R5 Vol2 Target Time Management" for VP-749

2.2.7 Validation Exercises List and dependencies

P07-06.01 has only actively contributed to the following exercises

[EXE]

Identifier	EXE-07.06.01-VP-749
Status	<In Progress>

[EXE Trace]

Relationship	Linked Element Type	Identifier	Compliance
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-0749.0100	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-0749.0200	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-0749.0300	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-0749.0400	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-0749.0500	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-0749.0600	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-0749.0700	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-0749.0800	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-0749.0900	N/A
<EXECUTES>	<V&V Scenario>	SCN-07.06.01-VALP-0749.0100	N/A

[EXE]

Identifier	EXE-07.06.01-VP-700
Status	<In Progress>

[EXE Trace]

Relationship	Linked Element Type	Identifier	Compliance
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-GEN1.0100	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-GEN1.0200	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-GEN1.0300	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-0700.1010	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-0700.1020	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-0700.1030	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-0700.1040	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-PERF.7001	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-PERF.7002	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-PERF.7003	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-PERF.7004	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-MET1.7001	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-MET1.7002	N/A
<EMBEDS>	<V&V Objective>	OBJ-07.06.01-VALP-MET1.7003	N/A
<EXECUTES>	<V&V Scenario>	SCN-07.06.01-VALP-0700.0100	N/A
<EXECUTES>	<V&V Scenario>	SCN-07.06.01-VALP-0700.0200	N/A

Table 12: Validation Exercise layout

For additional information on VP-710 and VP-713, please refer to their Validation Report referenced in 2.2.6

3 Conduct of Validation Exercises

The entire information is addressed in sections: §6.1.2, §6.2.2, §6.3.2 and §6.4.2.

4 Exercises Results

4.1 Summary of Exercises Results

The following table shows the summary of results compared to the success criteria identified within 07.06.01-D47 Step 1 Validation Plan 2015 per validation objective. The analysis covers all the Validation Objectives embedded in all Validation Exercises as per the D47 Validation Plan.

The validation objective status column assesses the results against the success criteria indicating the Validation objective status:

- OK: Validation objective achieves the expectations (exercise results achieve success criteria)
- NOK: Validation objective does not achieve the expectations (exercise results do not achieve success criteria)
- Partially OK: Validation objective partially achieves the expectations (exercise results only achieve some success criteria)

Three P07.06.01 Generic Objectives have been identified. These P07.06.01 objectives are common to all WP7 validation exercises covering DCB-0103-A; they may be applied to all Validation Plans, but the selection of Metrics and Indicators will be customised to fit the specific environment of each WP7 Primary Project.; i.e.; different Success Criteria within the same Generic Objective is defined for each validation exercise

Note that in the table below, all 17 CRTs identified for every Generic Objective and validation exercise are presented for each Validation exercise, actually repeating all CRTs instead of presenting only those which are specific to that exercise

.

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0101	The Network Manager is able to capture operational plan updates originated by stakeholders based on their Real Time knowledge of Airspace Status	In totality 40 ARES have been shared between NM and participants	OK
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0102	The Network Operational Plan is updated in Real Time by the NM upon reception of planning updates originated by stakeholders and a new Network DCB assessment is performed	Following the scenarios, NM performed impact assessments each time needed	
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0103	The Network Manager is able to capture EFPL 4D trajectory information originated by AU and update the NOP accordingly	This CRT belongs to **VP-713**:	
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0104	The NOP has been successfully updated when operating in global mix mode; i.e.; EFPLs and ICAO update messages. Supports OBJ-07.06.02-VALP-713A-2050. Satisfied by CRT-07.06.02-VALP-713A.1072.	This CRT belongs to **VP-713**:	
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0105	The Network Operational Plan is updated in Real Time upon reception of planning updates originated by stakeholders regarding hotspot detection, STAM analysis, coordination, preparation and implementation via STAM / regulation related B2B services (flow services)	This CRT belongs to **VP-700**:	
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0106	AOP changes produced at Airports are captured by the NMOC in Real Time and used to update the NOP accordingly.	This CRT belongs to **VP-749**:	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0201	Partners involved in operations are able to timely re-plan their operation due to changes in airspace availability updated in the NOP	7 trajectories per day have been updated in the RTSA scenarios	OK
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0202	Roles and tasks related to changes in airspace status are well known and accepted by all actors involved	2 AMCs (LARA & STANLY_ACOS), 1 AU (LIDO) 1 MIL AU (OPTARION), 1 FMP (Karlsruhe) NM (AOLO, IFPS, CADF, and TACT) were connected. Technical feasibility has been proven during the exercise. The interactions between all actors went well despite the time needed to perform some actions	
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0203	NOP publishes the necessary data and updates for the AU to build their 4D trajectory (for example publication of PTRs and RAD)	This CRT belongs to **VP-713**:	
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0204	The NOP supports the Mixed mode of operations by publishing (via SWIM-B2B and or in the situation display) AO4D flight trajectories, ICAO flight plans and derived NM calculated trajectories	This CRT belongs to **VP-713**:	
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0205	NOP provides confidentiality of commercially sensitive data (Flight Performance data and ToW). Satisfied by CRT-07.06.02-VALP-713A.1091	This CRT belongs to **VP-713**:	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0206	Partners involved in operations can obtain the necessary information from the NOP with the STAM / regulation related B2B services (flow services) to allow them to timely re-plan their operation in case of DCB imbalances using their local tools	This CRT belongs to **VP-700**:	
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0207	Roles and tasks related to changes in airspace Demand Capacity imbalances and the proposed corrective actions are well known and accepted by all actors involved	This CRT belongs to **VP-700**:	
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0208	Positive feedback from operational users from the NOP updates affecting Airports operations, used to update AOPs by the impacted Airports	This CRT belongs to **VP-749**:	
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0300	Common Situational Awareness	CRT-07.06.01-VALP-GEN1.0301	There is evidence of improvement provided by all the stakeholders in their sharing and accessibility to the totality of required information in ACC, ASM and Network systems environment.	2 AMCs (LARA & STANLY_ACOS), 1 AU (LIDO) 1 MIL AU (OPTARION), 1 FMP (Karlsruhe) NM (AOLO, IFPS, CADF, and TACT) were connected.	OK
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-GEN1.0300	Common Situational Awareness	CRT-07.06.01-VALP-GEN1.0302	The process, procedures and roles are clear, stable, usable and are well accepted by the involved actors	For the AMC, NM and the FMP the roles and task of all actors are clear and acceptable. For FOC the tasks and role were acceptable for the early release of airspace	
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-	Common Situational Awareness	CRT-07.06.01-VALP-GEN1.0303	NOP updates produced by AOP updates are simultaneously accessed by every affected ATM stakeholder within the	This CRT belongs to **VP-749**:	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
	GEN1.0300			Network		
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-AFUA.0100	Airspace capacity changes based on RTSA information	CRT-07.06.01-VALP-AFUA.0101	RTSA data exchange is monitored by the Network and changes in airspace capacity are assessed and updated in terms of number of IFR flights able to enter a given airspace volume (ATC sectors, UIR/FIR area) made available by AFUA.	On the 14 traffic volumes impacted by the airspace release, very few impacts on en route capacity has been assessed, no conclusion could be driven for such results. Nevertheless no particular changes in FMP loads have been measured (maximum adding of 4 flights per hour).	Partially OK
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-AFUA.0200	Environment performance drivers	CRT-07.06.01-VALP-AFUA.0201	The NM is able to record actual trajectories crossing times over restricted airspace areas to measure actual flown time when implementing VPA, RTSA concept and planned time flown in reference scenario.	21 min 57s for the day 2, 45 min25s for day 3 48 minutes for day 2, 60 minutes for day 3	Partially OK
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-AFUA.0200	Environment performance drivers	CRT-07.06.01-VALP-AFUA.0202	The NM is able to record new flight extensions (reduced EETs in traffic flow) measured when implementing VPAs and the initially expected in the Reference scenario.	MP 4: Fuel consumption for civil (divergence between demand before RTSA update and after) (MC.70.3) MP.5: Fuel consumption for mil. (average per flight) (MC.70.4)	
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-AFUA.0300	Civil-military cooperation and coordination	CRT-07.06.01-VALP-AFUA.0301	Airspace Users are able to timely obtain RTSA updated information to evaluate re-planning opportunities of their operations	7 civil trajectories were modified each day OK	Partially OK

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-07.05.04-VP-710	OBJ-07.06.01-VALP-AFUA.0300	Civil-military cooperation and coordination	CRT-07.06.01-VALP-AFUA.0302	Airspace Users obtain acceptance to their re-planning requests upon their evaluation of arising opportunities from ARES status changes	Due to shadow mode limitation, no Mil FPL were assessed NOK	
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0101	The Network Manager is able to capture operational plan updates originated by stakeholders based on their Real Time knowledge of Airspace Status	This CRT belongs to **VP-710**	OK
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0102	The Network Operational Plan is updated in Real Time by the NM upon reception of planning updates originated by stakeholders and a new Network DCB assessment is performed	This CRT belongs to **VP-710**	
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0103	The Network Manager is able to capture EFPL 4D trajectory information originated by AU and update the NOP accordingly	FPL Delay (ICAO DLA equivalent) and Change (ICAO CHG) messages were received on the NMVP via the FPL service interfaces and processed successfully	
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0104	The NOP has been successfully updated when operating in global mix mode; i.e.; EFPLs and ICAO update messages. Supports OBJ-07.06.02-VALP-713A-2050. Satisfied by CRT-07.06.02-VALP-713A.1072.	Both IFPS operators agreed that the current HMI will not efficiently support them during mixed mode operations. Nevertheless, during the validation this had no significant negative impact on their performance The evidence collected showed that mixed mode operations did not have a significant impact on IFPS operators' workload	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0105	The Network Operational Plan is updated in Real Time upon reception of planning updates originated by stakeholders regarding hotspot detection, STAM analysis, coordination, preparation and implementation via STAM / regulation related B2B services (flow services)	This CRT belongs to **VP-700**	
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0106	AOP changes produced at Airports are captured by the NMOC in Real Time and used to update the NOP accordingly.	This CRT belongs to **VP-749**	
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0201	Partners involved in operations are able to timely re-plan their operation due to changes in airspace availability updated in the NOP	This CRT belongs to **VP-710**	
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0202	Roles and tasks related to changes in airspace status are well known and accepted by all actors involved	This CRT belongs to **VP-710**	
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0203	NOP publishes the necessary data and updates for the AU to build their 4D trajectory (for example publication of PTRs and RAD)	Positive Feedback	
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0204	The NOP supports the Mixed mode of operations by publishing (via SWIM-B2B and or in the situation display) AO4D flight trajectories, ICAO flight plans and derived NM calculated trajectories	IFPS operators considered that the introduction of the EFPL did not impact their Situation Awareness The information provided by the EFPL is relevant for the tasks performed by all actors	
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0205	NOP provides confidentiality of commercially sensitive data (Flight Performance data and ToW). Satisfied by CRT-07.06.02-VALP-713A.1091	Objective partially reached. The FSPD and the ToW were not visible in the summary queries on the	Partially OK

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
					CHMI and NOP Portal. However, it is present in the OPLOG information that can be accessed via the CHMI and the NOP Portal.	
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0206	Partners involved in operations can obtain the necessary information from the NOP with the STAM / regulation related B2B services (flow services) to allow them to timely re-plan their operation in case of DCB imbalances using their local tools	This CRT belongs to **VP-700**	
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0207	Roles and tasks related to changes in airspace Demand Capacity imbalances and the proposed corrective actions are well known and accepted by all actors involved	This CRT belongs to **VP-700**	
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0208	Positive feedback from operational users from the NOP updates affecting Airports operations, used to update AOPs by the impacted Airports	This CRT belongs to **VP-749**	
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-EFPL.0100	Support to Network Predictability	CRT-07.06.01-VALP-EFPL.0101	Assess the level of contribution to the predictability of each element of the EFPL. Satisfied by CRT-07.06.02-VALP-713A.2011	The use of EFPL (using both the 4D trajectory and flight specific performance data) has in general a balanced impact on traffic volume entry time	Partially OK
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-EFPL.0100	Support to Network Predictability	CRT-07.06.01-VALP-EFPL.0102	The 4D trajectories, calculated by DCB, taking into account last update information are closer to the flown trajectories. Satisfied by CRT-07.06.02-VALP-713A.2031	This success criteria has not been addressed, please refer to VALR 713	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-EFPL.0200	Support to Network Predictability	CRT-07.06.01-VALP-EFPL.0201	The NOP has received 4D trajectory information from an EFPL, which has been used to better assess traffic demand (with entry traffic counts, Occupancy counts and Flight Lists) supporting the Network Manager in the enhancement of DCB assessment. Satisfied by CRT-07.06.02-VALP-713A.2052	Positive results, please refer to VALR 713	Partially OK
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-EFPL.0200	Support to Network Predictability	CRT-07.06.01-VALP-EFPL.0202	The impact of EFPL (compared to ICAO FPL) on delays is acceptable or delays are reduced. Satisfied by CRT-07.06.02-VALP-713A.2062		
EXE-07.06.02-VP-713	OBJ-07.06.01-VALP-EFPL.0200	Support to Network Predictability	CRT-07.06.01-VALP-EFPL.0203	The impact of EFPL (compared to ICAO FPL) on the number of flights impacted by regulations is acceptable. Satisfied by CRT-07.06.02-VALP-713A.0261		
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0101	The Network Manager is able to capture operational plan updates originated by stakeholders based on their Real Time knowledge of Airspace Status	This CRT belongs to **VP-710**	OK
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0102	The Network Operational Plan is updated in Real Time by the NM upon reception of planning updates originated by stakeholders and a new Network DCB assessment is performed	This CRT belongs to **VP-710**	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0103	The Network Manager is able to capture EFPL 4D trajectory information originated by AU and update the NOP accordingly	This CRT belongs to **VP-713**	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0104	The NOP has been successfully updated when operating in global mix mode; i.e.; EFPLs and ICAO update messages. Supports OBJ-07.06.02-VALP-713A-2050. Satisfied by CRT-07.06.02-VALP-713A.1072.	This CRT belongs to **VP-713**	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0105	The Network Operational Plan is updated in Real Time upon reception of planning updates originated by stakeholders regarding hotspot detection, STAM analysis, coordination, preparation and implementation via STAM / regulation related B2B services (flow services)	The FMP Monitor App of the NetPerf tool was used to monitor Traffic Counts (Figure **5**) # of Hot Spots created by FMPs (Data from 02/03/2016) # Hotspot identified: 17 **(**Data from 02/03/2016-03/03/2016) • # MUAC Measures = 21 • #NATS Measures=7	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0106	AOP changes produced at Airports are captured by the NMOC in Real Time and used to update the NOP accordingly.	This CRT belongs to **VP-749**	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0201	Partners involved in operations are able to timely re-plan their operation due to changes in airspace availability updated in the NOP	This CRT belongs to **VP-710**	OK
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0202	Roles and tasks related to changes in airspace status are well known and accepted by all actors involved	This CRT belongs to **VP-710**	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0203	NOP publishes the necessary data and updates for the AU to build their 4D trajectory (for example publication of PTRs and RAD)	This CRT belongs to **VP-713**	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0204	The NOP supports the Mixed mode of operations by publishing (via SWIM-B2B and or in the situation display) AO4D flight trajectories, ICAO flight plans and derived NM calculated trajectories	This CRT belongs to **VP-713**	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0205	NOP provides confidentiality of commercially sensitive data (Flight Performance data and ToW). Satisfied by CRT-07.06.02-VALP-713A.1091	This CRT belongs to **VP-713**	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0206	Partners involved in operations can obtain the necessary information from the NOP with the STAM / regulation related B2B services (flow services) to allow them to timely re-plan their operation in case of DCB imbalances using their local tools	**G_{STAM} 04** Total from 02/03/2016 to 03/03/2016: ○ # STAM Received = **28** (21+7) ○ 14 Level Cap; 14 Ground Delay **G_{STAM} 05** Total from 02/03/2016 to 03/03/2016 # STAM measures accepted by MUAC= 12 (out of 21) # STAM measures accepted by NATS= 5 (out of 7)	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0207	Roles and tasks related to changes in airspace Demand Capacity imbalances and the proposed corrective actions are well known and accepted by all actors involved	Positive Feedback	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0208	Positive feedback from operational users from the NOP updates affecting Airports operations, used to update AOPs by the impacted Airports	This CRT belongs to **VP-749**	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-0700.1010	Capacity Monitoring and Assessment	CRT-07.06.01-VALP-0700.1010	The Network can assess and record the declared Capacity values (OTMV) of a restricted sector with no STAM measures applied	The Network KPI Tab of the NetPerf tool was used to monitor: - Occupancy/Entry Load Comparison- (Figure 8) - Occupancy Variability (Figure 9) - No historical data available for Comparative Load Status Evolution	Partially OK
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-0700.1010	Capacity Monitoring and Assessment	CRT-07.06.01-VALP-0700.1011	The Network can record both entry counts and occupancy counts managed by the restricted sector when STAM measures are applied	The FMP Monitor App of the NetPerf tool was used to monitor Traffic Counts (Figure 5) # of Hot Spots created by FMPs (Data from 02/03/2016) # Hotspot identified: **17**	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-0700.1020	Fuel Efficiency Monitoring	CRT-07.06.01-VALP-0700.1020	The Network is able to assess and record new profile affected by level capping to flights affected STAM measures	The sample shown in Figure 11, shows the Global performance impact caused by all regulations in place taken	OK
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-0700.1020	Fuel Efficiency Monitoring	CRT-07.06.01-VALP-0700.1021	The Network is able to assess and record flight time / miles extension to flights affected by STAM measures	- # Affected Flights= 10 - Average Delay= **2’** - Total Delay=**20’** - Delta EET= **11’’** - Delta Route length= **20NM**	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-0700.1030	Punctuality Monitoring	CRT-07.06.01-VALP-0700.1030	The Network is able to assess and record ATFM departure delays of affected flights by STAM measures	See Airport Trend Analysis shown in **Figure 10** (March 4th 2016)	OK

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-0700.1030	Punctuality Monitoring	CRT-07.06.01-VALP-0700.1031	The Network is able to assess and record deviation in departure times from their initially planned to affected flights by STAM measures	See Screen Shots from Figure 13 and Figure 14 A-CDM Airport KPIs	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-0700.1030	Punctuality Monitoring	CRT-07.06.01-VALP-0700.1032	The Network is able to assess and record deviation in arrival times from their initially planned to affected flights by STAM measures	See Screen Shots from Figure 13 and Figure 14 A-CDM Airport KPIs	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-0700.1040	Predictability Monitoring	CRT-07.06.01-VALP-0700.1040	The Network is able to assess and record variability in departure times from their initially planned to affected flights by STAM measures	See Screen Shots from Figure 13 and Figure 14 A-CDM Airport KPIs	OK
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-0700.1040	Predictability Monitoring	CRT-07.06.01-VALP-0700.1041	The Network is able to assess and record variability in arrival times from their initially planned to affected flights by STAM measures	See Screen Shots from Figure 13 and Figure 14 A-CDM Airport KPIs	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-PERF.7100	Operational use of KPIs during execution	CRT-07.06.01-VALP-PERF.7100	Positive operational feedback about the support to network monitoring and supervision provided by the KPI dashboard.	Positive Feedback	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-PERF.7100	Operational use of KPIs during execution	CRT-07.06.01-VALP-PERF.7101	Predictability/Variability of traffic counts depending on the status of A/C at data extraction time (ground, off-block, airborne) has been assessed with the KPI tool	Predictability/Variability of traffic counts depending on Aircraft Status: ➢ **28 Screen shots** were taken during the trials	OK
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-PERF.7100	Operational use of KPIs during execution	CRT-07.06.01-VALP-PERF.7102	Adherence at Entry sector (in FL and Time) has been assessed with the KPI tool	Adherence at Entry sector ➢ **Screen shots** were taken during the trials	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-PERF.7100	Operational use of KPIs during execution	CRT-07.06.01-VALP-PERF.7103	The KPI dashboard helped identifying on-line deviations, imbalance situations and performance changes, which changes were further analysed through the recorded data to confirm the performance evolution during trial execution.	Positive Feedback	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-PERF.7100	Operational use of KPIs during execution	CRT-07.06.01-VALP-PERF.7104	Predictability/Variability of traffic counts depending on traffic demand category has been assessed with the KPI tool	Location Time Predictability: **7 Screen shots** were taken during the trials	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-PERF.7100	Operational use of KPIs during execution	CRT-07.06.01-VALP-PERF.7105	Analysis of the traffic counts according to the classification of flights on-time/ late/early has been performed with the KPI tool	Predictability/Variability of traffic flux: **19 Screen shots** were taken during the tri al	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-PERF.7200	PI evolution in trend representation	CRT-07.06.01-VALP-PERF.7200	Reliability of the occupancy counts in function of participating A/C is assessed , based on the "Inflow, Outflow and stable" flight proportion of the occupancy count has been analysed with the KPI tool	Use of KPIs for Occupancy Count Variability Predictability: ➢ **28 Screen shots** were taken during the trials	Partially OK
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-PERF.7200	PI evolution in trend representation	CRT-07.06.01-VALP-PERF.7201	Positive operational feedback by NMOC about the use of trend analysis to assess the evolution during execution	Positive Feedback	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-PERF.7200	PI evolution in trend representation	CRT-07.06.01-VALP-PERF.7202	Comparative Load Status Evolution for entry load in a sector to assess the load evolution of a day compared to a previous general behaviour; e.g.D-1 or D-7 has been analysed with the KPI tool	No historical information available from previous days (D-1 to D-7) to compare with trial days behaviour	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-PERF.7200	PI evolution in trend representation	CRT-07.06.01-VALP-PERF.7203	The reliability of departure data from airports depending on their sample time and source is used (DPIs, ATFM, FPL) has been analysed with the KPI tool	Use of KPIs for Reliability of departure data from airports: ➢ **19** Screen shots were taken during the trials	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-PERF.7300	NM DCB Process Improvements	CRT-07.06.01-VALP-PERF.7300	The FMP monitor enhanced with the occupancy load allows to monitor the DCB network situation with more finesse during the tactical phase or eventually in short time planning phase or simulation	Screen Shot in Figure **15** shows Variability of counts per flight status over 20 minutes	OK
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-PERF.7300	NM DCB Process Improvements	CRT-07.06.01-VALP-PERF.7301	The proportion of flights that are inflow, outflow and stable in the occupancy count has been assessed with the KPI tool	Screen Shot in **Figure 16** shows Occupancy Count Predictability depending on Traffic Flux	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-PERF.7300	NM DCB Process Improvements	CRT-07.06.01-VALP-PERF.7302	A graphical representation of the predicted occupancy counts, showing the origin of A/C status data is used by the NM to obtain enhanced awareness of occupancy counts stability	Predictability/Variability of traffic counts depending on Aircraft Status: **28 Screen shots** were taken during the trials	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-PERF.7300	NM DCB Process Improvements	CRT-07.06.01-VALP-PERF.7303	A graphical representation of the predicted occupancy counts, showing the origin of A/C status data is used by the NM to obtain enhanced awareness of occupancy counts predictability and stability		

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-PERF.7400	Measurements to support post analysis	CRT-07.06.01-VALP-PERF.7400	The selected measurements have been identified by NM as more accurate and complete to allow identifying in post analysis the behaviour of the network in the performance areas. Especially in the area of predictability and efficiency and in the context of STAM (examples Nr of flights affected, delay attribution per flight, total Nr of measures implemented, total Nr of hotspots identified and resolved , delta miles or delta fuel consumption for affected flights …)	28 Hotspots were identified from 02/03/2016 to 02/03/2016 28 Hotspot created STAM measures • Ratio =1 21 STAM measures by MUAC: • 12 implemented; 09 abandoned; success ratio = 57% 7 STAM measures by NATS: -5 Implemented -2 Abandoned ➢ success ratio = 71%	OK
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-MET1.7100	Operational feasibility of consideration of weather in the STAM process	CRT-07.06.01-VALP-MET1.7100	Positive operational feedbacks about WX dissemination and significant WX consideration when creating STAM proposals.	Positive Feedback: EHAMA04M regulation implemented due to weather on March 4th, 2016 as shown in Figure 19	Partially OK
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-MET1.7100	Operational feasibility of consideration of weather in the STAM process	CRT-07.06.01-VALP-MET1.7101	4DWxCube graphical presentation increases weather awareness and provides enough granularities to detect if weather avoidance is considered/achieved when creating STAM	Five WX Areas of Interest created during the trials: • LFEEKD2F • LFRRZIU • LFBBBDX • LFBBP3 • LFBBP12 This concept was modified and decided that hotspot are not created directly from the WAoI:	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
					- Network role as trial observer - Hotspot creation left to FMP	
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-MET1.7200	Roles and responsibility of WX management in STAM application	CRT-07.06.01-VALP-MET1.7200	Roles and responsibilities have been determined to be clear and consistent by all concerned actors. In particular NMOC role	Positive Feedback	OK
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-MET1.7300	Operational feasibility of consideration of weather in the STAM process	CRT-07.06.01-VALP-MET1.7300	Positive operational feedbacks about the feasibility of considering the impact of significant weather when creating/applying the STAM measure (RR or eventually delay or flight level capping) to resolve a hotspot.	On March 3rd a Screen Shot shows how Convention, Turbulence and Icing Areas are identified (Figure 24) Other view shows simultaneously the areas where imbalances are detected, the neighbouring areas and the forecasted significant weather in both Opportunities for Ground delay or level capping measures are detected	Partially Ok
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-MET1.7300	Operational feasibility of consideration of weather in the STAM process	CRT-07.06.01-VALP-MET1.7301	Correspondence between the NMOC created monitored areas- WXAoIs- (sensitive to DCB imbalances and with significant weather forecasted) and related measures consequently implemented	This concept was modified and decided that hotspot are not created directly from the WXAoIs	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-MET1.7400	Impact of Weather information on Traffic Volume capacity Assessment	CRT-07.06.01-VALP-MET1.7400	Correspondence between the NMOC created monitored areas- WXAoIs - (sensitive to DCB imbalances and with significant weather forecasted) and related measures consequently implemented	This concept was modified and decided that hotspot are not created directly from the WXAoIs	Partially OK
EXE-13.02.03-VP-700	OBJ-07.06.01-VALP-MET1.7400	Impact of Weather information on Traffic Volume capacity Assessment	CRT-07.06.01-VALP-MET1.7401	Significant weather phenomena (turbulence / Convection / Icing) integrated with DCB improves the identification with more anticipation, of possible capacity shortfalls and imbalances.	Refer to CRT-07.06.01-VALP-MET1.7300, Figure 23 and Figure 24 **Positive Feedback**	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0101	The Network Manager is able to capture operational plan updates originated by stakeholders based on their Real Time knowledge of Airspace Status	This CRT belongs to **VP-710**	OK
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0102	The Network Operational Plan is updated in Real Time by the NM upon reception of planning updates originated by stakeholders and a new Network DCB assessment is performed	This CRT belongs to **VP-710**	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0103	The Network Manager is able to capture EFPL 4D trajectory information originated by AU and update the NOP accordingly	This CRT belongs to **VP-713**	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0104	The NOP has been successfully updated when operating in global mix mode; i.e.; EFPLs and ICAO update messages. Supports OBJ-07.06.02-VALP-713A-2050. Satisfied by CRT-07.06.02-VALP-713A.1072.	This CRT belongs to **VP-713**	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0105	The Network Operational Plan is updated in Real Time upon reception of planning updates originated by stakeholders regarding hotspot detection, STAM analysis, coordination, preparation and implementation via STAM / regulation related B2B services (flow services)	This CRT belongs to **VP-700**	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0100	Feasibility	CRT-07.06.01-VALP-GEN1.0106	AOP changes produced at Airports are captured by the NMOC in Real Time and used to update the NOP accordingly.	AOP updates have been updated in the NOP via API DPI messages	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0201	Partners involved in operations are able to timely re-plan their operation due to changes in airspace availability updated in the NOP	This CRT belongs to **VP-710**	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0202	Roles and tasks related to changes in airspace status are well known and accepted by all actors involved	This CRT belongs to **VP-710**	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0203	NOP publishes the necessary data and updates for the AU to build their 4D trajectory (for example publication of PTRs and RAD)	This CRT belongs to **VP-713**	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0204	The NOP supports the Mixed mode of operations by publishing (via SWIM-B2B and or in the situation display) AO4D flight trajectories, ICAO flight plans and derived NM calculated trajectories	This CRT belongs to **VP-713**	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0205	NOP provides confidentiality of commercially sensitive data (Flight Performance data and ToW). Satisfied by CRT-07.06.02-VALP-713A.1091	This CRT belongs to **VP-713**	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0206	Partners involved in operations can obtain the necessary information from the NOP with the STAM / regulation related B2B services (flow services) to allow them to timely re-plan their operation in case of DCB imbalances using their local tools	This CRT belongs to **VP-700**	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0207	Roles and tasks related to changes in airspace Demand Capacity imbalances and the proposed corrective actions are well known and accepted by all actors involved	This CRT belongs to **VP-700**	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0200	Feasibility	CRT-07.06.01-VALP-GEN1.0208	Positive feedback from operational users from the NOP updates affecting Airports operations, used to update AOPs by the impacted Airports	The NM SWIM Flight Management service provides information on flights lists by Aerodrome, Traffic Volume as well as operations to gather detailed information on individual flights	OK
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0300	Common Situational Awareness	CRT-07.06.01-VALP-GEN1.0301	There is evidence of improvement provided by all the stakeholders in their sharing and accessibility to the totality of required information in ACC, ASM and Network systems environment	This CRT belongs to **VP-710**	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0300	Common Situational Awareness	CRT-07.06.01-VALP-GEN1.0302	The process, procedures and roles are clear, stable, usable and are well accepted by the involved actors	This CRT belongs to **VP-710**	OK
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-GEN1.0300	Common Situational Awareness	CRT-07.06.01-VALP-GEN1.0303	NOP updates produced by AOP updates are simultaneously accessed by every affected ATM stakeholder within the Network	Stakeholders can access updates on flights resulting from API and DPIs via NM SWIM Flight Management service. With this service, they are able to query flight	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
					lists and individual flights. They can also query the information using the NOP Portal flight lists	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0100	Exchange of DPI and API	CRT-07.06.01-VALP-0749.0100	Flight data updated and profiles calculated with the DPI and API information in short term planning are closer to the actual flown profiles and actual flight data.(In and off block times , take-off and landing estimates, de-icing, terminal procedures, runways, taxi times flight data status	**Maop1.01** Refer to 6.4.3.3.1 predictability provided by VP749 is better than with the flight plan data **Maop1.02** Arrival analysis removed due to simulation methodology (§6.4.2.5) **Maop1.01** DPI number higher than in OPS (§ 6.4.3.4)	OK
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0200	Rolling exchange of DPI and API– Predictability	CRT-07.06.01-VALP-0749.0200	With the new rolling data exchange, flight data and profiles in NOP reflect at any moment (including the early tactical phase which is not currently covered) the airport environment, resources and assignment (terminal procedures, runways and departure times TTOT/TSAT) better than in the time driven current manner implemented in A-CDM	**Maop1.01** See CRT-07.06.01-VALP-0749.0100 and improved traffic count predictability (§6.4.3.3.4)	OK
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0200	Rolling exchange of DPI and API– Predictability	CRT-07.06.01-VALP-0749.0201	With the new rolling data exchange the traffic counts in NOP for the airports participating provide better values at any moment of the traffic load (comparing estimated vs. actual traffic load). This enhancement in Network traffic demand accuracy improves Network predictability and the use of available capacity	**Maop1.01** See CRT-07.06.01-VALP-0749.0100 and improved traffic count predictability (§6.4.3.3.4)	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0200	Rolling exchange of DPI and API– Predictability	CRT-07.06.01-VALP-0749.0202	NOP enhanced rolling up to date information, is sent back to all impacted AOPs in a more accurate and timely manner, due to AOPs interlinked trajectory information used in the rolling NOP updating process. This enhancement in airport traffic demand accuracy improves Airport predictability and the use of Airport available capacity	Refer to (§ 6.4.3.3.2) Predictability per Airport. Graphs show the predictability gain of using Target (calculated) Times versus Estimated Times based on Flight Plan data. Both Global and specific Airport predictability gains are shown	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0300	Rolling exchange of DPI and API– DCB	CRT-07.06.01-VALP-0749.0300	With the new rolling data exchange Network Punctuality is enhanced as the delay per flight is reduced compared to the reference scenario (OPS)	Refer to (§ 6.4.3.3.4) Traffic Count Predictability	OK
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0300	Rolling exchange of DPI and API– DCB	CRT-07.06.01-VALP-0749.0301	With the new rolling data exchange, anticipated knowledge of arrival traffic demand improves the allocation of airport resources, thus making better use of Airport available Capacity	The better predictability of VP749 is due to the rolling exchange of DPI that provide the most up-to-date take off times according to the (heavy) traffic situation; unlike flight plan messages updating the EOBT, that are sent late or very late and not for all flights	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0400	Rolling exchange of DPI and API - Situation awareness	CRT-07.06.01-VALP-0749.0400	Actions to recover from traffic disruptions are taken with greater anticipation due to continuously crossed AOP-NOP updating of flight data and profiles changes - in and off block times, take-off and landing estimates, de-icing, terminal procedures, runways, taxi times flight data status, ATV status, Turn-around information, IATA identification are exchanged on real time and updated in the AOP and NOP (B2B	The time scope of departure demand accuracy, is extended Refer to (§ 6.4.3.3.1): TTOT versus ATOT: AOP-NOP vs. FPL We observe (excluding the shaded area*) provided by VP749 is better than with the	OK

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
				and B2C). The effect of anticipating decisions is observed to reduce delays (improve punctuality) and recover deviations of flight profiles (increased Flight Efficiency)	flight plan data. An average gain of over 1, 5 min in the brackets: -6 h to -3h that increases to over 4,3 min and gets to 5 min – in the last bracket -1h to 0h	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0500	ATV sharing between AOP and NOP	CRT-07.06.01-VALP-0749.0500	Aircraft Time Departure information (DPI) is more accurately and timely updated when using Turn-around impact information. This anticipated knowledge of true demand (increased Predictability) by the NOP will enable the enhancement in the use of Airspace available Capacity	Refer to (§ 6.4.3.5): ATV sharing between AOP and NOP Graphs show how accuracy of the demand is improved as per 540 minutes ahead of flight departure and for prediction of up to 5 aircraft jumps forward	OK
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0500	ATV sharing between AOP and NOP	CRT-07.06.01-VALP-0749.0501	NOP is able to anticipate landing time estimates (ELDT) to Airports with increased accuracy due to Knock-on effect management. This increase in arrival predictability will enable a more efficient use of Airport available Capacity	Metrics in time accuracy show gains of calculated (TTOT) versus FPL ranging from a minimum of 5,19% to a maximum of 66,97 % Measured in number of jumps forward the gain goes from 0,20% % (5 jumps ahead) to 50,40 (1 jump ahead)	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0500	ATV sharing between AOP and NOP	CRT-07.06.01-VALP-0749.0502	The link between two CDM airports is feasible, resulting in more accurate and timely information interchanged, thus extending the accuracy time scope (predictability) to over three hours (depending on the number of Airports linked)	Predictability gains show: • Up to 55% in standard deviation • 30% (one jump ahead)- 11,40% (5 jumps ahead)	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0500	ATV sharing between AOP and NOP	CRT-07.06.01-VALP-0749.0503	Reactionary delays are reduced, increasing departure Punctuality and Network Predictability	Refer to (§ 6.4.3.6) Airport DCB Process Improvements Total reactionary delay (minutes) for LEPA; LEMD; LEBL: Solution Sc.: 67,40; 11,75; 763,58 (minutes) Ref. Sc.: 137,5; 224,75; 1014,37 (minutes)	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0600	Airport DCB Process Improvements	CRT-07.06.01-VALP-0749.0600	Overall delay reduction for flights between airports participating to the exercise; i.e.: increased Punctuality	Refer to (§6.4.3.3.46.4.3.6) Airport DCB Process Improvements	Partially OK
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0600	Airport DCB Process Improvements	CRT-07.06.01-VALP-0749.0601	The objective will be successfully achieved if it contributes to a reduction of differences between Actual and planned RBT duration (in minutes) by reducing variability in estimated operational capacity (PRE), thus reducing uncertainty(PRE) in the allocation of Airport available resources (CAP)	Refer to (§ 6.4.3.3.4): Traffic Count Predictability The graph compares OPS and VP749, both supported with historical data in the period when their flight plans have not yet arrived (from -24h to – 3.15 min) Traffic count predictability for LEPAARR and LEALDEP are shown	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0600	Airport DCB Process Improvements	CRT-07.06.01-VALP-0749.0602	The objective will be successfully achieved if it contributes to improve the departure sequencing (CAP), reducing Taxi-out variance (improved taxi-out Predictability).	Taxi-out is fed from the OPS system to the simulation environment. **It can only be assessed in a live trial exercise**	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0600	Airport DCB Process Improvements	CRT-07.06.01-VALP-0749.0603	The objective will be successfully achieved if it contributes to an increase in IFR movements per airspace volume per unit time (most challenging En-Route environment) (CAP).	Not Measured Non possible in a simulation environment	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0600	Airport DCB Process Improvements	CRT-07.06.01-VALP-0749.0604	The objective will be successfully achieved if it contributes to an increase in IFR movements per airspace volume per unit time (most challenging TMA environment) (CAP).	Not Measured Non possible in a simulation environment	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0600	Airport DCB Process Improvements	CRT-07.06.01-VALP-0749.0605	The objective will be successfully achieved if it contributes to a reduction in the average fuel burn per flight (ENV-Fuel EFF)	Not Measured Non possible in a simulation environment	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0700	Airport resource planning Improvements	CRT-07.06.01-VALP-0749.0700	The objective will be successfully achieved if it contributes to a reduction of differences between Actual and planned RBT duration (in minutes) by reducing variability in estimated operational capacity (PRE) thus reducing uncertainty (PRE) in the allocation of Airport available resources (CAP) .	Refer to (§6.4.3.3.4) Airport DCB Process Improvements	Partially OK
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0700	Airport resource planning Improvements	CRT-07.06.01-VALP-0749.0701	The objective will be successfully achieved if it contributes to improve the departure sequencing (CAP), reducing Taxi out variance (improved taxi-out Predictability).	Not Measured: Not possible in a simulation environment Taxi-out is fed from the OPS system to the simulation environment. It can only be assessed in a live trial exercise	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0700	Airport resource planning Improvements	CRT-07.06.01-VALP-0749.0702	Overall delay reduction for flights between airports participating to the exercise; that is increasing Punctuality	AIMA is not much better in terms of arrival delay (from Schedule) but it “cherry picks” the aircraft to be delayed in order to reduce the knock-on effect, which in fact benefits Network performance, as fewer aircraft will depart with smaller delays in the	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
					following jumps	
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0800	Data exchange improvements and manual effort and coordination reduction	CRT-07.06.01-VALP-0749.0800	Confirm that there is no housekeeping effort required by NMOC to keep in the NOP displays (CHMI and NOP portal) the runway configurations and capacity data showing the most up to date values and in consistency with AOP.	Information exchange was performed using B2B (system-to-system connection) which involves no manual intervention: The AOP was automatically updated with NMOC landing estimates NMOC received DPI information from Airports. Number of DPIs was significantly greater than the number provided by A-CDM as the time horizon was extended from 3h to 9 h. before flight departure	OK
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0900	Airport Arrival Performance	CRT-07.06.01-VALP-0749.0900	The number of scheduled flights arriving as planned (no delay) is increased	Refer to (§6.4.3.3.4) Airport DCB Process Improvements Number of arrival Flights delayed for LEPA; LEMD;LEBL: Solution Scenario: 17; 30; 74 Refer. Scenario: 22; 37; 50	Partially OK
EXE-13.02.03-VP-749	OBJ-07.06.01-VALP-0749.0900	Airport Arrival Performance	CRT-07.06.01-VALP-0749.0901	Total reactionary delay of delayed flights is reduced	Refer to (§ 6.4.3.6) Airport DCB Process Improvements Total reactionary delay (minutes) for LEPA; LEMD; LEBL: Solution Sc.: 67,40; 11,75; 763,58	

Exercise ID	Validation Objective ID	Validation Objective Title	Success Criterion ID	Success Criterion	Exercise Results	Validation Objective Status
					Ref. Sc.: 137,5; 224,75; 1014,37	

Table 13: Summary of Validation Exercises Results

4.2 Analysis of Exercises Results

Analysis of results is summarised and detailed throughout Sections § 6.1.3, § 6.2.3, § 6.3.3 and § 6.4.3

4.3 Confidence in Results of Validation Exercises

P07.06.01 has only been actively participating in VP-700 and VP-749:

- In VP-700, the role of the NOP was partially limited as there was no intervention with local actors as planned, Apart from this element, the confidence in the validation objectives results from both MET and KPIs is high. Refer to 6.1.3.4 for detailed information.
- P07.06.01 had full active participation in VP-749: in the AOP/NOP integration and the impact of TTA management in Airport Performance. The confidence in the results is aligned to the possibilities and limitations imposed by the validation technique used, Refer to 6.3.3.2 for detailed information.

For VP-710 Refer to P07.05.04-D52-Validation Report AFUA S1 Edition 00.01.01 [21].

For VP-713 refer to 07.06.02-D55 -Step 1 Business Trajectory Validation Report for VP713 [25].

4.3.1 Quality of Validation Exercises Results

VP-700:

In VP-700 trial, the information gathered via screen-shots clearly showed the potential benefits for the Network of using the extra information delivered by both, MET information and Network Performance Indicators to early trigger mitigation actions on performance disruptions.

VP-749:

The high amount of trials and the number of monitored flights gives a high confidence on the results

- 2 dry runs and 6 complete trial days
- Above 26.000 arrival and departures flights per trial day
- 1.621 aircraft performing a minimum of two jumps per day between any of the four participant Airports

In addition to the wide traffic sample:

- The post-analysis performed during the debriefing sessions showed similar behaviours and conclusions
- Multiple scenarios and various environment and parameter configurations contributed to validate the objectives in a wide set of conditions
- At any time the consistency of the AOP data with the real /shadow OPS situation was monitored and similarly, at network side the NOP data consistency and alignment with AOP was monitored via the two AOP and NOP HM interfaces. Refer to Primary Projects Validation Reports for additional or detailed information:
  - 13.02.03 D383 VALR S1 R5 STAM” for VP-700
  - 13.02.03 D383 VALR S1 R5 Vol2 Target Time Management” for VP-749
  - “07.05.04-D52-Validation Report AFUA S1 Edition 00.01.01” for VP-710
  - “07.06.02-D55 -Step 1 Business Trajectory Validation Report for VP713”

4.3.2 Significance of Validation Exercises Results

See above.

5 Conclusions and recommendations

5.1 Conclusions

These are the conclusions obtained from the Validation Reports addressed in this document:

5.1.1 MET-NOP Integration

The operational feasibility of the concept and its benefit was proven:

The MET-NOP Integration allowed combining significant weather (SIGMET) forecasts and their evolution together with ATFCM measures (regulations and STAM) and helped identifying areas that required monitoring. The integration of MET-NOP was considered an added-value in support of NMOC network monitoring activity.

Regarding the technical feasibility, systems and tools:

1. the user friendly representation of the significant weather on a map in full integration with ATFCM measures, and the new capabilities to manage areas that required monitoring (WAoI=weather areas of interest) were considered very useful features and concepts that should be taken into account in the phase of industrialisation.

2 the MET data exchanged from the MET provider was limited in the exercise due to prototype limitations, no problems were identified in these conditions. .However a careful analysis would be required at industrialisation to assess the amount of MET traffic data the NOP system can cope with.

5.1.2 Network Performance KPIs

The operational benefit of the new KPIs was proven:

The new set of KPIs proposed and validated in exercise VP700 assisted the network manager in on-line monitoring:

- By identifying deviations from the plan, imbalance situations as well as supporting their analysis and investigation.
- By supporting the analysis of sectors and airports traffic counts specially in terms of variability and its flight composition, according to different views (A/C status changes, flights ahead or behind schedule compared to plan, inflow or intruder flights /outflow extruder…)

The KPI graphical representation was highly appreciated by the NM participants in the trial for its user friendliness and fitness for purpose.

The set of Network KPI validated were considered to provide added-value to the NMOC on-line monitoring although further improvements to reduce the amount of data presented to the user were identified (see recommendations).

5.1.3 Improved collaboration via tool support

VP710 has successfully contributed to validate NOP in the objectives related to improve collaboration via tool support and Network Performance, mainly fuel savings.

The concept of the **Real Time Status of Airspace (RTSA)** update has been very favourably accepted by the different actors (Network Manager, Airspace managers (including AMCs), Military Airspace Users, FOCs, and FMPs) who have commended this cooperation between them.

- Sharing airspace status was the opportunity to promote the awareness about the different drivers that are behind each user. The concept can then be considered as validated.
- Technical systems were able to communicate, despite the fact that the implementation of the RTSA was implemented using a technical workaround, which led to a negative perception, in

particular in terms of Human Performance. The design of dedicated tools and an increase in automation levels should be recommended Predictability

- The stakeholders involved in the AFUA concept development and validation activities agreed to validate concept elements by means of already developed prototype systems in order to demonstrate the system interoperability and feasibility of SWIM technical profile TP (B2B) as well as the applicability of data exchange standards (AIXM 5.1)
- Clear benefits in terms of Network Performance, mainly fuel savings (environment efficiency) have been proven through this exercise. It also contributed to civil and military cooperation & coordination with more dedicated AUs
- It is also noted that Cross-border operations through collaborative airspace planning and European-wide shared use of military training areas were validated positively during this exercise, demonstrating the ability of a country to book areas inside or shared with its neighbour.

VP713 has successfully contributed to validate NOP in the objectives related mainly to improve collaboration via tool support and to Network Predictability

EFPL flight plan processing objectives, that include for example NOP and AU data exchange, trajectory updates in the NOP and mixed mode ICAO-FPL of operations have provided overall positive results.

The exercise clarified the need to include both the 4D trajectory and flight performance data in the EFPL to achieve improvements on the following aspects:

- Flight plan acceptance process improvement by reducing both the rates of wrongly accepted and wrongly rejected flight plans;
- Reduction of trajectory misalignment between the AU and NM actors;
- Traffic predictability improvement

VP700 has successfully contributed to validate NOP in the objectives related mainly to improve collaboration via tool support in the STAM coordination with local tools.

Local DCB tools were able to determine a Hotspot and co-ordinate STAM via NM B2B Web Services between adjacent ANSPs, keeping NOP in the data-exchange loop.

5.1.4 AOP-NOP Integration

VP749 has overall successfully validated the AOP-NOP Integration concept in the scope of the solution.

Predictability has been widely addressed during this exercise, as it is considered the main performance driver for the rest of KPAs, specially Punctuality and Capacity.

Gains in predictability have been assessed focusing on two main predictably drivers:

- Improved accuracy of predictions of Departure Times via TTOT assessment compared to current operations and
- Expanded Time horizon of predictions, from the current 3 Hours before EOBT to 9 hours before EOBT (taken from the planned departure times in the flight plan).

Early start of rolling exchange of departure times (contained in DPI) between both CASA and AOP shows improved predictability within the 4 hours before EOBT window. However there is some variability that will be addressed (see recommendations) in future trials.

The predictability provided by AOP-NOP Integration is significantly better than the one obtained with flight plan data. In heavy traffic days, the predictability gain is higher: the higher the traffic demand the better the gain. The increase of predictability is clearly explained by the rolling exchange of DPI that provides the most up-to-date take-off times according to the (heavy) traffic situation

The Multi-Airport interaction and exchange of planning information (API and DPI) clearly benefits from the earlier and more accurate ELDT/TTO predictions throughout the aircraft rotations and connecting legs. For two thirds of the observations, the multi-airport approach provides both in terms of gain in anticipation and predictions for the jumps/legs ahead, a more accurate picture than the current single airport approach.

Target times for airport arrival DCB has proven to increase punctuality by successfully decreasing the knock–on effect on following legs. AIMA (Airport IMpact Assessment - AOP logic) produces higher arrival delays for a given measured period but the overall delay, aggregated throughout the day for the consecutive legs shows a significantly lower effect compared to CASA. These results are explained by AIMA concept that “cherry picks” aircraft to be delayed that can absorb the delay throughout the aircraft rotations and as such reduce the knock-on effect.

VP749 has overall successfully validated the AOP-NOP Integration concept in the scope of the solution. It is worth highlighting the (very) positive results regarding the predictability gain as much in network as in airports and the positive results regarding the multi airport integration. The following point is planned to be improved in SESAR2020: early start of rolling exchange of departure times between CASA and AOP (CTOT and TSAT-TTOT). The validation technique of shadow involves some limitations that will be also addressed in SESAR2020 live trial (see recommendations).

5.2 Recommendations

This section contains recommendations for next phases for the exercises addressed in this Validation Report.

5.2.1 MET-NOP INTEGRATION

The following items were not in the validation exercise VP700 due to prototype limitations and shall be addressed at industrialisation:

- SIGMET Observation data should be logged for post-analysis, in complement to DCB and flights data, in order to improve flight demand repository, DCB predictions and the knowledge database - lessons learnt.
- SIGMET airport data should be certainly added to the MET data exchanged - VP700 only included en-route SIGMET.

The amount of MET data exchanged was limited in the exercise (no airport data and no observation data). As the amount of data can easily become very large, at industrialisation a careful analysis would be required to assess the amount of MET data exchanged and frequency that the systems (especially NM) can cope with.

The following were not in the scope but are recommended for evolution to v4:

1 Share in computer-to-computer (B2B) the network impact assessment of SIGMET from NM system to locals to provide NOP actors a more integrated or complete network assessment and to support an informed decision taking.

2 In addition to the visualisation (integration) on the map display, extend the traffic load values and its representation with the impact assessment of SIGMET. This would allow the user, NMOC or other NOP actors, to see the load forecast when including the weather impact (reduced capacity), supporting the monitoring and decision making.

5.2.2 Network Performance KPIs

Following VP700, the exercise stressed the importance and need for the operator to better understand the algorithm used in performance calculations. Understanding the algorithm and the possible limitations helps the operator to determine the level of confidence and integrate the use of the KPIs in his monitoring activity.

The role of NMOC in assessing network impact of STAM as part of the overall NMOC monitoring activity had not been previously identified (already pending from the time of the first STAM validation). It was not in the scope of this exercise either. It needs to be clarified for future concept (planned in SESAR 2020).

Better support (with new KPIs or combined representations of existing KPIs) to the user in his decisions that require trade-off between performance areas (e.g. Punctuality vs. efficiency etc...).

Currently there is no access to archive data via B2B services. Access to archive data via B2B would allow for enhanced trend analysis and comparisons between current traffic situations extrapolated to the near future and benchmarked against a reference situation in the past.

Move towards an alert driven model where the user can be notified of a problem and additionally some proposals for resolution would be presented (SESAR2020).

5.2.3 Improved collaboration via tool support

Following VP700 exercise supporting the STAM coordination with local tools, the main recommendation are:

- Simplify STAM B2B services for hotspot management and measure coordination.
- Mitigate discrepancies between data owned by the local systems and NM systems addressed in the step v4 of industrialisation.

Concerning VP710 objective related to improvement of collaboration via local tools:

- Higher level of automation and systems support (NM and locals) considered in the step v4 of industrialisation.
- Detailed procedures for the information exchange should be in place to support the CDM process.
- The system in place should be linked to all relevant CDM partners to enable the exchange of the required information among all actors involved.

The VP713 recommendations on the same subject are:

- Identify the best options in terms of EFPL data to be used by the NM systems in order to optimise traffic predictability,
- Clarify the requirements in terms of more detailed error messages provided by NOP to the AUs in the reply for an invalid EFPL.

5.2.4 AOP-NOP Integration

Based on the results from VP-749 P07.06.01 (AOP/NOP Integration) and OFA05.01.01 (Airport DCB Process Improvement), following recommendations are made:

- Improve pre-sequence logic in AOP to deal with CTOT improvements (Optimal CTOT);
- Early start (at -240min before take-off) of rolling exchange of departure times between CASA and AOP has given positive results in predictability within the -240min. However in heavy traffic days there is some variability that should be improved.

  In addition the variability increase observed in the period -480min to -240min caused by flights affected by important delays should also be addressed.
- PFD (planned flight data in NM) provides an essential element in the concept for predictability before FPL is filed. PFDs are therefore an enabler for the AOP-NOP optimal concept (to maximise predictability). Nowadays PFDs are available but not yet loaded on NM ETFMS OPS system. For the roadmap of AOP-NOP concept towards operation, an evolution in two steps is recommended:

  1. AOP-NOP with full horizon of FPL =>DPI will be exchanged as soon as the FPL is submitted,
  2. AOP-NOP with FPL and additionally PPDs => DPI will be exchanged as to -24h before.
- AIMA has proven to provide benefits compared to CASA in solving Airport DCB situations by Airports in TTA management. However regarding the delay comparison between both, it has not been possible to use an accurate Reference Scenario to compare CASA and AIMA total delay. It must be emphasised that delay is only one of the attributes of performance. And furthermore that

delay attribution and delay impact (reactionary delay) have not been fully analysed and should be part of any future exercise.

A live trial should be conducted to confirm and expand on the VP749 results, to measure DPI delays and traffic count predictability for AOP-NOP rolling concept and to measure and compare AIMA delays against a LIVE Reference Scenario. The use of simulators cannot be recommended as a simulator will introduce simplified behaviour that is disruptive to the overall impact analysis. The effects of slight variations at the saturation level of the operational conditions can lead to a false conclusion in either direction; the simulator being a much better performer or, on the opposite end, the worst.

Although the (high) predictability gain of AOP-NOP is very clearly measured at flight level, to be able to see the predictability gain reflected in the traffic counts more participating airports are required in the trial.

Additionally, the algorithms used by the AIMA tool to determine the impact, the sequence, and the revised target times should continue to evolve to allow an overall improvement in network system performance. Also an automated input from AO regarding the priority of his flights should be fed in the AIMA algorithm.

An expanded set of participant aerodromes is recommended.

Airspace User/Flight View, HDLA, and en-route ANSP/ATC involvement is recommended to allow a feasibility assessment of the end-to-end process.

Hotspots should allow for Aerodromes as reference locations.

5.3 OI Maturity

The following table summarises the features of the OI Step *DCB-0103-A* and provides the assessment of the maturity of the concept elements per the methodology shown in the Release 5 SE 3.1 Review Report [29] all concept features are considered to have reached the following maturity level:

- V3 Completed with "Acceptable Issues" = The Concept Feature may transition to industrialisation assuming that non-blocking issues are satisfactorily addressed as part of the project activities, or will be addressed during industrialisation. No further validation is needed.

Enhancement	Validation	Conclusions	Recommendations / Work Left to Do	Maturity
Comprehensive integration of AOP and NOP data (AOP-NOP Integration)	VP749 *P13.02.03*	AOP-NOP is a key topic of Solution 20 and subject of a pilot common project PCP (AF#4). Integration of AOP information with the NOP increased significantly Network and Airport predictability as a consequence of improved demand prediction. The benefit was observed as from nine hours ahead in time horizon and four to five legs ahead for aircraft. AOP exchanged departure (extended DPI) and arrival planning information (API) per flight and NOP exchanged ELDT (estimated landed time). This early and dynamic exchange is the key for the predictability gain, in particular supporting the Multi-Airport interaction.	Refine pre-departure sequence logic in AOP (allocation of TTOT and TSAT) to deal more efficiently with CTOT improvements provided by CASA. ⇨ *Addressed in SESAR2020/PJ24.* Delays and Traffic count predictability that cannot be measured in a v3 is *planned in SESAR2020/PJ24 live trial.* The algorithms used by the AIMA tool to determine the impact, the sequence, and the revised target times should be validated in a live trial ⇨ *Addressed in SESAR2020/PJ24.* Reduce the TTOT variability (e.g. variability between an earlier TTOT prediction and a later one) originating from the early (-240min) exchange of departure times between CASA and AOP. ⇨ *Addressed in SESAR2020/PJ24.*	V3 with Acceptable Issues

Enhancement	Validation	Conclusions	Recommendations / Work Left to Do	Maturity
			Pfd (planned flight data) or demand data repository that was used in the exercise VP749 provided an essential element in support to predictability before FPL was filed. However Pfd are not yet integrated in NM OPS system. AOP-NOP Int. can work without these data and increase predictability but the gain limited. Some initiatives exist to address this topic in NM but nothing concrete. This is considered an important recommendation to follow up.	
Increased visibility of network performance (Network Performance KPIs)	VP700 *P13.02.03*	NOP provided increased visibility of the network performance to support performance driven operations by use of new KPIs supporting NMOC on-line monitoring. The choice of KPIs proposed and its graphical representation were considered supportive to NMOC on-line monitoring and to the analysis of network disruptions.	Refine the role and responsibility of NMOC in the STAM process – e.g. Network performance monitoring role. ⇨ *Addressed in SESAR2020/PJ24.* Reduce the amount of data presented to the user and increase the use of user notifications and alerts to increase the automation support for DCB activity. ⇨ *Addressed in SESAR2020/PJ24.*	V3 with Acceptable Issues

Enhancement	Validation	Conclusions	Recommendations / Work Left to Do	Maturity
Initial integration of weather information (MET-NOP Integration)	VP700 *P13.02.03*	The MET-NOP Integration allowed combining significant weather (SIGMET) forecasts and their evolution together with ATFCM measures (regulations and STAM) and helped identifying areas that required monitoring. The integration of MET-NOP enhances network monitoring and supports collaborative decision making.	The following were not in the validation exercise due to prototype limitations and will be addressed at industrialization: SIGMET Observation data should be logged for post-analysis, in complement to DCB and flights data, in order to improve flight demand repository, DCB predictions and the knowledge database–lessons learnt. SIGMET airport data should be certainly added. VP700 already included en-route SIGMET. The amount of MET data exchanged was limited in the exercise (no airport data and no observation data). As the amount of data can easily become very large, for industrialization a careful analysis would be required to assess the amount MET data traffic NOP (NM) system can cope with. The following were not in the scope but are recommended for evolution to v4: 1. Share in B2B the network impact assessment of SIGMET to provide NOP actors a more integrated/complete network assessment, 2. In addition to the visualization on the map display, extend to the traffic counts representation and traffic count values with the impact assessment of SIGMET.	V3 with Acceptable Issues
Improved collaboration via tool support:				V3 with Acceptable Issues
- DCB local tools	VP700 *P13.02.03*	Local DCB tools were able to determine a Hotspot and co-ordinate STAM via NM B2B Web Services between adjacent ANSPs, keeping NOP in the data-exchange loop.	Simplify STAM B2B services for hotspot management and measure coordination. Mitigate discrepancies between data owned by the local systems and NM systems addressed in the step v4 of industrialisation.	
- RTSA	VP710 *P07.05.04*	ARES were successfully shared with NOP and other actors and a limited number of trajectories were updated accordingly.	Higher level of automation and systems support (NM and locals) considered in the step v4 of industrialisation.	
- EFPL	VP713 *P07.06.02*	EFPL trajectory and updates, mixed mode ICAO-EFPL updates, have been successfully shared with NOP. The flight performance data in the EFPL is required to achieve predictability improvements in NOP.	Identify the best options in terms of EFPL data to be used by the NM systems in order to optimise traffic predictability Clarify the requirements in terms of more detailed error messages provided by NOP to the AUs in the reply for an invalid EFPL.	

6 Validation Exercises reports

6.1 VP-700

Tactical traffic regulations as currently applied by the NM limit the traffic entering a sector through the systematic allocation of departure slots (Calculated Take-off Times – CTOTs) to all concerned flights, regardless of how they contribute to the expected overload. This is achieved through the Computer Assisted Slot Allocation (CASA) process.

This process, remaining valuable in case of major imbalance, turned out to be not optimal when the demand does only slightly exceed the available capacity (and/or for a limited duration).

Short Term ATFCM Measures (STAM) consist in smoothing the sector workload by reducing traffic peaks using short term measures such as small ground delay, flight level capping or small re-routings applied to a limited number of flights (called cherry picking). Already this can make the traffic less complex for ATC.

The effective application of STAM requires an improved information quality for traffic forecast. To achieve this Occupancy Counts are added to the currently used Hourly Entry Counts into a sector. In a broad sense Occupancy Counts correspond to the number of flights in charge of the planning air traffic controller at a given time.

From a Network perspective, an impact assessment on downstream traffic sectors of the possible measures to solve traffic demand / capacity imbalances, is performed, both by use of STAM measures and by applying CASA procedures.

The contribution of P07.06.01 to VP-700 validation assesses the operational ability to include two Network monitoring processes: a MET Status Monitoring and a Network Performance Monitoring, both supported by **DCB-0103-A** under **OFA 05.03.07**

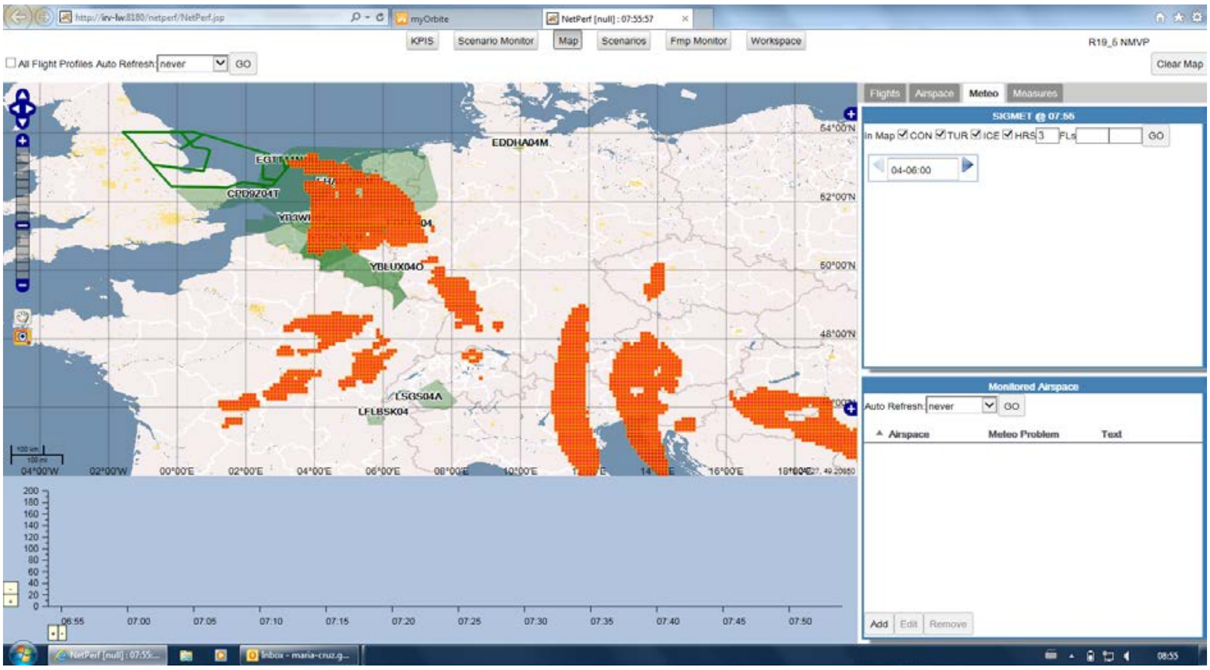


Figure 1: MET status monitoring

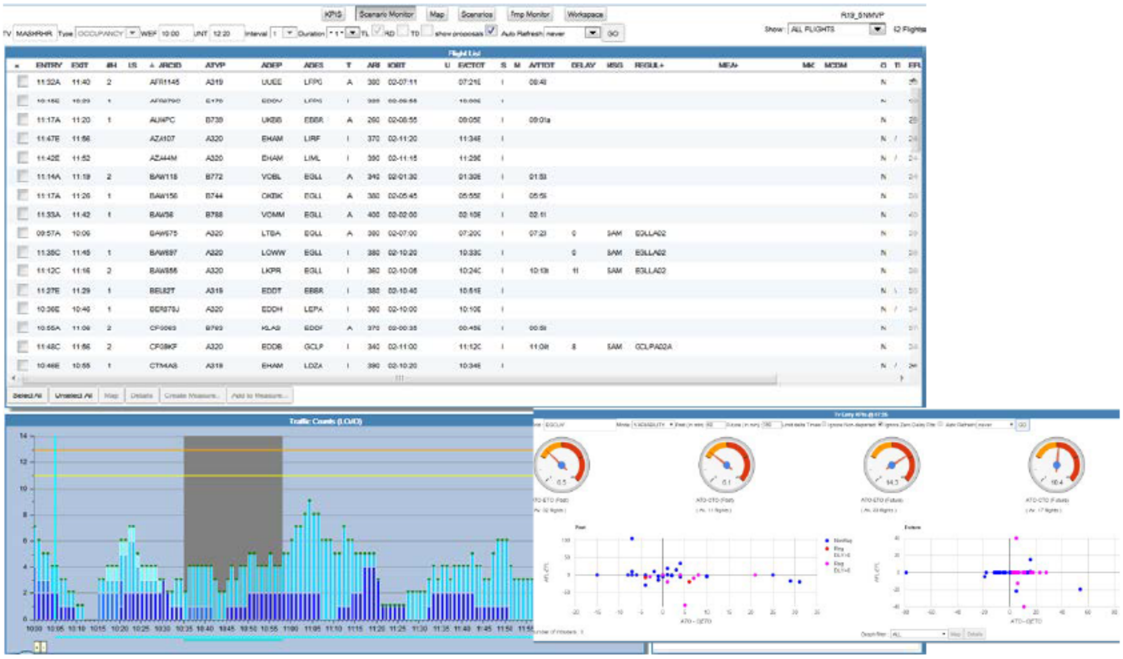


Figure 2: Network Performance Monitor

6.1.1 Exercise Scope

6.1.1.1 Exercise Level

ATM System. Maturity Level: V3 Maturity Level. Human-in-the-loop simulation of the integration of STAM including Network Supervision and interface with local tools connected via B2B.

6.1.1.2 Description of the Operational concept being addressed

The last sub-exercise in the VP700 project to validate the implementation of STAM Measures via local tools has taken place from February 29, 2016 until March 4, 2016. This exercise is the grand finale of the preparation, co-ordination, and execution of Short Term ATFM Measures (STAM) like Ground Delay, Horizontal Rerouting, and Flight Level Capping, using NM B2B Web Services. These Web Services were developed in NM Release 19.5 and further improved in NM 20.0 and allowed local ANSP tools to connect with the NM Systems to exchange data and information in order to improve the efficiency and effectiveness of these STAM. The performance improvements are enabled by allowing the ANSP to act on local intelligence about complexity, workload, procedures, and other knowledge and therefore become more successful to select the right flights at the right time to restore the Demand Capacity Balance (DCB).

Typically the local system is able to determine a Hotspot based on occupancy counts that are exceeding defined OTMV thresholds (Occupancy Traffic Monitoring Values), declare it, and monitor its evolution. In case there is a significant Capacity Demand Imbalance, the ANSP may decide to propose a measure (STAM) to be created to alleviate the imbalance, selecting those flights that are picked by the local tool using decision criteria that are optimised to the local ANSP.

The objective is to co-ordinate STAM via NM B2B Web Services between adjacent ANSPs, here NATS and MUAC, in both directions. ANSP creates and proposes STAM based on actual traffic situations, ask for co-ordination and approval of the measures, implement them and monitor their evolution. It is emphasised that the validation stops at the monitoring as there is no real world component to make sure that flights actually comply

As already stated P07.06.01 contributes to VP-700 by the inclusion of NOP-MET and NOP performance Monitoring:

<u>MET Status Monitoring</u>:

The validation consists in dynamically updating a standalone tool with significant weather using 4DWxCube data to estimate significant weather when applying STAM measures. The overall process is as follows:

- Significant weather is displayed as "MET cubes" on the map
- In D-day NMOC identifies areas where eventual tactical measures (e.g. STAM measure) may be necessary and are or is expected to be affected by significant weather.
- NMOC highlights those areas for monitoring (evolution of hotspot and Significant weather).
- Through the available process, NMOC seeks information on the local impact (potential capacity reduction within a certain time.
- NMOC will coordinate with the local ANSP if necessary (in case of network impact) and understand what solution ANSP proposes, like capacity reduction or STAM or nothing. In case of network impact NMOC continues monitoring the imbalance to assess that the solution solves the problem and does not create any other in the network.

MET tool characteristics

- The 4DWxCube provides Significant Met data- Turbulence, convection and Icing- for en-route for forecast (from 36 or 24h horizon) and observation.
  - Airports Significant Met data is not included in previous and need to be obtained from another source.
- Each significant phenomenon i.e. Turbulence/Convection/Icing can be enable/disable
- The met data is provided in grids (lat, long) per FL bands.
- The network needs less granularity than the one provided by 4DWxCube
  - Reduction algorithm applied in MET tool and colours (severity) assigned
- Cubes symbols are depicted in yellow (light), orange (medium) and red (severe) on the map for each phenomena.
- Regulations and STAMs are shown as well as SIGMET data

The tool display has been prototyped (by EUROCONTROL) in a secondary display, parallel to the NOP portal. It integrates NM and MET data. An example is shown in Figure 3.

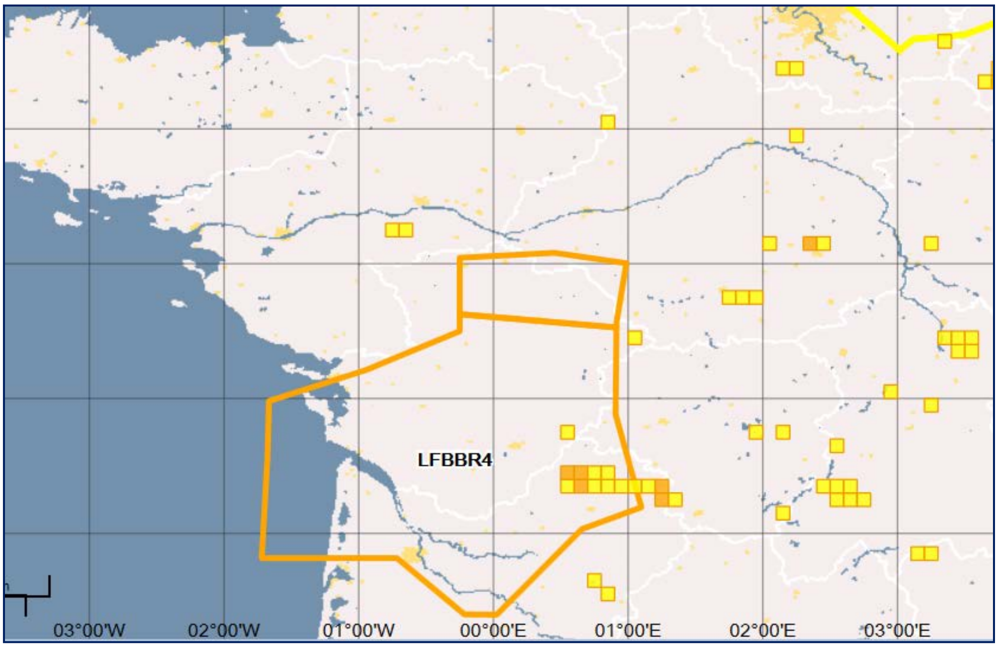


Figure 3: NOP MET Display

Network Performance Monitoring:

To develop a KPI tool display in a secondary display, parallel to the NOP portal to validate the operational use of a set of global performance indicators to assist the Network Performance Monitoring as well as some ergonomic aspects.

- Monitoring in execution phase, short term planning (optional) and post-OPS –especial accent on on-line monitoring.
- Monitoring linked to scenarios where STAM measures are created, occupancy counts vs. entry counts monitoring.
- Network KPIs on delays, adherence, predictability
- Graphical display showing totals and also per measure type, evolution and trends of indicator

Project 07.06.01 mainly addresses STAM performance benefits on the Network by the operational use of a representative set of KPIs to assist network monitoring during the execution phase and verification in post-analysis of the resulting impact on the network.

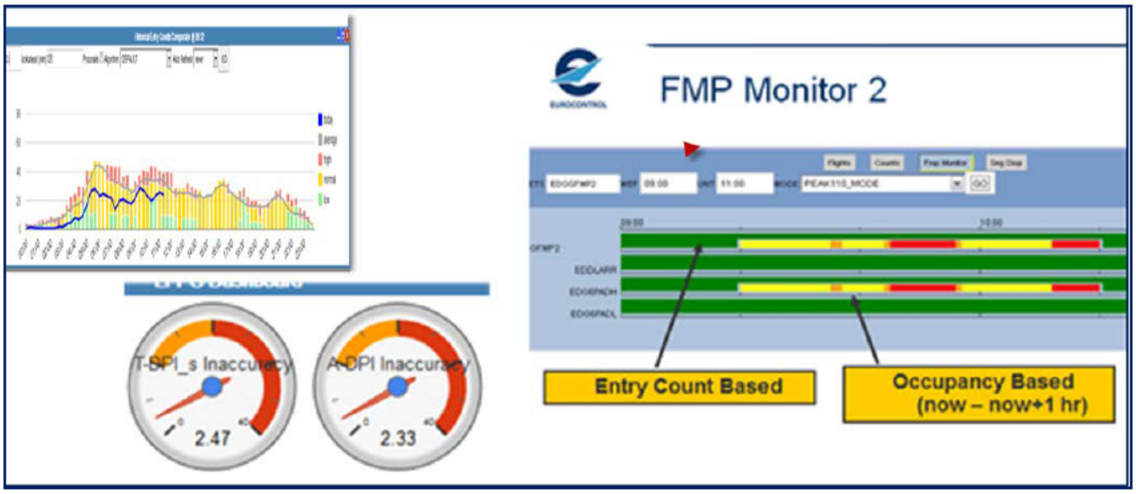


Figure 4: Network Performance Display

As shown in Figure 4: Network Performance *Display*, an initial graph of the extended FMP monitoring with occupancy counts has been developed and presented in an Initial mock-up, developed by extracting values via B2B and populate them to calculate KPIs.

6.1.1.3 Validation objectives and Hypothesis

For P07.06.01 the objective is:

– To evaluate the Network Performance using Key Performance Indicators so they can improve the monitoring of the Demand Capacity Balancing (DCB) in function of the Network Impact;

– To support the NM in the evaluation of upstream and downstream effect of the proposed STAM, providing advice to ANSPs in relation to the opportunities and penalties related to the proposed measures outside their immediate area of responsibility

Refer to § 2.2.3 for detailed information on VP-700 Validation Objectives, Success Criteria and Choice of Indicators and Metrics

The following table summarises 07.06.01 Validation Objectives

Objective Id	KPA/ Topics	Hypotheses
OBJ-07.06.01-VALP-GEN1.0100	Operational Feasibility	Any change in stakeholders operational plans can be transmitted to the NOP and the Network Plan can be updated accordingly

Objective Id	KPA/ Topics	Hypotheses
OBJ-07.06.01-VALP-GEN1.0200	Operational Feasibility	All partners involved in operations can have easy access to any NOP data with potential impact on their operations.
OBJ-07.06.01-VALP-0700.1010	Capacity Monitoring and Assessment	The Network is able to monitor, assess and record in real time en-route capacity and demand changes due to STAM up to date information on selected flights
OBJ-07.06.01-VALP-0700.1020	Fuel Efficiency Monitoring	The Network is able to monitor and record changes in flight profiles due to level capping and re-routing measures when applying STAM
OBJ-07.06.01-VALP-0700.1030	Punctuality Monitoring	The Network is able to monitor and record departure and arrival deviation of flights from their initially planned schedules, as well as the causes of deviation (e.g. delay message, regulation, STAM…), , to assess their departure and arrival punctuality index
OBJ-07.06.01-VALP-0700.1040	Predictability Monitoring	The Network is able to monitor and record departure and arrival deviations of flights from their initially planned schedules, as well as the causes of deviation, to assess their block-to-block variability and arrival and departure On-Time Performance
OBJ-07.06.01-VALP-PERF.7100	Operational use of KPIs during execution	The operational use of a representative set of KPIs assists network monitoring in execution
OBJ-07.06.01-VALP-PERF.7200	KPI evolution in trend representation	The trend analysis benefits the assessment of the evolution during execution (i.e. along the day) and comparison of trends with parallel periods (i.e. day before or a similar day in a similar context).
OBJ-07.06.01-VALP-PERF.7300	NM DCB Process Improvements	Extending FMP monitor with the occupancy load factors (different colours for different thresholds) better assesses the DCB network situation.
OBJ-07.06.01-VALP-PERF.7400	Measurements to support post analysis	Asses the adequacy of set of measurements to assist in the post analysis of network performance
OBJ-07.06.01-VALP-MET1.7100	Operational feasibility of consideration of weather in the STAM process	The diffusion of the significant WX and its consideration in support of STAM measures is operationally feasible. Significant WX forecast data supports the implementation of STAM in preventing to introduce a weather risk i.e. by placing flights at (high) risk of being affected by significant WX.
OBJ-07.06.01-VALP-MET1.7200	Roles and responsibility of WX management in STAM application	Assessment of the roles and responsibilities of the actors involved in the WX management in STAM application. In particular the role of NMOC as monitoring and in the escalation process.
OBJ-07.06.01-VALP-MET1.7300	Operational feasibility of consideration of weather in the STAM process	Considering the impact of significant weather when creating/applying a STAM measure (RR or eventually delay or flight level capping) to resolve a hotspot is operational feasible
OBJ-07.06.01-VALP-MET1.7400	Impact of Weather information on Traffic Volume capacity	The integration of Weather information into DCB procedures as from D-1 in support of the creation and the updating of the network operational plan, improves weather forecast, enhancing its impact assessment on Traffic Volume Capacity

Objective Id	KPA/ Topics	Hypotheses
	Assessment	values

Table 14: Summary of VP-700 Validation Objectives and Hypothesis

6.1.2 Conduct of Validation Exercise

EXE-13.02.03-VP-700 is a Passive Shadow Mode / Live Trial on STAM including Network Supervision and interface with local tools connected via SWIM (B2B). VP-700 is composed of several sub-exercises to be performed in different locations and involving different ANSPs. See SESAR P13.02.03 D342 VALP S1 R5 00.01.03 for details on ANSP participants and trial schedules.

Results from all Trial runs are expected regarding P07.06.01 Generic Objectives (described in Table **14** above):

- OBJ-07.06.01-VALP-GEN1.0100
- OBJ-07.06.01-VALP-GEN1.0200

P07.06.01 Objectives to support Network Performance Monitoring and assessment are addressed under NATS / MUAC EUROCONTROL trial run, executed from 02-04 march 2016:

- OBJ-07.06.01-VALP-0700.1010
- OBJ-07.06.01-VALP-0700.1020
- OBJ-07.06.01-VALP-0700.1030
- OBJ-07.06.01-VALP-0700.1040
- OBJ-07.06.01-VALP-PERF.7100
- OBJ-07.06.01-VALP-PERF.7200
- OBJ-07.06.01-VALP-PERF.7300
- OBJ-07.06.01-VALP-PERF.7400
- OBJ-07.06.01-VALP-MET1.7100
- OBJ-07.06.01-VALP-MET1.7200
- OBJ-07.06.01-VALP-MET1.7300
- OBJ-07.06.01-VALP-MET1.7400

6.1.2.1 Exercise Preparation

This section summarizes the activities undertaken to prepare properly the execution of the VP-700 NATS/MUSAC EUROCONTROL sub-exercise according to its design described in 13.02.03 D383 VALR S1 R5 Vol 1 STAM 00.01.00

The exercise preparation required the involvement of different staff with specific skills and responsibilities. The main activities carried out during the preparation phase are collected in the table below including the staffs/actors in charge of performing them.

Organisation	Participant	Function
NM	Juan Rodriguez Poveda	Observer – Procedures and Process - NM Operations Expert
	Maria Cruz Garcia De Dios	Observer – KPIs and Network Performance - NM Operations Expert
ENAIRE	Amalia Garcia Alonso	Validation Leader

Organisation	Participant	Function
NATS	Mark Witherington	Primary Participant – FMP Co-ordination and Participation
	Mike Mangan	Primary Participant – FMP Co-ordination and Participation – KPIs and ANSP Performance
	Simon Barry	Primary Participant – FMP Co-ordination and Participation – KPIs and ANSP Performance
MUAC	Robert Parys	Primary Participant –Project Manager
	Gareth Lawton	Validation and Concept Development Expert for local tool.
	Rupesh Nanglia	Developer Local Tool
SESAR ATM/RDS/NET	Leo Van Der Hoorn	Validation Exercise Support
	Peter Choroba	Support to Validation Exercise Lead
	Darren Smith	Developer NetPerf KPI tool and STAM Prototype Demonstrator
	Stefan Steurs	Technical Leader and Exercise Facilitator
	Stella Saldana	Validation Exercise Leader for 7.6.1 shared objectives on Performance and Meteo
	Alejandro Egido Salazar	Observer – KPIs and ANSP Performance
	Francoise Guenin	NMVP Platform Co-ordinator

6.1.2.2 Exercise Planning

The exercise took place from February 29 to March 4, 2016.
The schedule was the following (all times are in local Brussels, Paris, Rome time – subtract 1 hour for London, Greenwich time):

Date	Period	Activity	Conference Room
2016/02/29	10:00 – 13:00	VP700 Dry Run	Meeting Room HQ 52.830 (8p - videoconference)
2016/03/01	10:00 – 13:00	VP700 Dry Run	Meeting Room HQ 52.852 (10p - videoconference)
2016/03/02	07:00 – 12:30	Formal VP700 Session	Meeting Room HQ 52.805 (6p)
2016/03/03	07:00 – 12:30	Formal VP700 Session	Meeting Room HQ 52.830 (8p - videoconference)
2016/03/04	07:00 – 12:30	Formal VP700 Session	Meeting Room HQ 52.830 (8p - videoconference)

WebEx sessions were organised for each of these days to allow easy and expedient communication.

A conference room was reserved in HQ to allow the participants to share a common location and potentially to access Visio. Due to the shift in the exercise by 1 week, the room could not be reserved fulltime.

For the Formal runs, there was a specific agenda for each day:

Exercise Agenda	
Pre-Exercise Brief Agenda	- Technical Readiness

	- Brief status of each system and connectivity - Ops Readiness and brief - AOB
Exercise	- Cover 13.2.3 scenarios as described in the MOPS - Cover 7.6.1 scenarios as described in the MOPS - At the end of the exercise day send a 'system available' message to VP749 for integration and testing
Post-Exercise Brief Agenda	- General report from Ops users on how the exercise went - Scenarios run - Questionnaire completion (confirm questionnaires have been completed) - Lessons learnt - Any Tech Issues to be resolved - AOB

6.1.2.2.1 Platform Configuration

The following systems were used for the trials:

NOP Portal: https://www.nmvp.nm.eurocontrol.int/PORTAL/index.html

- user id + token required
- or vp522 user id + fixed password
- profile: FMP + STAM Features
- domain: NMVP

NetPerf tool: [28] (internal to EUROCONTROL)

- this platform provides MET data (only this platform and not the one below) https://www.nmvp.nm.eurocontrol.int/netperf/ (external and internal to EUROCONTROL)
- user id + token required

CHMI: C:\EUROCONTROL\CHMI_CONFIG.20.0.0.12.0.3.19-SATI\bin\chmi\CHMI_20.0.0.12.0.3.19_via_www.nmvp.nm.eu.int.PROXY.bat

- user id + token required
- or vp522 user id (v1 & fmpid like lfee) + static password (20140625)
- profile: FMP + STAM Features
- domain: NMVP

TACT MMI (vncviewer)

- server: mmivp1-fe.cfmu.eurocontrol.int:81
- static password CFMU administrator asterisk

6.1.2.2.2 Local Prototype

The Local Prototype was developed by P13.02.03 and integrated in the NMVP.

The main function provided by the prototype is to support the OPS Supervisor in the hotspot detection, the analysis and preparation of STAM measures (by means of what-if and network impact assessment functions) and STAM Coordination.

The main functionalities of the prototype are the following:

- Local Traffic Complexity Prediction. Three complexity indicators are predicted in order to support hotspots detection depending on predefined thresholds:

    - Entry rate: Number of aircraft predicted entering in the sector within the next hour;
    - Occupancy: Number of aircraft in the sector;
    - Workload: Workload based on complexity for an operational sector.
- Trajectory What-if for STAM solutions: This functionality allows the user to test different STAM solutions (cherry picking measures or flow measures). The sub-system re-computes the traffic complexity (entry, occupancy and workload) related to the new air traffic situation.
- Local M-CDM to support the STAM coordination process

6.1.2.2.3 Training

A user's manual: [28] "NetPerf- A demonstrator" was developed to describe the use of the tool used for Network KPI and FMP monitoring

VP-700 execution preparation and training sessions were held from 01-04 February 2016 in EUROCONTROL Brussels:

The work mainly focused on the use of the "NetPerf-A demonstrator" tool, which provides a number of distinct work areas, representing different facets of the prototype:

- KPIs: A pre-configured dashboard of the most popular KPI tools.
    - ✓ Other KPI tools are available via the Workspace tab
- Scenario Monitor: An "improved VP522 like" experience for creating STAMs
- Map: Map and vertical views.
- Scenarios: Very basic STAM scenario editor.
- FMP Monitor: An improved FMP Monitor that includes both Entry and Occupancy Loading.
- Workspace: A general workspace (CHMI-like) from which the user may open any number of "applications" KPIs

Prior to trial execution two Dry-Run sessions were held on February 29th and March 01st. EUROCONTROL Conference rooms HQ 52.830 and HQ 52.852 were used for these training, verification sessions.

6.1.2.3 Exercise execution

6.1.2.3.1 Guidelines

After the first day of the dry run it became clear that there was a need for additional guidelines so the exercise would run smoothly. These are the proposed rules:

To limit any possible confusion or misbehaviour of the systems involved in the exercise, please try to respect the following ground rules:

- ➢ Hotspots
    - Do not override existing hotspots – once a hotspot is created it should not be removed unless the measure to which it is associated is abandoned (otherwise you end up with a measure without a hotspot or a hotspot period not intersecting with the measure period)
    - The hotspot should be created with a look ahead period of maximum 3 hours taking into account system is UTC and Brussels/Maastricht is therefore one hour ahead. A hotspot created at 07H00 local in the morning should therefore be terminating before or around 09H00 UTC. At NATS there is no time different so they can create at 07H00 local a hotspot until 10H00 UTC. The look ahead should never be less than 1 hour.
    - Hotspot periods should have a minimum length of about 20 minutes and a maximum length of about 60 minutes
- ➢ Measures

- The measure period should extend the hotspot period from 30 minutes before to 60 minutes after
- Ground Level Cap or Horizontal Rerouting should use 'AVOID' airspace constraints possibly combined with 'VIA' airspace constructs
- Must be co-ordinated so the state shall be PROPOSAL before approval or rejection by partner ANSP
- Must be promoted to IMPLEMENTING/FOR_IMPLEMENTATION after approval
- Must be ABANDONED or COMPLETED after end of measure period is reached

➢ Flights

- Must pass the reference location of the measure within time and within level
- Must be still on the ground when the measure is implemented (M-CDM co-ordination included)
- Must not be regulated or rerouted by a NM Regulation or Group Rerouting …
- Must not be suspended, or sequenced with DPI-s, preferable the Take-Off-Time should be at least 40 minutes before the start of the measure (which is more than an hour from the start of the hotspot period)
- Must cross MUAC and NATS airspaces for co-ordination between these ANSPs/FMPs

6.1.2.3.2 Witnessing and Monitoring

We had to perform two different activities:

➢ witnessing:

- looking at the actions and status: who does what, where do we start, where do we finish
- before and after preparation and execution: there are different discrete steps – what is the flow
- of STAM: basically all we want to do is to affect flights such that a DCB imbalance is resolved

➢ monitoring:

- Count: how many measures, how many flights, etc.
- Analyse: can we understand what happens, why things are done
- Advice: when we think we are not achieving the objectives, provide relevant information to adjust approach

6.1.2.3.3 Validation Scenarios

VP-700 was executed according to the following validation scenarios as they have been developed in D47 VALP

Scenario ID	Scenarios Description
SCN-07.06.01-VALP-NOP4.4000	Daily Plan Monitoring-Network Performance Monitoring and Supervision-No Imbalance Detection
SCN-07.06.01-VALP-NOP4.5000	Daily Plan Monitoring and DCB Imbalance-Network Performance Monitoring and Supervision-Imbalance Detection
SCN-07.06.01-VALP-0004.0000	Handling En Route Weather Phenomena
SCN-07.06.01-VALP-0700.0120	STAM Ground Delay
SCN-07.06.01-VALP-0700.0130	STAM Horizontal Rerouting impacted by Significant WX

SCN-07.06.01-VALP-0700.0140	Significant WX impacts Capacity- FLCAP STAM

6.1.2.3.3.1 Reference & Solution Scenarios

According to the Guidelines on Scenarios provided by P16.06.0X and B.05, the following Reference and Solution scenarios were identified:

- **Reference Scenario:** Due to the validation technique chosen for this exercise (shadow-mode), the reference scenario (conducted by the operational NM without using the Network Performance KPIs used in the validation) is based on actual traffic and current operational environment.
- **Solution Scenario**: The solution scenario, has been conducted by the NMOC using the new KPI support tools under validation to:
  - Support Local Performance impact Assessment of the proposed STAM measures
  - Performs an impact analysis using the Network Impact Display (NID) of the proposed STAM in the Network to check if the proposed STAM forces the flights in a close airspace, or if the selected flights are already affected by another STAM or if the proposed STAM forces the flights into a regulation.

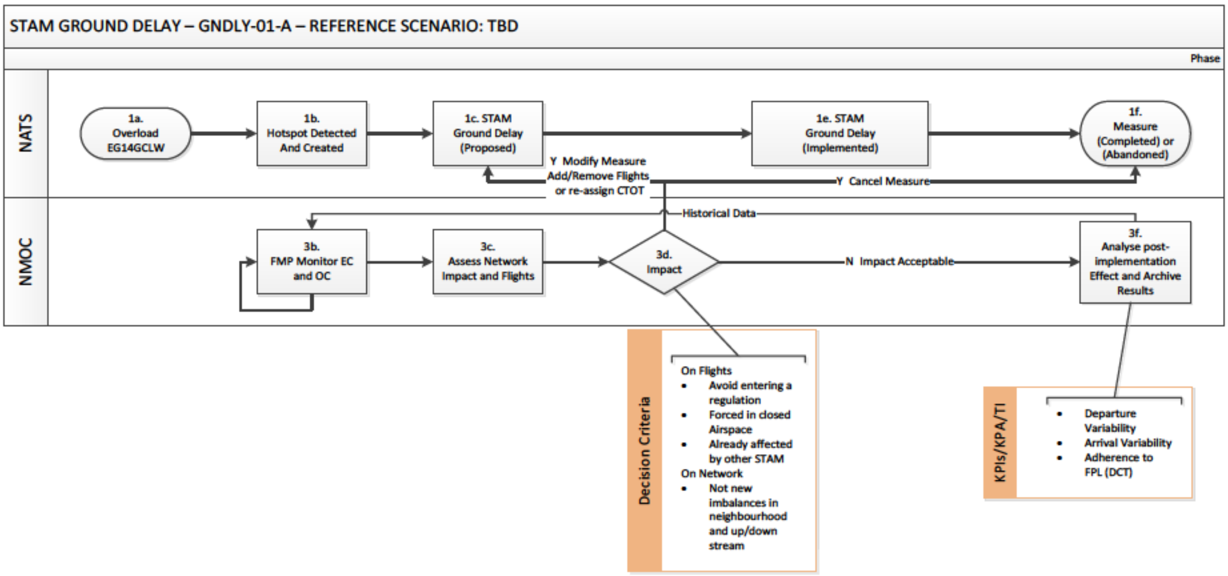
6.1.2.3.4 Operational Scenarios

STAM Ground Delay

Identifier: SCN-07.06.01-VALP-0700.0120

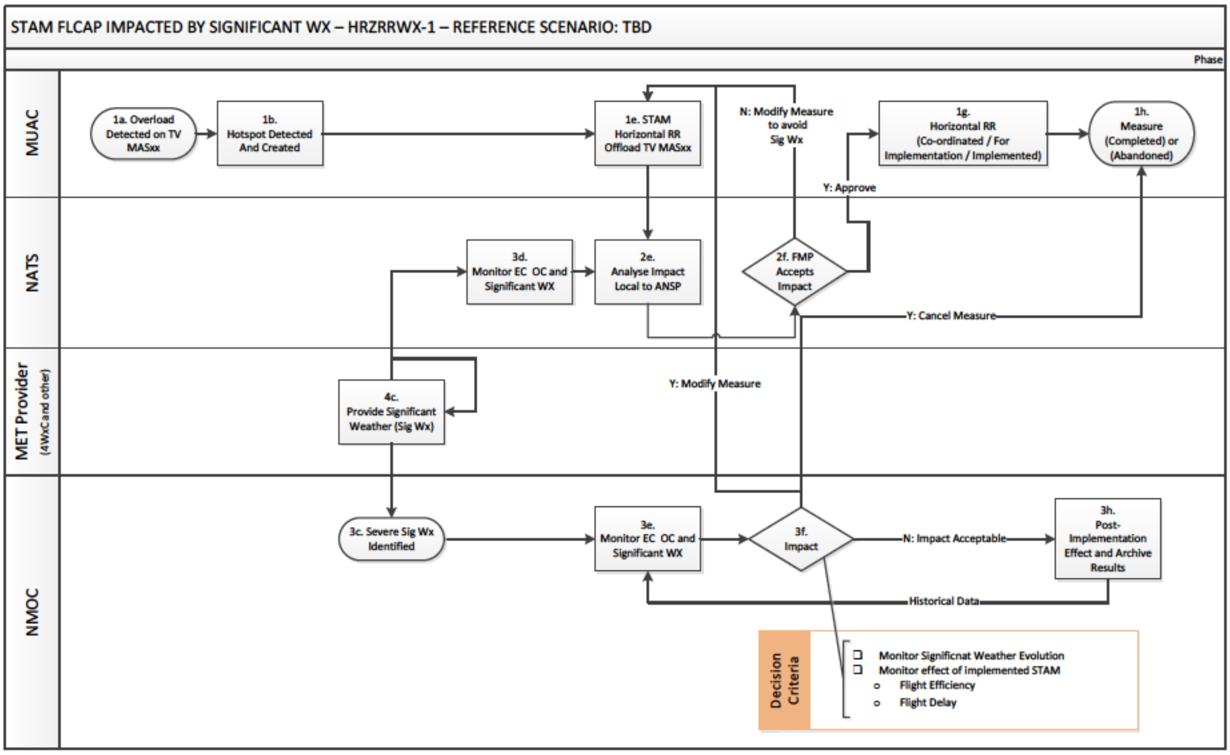
Local Traffic Manager (LTM) NATS detects and creates a hotspot. To resolve it, NATS creates first in proposal, a ground delay STAM measure in Heathrow. In parallel, NMOC get notified of the hotspot creation and start monitoring the hotspot. Subsequently NMOC get notified of the creation in proposal of the ground delay STAM measure. NMOC performs the impact analysis of the proposed STAM in the Network and performs the impact on the individual STAMed flights. For example NMOC would check if the proposed STAM forces the flights in a close airspace or if the selected flights are already affected by another STAM or if the proposed STAM forces the flights into a regulation. For the impact on the network, NMOC would use the Network Impact Display (NID) that provides the new picture of counts and flights for the relevant / impacted TVs according to the proposed STAM so that NMOC can determine the impact.

If the network impact analysis has been negative NMOC informs NATS indicating what the problem is, either some flights should be removed or added to the measure or the whole measure should not be created or cancelled, if already implemented. NATS updates the proposed measure and promoted to implementation or abandon or cancel. Otherwise, if NMOC impact analysis is positive, the measure is implemented without any changes.



STAM Horizontal Rerouting impacted by Significant WX

Identifier: SCN-07.06.01-VALP-0700.0130



This particular scenario describes actions taken when an overload is detected by a Local LTM and in its coordination for the implementation of an STAM horizontal rerouting with the affected LTM; the latter detects an impact due to weather considerations. In parallel NMOC performs their Network impact assessment, supported by the weather information, and can also identify the impact which is communicated to the Local LTM

Detection and negotiation (-2 hours)

LTM MUAC detects and creates a hotspot in MASxx. To resolve it MUAC creates first in proposal, STAM horizontal rerouting to offload MASxx. In its coordination with the affected LTM NATS, the latter detects an impact as the rerouted flights would cross an area of severe turbulences. In parallel, NMOC has got notified of the hotspot creation and subsequently of the creation in proposal of the STAM horizontal rerouting. NMOC performs the impact analysis of the proposed STAM in the

Network, considering significant weather as well as EC and OC methods as usual. In the impact analysis NMOC also identifies the area of severe turbulences that would be crossed.

Implementation (- 1 hour)

LTM MUAC modifies the STAM rerouting to avoid the turbulences as indicated by NATS. The modified measure is checked against by NATS that agrees and finally the measure is promoted to be implemented.

Post- Implementation Monitoring and Observation

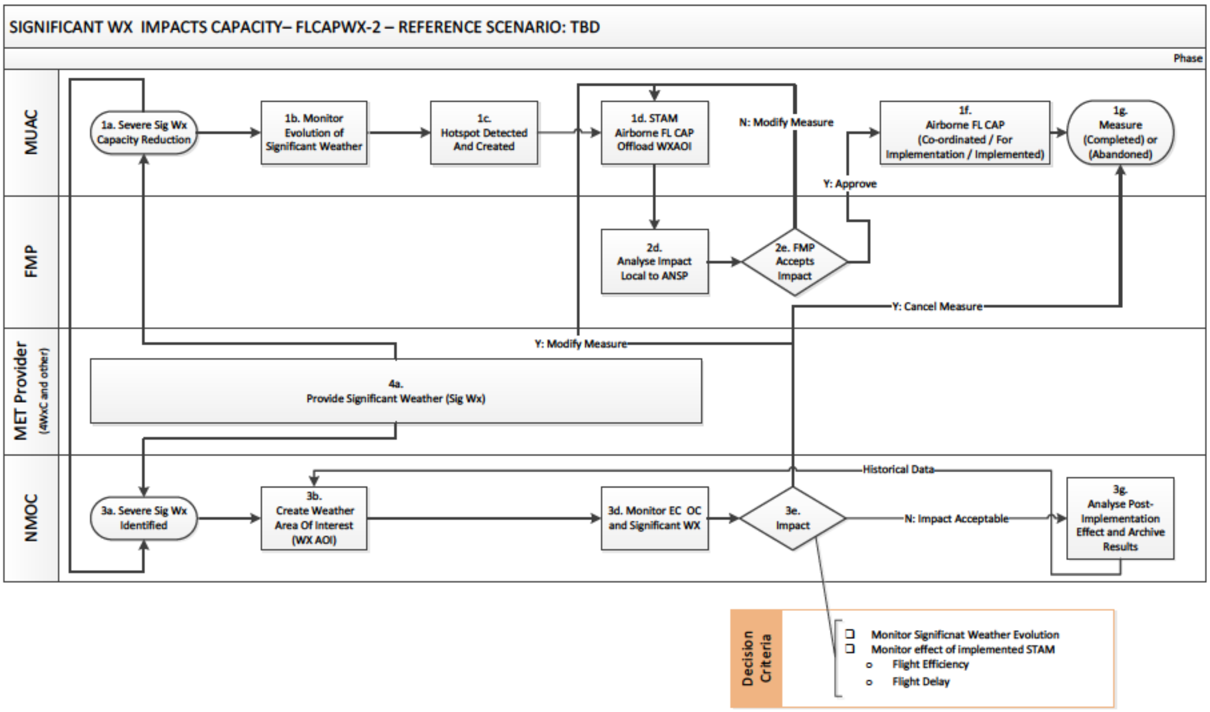
LTMs and NMOC monitor using the local tools and the NM weather display respectively the evolution of forecasted turbulence.

LTM and NMOC monitor the effectiveness of the implemented measure, in order to adjust, and optimise ATC protection and flight efficiencies and minimise delays

The NM weather application gets updated by weather observations by 4DWxCube. The display confirms the occurrence of the forecasted turbulence.

Significant WX impacts Capacity- FLCAP STAM

Identifier: SCN-07.06.01-VALP-0700.0140



This particular scenario describes actions taken when Clear Air Turbulence has been reported by the MET Service Provider above FL290. A level cap measure is required to present an A/C into a different sector to that originally planned.

Monitoring (D-1 to D Day)

The LTM maintains a general picture of weather at D-1 and identifies clear air turbulence, which may result in a reduction in ATM capacity within their area of responsibility. On the D Day, the LTM informs NMOC (via information sharing on the NOP or phone call).

NMOC identifies the **reported air** turbulence on the NM weather application, creates a weather Area of Interest –WxAoI- and changes the contour of the WxAoI to green to indicate active monitoring.

Initiate (– 4 to 3 hours)

New weather forecast is published by 4DWxCube and updates the NM weather application which confirms the turbulence CAT above FL290. NMOC monitors the load on the affected area.

The LTM identifies at 4/3 hours a potential period of excessive demand/workload within the sector family group where capacity may be reduced due to this phenomena. Situation is monitored and measures are left until approximately 1.5 to 1 hour before EOBT to assess the maturing weather situation.

Negotiate (- 1.5 to 1 hour)

The LTM carries out an initial assessment and concludes to create a STAM level cap rerouting. NMOC gets notified that the STAM has been created in state proposal. After the M-CDM coordination with relevant actors (FM, ATC, and Airspace Users) the STAM measure is agreed.

Implement (- 1 hour to 30 minutes)

The STAM measure is promoted to implementation. NMOC gets notified that the STAM has been promoted to implementation.

LTM and NMOC monitor using the local tools and the NM weather display respectively the evolution of forecasted turbulence.

LTM and NMOC monitor the effectiveness of the implemented measure, in order to adjust, and optimise ATC protection and flight efficiencies and minimise delays.

Observation

The NM weather application gets updated by weather observations by 4DWxCube. The display confirms the occurrence of the forecasted turbulence.
LTM and NMOC monitor the effectiveness of the implemented measure

6.1.2.3.5 Exercise Execution Reporting

Following the execution agenda, reports both from the two Dry run days February 29th and March 1st and the following trial days, March 2nd to March 4th were delivered with the participation of NM and FMP managers.

See 13.02.03 D383 VALR S1 R5 Vol 1 STAM document to access to the complete post- exercise reports

6.1.2.3.6 Deviation from the planned activities

SCENARIOS:

- ✓ SCN-07.06.01-VALP-0700.0110: STAM Airborne Flight Level Cap was not used during the trial, as it was decided to apply STAM measures, only to aircraft on the ground (or close to their approved Taxi-out procedure)

MET: REQ-07.06.01-TS-MET1.1500:

The WxSS (prototype) map display navigation should allow the creation of hotspots through a drop down menu retrieved by mousing over a WxAoI.

- This concept was modified and decided that hotspot are not created directly from the WAoI.
- The following METEO indicators related to the use of WxAoIs in the creation of Hotspots could not be measured: **S_{MET} 02; S_{MET} 03 S_{MET} 07**

CRTs:

- ✓ CRT-07.06.01-VALP-0700.1010.- Comparative Load Status Evolution

  It could not be achieved, as no Historical data had been previously recorded to enable live entry counts situation comparison against historical data

- ✓ CRT-07.06.01-VALP-MET1.7101: Number of WXAoI converted into Hot Spots VP-700

  The role of the Network was limited during these trials to act as an observer, so even been able to create Weather Areas of Interest which impacted operations, the creation of Hotspots was a role limited to FMPs that had no access to the new weather information used during the trials

- ✓ CRT-07.06.01-VALP-MET1.7400: Correspondence between the NMOC created monitored areas- WXAoIs - (sensitive to DCB imbalances and with significant weather forecasted) and related measures consequently implemented. This concept was modified and decided that hotspot are not created directly from the WAoI.

6.1.3 Exercise Results

6.1.3.1 Summary of Exercise Results

The Trial has been addressed in 7 different runs executed by 7 different ANSP organisations. Results are divided in three groups, addressing three differentiated groups of Validation Objectives:

- Generic Objectives, addressing Operational Feasibility of Local / Network integration. Results from every validation run are reflected in this Validation Report
- Support to VP-700 Performance Monitoring Objectives: These objectives have been mainly addressed during the last run executed from March 02 to March 03 2016 between NATS, MUAC and EUROCONTROL
- P07.06.01 Performance Objectives on the Operational use of KPIs during execution /post analysis and MET-NOP Information Integration. These objectives have only been addressed during the last run executed from March 02 to March 03 2016

With regard to P07.06.01 Objectives, the following results have been obtained:

Generic Objectives:

Validation Objective	Validation Objective Title	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-700 results	Validation Status Objective
OBJ-07.06.01-VALP-GEN1.0100	Operational Feasibility	CRT-07.06.01-VALP-GEN1.0105	The Network Operational Plan is updated in Real Time upon reception of planning updates originated by stakeholders regarding hotspot detection, STAM analysis, coordination, preparation and implementation via STAM / regulation related B2B services (flow services)	**G_{STAM} 01** Number of Occupancy Counts detected per imbalanced Traffic volume **G_{STAM} 02** Number of Hot Spots created by FMPs **G_{STAM} 03** Number of STAM measure created and updates	The FMP Monitor App of the NetPerf tool was used to monitor Traffic Counts (Figure 5) # of Hot Spots created by FMPs (Data from 02/03/2016) # Hotspot identified: 17 (Data from 02/03/2016-03/03/2016) • # MUAC Measures = 21 • #NATS Measures=7	Ok
OBJ-07.06.01-VALP-GEN1.0200	Operational Feasibility	CRT-07.06.01-VALP-GEN1.0206	Partners involved in operations can obtain the necessary information from the NOP with the STAM / regulation related B2B services (flow services) to allow them to timely re-plan their operation in case of DCB imbalances	**G_{STAM} 04** Number of STAM proposals received (draft) **G_{STAM} 05** Number of STAM measures accepted (implemented)	**G_{STAM} 04** Total from 02/03/2016 to 03/03/2016: o # STAM Received = **28** (21+7) 14 Level Cap; 14 Ground Delay **G_{STAM} 05** Total from 02/03/2016 to 03/03/2016	Ok

Validation Objective	Validation Objective Title	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-700 results	Validation Status Objective
			using their local tools		# STAM measures accepted by MUAC= 12 (out of 21) # STAM measures accepted by NATS= 5 (out of 7)	
		CRT-07.06.01-VALP-GEN1.0207	Roles and tasks related to changes in airspace Demand Capacity imbalances and the proposed corrective actions are well known and accepted by all actors involved	**G**G_{STAM} **06** Local or coordinated STAM	**Questionnaire**	Ok y

Support to VP-700 Performance Monitoring Objectives; Operational Use of Network KPIs and MET-NOP Information Integration:

Validation Objective	Validation Objective Title	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-700 results	Validation Status Objective
OBJ-07.06.01-VALP-0700.1010	Capacity Monitoring and Assessment	CRT-07.06.01-VALP-0700.1010	The Network can assess and record the declared Capacity values (OTMV) of a restricted sector with no STAM measures applied	S_{STAM} **01** Number and type (entry/occupancy) of count queries Supporting KPIs: Occupancy/Entry Load Comparison- Occupancy Variability Comparative Load Status Evolution	The Network KPI Tab of the NetPerf tool was used to monitor: - Occupancy/Entry Load Comparison- (Figure 8) - Occupancy Variability (Figure 9) - No historical data available	Partially OK
		CRT-07.06.01-VALP-0700.1011	The Network can record both entry counts and occupancy counts managed by the restricted sector when STAM measures are applied	G_{STAM} **01** Number of Occupancy Counts detected per imbalanced Traffic volume G_{STAM} **02** Number of Hot Spots created by FMPs	The FMP Monitor App of the NetPerf tool was used to monitor Traffic Counts (Figure **5**) # of Hot Spots created by FMPs (Data from 02/03/2016) # Hotspot identified: **17**	Ok
OBJ-	Fuel Efficiency	CRT-	The Network is able to assess and	S_{STAM} **02** Total additional time	The sample shown in Figure 11, shows the Global performance	Ok

Validation Objective	Validation Objective Title	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-700 results	Validation Status Objective
07.06.01-VALP-0700.1020	Monitoring	07.06.01-VALP-0700.1020	record new profile affected by level capping to flights affected STAM measures	flown (minutes) Supporting KPIs: Adherence at entry Sector Adherence to flight duration (Time Over Variability or Delay)	impact caused by all regulations in place taken: - # Affected Flights= 10 - Average Delay= **2'** - Total Delay=**20'** - Delta EET= **11''** - Delta Route length= **20NM**	
		CRT-07.06.01-VALP-0700.1021	The Network is able to assess and record flight time / miles extension to flights affected by STAM measures			
OBJ-07.06.01-VALP-0700.1030	Punctuality Monitoring	CRT-07.06.01-VALP-0700.1030	The Network is able to assess and record ATFM departure delays of affected flights by STAM measures	**S_{STAM} 03**: Average delay and type (ATFM, APT) for airport (arrival and departure) traffic **S_{STAM} 05**: Percentage of affected traffic departing ON-TIME Supporting KPIs: Location Time Predictability Airport Traffic Demand and Delays Nature	See Airport Trend Analysis shown in **Figure 10** (March 4th 2016) See Screen Shots from **Figure 13** and **Figure 14** A-CDM Airport KPIs	Ok
		CRT-07.06.01-VALP-0700.1031	The Network is able to assess and record deviation in departure times from their initially planned to affected flights by STAM measures			
		CRT-07.06.01-VALP-0700.1032	The Network is able to assess and record deviation in arrival times from their initially planned to affected flights by STAM measures	**S_{STAM} 04**: Percentage of affected traffic arriving ON-TIME	See Screen Shots from **Figure 13** and **Figure 14** A-CDM Airport KPIs	Ok
OBJ-07.06.01-VALP-0700.1040	Predictability Monitoring	CRT-07.06.01-VALP-0700.1040	The Network is able to assess and record variability in departure times from their initially planned to affected flights by STAM measures	**S_{STAM} 07** Departure variability (ON-TIME Departure Performance)	See Screen Shots from **Figure 13** and **Figure 14** A-CDM Airport KPIs	Ok
		CRT-07.06.01-VALP-0700.1041	The Network is able to assess and record variability in arrival times from their initially planned to affected flights by STAM measures	**S_{STAM} 06** Arrival variability (ON-TIME Arrival performance)	See Screen Shots from Figure **13** and Figure 14 A-CDM Airport KPIs	Okay
	Operational use of KPIs during	CRT-07.06.01-VALP-	Positive operational feedback about the support to network monitoring and supervision provided by the KPI	**S_{KPI} 01** Type and frequency of use of the different KPIs (only considered the open of the graph	Questionnaire Predictability/Variability of traffic counts depending on	Okay

Validation Objective	Validation Objective Title	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-700 results	Validation Status Objective
OBJ-07.06.01-VALP-PERF.7100	execution	PERF.7100	dashboard	and not the auto-refresh) S_{KPI} **02** Operational evaluation on the use of the KPIs	Aircraft Status: ➢ **28 Screen shots** were taken during the trials Location Time Predictability: ➢ **7 Screen shots** were taken during the trials Adherence at Entry sector ➢ **5 Screen shots** were taken during the trials Predictability/Variability of traffic flux: **19 Screen shots** were taken during the trials	
		CRT-07.06.01-VALP-PERF.7101	Predictability/Variability of traffic counts depending on the status of A/C at data extraction time (ground, off-block, airborne) has been assessed with the KPI tool			
		CRT-07.06.01-VALP-PERF.7102	Adherence at Entry sector (in FL and Time) has been assessed with the KPI tool			
		CRT-07.06.01-VALP-PERF.7103	The KPI dashboard helped identifying on-line deviations, imbalance situations and performance changes, which changes were further analysed through the recorded data to confirm the performance evolution during trial execution.	S_{KPI} **01** Type and frequency of use of the different KPIs (only considered the open of the graph and not the auto-refresh) S_{KPI} **02** Operational evaluation on the use of the KPIs	**See indicators above**	Okay
		CRT-07.06.01-VALP-PERF.7104	Predictability/Variability of traffic counts depending on traffic demand category has been assessed with the KPI tool			
		CRT-07.06.01-VALP-PERF.7105	Analysis of the traffic counts according to the classification of flights on-time/ late/early has been performed with the KPI tool			
OBJ-07.06.01-VALP-	KPI evolution in trend representation	CRT-07.06.01-VALP-	Reliability of the occupancy counts in function of participating A/C is assessed , based on the "Inflow, Outflow and stable" flight proportion	S_{KPI} **03** Frequency of use of the KPIs (for Occupancy Count Variability Predictability and Comparative Load Status	Use of KPIs for Occupancy Count Variability Predictability: ➢ **28 Screen shots** were taken	**Partial**

Validation Objective	Validation Objective Title	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-700 results	Validation Status Objective
PERF.7200		PERF.7200	of the occupancy count has been analysed with the KPI tool	Evolution) **S_{KPI} 02** Operational evaluation on the use of the KPIs	during the trials Comparative Load Status Evolution: ➢ No historical information available from previous days (D-1 to D-7) to compare with trial days behaviour Questionnaire	
		CRT-07.06.01-VALP-PERF.7201	Positive operational feedback by NMOC about the use of trend analysis to assess the evolution during execution			
		CRT-07.06.01-VALP-PERF.7202	Comparative Load Status Evolution for entry load in a sector to assess the load evolution of a day compared to a previous general behaviour; e.g.D-1 or D-7 has been analysed with the KPI tool	**S_{KPI} 03** Frequency of use of the KPIs (for Occupancy Count Variability Predictability and Comparative Load Status Evolution) **S_{KPI} 02** Operational evaluation on the use of the KPIs	Use of KPIs for Reliability of departure data from airports: ➢ **19** Screen shots were taken during the trials Questionnaire=	**Okay**
		CRT-07.06.01-VALP-PERF.7203	The reliability of departure data from airports depending on their sample time and source is used (DPI-s, ATFM, FPL) has been analysed with the KPI tool			
OBJ-07.06.01-VALP-PERF.7300	NM DCB Process Improvements	CRT-07.06.01-VALP-PERF.7300	The FMP monitor enhanced with the occupancy load allows to monitor the DCB network situation with more finesse during the tactical phase or eventually in short time planning phase or simulation	**S_{KPI} 03** (for Count Variability Predictability, Comparative Load Status Evolution, Location Time Predictability, Occupancy Count Predictability depending on traffic Flux and Occupancy Count Predictability depending on A/C origin) **S_{KPI} 02** Operational evaluation on the use of the KPIs	Screen Shot in shows Variability of counts per flight status over 20 minutes Screen Shot in **Figure 16** shows Occupancy Count Predictability depending on Traffic Flux Questionnaire=	**Okay**
		CRT-07.06.01-VALP-PERF.7301	The proportion of flights that are inflow, outflow and stable in the occupancy count has been assessed with the KPI tool			
		CRT-07.06.01-VALP-PERF.7302	A graphical representation of the predicted occupancy counts, showing the origin of A/C status data is used by the NM to obtain			

Validation Objective	Validation Objective Title	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-700 results	Validation Status Objective
			enhanced awareness of occupancy counts stability			
		CRT-07.06.01-VALP-PERF.7303	A graphical representation of the predicted occupancy counts, showing the origin of A/C status data is used by the NM to obtain enhanced awareness of occupancy counts predictability and stability			
OBJ-07.06.01-VALP-PERF.7400	Measurements to support post analysis	CRT-07.06.01-VALP-PERF.7400	The selected measurements have been identified by NM as more accurate and complete to allow identifying in post analysis the behaviour of the network in the performance areas. Especially in the area of predictability and efficiency and in the context of STAM (examples Nr. of flights affected, delay attribution per flight, total Nr. of measures implemented, total Nr. of hotspots identified and resolved , delta miles or delta fuel consumption for affected flights …)	Resolution of hotspots **S**$_{KPI}$ **03** Number of hotspots used in a STAM measure vs. total **S**$_{KPI}$ **04** Number of STAM measures abandoned vs. implemented	28 Hotspots were identified from 02/03/2016 to 02/03/2016 28 Hotspot created STAM measures • Ratio =1 21 STAM measures by MUAC: • 12 implemented; 09 abandoned; success ratio = 57% 7 STAM measures by NATS 5 implemented; 02 abandoned : success ratio = 71%	**Okay**
OBJ-07.06.01-VALP-MET1.7100	Operational feasibility of consideration of weather in the STAM process	CRT-07.06.01-VALP-MET1.7100	Positive operational feedbacks about WX dissemination and significant WX consideration when creating STAM proposals.	**S**$_{MET}$ **04** Operational feedbacks about WX dissemination	Positive Feedback: EHAMA04M regulation implemented due to weather on March 4th, 2016 as shown in Figure 19	**Okay**
		CRT-07.06.01-VALP-MET1.7101	4DWxCube graphical presentation increases weather awareness and provides enough granularities to detect if weather avoidance is considered/achieved when creating STAM	**S**$_{MET}$ **01** Number of WXAoI created in the sector **S**$_{MET}$ **02** Number of WXAoI converted into Hot Spots VP-700 **S**$_{MET}$ **03** Elapsed time between the WXAoI creation and hotspot creation, when applies	Five WX Areas of Interest created during the trials: • LFEEKD2F • LFRRZIU • LFBBBDX • LFBBP3 • LFBBP12	**Partial** as NM could create WXAoIs but could not create Hotspots **S**$_{MET}$ **02** and **S**$_{MET}$ **03** could not be

Validation Objective	Validation Objective Title	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-700 results	Validation Status Objective
					This concept was modified and decided that hotspot are not created directly from the WAoI: - Network role as trial observer - Hotspot creation left to FMP;	measured
OBJ-07.06.01-VALP-MET1.7200	Roles and responsibility of WX management in STAM application	CRT-07.06.01-VALP-MET1.7200	Roles and responsibilities have been determined to be clear and consistent by all concerned actors. In particular NMOC role	**S_{MET} 05** Operational feedbacks about roles and responsibilities being clear and consistent	**Feedback was Positive**	**Okay**
OBJ-07.06.01-VALP-MET1.7300	Operational feasibility of consideration of weather in the STAM process	CRT-07.06.01-VALP-MET1.7300	Positive operational feedbacks about the feasibility of considering the impact of significant weather when creating/applying the STAM measure (RR or eventually delay or flight level capping) to resolve a hotspot.	**S_{MET} 04** Operational feedbacks about WX integration	On March 3rd a Screen Shot shows how Convention, Turbulence and Icing Areas are identified (Figure 24) Other view shows simultaneously the areas where imbalances are detected, the neighbouring areas and the forecasted significant weather in both Opportunities for Ground delay or level capping measures are detected	**Okay**
OBJ-07.06.01-VALP-MET1.7400	Impact of Weather information on Traffic Volume capacity	CRT-07.06.01-VALP-MET1.7400	Correspondence between the NMOC created monitored areas-WXAoIs - (sensitive to DCB imbalances and with significant weather forecasted) and related measures consequently implemented	**S_{MET} 07** Duration of forecasted Weather phenomena versus actual duration	This concept was modified and decided that hotspot are not created directly from the WAoI **S_{MET} 07 could not be measured**	**NOK**

Validation Objective	Validation Objective Title	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-700 results	Validation Status Objective
		CRT-07.06.01-VALP-MET1.7401	Significant weather phenomena (turbulence / Convection / Icing) integrated with DCB improves the identification with more anticipation, of possible capacity shortfalls and imbalances.	**SMET 04** Operational feedbacks about WX integration	Refer to CRT-07.06.01-VALP-MET1.7300, **Figure 23** and **Figure 24** **Positive Feedback**	**Okay**

Table 15: Summary of Exercise results

6.1.3.2 Detailed Trial Results

The Project was initially planned to be split in 7 sub exercises to be run by 7 different ANSPs: DFS; DSNA; ENAIRE; EUROCONTROL; MUAC and NATS. As already indicated in § 6.1.3.1, P07.06.01 objectives supporting DCB-103A were addressed during the last run executed from March 02 to March 03 2016 between NATS, MUAC and EUROCONTROL.

Trial Results related to both; P07.06.01 Generic objectives and Support to VP-700 Performance Monitoring Objectives have been extracted from the NATS / MUAC EUROCONTROL trial

Generic Objectives, Addressing Operational Feasibility of Local / Network Integration

OBJ-07.06.01-VALP-GEN1.0100: Operational Feasibility

- **CRT-07.06.01-VALP-GEN1.0105**

The Network Operational Plan is updated in Real Time upon reception of planning updates originated by stakeholders regarding hotspot detection, STAM analysis, coordination, preparation and implementation via STAM / regulation related B2B services (flow services)

- **Metrics:**

G_{STAM} 01: Number of Occupancy Counts detected per imbalanced Traffic volume.

During VP-700 trials, EUROCONROL NetPerf was the tool mainly used for Network Performance Monitoring. An FMP Monitor application allowed having a General view of traffic situation during exercises duration. In Figure **5** below two FMP IDs were selected: EDYYFMP (NATS) and EGTTFMP (MUAC). The tool contains an improved FMP Monitor, showing both loading bars for entry loading and occupancy loading.

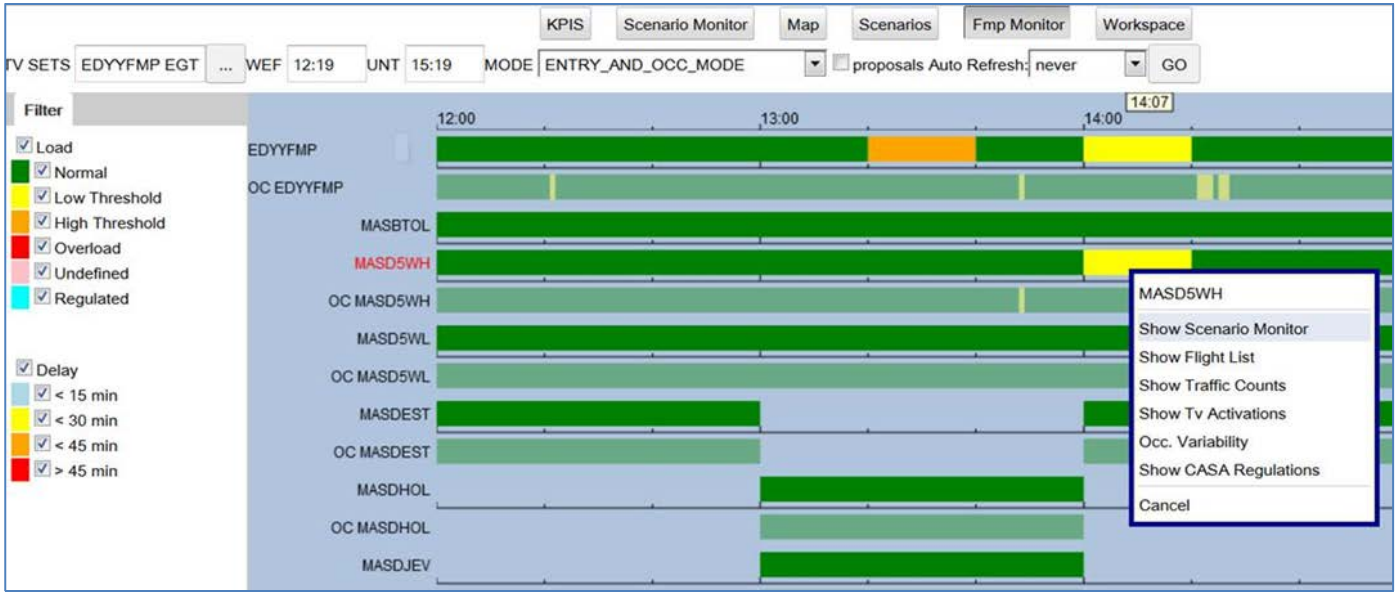


Figure 5: FMP Monitor

The colour coding for loading bars for entry counts follows the following convention:

- Undefined – no hourly rates are defined for the TV
- Normal – entry count < 90% hourly rate
- Low – entry count is >= 90% hourly rate and < hourly rate
- High – entry count is >= hourly rate and < 110% hourly rate
- Overload- entry count >= 110% hourly rate

For those TVs that reference airspace, the loading bars colour coding for occupancy counts is the following:

- Undefined – no OTMVs exist
- Normal – the occupancy counts are below the OTMV sustained value
- Low – the occupancy counts are between [OTMV sustained, OTMV peak] but not for a sufficiently long period to justify a “High”
- High – – the occupancy counts are between [OTMV sustained, OTMV peak] for a sufficiently long period
- Overload – the occupancy counts are above OTMV peak

Clicking right on the bar allows the selection of Traffic counts, either Entry Counts with Capacity values or Occupancy Counts with Operational Traffic Monitoring Values (OTMV). In Figure 6 Entry hourly counts to EGCLW from 07:35 to 11:35 were shown in 20 minutes intervals. The figure shows the TV entry hourly Capacity (60 flights) and the traffic load in the first diagram period (28 flights).

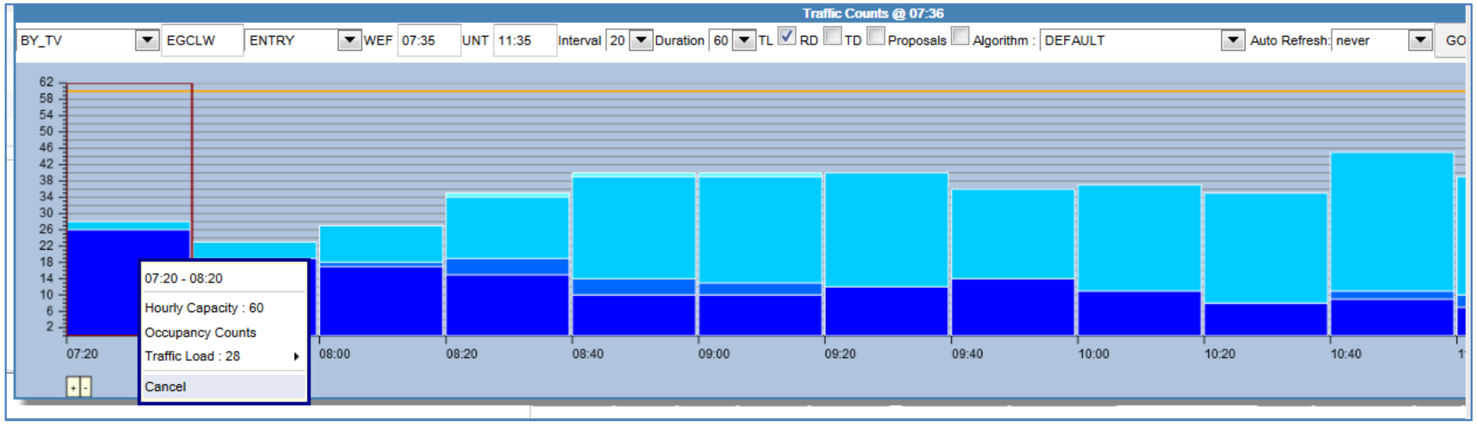


Figure 6: EGCLW Traffic Volume Entry Counts

Occupancy counts could have been selected as shown in Figure 7 screen shot, for MASHRHR Traffic Volume from 11:00 to 11:41

The figure shows the OTMV values for the selected TV and traffic sample, and the forecasted occupancy counts every 1 minute interval

- OTMV values are set to Peak=13; Sustained= 11
- Occupancy Counts in the 11:18 -11:19 interval = 6

The status of the occupancy counts could also be displayed as well as the Flight list for the selected period

In the sample Figure 7, a ground delay measure (YHRHR02G) has been applied to flight WZZCY, causing a departure delay of 20 minutes

G_{STAM} 02: Number of Hot Spots created by FMPs (Data from 02/03/2016)

Hotspot identified: **17**

Hotspot solved (acceptable or resolved): **16**

G_{STAM} 03: Number of STAM measure created and updates (Data from 02/03/2016-03/03/2016)

MUAC Measures= **21; NATS measures= 7**

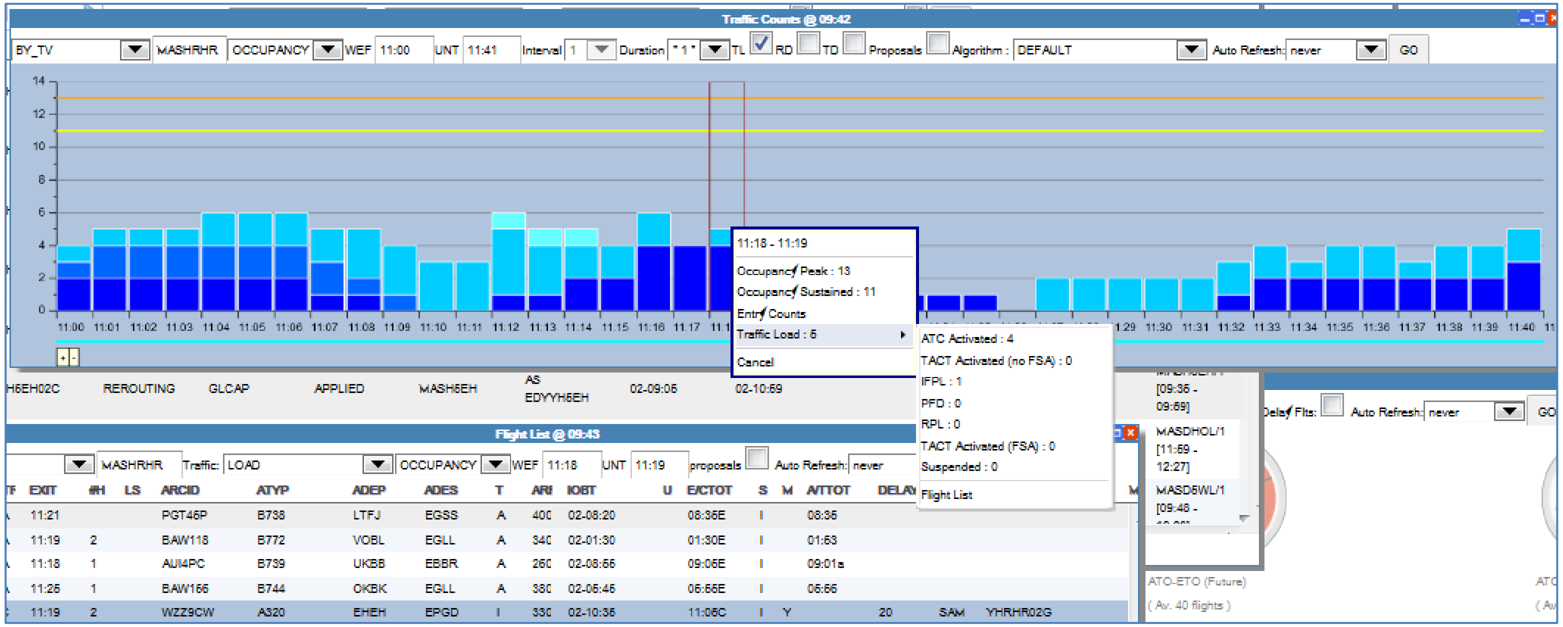


Figure 7: MASHRHR Traffic Volume Occupancy Counts and Flight List

- **CRT-07.06.01-VALP-GEN1.0206**

Partners involved in operations can obtain the necessary information from the NOP with the STAM / regulation related B2B services (flow services) to allow them to timely re-plan their operation in case of DCB imbalances using their local tools

- **Metrics:**

G_{STAM} 04 Number of STAM proposals received (draft)

- **Total from 02/03/2016 to 03/03/2016:**
  - # STAM Received = **28** (21+7)
  - 14 Level Cap; 14 Ground Delay

GSTAM 05 Number of STAM measures accepted (implemented)

- **Total from 02/03/2016 to 03/03/2016:: # STAM measures accepted by MUAC= 12 (out of 21)**
- **Total from 02/03/2016 to 03/03/2016:: # STAM measures accepted by NATS= 5 (out of 7)**

OBJ-07.06.01-VALP-GEN1.0200: Operational Feasibility

- **CRT-07.06.01-VALP-GEN1.0207**

Roles and tasks related to changes in airspace Demand Capacity imbalances and the proposed corrective actions are well known and accepted by all actors involved

- **Metrics**

G_{STAM} 06 Local or coordinated STAM

Average STAM Coordination Time **(**02/03/2016 to 03/02/2016)**:**

- From their proposal to being implemented or abandoned was measured as **18 minutes for the 28 managed measures**

Support to VP-700 Performance Monitoring Objectives:

OBJ-07.06.01-VALP-0700.1010: Capacity Monitoring and Assessment

- **CRT-07.06.01-VALP-0700.1010**

The Network can assess and record the declared Capacity values (OTMV) of a restricted sector with no STAM measures applied

- **Metrics:**

S_{STAM} 01 Number and type (entry/occupancy) of count queries Supporting KPIs:

- **Occupancy/Entry Load Comparison-**

  The NetPerf tool permits the user to see, for a given airspace traffic volume,

  - Entry counts (by default Hourly counts every 20 minutes)
  - Min/Max/Average occupancy counts for each entry count bar

  In the example below (Figure 8), the 06:00 entry bar shows 22 flights. That is, 22 flights enter the TV in the time period [06:00, 07:00)

  In that same period [06:00, 07:00}, we see that in terms of occupancy we have

  - A peak occupancy of 16 (shown in red)
  - An average occupancy of 12 (shown in white)
  - A minimum occupancy of 9 (shown in green

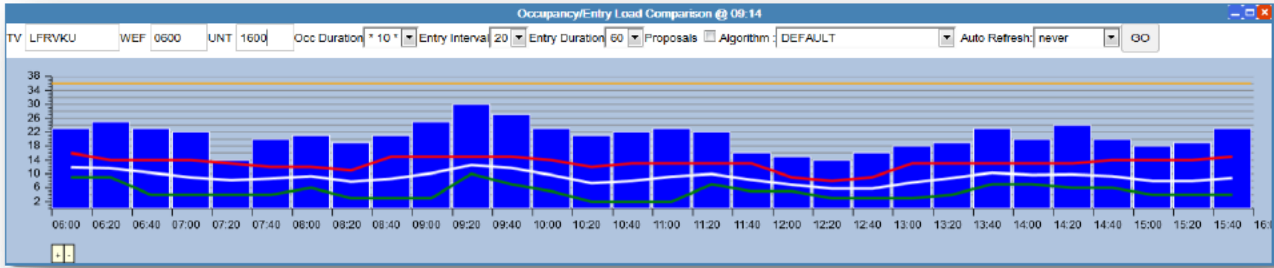


Figure 8: Occupancy / Entry Load Comparison

- **Occupancy Variability**

  The figure below shows the change in variability during 20 observations with one minute refresh rate

  As shown in the two figures below, Occupancy Counts are not stable and differ in very short timeframes.

  The variability is low when the flight is airborne, thus high predictability of time over. On the contrary, when the flight is still on the ground, the variability is much higher, especially at INI Status (IFPL), and is progressively as aircraft become closed to push-back; indicated by updating messages for sequencing (DPI→SEQ), or airborne (FSA)

  The tool is started up, examining a given Traffic volume, viewing the occupancy counts for some future time: 08:13 to 11:30 in the screen shots shown in Figure 9.

  The initial screen shot shows very little data

  - A mini-FMP monitor, displaying the occupancy monitor bar
  - The occupancy counts, shown in a graph format.
  - Some initial statistics concerning the nature of the traffic
    - Number of airborne flights
    - Number of flights in the 1st 10 minutes of being airborne (i.e. SID/climb phase)
    - Number of flights on the ground
    - Number of flights on the ground and suspended
    - Number of flights on the ground at A-CDM airports
    - Number of flights on the ground at A-CDM airports and not yet T-DPI-s pre-sequenced
    - Number of flights with slots
    - Number of flights pre-allocated slots (>2h EOBT)

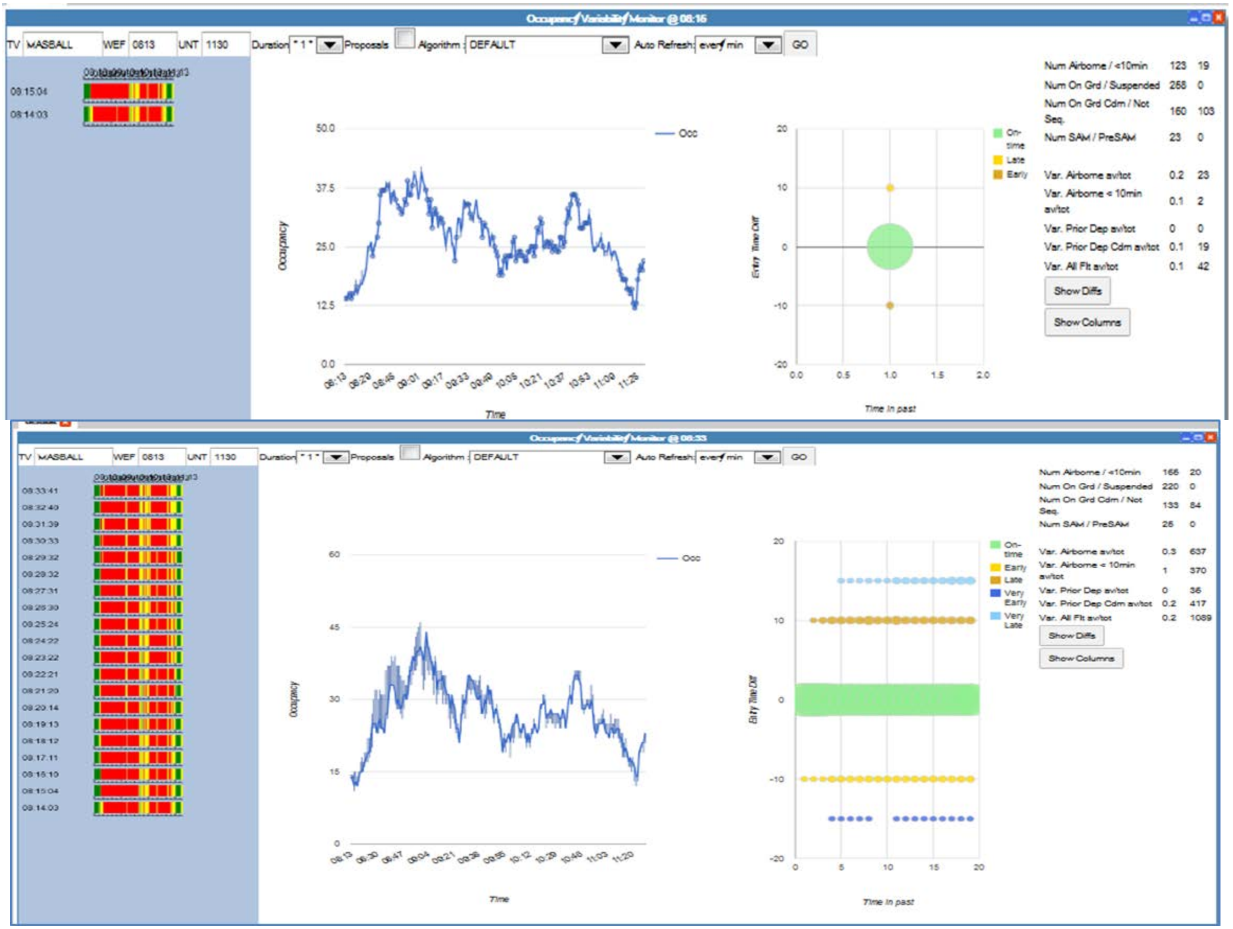


Figure 9**:** Variability of Counts in MASBALL

- The sample was made for MASBALL Traffic Volume from 08:13 to 11:30; using default algorithm and an auto-refresh rate of 1 minute
- The obtained results (called a new 'observation') are then combined with the previous observations.

\- **Comparative Load Status Evolution**

No historical information available from previous days (D-1 to D-7) to compare with trial days behaviour

➢ **CRT-07.06.01-VALP-0700.1011**

The Network can record both entry counts and occupancy counts managed by the restricted sector when STAM measures are applied

- **Metrics:**

G$_{STAM}$ 01 Number of Occupancy Counts detected per imbalanced Traffic volume

- See CRT-07.06.01-VALP-GEN1.0105

G$_{STAM}$ 02 Number of Hot Spots created by FMPs

- See CRT-07.06.01-VALP-GEN1.0105

OBJ-07.06.01-VALP-0700.1020: Fuel Efficiency Monitoring

- **CRT-07.06.01-VALP-0700.1020**
- **CRT-07.06.01-VALP-0700.1021**

0700.1020: The Network is able to assess and record new profile affected by level capping to flights affected STAM measures
0700.1021: The Network is able to assess and record flight time / miles extension to flights affected by STAM measures

- **Metrics:**

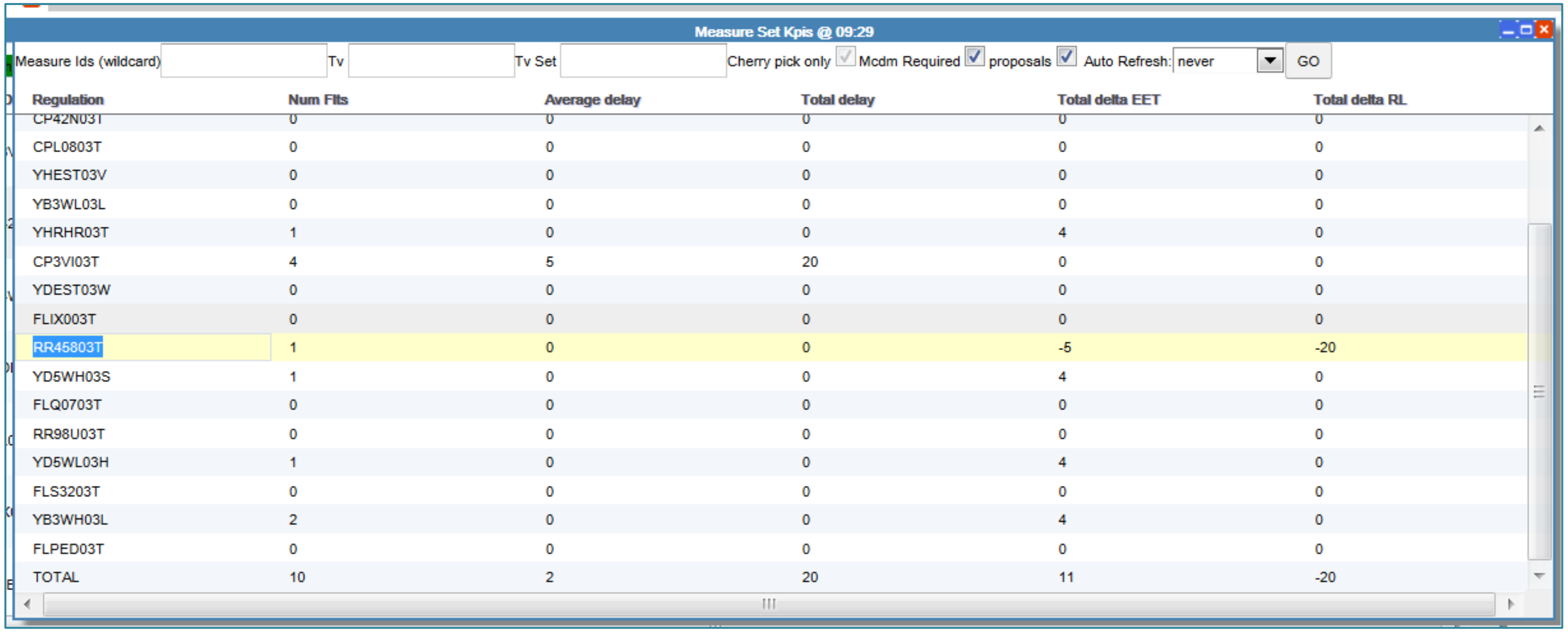
S$_{STAM}$ 02 Total additional time flown (minutes) and Total Route length extension

The NetPerf tool was used to obtaine the impact of applied regulation measures on flights on Thursday March 3rd 2016 at 09:23, as seen in **Figure 10:**

- Regulation ID and Number of affected flights by each regulation **(10)**
- Average Delay and Total Delay: **2** minutes average; **20** minutes total
- Total delta Estimated elpase Time (EET) and total delta Route Length,: Total delta EET= **11** minutes; Total delta Roue Length = **-20** NM

Figure 11 below shows how the TV Entry KPI tool was used to measure entry adherance at MASHALL Traffic Volume from two hours before Monitoring Time (09:29) to one hour after. Entry Varaibility or delay can be selected for normal traffic, traffiic under ATFM measures or both

The objective is to see the global performance impact caused by all regulations in place (ATFCM or STAM) as well as the impact on Delay, Estimated Elapsed Time and Route Length



Regulation	Num Flts	Average delay	Total delay	Total delta EET	Total delta RL
CP42N03T	0	0	0	0	0
CPL0803T	0	0	0	0	0
YHEST03V	0	0	0	0	0
YB3WL03L	0	0	0	0	0
YHRHR03T	1	0	0	4	0
CP3VI03T	4	5	20	0	0
YDEST03W	0	0	0	0	0
FLIX003T	0	0	0	0	0
RR45803T	1	0	0	-5	-20
YD5WH03S	1	0	0	4	0
FLQ0703T	0	0	0	0	0
RR98U03T	0	0	0	0	0
YD5WL03H	1	0	0	4	0
FLS3203T	0	0	0	0	0
YB3WH03L	2	0	0	4	0
FLPED03T	0	0	0	0	0
TOTAL	10	2	20	11	-20

Figure 10: Global performance impact caused by all regulations in place

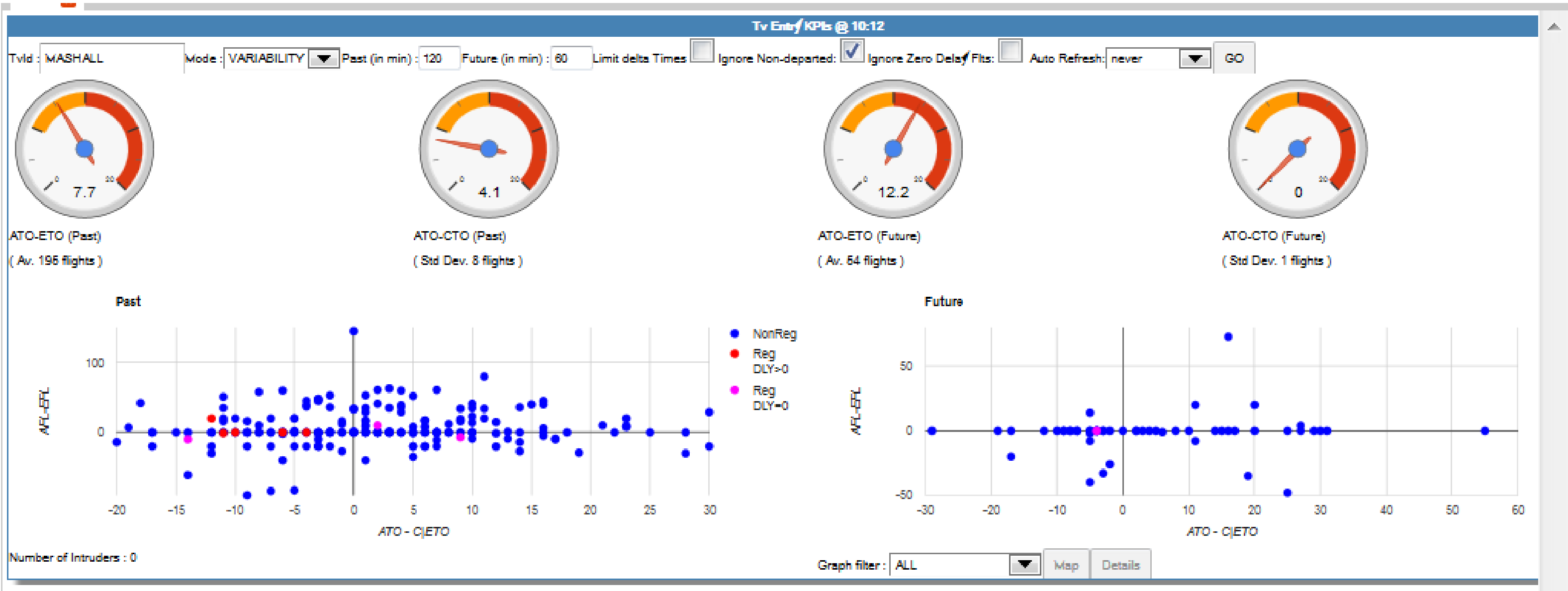


Figure 11: MASHALL Predicted versus actual Entry Time Over: Variability and Delay

OBJ-07.06.01-VALP-0700.1030: Punctuality Monitoring

- **CRT-07.06.01-VALP-0700.1030**
- **CRT-07.06.01-VALP-0700.1031**
- **CRT-07.06.01-VALP-0700.1032**

0700.1030: The Network is able to assess and record ATFM departure delays of affected flights by STAM measures
0700.1031: The Network is able to assess and record deviation in departure times from their initially planned to affected flights by STAM measures
0700.1032: The Network is able to assess and record deviation in arrival times from their initially planned to affected flights by STAM measures

- **Metrics:**

S_{STAM} 03: Average delay and type (ATFM, APT) for airport (arrival and departure) traffic:

The Airport trends KPI gives a view of the traffic DEMAND and the trends in terms of traffic and traffic delay

Figure 12: Airport Trends KPI

Figure 12 above shows the traffic demand on March 4th at 07:00 UTC in two main Airports: Heathrow and Amsterdam Airports

The query shows how traffic behaved in those two Airports form 05:00 (three hours before) and the expected demand for the next 60 minutes

The left hand graph gives the traffic Demand categorised by Flight State (Suspended, Filed, Departed); CDM State (T-DPI-t, T_DPI-s or Pushed Back: A-DPI) and the Regulated or not Regulated Status

The right hand graph gives a view of the generated delays: ATFCM Delays; Airport Delays or Take-Off Delays

You can simultaneously monitor a number of airports according to the area and may allow early detection of multiple influencers (in a combined way) for en-route areas

OBJ-07.06.01-VALP-0700.1040: Predictability Monitoring

- **CRT-07.06.01-VALP-0700.1040**

- **CRT-07.06.01-VALP-0700.1041**

The Network is able to assess and record variability in departure times from their initially planned to affected flights by STAM measures
The Network is able to assess and record variability in arrival times from their initially planned to affected flights by STAM measures

- **Metrics:**

S$_{STAM}$ 05: Percentage of affected traffic departing ON-TIME

Supporting KPIs:

- Location Time Predictability
- Airport Traffic Demand and Delays Nature

The situational awareness of major airport performance (KPIs) can be monitored and detailed information on a specific airport can be drilled-down. Figure **13** below shows Munich Airport KPIs, for the last 60 minutes (07:43 UTC) and the expected performance for the next 3 hours

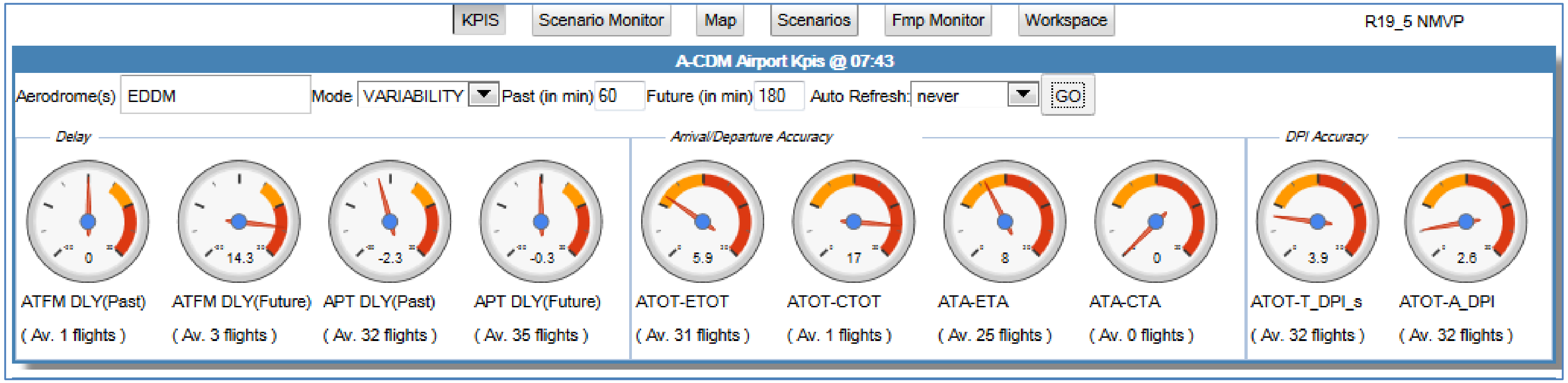


Figure 13**:** Situational awareness of Munich airport performance (KPIs)

The following KPIs are obtained:

- ATFM and Airport average departure delay for the past 60 minutes
- ATFM and Airport Average expected departure delay for the next 3 hours
- Standard deviation of arrivals, both for non-regulated flights (ATA-ETA) and for regulated flights (ATA-CTA)

For A-CDM Airports DPI accuracy is also obtained

- ATOT-DPI_s (TTOT)

- ATOT-DPI_A (TTOT)

An Airport monitoring dash-board, selecting those Major Airports that represent a specific traffic flow can be built as it is shown in Figure 14, where three Airports affected by the traffic flow are monitored:

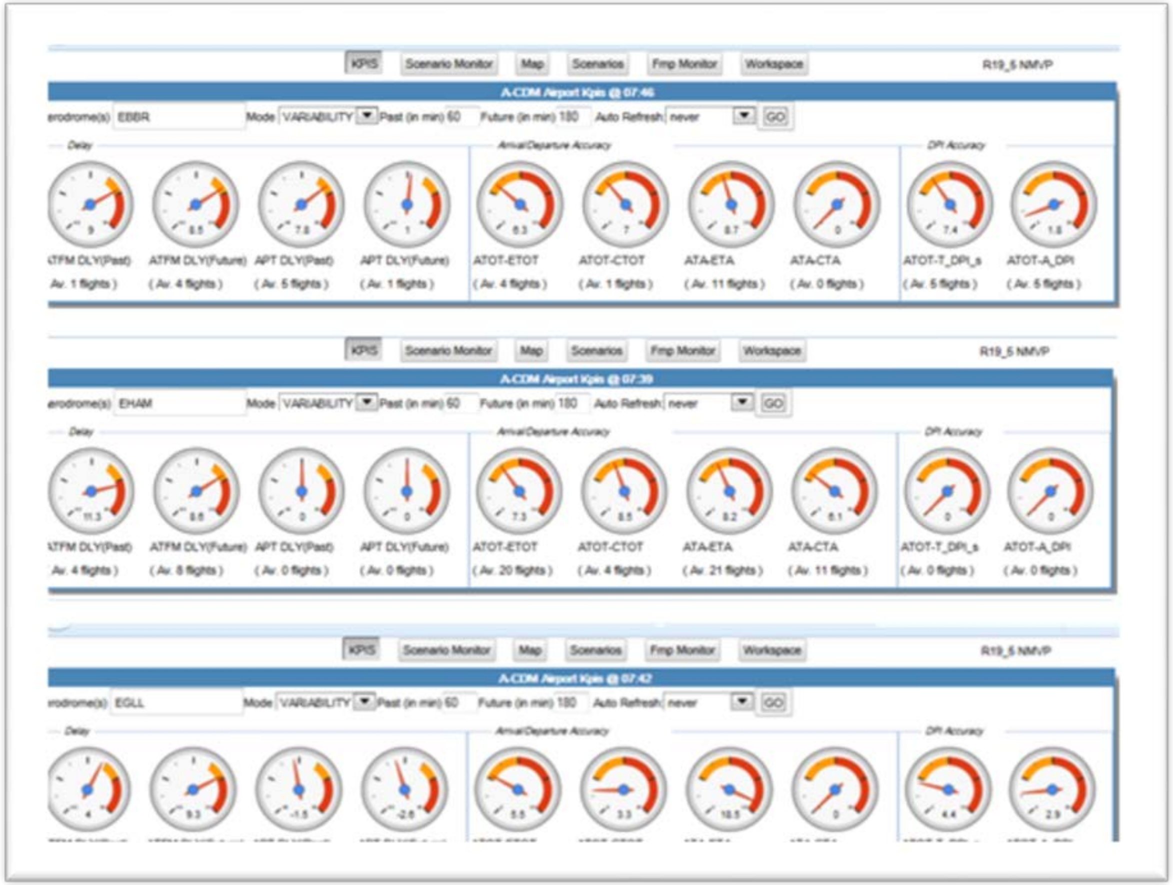


Figure 14**:** Performance Situational awareness of three major airports: EGLL; EHAM

S$_{STAM}$ 04: Percentage of affected traffic arriving ON-TIME

S$_{STAM}$ 06 Arrival variability (ON-TIME Arrival performance)

S_{STAM} **07** Departure variability (ON-TIME Departure Performance)

See Airport KPIs application **(**Figure **13**: Situational awareness of Munich airport performance (KPIs), where Airport Arrival and Departure Performance is displayed for both, no regulated flights (ATOT-ETOT) and regulated (STAMed) flights (ATOT-CTOT).

– The application allows selecting Average delay or Standard deviation

OBJ-07.06.01-VALP-PERF.7100: Operational Use of KPIs during Execution

➢ **CRT-07.06.01-VALP-PERF.7100**

Positive operational feedback about the support to network monitoring and supervision provided by the KPI dashboard

➢ **Metrics**

S_{KPI} **02** Operational evaluation on the use of the KPIs

➢ **Operational Feedback is Positive**

The following Success Criteria CRTs share the same results, based on trial monitoring and feedback from questionnaire

➢ **CRT-07.06.01-VALP-PERF.7101**

➢ **CRT-07.06.01-VALP-PERF.7102**

➢ **CRT-07.06.01-VALP-PERF.7103**

➢ **CRT-07.06.01-VALP-PERF.7104**

➢ **CRT-07.06.01-VALP-PERF.7105**

PERF.7101 Predictability/Variability of traffic counts depending on the status of A/C at data extraction time (ground, off-block, airborne) has been assessed with the KPI tool
PERF.7102 Adherence at Entry sector (in FL and Time) has been assessed with the KPI tool
PERF.7103: The KPI dashboard helped identifying on-line deviations, imbalance situations and performance changes, which changes were further analysed through the recorded data to confirm the performance evolution during trial execution.
PERF.7104 Predictability/Variability of traffic counts depending on traffic demand category has been assessed with the KPI tool
PERF.7105 Analysis of the traffic counts according to the classification of flights on-time/ late/early has been performed with the KPI tool

➢ **Metrics**

S_{KPI} **01** Type and frequency of use of the different KPIs (only considered the open of the graph and not the auto-refresh)

Predictability/Variability of traffic counts depending on Aircraft Status:

- o **28 Screen shots** were taken during the trials

Location Time Predictability:

- o **7 Screen shots** were taken during the trials

Adherence at Entry sector

- o **5 Screen shots** were taken during the trials

Predictability/Variability of traffic flux:

- o **19 Screen shots** were taken during the trials

S_{KPI} 02 Operational evaluation on the use of the KPIs

- ➢ **Operational Feedback is Positive**

OBJ-07.06.01-VALP- PERF.7200 KPI Evolution in Trend Representation

- ➢ **CRT-07.06.01-VALP-PERF.7200**
- ➢ **CRT-07.06.01-VALP-PERF.7201**

Reliability of the occupancy counts in function of participating A/C is assessed , based on the “Inflow, Outflow and stable” flight proportion of the occupancy count has been analysed with the KPI tool
Positive operational feedback by NMOC about the use of trend analysis to assess the evolution during execution

- ➢ **Metrics**

S_{KPI} 03 Frequency of use of the KPIs (for Occupancy Count Variability Predictability and Comparative Load Status Evolution)

Occupancy Count Variability Predictability:

- ➢ **28 Screen shots** were taken during the trials

Comparative Load Status Evolution:

- ➢ No historical information available from previous days (D-1 to D-7) to compare with trial days behaviour

S_{KPI} 02 Operational evaluation on the use of the KPIs

- ➢ **Operational Feedback is Positive**

- **CRT-07.06.01-VALP-PERF.7202**
- **CRT-07.06.01-VALP-PERF.7203**

Comparative Load Status Evolution for entry load in a sector to assess the load evolution of a day compared to a previous general behaviour; e.g.D-1 or D-7 has been analysed with the KPI tool
The reliability of departure data from airports depending on their sample time and source is used (DPIs, ATFM, FPL) has been analysed with the KPI tool

- **Metrics**

  S_{KPI} 03

  Reliability of departure data from airports

  - **19** Screen shots were taken during the trials

  S_{KPI} 02 Operational evaluation on the use of the KPIs

  - **Operational Feedback is Positive**

OBJ-07.06.01-VALP- PERF.7300 NM DCB Process Improvements

- **CRT-07.06.01-VALP-PERF.7300**
- **CRT-07.06.01-VALP-PERF.7301**
- **CRT-07.06.01-VALP-PERF.7302**

he FMP monitor enhanced with the occupancy load allows to monitor the DCB network situation with more finesse during the tactical phase or eventually short time planning phase or simulation
The proportion of flights that are inflow, outflow and stable in the occupancy count has been assessed with the KPI tool
A graphical representation of the predicted occupancy counts, showing the origin of A/C status data is used by the NM to obtain enhanced awareness of occupancy counts stability

- **Metrics**

S_{KPI} 03 Frequency of use (for Count Variability Predictability, Comparative Load Status Evolution, Location Time Predictability, Occupancy Count Predictability depending on traffic Flux and Occupancy Count Predictability depending on A/C origin)

****See data recorded for CRT-07.06.01-VALP-PERF.71xx to CRT-07.06.01-VALP-PERF.72xx**

As already shown in Figure **9** the use of the Occupancy Variability Monitor gives information in each observation of number of aircraft and aircraft status, which can also be shown in a pie diagram as shown in below

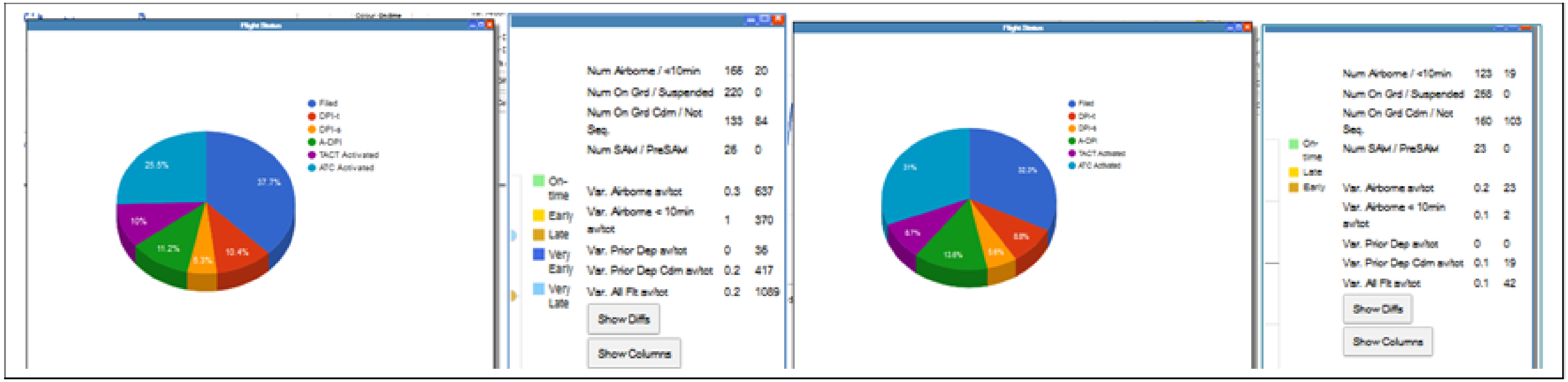


Figure 15**:** Variability of counts per flight status over 20 minutes

The tool also offers functionality to examine in detail the differences observed between two observation times. Clicking on the “Show Diffs” button brings up the “Difference Tool”. Figure 16 shows in the top section shows the occupancy counts observed at time1 (10:01:137), with an evaluation on the stability of the flights seen in each count bar seen at time2 (09:37:08),

- Stable – flights in the bar at time2 are still there at time1.
- Inflow - flights are in the bar at time1, but were not there at time2
- Outflow – flights are not in the bar at time1, but were there at time2.

The middle section shows the flights that have a different TV entry time between observation time1 (12:08:57) and time2 (10:51:17). The entry delta is clearly shown in red/green, along with further information observed at time-1 and time-2.

Selecting a flight in the middle section shows, in the third selection the OPLOG, events that occurred between time1 and time2. This helps understanding why the TV entry delta observed

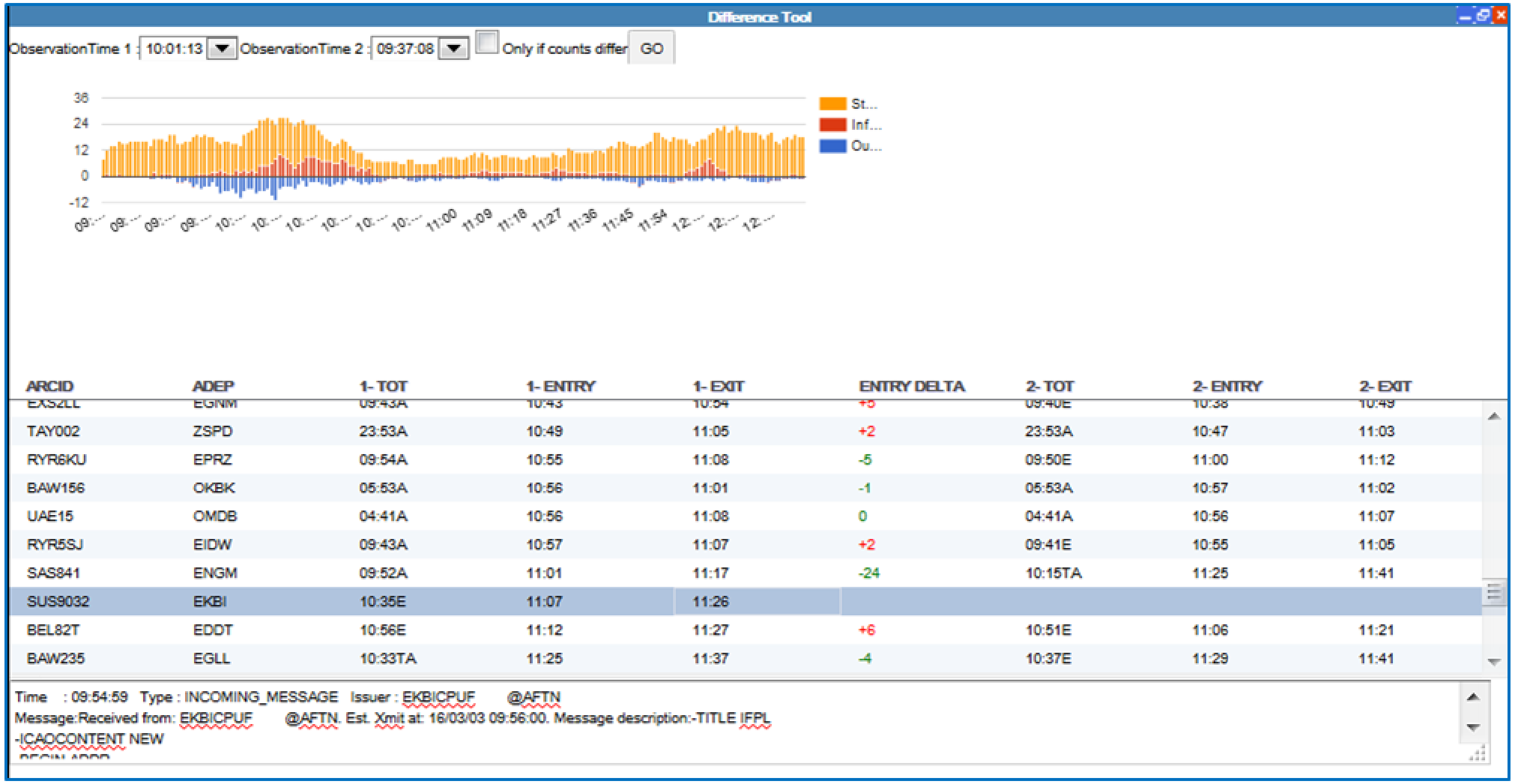


Figure 16: Occupancy Count Predictability depending on Traffic Flux

- **CRT-07.06.01-VALP-PERF.7303**

A graphical representation of the predicted occupancy counts, showing the origin of A/C status data is used by the NM to obtain enhanced awareness of occupancy counts stability

S$_{KPI}$ **02** Operational evaluation on the use of the KPIs

- **Operational Feedback is Positive**

OBJ-07.06.01-VALP- PERF.7300 NM DCB Process Improvements

- **CRT-07.06.01-VALP-PERF.7400**

The selected measurements have been identified by NM as more accurate and complete to allow identifying in post analysis the behaviour of the network in the performance areas. Especially in the area of predictability and efficiency and in the context of STAM (examples Nr. of flights affected, delay attribution per flight, total Nr. of measures implemented, total Nr. of hotspots identified and resolved , delta miles or delta fuel consumption for affected flights …)

- **Metrics**

Resolution of hotspots:

S_{KPI} 03 Number of hotspots used in a STAM measure vs. total

28 Hotspots were identified from 02/03/2016 to 02/03/2016 / 28 Hotspot created STAM measures

Ratio =1

S_{KPI} 04 Number of STAM measures abandoned vs. implem61**% success ratio**

21 MUAC: 12 implemented; 09 abandoned = 57% success ratio

7 NATS: 5 implemented; 02 abandoned = 71% success ratio

Hotspots can be defined in an easy way by selecting the period on the occupancy counts using the Scenario Monitor functionality (Figure 17) of the NetPerf Tool
Using predefined scenarios, flights can be cherry picked in an easy way and the impact can be seen on the counts directly.

The user may correct the hotspot information as required. The user may also declare new OTMV values (peak and/or sustained) for the hotspot period – in the same manner that a regulation defines new hourly entry rates.

The Scenarios panel shows those pre-defined scenarios that are relevant to the TV. The scenario IDs are listed, along with the number of flights matching the filter criteria.

The Scenarios panel also contains generic scenarios – GENERIC AIR and GENERIC GRD. As the names suggest, these scenarios just determine, based on basic flight data, what flights are eligible for Ground and Air-based measures.

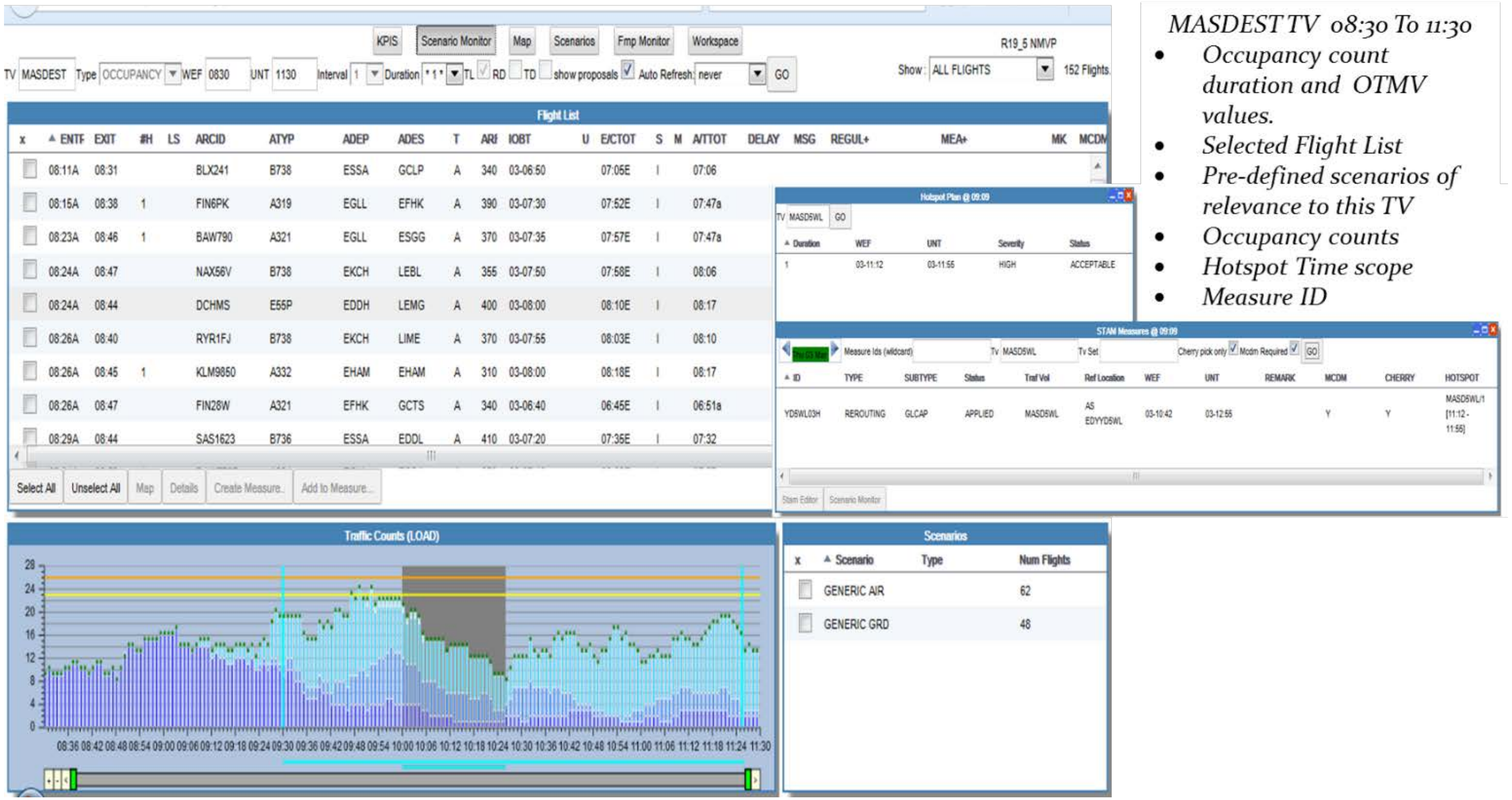


Figure 17: Scenario Monitor: Main STAM functionality

Selecting a scenario, leads to the eligible flights being highlighted in green in the flight list (Figure **18**). Manual adjustments (delay or time) can be easily made on individual flights

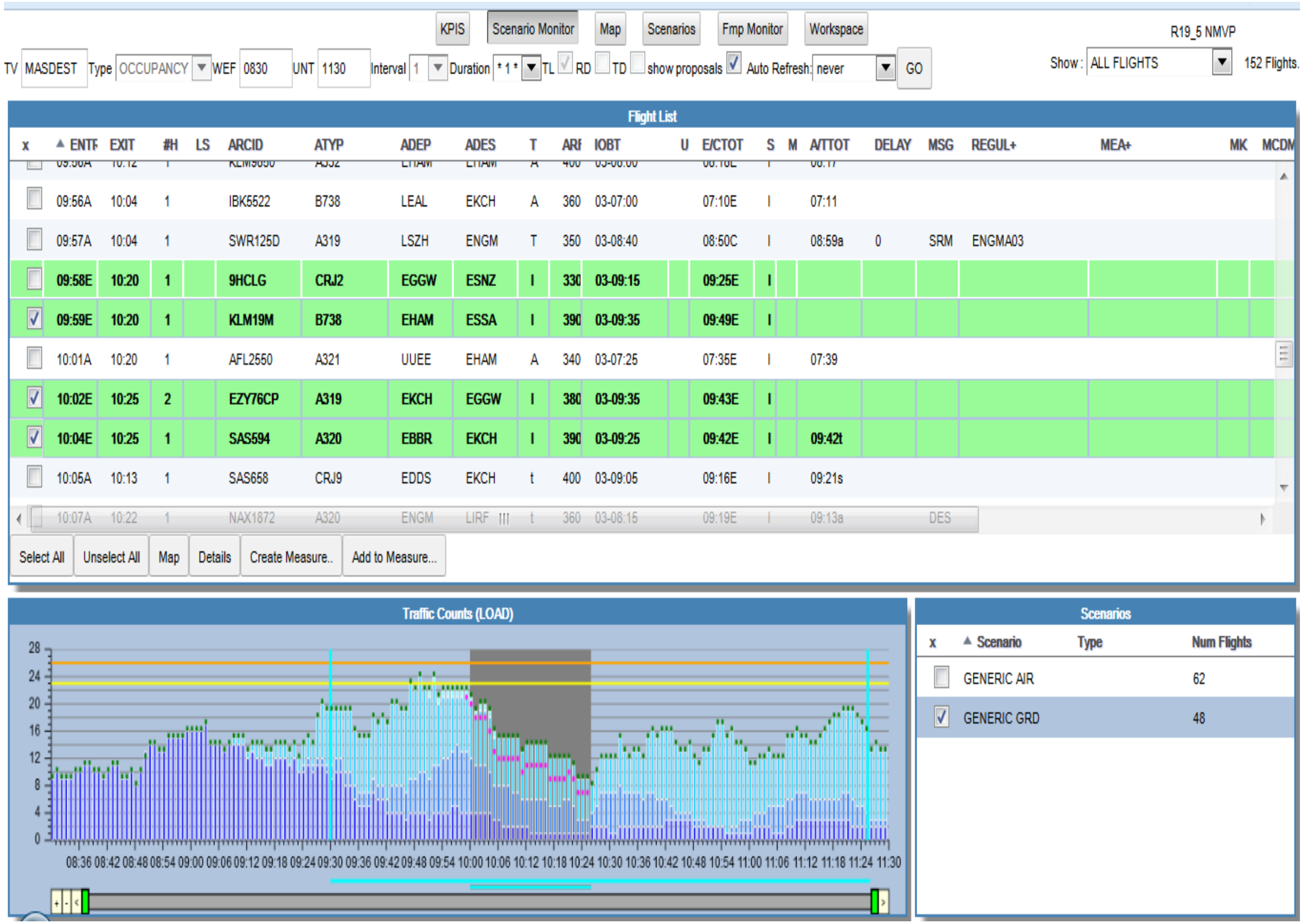


Figure 18: Scenario to create STAMs and individual adjustments

OBJ-07.06.01-VALP-MET1.7100: Operational feasibility of consideration of weather in the STAM process

- **CRT-07.06.01-VALP-MET1.7100C**

Positive operational feedbacks about WX dissemination and significant WX consideration when creating STAM proposals.

➢ **Metrics**

S$_{MET}$ 04 Operational feedbacks about WX dissemination

On March 4th 2016 the current OPS tools showed the implementation of a weather regulation due to weather: EHAMA04M. See the regulation in Figure 19 and the traffic affected

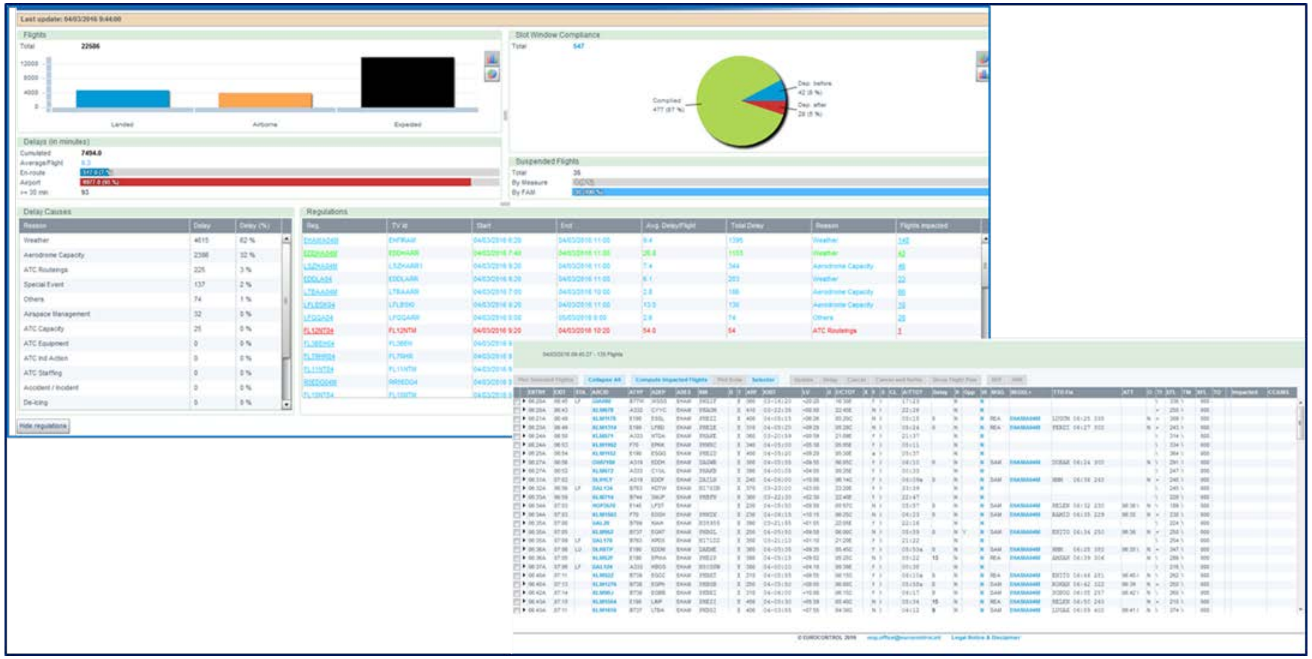


Figure 19: EHAMA04M Regulation due to weather (04/03/2016)

By using the tool under validation (Figure 20), map functionality allows viewing METEO forecasts together with the areas subject to ATFCM measures and also has a functionality that allows viewing METEO forecasts together with areas subject to ATFCM measures. . This Map was only available at the NMOC, whose role during the trial was to act only as observer, but it clearly shows the benefits of its use when crating STAM proposals

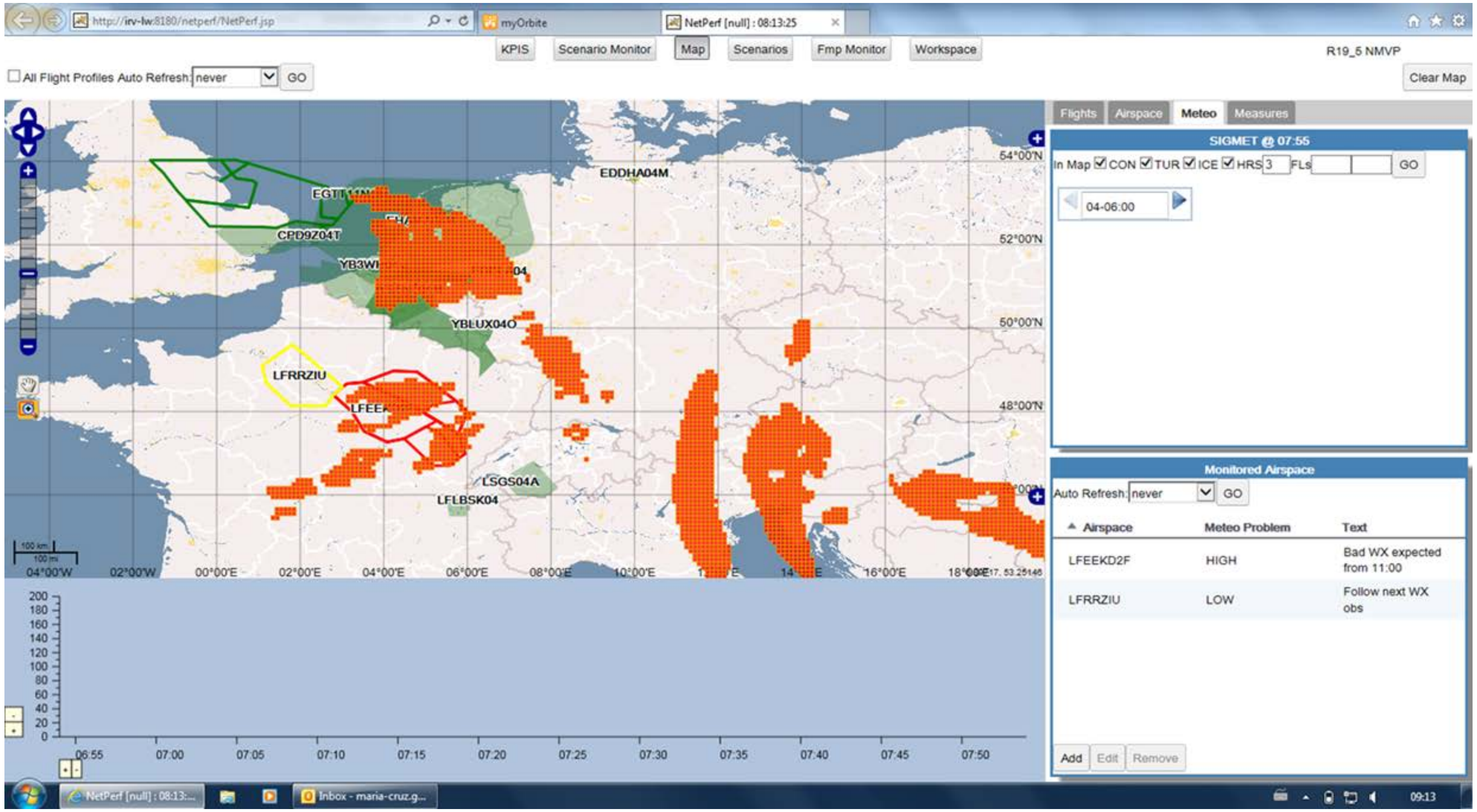


Figure 20: METEO forecasts subject to short term planning ATFCM measures

- **Operational Feedback is Positive**

- **CRT-07.06.01-VALP-MET1.7101**

4DWxCube graphical presentation increases weather awareness and provides enough granularities to detect if weather avoidance is considered/achieved when creating STAM.

- **Metrics**

S_{MET} 01 Number of WXAoI created in the sector;

Five WXAoI were created during the trials: two of them shown in the Monitored Airspace pop-up of Figure 21

- LFEEKD2F
- LFRRZIU
- LFBBBDX
- LFBBP3
- LFBBP12

According to the weather phenomena, the tool allows to mark an Area of Interest, for monitoring airspace where traffic may ask for vertical change.

In the Figure, one sector, LFBBP3 is identified for monitoring; as due to the weather phenomena, traffic may ask for descending.

The flight shown was chosen for a ground delay.

S_{MET} 02 Number of WXAoI converted into Hot Spots:

This concept was modified and decided that hotspot are not created directly from the WAoI.

Being the role of the NMOC limited to act as Observer, prevented the NM from the creation of Hotspots. This Map functionality was not shared with the participant FMPs that actually had the responsibility of creating Hotspots. Therefore metrics **S_{MET} 02** and **S_{MET} 03** could not be measured

S_{MET} 03 Elapsed time between the WXAoI creation and hotspot creation, when applies (See above).

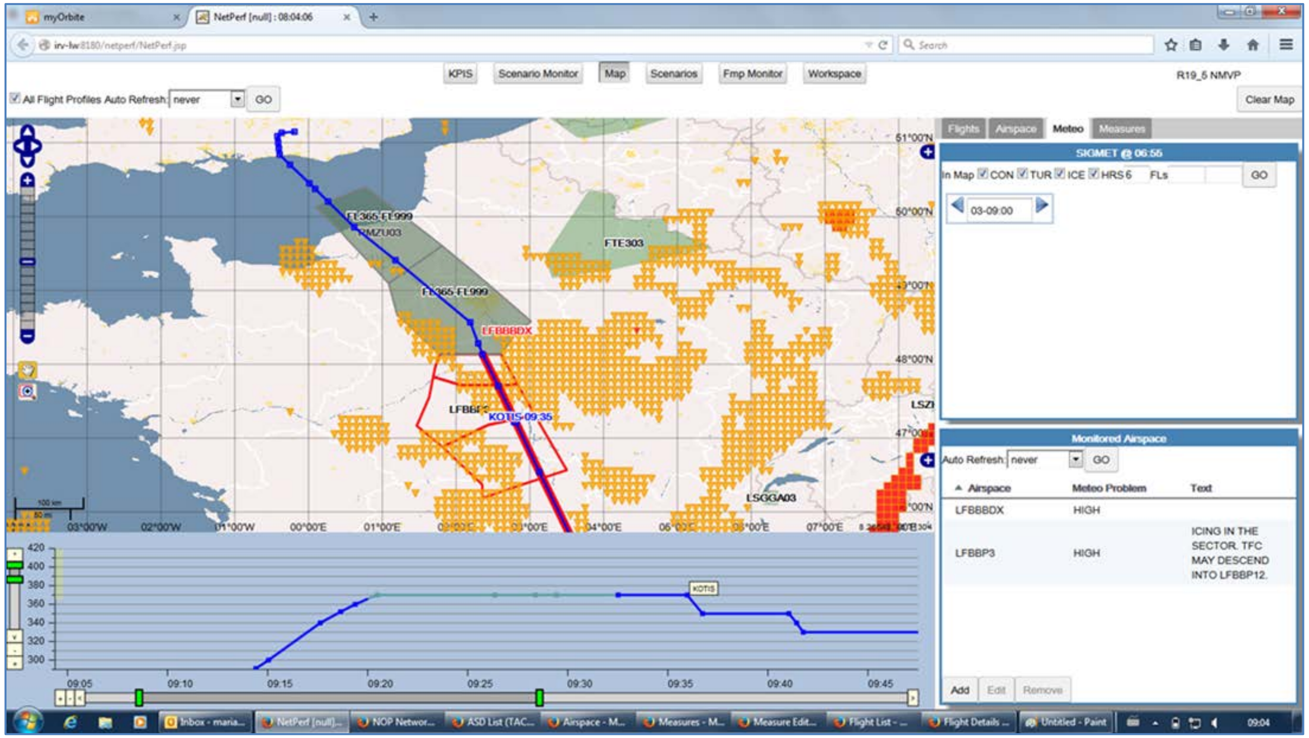


Figure 21: WX Areas of Interest

OBJ-07.06.01-VALP-MET1.7200: Roles and Responsibility of WX management in STAM application

- **CRT-07.06.01-VALP-MET1.7200**

Roles and responsibilities have been determined to be clear and consistent by all concerned actors. In particular NMOC role

- **Metrics**

  S$_{MET}$ 05 Operational feedbacks about roles and responsibilities being clear and consistent

  The sector shown, LFBBP12 is also identified for monitoring, as due to the weather phenomena in sector LFBBP3, traffic may ask for a descend. The sector appears clear of significant weather

It can also be shown, simultaneously areas where imbalances are detected, their neighbouring areas and the forecasted significant weather in both

The Feedback from NM has been **Positive,** but no feedback from FMPs possible as they don´t share the same **Weather** displays

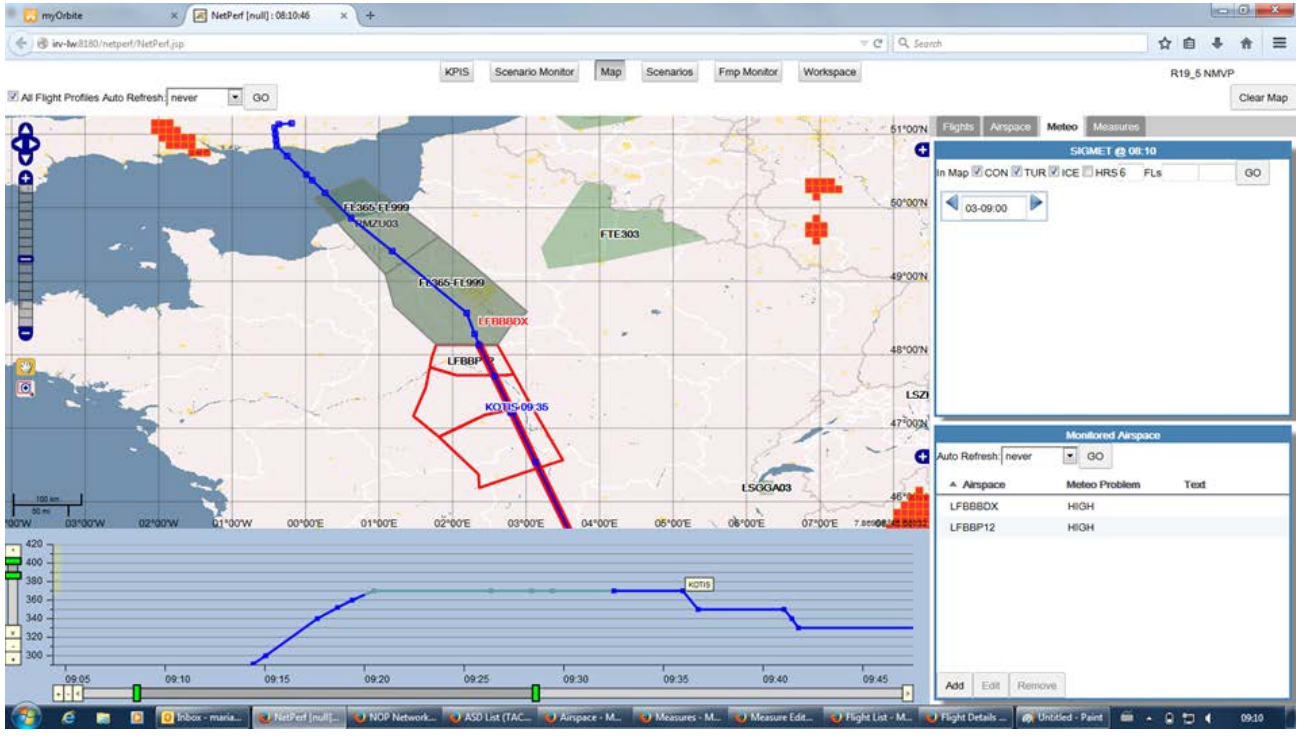


Figure 22**:** Flight profile shown crossing WX AoI LFBBP12

OBJ-07.06.01-VALP-MET1.7300: Operational Feasibility of Consideration of Weather in the STAM Process

➢ **CRT-07.06.01-VALP-MET1.7300**

Positive operational feedbacks about the feasibility of considering the impact of significant weather when creating/applying the STAM measure (RR or eventually delay or flight level capping) to resolve a hotspot.

➢ **Metrics**

S_{MET} 04 Operational feedbacks about WX integration

As shown in Figure 23, the tool used in the validation also shows the areas affected by ATFCM measures (both regulations and STAM).

According to the weather phenomena, the tool allows to mark an Area of Interest, for monitoring airspace where traffic may ask for vertical change.

This kind of displays may add information for the relevance of the most suitable traffic to be chosen for a given STAM. (RR or Flight Level capping) and its likelihood to face significant weather

On March 3rd, the tool being validated permitted to look short time forecast weather information read from the 4DWxCube cube data. Figure 24 shows impact of weather phenomena in the selected area:

Furthermore, the tool has a convention coding representation of some phenomena chosen for the validation

We have squares in red, so high turbulence in some areas. We also have inverted triangles in orange, so medium icing phenomena in the area of the exercise and some potential downstream area.

The expected behaviour of flights affected by such conditions could be:

[1] Avoid convective weather, both horizontally and vertically – go round the storm. It could imply an airborne decision and also potential CHG of FPL.

[2] Avoid turbulence normally by changing level, more frequently by descending: Airborne decision.

[3] Icing avoidance, normally by change level, asking for descend. Some type of aircrafts, turbo propellers are more sensitive to icing and more likely for in-flight descending.

Weather Phenomena	Geometric presentation	Weather impact	Colour coding
TURBULENCE	Squares	LOW	Yellow
CONVECTION	Triangle	MEDIUM	Orange
ICING	Inverted triangle	HIGH	Red

Should an STAM measure (RR or Flight Level capping) put the selected traffic on a significant weather, there is some potential anticipation on the flight behaviour

- **Operational Feedback is Positive**

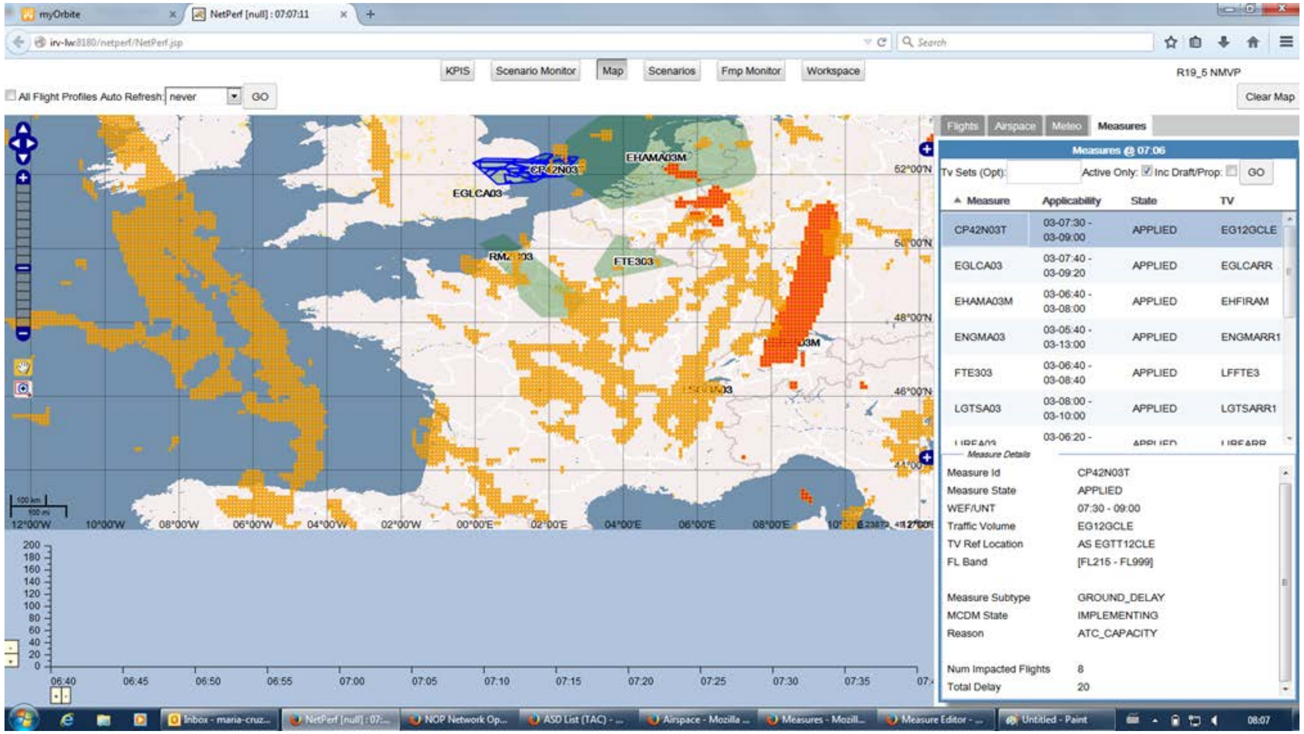


Figure 23: ATFM measures based on Weather

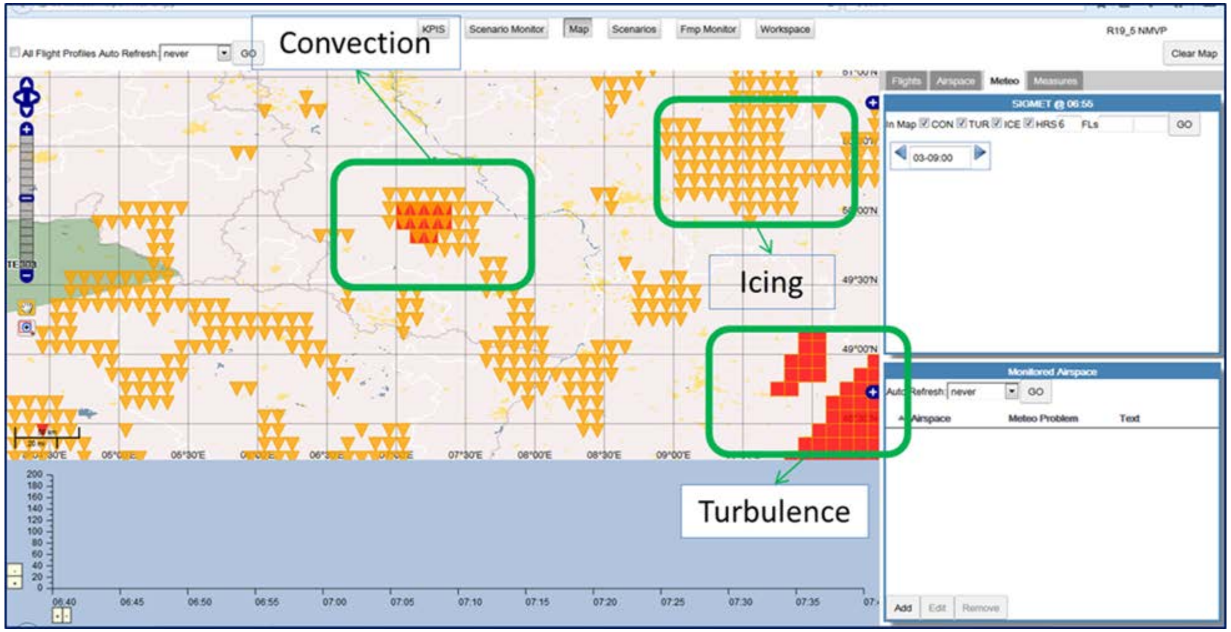


Figure 24: 4DWxCube data on March 3rd 2016

OBJ-07.06.01-VALP-MET1.7400 Impact of Weather information on Traffic Volume capacity

- **CRT-07.06.01-VALP-MET1.7400**

Correspondence between the NMOC created monitored areas- WXAoIs - (sensitive to DCB imbalances and with significant weather forecasted) and related measures consequently implemented

- **Metrics**

S_{MET} 07 Duration of forecasted Weather phenomena versus actual duration

This concept was modified and decided that hotspot are not created directly from the WAoI: **S_{MET} 07 could not be measured**

- **CRT-07.06.01-VALP-MET1.7401**

Significant weather phenomena (turbulence / Convection / Icing) integrated with DCB improves the identification with more anticipation, of possible

capacity shortfalls and imbalances.

- **Metrics**

S_{MET} 04 Operational feedbacks about WX integration

Refer to CRT-07.06.01-VALP-MET1.7300 and Figures 25 and 26

- **Operational Feedback is Positive**

6.1.3.2.1 Results on concept clarification

6.1.3.2.2 Results per KPA

Refer to P13.02.03 D383 VALR S1 R5 STAM [22]

6.1.3.2.3 Results impacting regulation and standardisation initiatives

N/A

6.1.3.3 Analysis of Exercise Results

The analysis of the exercises results, including rationale of the results has been already performed throughout section § 6.1.3.2

6.1.3.3.1 Unexpected Behaviours/Results

N/A

6.1.3.4 Confidence in Results of Validation Exercise

The objectives were validated although some not in its full extend as the role of NM in this validation was mainly in the background. NM representatives monitored, analysed and investigated network as NMOC would do but using and being supported by the new tool provided that included NOP-MET and new KPI functionalities; NM representatives did not have an active intervention with local actors. Apart from this element, the confidence in the validation objectives results from both MET and KPIs is high

6.1.4 Conclusions and recommendations

6.1.4.1 Conclusions

This section provides more specific conclusions in addition to the overall conclusions provided in section 5.1.

6.1.4.1.1 Results MET-NOP Integration

The following concept features that were part of the MET-NOP Integration, were validated with positive results:

- The integration of SIGMET forecasts with ATFCM measures (regulations and STAM) and its visualisation in a common display;
- The visualisation of the different significant weather phenomena and the forecast evolution up to the next 24h;
- The possibility to identify and mark the areas that required monitoring (WAoI). For example WAoI would be congested areas directly affected by weather or adjacent areas that could be used to download traffic (diverted flows);
- The possibility to identify and mark the areas that required monitoring (WAoI). WAoI would be congested areas directly affected by weather or adjacent areas that could be used to download traffic (diverted flows).

6.1.4.1.2 Results KPIs for Network Performance

The following feature of the KPIs for Network Performance Integration were validated with positive results:

- Trend representation for KPIs was considered useful in support of monitoring as provides both past analysis and future predictions in a single graph, without needing to wait for post OPS analysis

6.1.4.2 Recommendations

This section provides more specific recommendations in addition to the overall recommendations provided in section 5.2.

6.1.4.2.1 MET-NOP Integration

As a next step in the integration MET-NOP, in particular in DCB domain, it is recommended to include in the STAM catalogue of scenarios (pre-determined solutions to instantiate STAM), scenarios that would apply in response to significant weather phenomena.

For further future, consider in MET-NOP, the integration with DAC (Dynamic Airspace Configuration).

6.1.4.2.2 KPIs for Network Performance

Present proposals to the user for a problem resolution (e.g. scenarios from a catalogue with some criteria like “impact”, cost, and confidence).

Extend the KPIs to better support trade-off between performance areas.

Additionally support with KPI the trade-off of the different actors involved: NMOC, ANSPs and Airspace users.

Provide alerts for forecast DCB imbalances. The idea is for the application to be more proactive and inform the operator (NMOC) of a network situation that according to one or multiple criteria deserves attention and possibly an action. Note that currently there are no alerts and no map representation of a demand and capacity assessment.

From pre-tactical phase there is an active demand and capacity assessment done in NMOC. A graphical representation on the map e.g. areas coloured from green to red (heat map) or density graphs showing the demand and capacity assessment will support NMOC monitoring.

6.2 Validation Exercise VP-710 Report

The concept of AFUA, intends to propose solutions to provide the necessary volume of reserved airspace to the military to conduct their operations safely and to improve the Network efficiency and the capacity at the same time.

The implementation of modular areas should have increased flexibility:

- For the military and potential ARES user to have the necessary volume of airspace to fulfil their individual demands and
- To have an increased volume of airspace available for those flights affected by the activation of ARES in order to potentially increase the efficiency of the airspace configurations.

6.2.1 Exercise Scope

For the network management, the AFUA project intents to establish and improve a Collaborative Decision Making (CDM) process involving all pertinent partners to ASM in order to achieve a structured and goal oriented approach.

Additionally the continuous sharing, potentially in real time, of airspace planning and status provides a shared situation awareness and contributes to a more efficient DCB process

The role of 07.06.01 is to act as a key enabler for the implementation of the AFUA concept, capturing airspace changes updating the Network Operations Plan accordingly and providing the means to ensure that all involved stakeholders have easy access to the airspace evolving situation,

Two exercises concerned with sharing of airspace planning and status by integration of VPA in the Network: VP-016 and Real Time Status of Airspace (RTSA) updating: VP-710 have been addressed by 07.06.01

6.2.1.1 Exercise Level

VP-710 exercise is the last part of the FAM Step1 Validation, as defined in P07.05.04-D48 Step 1 Flexible Airspace Management Validation Plan (VALP) [19]. It is a V3 exercise

The OI steps concerned are:

- AOM-0202-A Automated Support for strategic, pre-tactical and tactical Civil-Military Coordination in Airspace Management (ASM);
- AOM-0206-A Flexible and modular ARES in accordance with the VPA design principle;
- DCB-0103-A Collaborative NOP for Step 1

P07.06.01 only addresses DCB-0103-A Collaborative NOP for Step 1

6.2.1.2 Description of the Operational concept being addressed

This exercise addresses sections 2.3.1 to 2.3.4 of the AFUA (Advanced Flexible Use of Airspace) OSED (Operational Scenarios and Environment Definition) [18]; that is; the processes and services of AFUA.

It concentrates on the activation / de-activation and modification of ARES status in real time. In particular, this exercise addresses the RTSA update process, focusing on VPA structures, by demonstrating the feasibility of the B2B connection in AIXM format between national / regional ASM Support Systems, the regional ATFCM system and Airspace Users (FOC/WOC).From an operational point of view, this exercise also addresses the evaluation of impact of the RTSA dissemination on the different operators (impact assessments).

VP-710 connects (Figure **25**) an ASM Support System (STANLY_ACOS) with the NM system in real time. Its main objective is to validate the expected benefit from the exchange of real time ASM information for the Military, NM and FOC/WOC stakeholders. These related data exchanges are performed in B2B using the AIXM format in its current version. The ASM support systems used are the LARA system and STANLY_ACOS system. The NM system is self-explanatory. The ATFCM system used was the NM system of EUROCONTROL

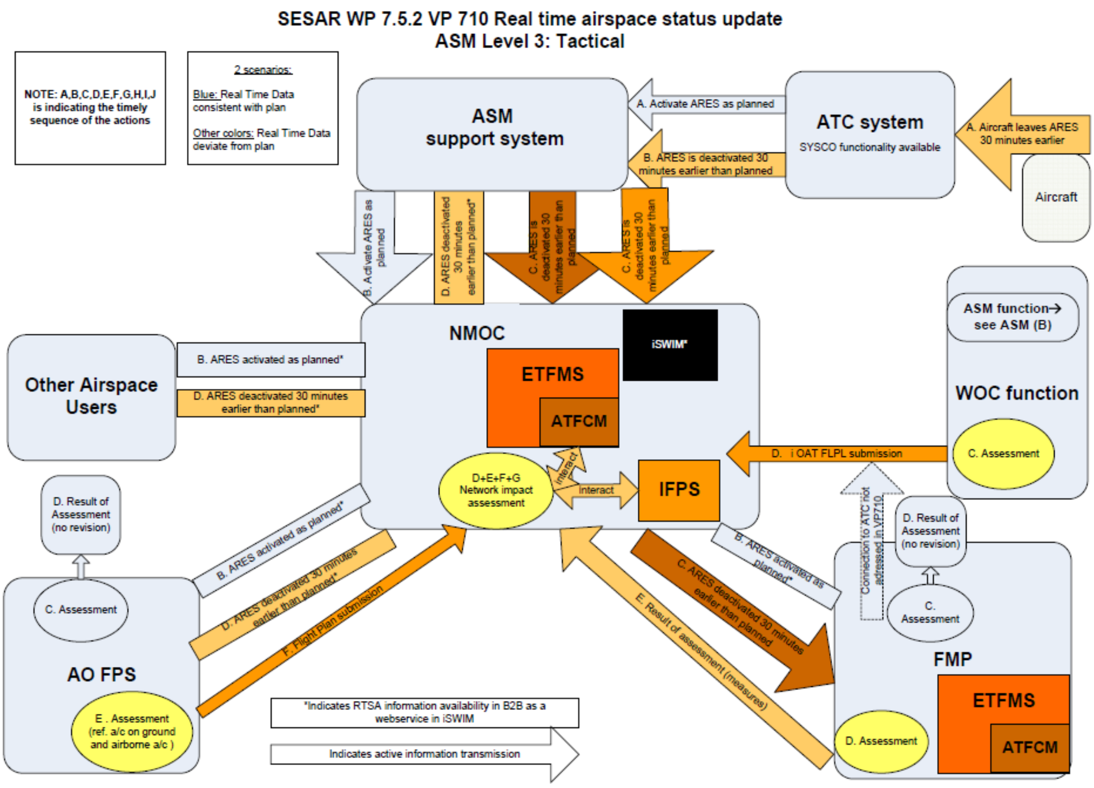


Figure 25**:** Validation Exercise VP-710 scope and systems

6.2.1.3 Validation objectives and Hypothesis

Refer to §2.2.3 and 07.05.04-D48 S1 FAM VALP [19] for detailed information on VP-710 Validation Objectives, Success Criteria and Choice of Indicators and Metrics

The following table summarizes 07.06.01 VP-710 Validation Objectives

Objective Id	KPA/ Topics	Hypotheses
OBJ-07.06.01-VALP-GEN1.0100	Operational Feasibility	Any change in stakeholders operational plans can be transmitted to the NOP and the Network Plan can be updated accordingly
OBJ-07.06.01-VALP-GEN1.0200	Operational Feasibility	All partners involved in operations can have easy access to any NOP data with potential impact on their operations.
OBJ-07.06.01-VALP-GEN1.0300	Common Situational Awareness	All stakeholders share the same data so that the collaborative decision making of airspace management is enhanced
OBJ-07.06.01-VALP-AFUA.0100	Airspace capacity changes based on RTSA information.	The Network is able to monitor and assess in real time en-route capacity changes due to RTSA up to date information on additional airspace provided by opening of the ARES to other airspace users
OBJ-07.06.01-VALP-AFUA.0200	Environment performance drivers	The Network is able to monitor and record changes in the key performance drivers of environment, due to an increase in flight efficiency, thanks to the ability to better match airspace allocation to actual user needs.
OBJ-07.06.01-VALP-AFUA.0300	Civil –military cooperation and coordination	The Network is able to monitor and assess new flexibility opportunities for Airspace Users due to increased civil-military cooperation and coordination

Table 16: Summary of VP-710 Validation Objectives and Hypothesis

6.2.1.4 Choice of methods and techniques

The following table represents the indicators and metrics used for assessing the P07.06.01 objectives

Objective Id	KPA/ Topics	Metrics/Indicators
OBJ-07.06.01-VALP-GEN1.0100	Network Operational Feasibility Assessment	MG.1: Number of Network airspace updates due to stakeholders trajectory updates MG.2: Number of Network DCB updates due to stakeholders trajectory updates
OBJ-07.06.01-VALP-GEN1.0200	Stakeholders Operational Feasibility Assessment	MC.60.1/MG. 3: Number of trajectory updates MA.20.1/MG.4 Number of stakeholders involved and feedbacks
OBJ-07.06.01-VALP-GEN1.0300	Collaborative Decision Making of Airspace Management processes)	MA.20.1/MG.4 Number of stakeholders involved and feedbacks MA.20.2/MG.5: Role and tasks are well known and accepted by all actors
OBJ-07.06.01-VALP-AFUA.0100	Airspace capacity changes based on RTSA information.	MC.21.1/MP 1:Number of extra IFR flights able to enter a given airspace volume provided by AFUA

Objective Id	KPA/ Topics	Metrics/Indicators
OBJ-07.06.01-VALP-AFUA.0200	Environment performance drivers	MC.60.4/MP.2: Time crossed in the released ARES (difference of time between the first entry in the ARES and the last exit of the ARES) MC60.6/MP.3: Time flown in the released ARES (total duration of occupation considering all the time of each flight entered in the ARES) MC.70.3/MP 4: Fuel consumption for civil (divergence between demand before RTSA update and after) MC.70.4/MP.5: Fuel consumption for mil. (average per flight)
OBJ-07.06.01-VALP-AFUA.0300	Civil –military cooperation and coordination	MC.60.1/MP.6: Number of trajectory updates MC.60.2/MP.7: Number of access on demand deliver to non-scheduled flight MC.60.3/MP.8: number of military flights accommodated on short or ad-hoc requirements MC.60.4/MC.9: number of flight entries in the released ARES (planned compare to used)

6.2.1.5 Validation Exercises List and dependencies

The VP-710 Phase 2 is consecutive to the VP-710 Phase 1, validating RTSA exchange between ATC system and ASM Support system. This is the last exercise performed in the context of the AFUA Step 1 validation

6.2.2 Conduct of Validation Exercise

For full description of the validation preparation and execution see [21] P07.05.04-D52-Validation Report AFUA S1 document

6.2.2.1 Exercise execution

The VP-710 exercise Phase 2 was performed from 8th to 10th of June 2015. Two spare days were planned on 11th and 12th June 2015 but were not used. VP-710 Phase 2 exercise followed the agreed 3 days plan

6.2.2.1.1 Reference and Solution scenarios

Due to the limitation of the NMVP running in shadow mode, no reference scenario as such is used. Measurements have been made during each run, prior and after implementation of the elements of the scenario. The prior data have been considered as “Reference” and the data obtained after the implementation of the concept are called “Solution”.

VP-710 Phase 2 was executed according to the following validation scenarios as they have been developed in D48 VALP [19]:

Scenario ID	Scenarios Description
SCN-07.05.04-VALP-B001.0040	ASM Support Systems RTSA Information Exchange
SCN-07.05.04-VALP-B001.0070	Reservation during eAUP/eUUP Execution
SCN-07.05.04-VALP-B001.0060	In Flight ARES Request or Modification Scenario
SCN-07.05.04-VALP-B001.0050	Early Release of Airspace

Table 17: Solution Scenarios for VP-710 Phase 2

6.2.2.2 Deviation from planned activities

6.2.2.2.1 Deviations with respect to the Validation Plan

Following events and decisions that are considered as a deviation from the planned activities should be noted:

- NMVP was not able to run in RTS mode, but only in shadow mode, implying some limitations for the analysis: trajectory recalculations occurred with due regard to the flight phase to exclude flights in execution. Only those flights, not already in the execution phase at the time of recalculation, (i.e. at gate in the context of this Exercise) have been considered for actual re-planning.
- All ATS Flight Plans have been filed to NMVP following the ICAO Flight Plan Form (IFPL), not in the form of Extended Flight Plans (EFPLs) as initially planned. This was due to an issue in the FOC system (the Lido/Flight prototype) and mainly for WOC system, where ICAO FPLs have been submitted for the military aircraft, decreasing the opportunity to make full measurements on military benefits.
- During the dry-run a decision has been taken for LARA not to produce SUUP. This followed the decision by Lufthansa System to work with the German airspace and not the Dutch airspace managed by LARA. However, the production of SUUP from LARA was well tested during the dry-runs, the demo to the SJU/IS for RE5SE2 review and during platform integration.
- AOLO did not send the proposal list, as initially planned in Validation Plan. There is a need to review the collaboration between Airspace Operator and AOLO. The LIDO/Flight system makes it difficult to perform a real negotiation in time, as there is no option to compare two lists of flights.
- The number of missions for day 2 and 3 had been reduced to create more opportunities for potential benefit in the impact assessment at the network level and to overcome system limitations.

It should be also reminded, as described in the Validation Plan [18], that the transmission of the RTSA was not done as initially planned, due to NM technical limitations, but though a workaround (production of SUUP

6.2.3 Exercise Results

6.2.3.1 Summary of Exercise Results

With regard to P07.06.01 Objectives the following results have been obtained:

Validation Objective	Validation Objective Title	Success Criteria ID	Success Criteria	Metrics / Indicators	VP-710 results	Validation Status Objective
OBJ-07.06.01-VALP-GEN1.0100	Operational Feasibility	CRT-07.06.01-VALP-GEN1.0101	The Network Manager is able to capture operational plan updates originated by stakeholders based on their Real Time knowledge of Airspace Status	MG.1: Number of Network airspace updates due to stakeholders trajectory updates	In totality 40 ARES have been shared between NM and participants.	OK
		CRT-07.06.01-VALP-GEN1.0102	The Network Operational Plan is updated in Real Time by the NM upon reception of planning updates originated by stakeholders and a new Network DCB assessment is performed	MG.2: Number of Network impact assessments due to stakeholders trajectory updates	Following the scenarios, NM performed impact assessments each time needed.	OK
OBJ-07.06.01-VALP-GEN1.0200	Operational Feasibility	CRT-07.06.01-VALP-GEN1.0201	Partners involved in operations are able to timely re-plan their operation due to changes in airspace availability updated in the NOP.	MG. 3: Number of trajectory updates (MC.60.1)	7 trajectories per day have been updated in the RTSA scenarios	OK
		CRT-07.06.01-VALP-GEN1.0202	Roles and tasks related to changes in airspace status are well known and accepted by all actors involved	MG.4 Number of stakeholders involved and feedbacks (MA.20.1)	2 AMCs (LARA & STANLY_ACOS), 1 AU (LIDO) 1 MIL AU (OPTARION), 1 FMP (Karlsruhe) NM (AOLO, IFPS, CADF, and TACT) were connected. Technical feasibility has been proven during the exercise. The interactions between all actors went well despite the time needed to perform some actions	OK

Validation Objective	Validation Objective Title	Success Criteria ID	Success Criteria	Metrics / Indicators	VP-710 results	Validation Status Objective
OBJ-07.06.01-VALP-GEN1.0300	Common Situational Awareness	CRT-07.06.01-VALP-GEN1.0301	There is evidence of improvement provided by all the stakeholders in their sharing and accessibility to the totality of required information in ACC, ASM and Network systems environment	MG.4 Number of stakeholders involved and feedbacks (MA.20.1)	2 AMCs (LARA & STANLY_ACOS), 1 AU (LIDO) 1 MIL AU (OPTARION), 1 FMP (Karlsruhe) NM (AOLO, IFPS, CADF, and TACT) were connected.	OK
		CRT-07.06.01-VALP-GEN1.0302	The process, procedures and roles are clear, stable, usable and are well accepted by the involved actors	MG.5: Role and tasks are well known and accepted by all actors (MA.20.2)	For the AMC, NM and the FMP the roles and task of all actors are clear and acceptable. For FOC the tasks and role were acceptable for the early release of airspace	OK
OBJ-07.06.01-VALP-AFUA.0100	Airspace capacity changes based on RTSA information	CRT-07.06.01-VALP-AFUA.0101	RTSA data exchange is monitored by the Network and changes in airspace capacity are assessed and updated in terms of number of IFR flights able to enter a given airspace volume (ATC sectors, UIR/FIR area) made available by AFUA	MP 1: Number of extra IFR flights (traffic counts) able to enter a given airspace volume provided by AFUA (MC.21.1) • Initial Traffic Load due to activation of ARES • Final Traffic load due to AFUA measures	On the 14 traffic volumes impacted by the airspace release, very few impacts on en route capacity has been assessed, no conclusion could be driven for such results. Nevertheless no particular changes in FMP loads have been measured (maximum adding of 4 flights per hour).	Partially OK
OBJ-07.06.01-VALP-AFUA.0200	Environment performance drivers	CRT-07.06.01-VALP-AFUA.0201	RTSA data exchange is monitored by the Network and changes in airspace capacity are assessed and updated in terms of number of IFR flights able to enter a given airspace volume (ATC sectors, UIR/FIR area) made available by AFUA.	MP.2: Time crossed in the released ARES(difference of time between the first entry in the ARES and the last exit of the ARES (MC.60.4) MP.3: Time flown in the released ARES (total duration of occupation considering all the time of each flight entered in the ARES) (MC.60.6)	21min 57s for the day 2, 45min25s for day 3 48minutes for day 2, 60minutes for day 3	OK

Validation Objective	Validation Objective Title	Success Criteria ID	Success Criteria	Metrics / Indicators	VP-710 results	Validation Status Objective
		CRT-07.06.01-VALP-AFUA.0202	The NM is able to record new flight extensions (reduced EETs in traffic flow) measured when implementing VPAs and the initially expected in the Reference scenario	MP 4: Fuel consumption for civil (divergence between demand before RTSA update and after) (MC.70.3) MP.5: Fuel consumption for mil. (average per flight) (MC.70.4)	1,13% of fuel gained the second day and 1,79 % of fuel for the third day Not assessed as not Mil. FPL	Partially OK
OBJ-07.06.01-VALP-AFUA.0300	Civil –military cooperation and coordination	CRT-07.06.01-VALP-AFUA.0301	Airspace Users are able to timely obtain RTSA updated information to evaluate re-planning opportunities of their operations	MP.6: Number of trajectory updates (MC.60.1)	7 civil trajectories were modified each day	OK
		CRT-07.06.01-VALP-AFUA.03202	Airspace Users obtain acceptance to their re-planning requests upon their evaluation of arising opportunities from ARES status changes	MP.7: Number of access on demand deliver to non-scheduled flight (MC.60.2) MP.8: number of military flights accommodated on short or ad-hoc requirements (MC.60.3) MC.9: number of flight entry in the released ARES (planned compare to used) (MC.60.4)	Due to shadow mode limitation, no Mil FPL were assessed	NOK

Table 18: VP-710 Summary of Validation Results

It should be noted that the content of objectives and success criteria of P07.06.01 are same as in P07.05.04 VALP, and currently they have been refined since then.

Few Objectives and Success Criteria have been modified as follows:

- Previous Interoperability Objectives: OBJ-07.06.01-VALP-AFUA.0100; OBJ-07.06.01-VALP-AFUA.0200; OBJ-07.06.01-VALP-AFUA.0300 have been suppressed.
- Their ID have been re-used for objectives previously numbered as OBJ-07.06.01-VALP-AFUA.0400; OBJ-07.06.01-VALP-AFUA.0500; OBJ-07.06.01-VALP-AFUA.0600

Previous CRT-07.06.01-VALP-AFUA.0101 is removed, as no metric was associated to it previously and it is already implicit in remaining unique CRT.

6.2.3.1.1 Results on concept clarification

The exercise has demonstrated the interconnection between the ASM, NM, FOC and WOC systems. The RTSA have been distributed and processed among the ATM actors concerned. This RTSA data has been used by involved actors in order to provide their own impact assessments and facilitate a new flight planning cycle for the re-routing of the eligible flights.

The involvement of FOC/WOC in the Validation Exercise confirms the strategic significance of the airspace users' participation in AFUA. Specifically, it reinforces the perception of the role held by the FOC/WOC within the decision-making process performed by the concerned stakeholders to assess the actual feasibility of a flexible use of the airspace resources.

On the other hand interfacing ASM Support Systems across national borders enhances the AFUA operations by:

- Enabling users across borders to request foreign airspace via the local ASM Support System;
- Enabling the cross-border CDM process;
- Ensuring common ASM vision of the airspace use across borders.

6.2.3.1.2 Civil-Military Cooperation and Coordination

The exercise demonstrated that the involvement of all actors in the concept and through the experiment can deliver a **POSITIVE** contribution to the civil –military cooperation and coordination. The fuel and CO2 emissions have been reduced, thanks to the RTSA information sharing, the exercise has demonstrated positive contribution to all other indicators intended to be assessed by AUs. The civil traffic has partly benefited from the volume of ARES airspace offered to them. Only those flights still on ground have been impacted

6.2.3.1.3 Results impacting standardisation initiatives

With regards to ASM–ASM and ASM-NM RTSA exchange the following standardisation initiatives could be foreseen:

- Baseline requirements for system support,
- Standard message for RTSA data to NM,

The exercise clearly shows that the ASM Support Systems across Europe shall have common baseline functionality/requirements in order to build on the required interfaces.

The exercise also demonstrated the need for a "simplified" solution with regard to the provision of real-time airspace status to NM. A possible solution could be the mechanism currently applied by LARA and STANLY_ACOS when interfacing with the ATC systems, i.e. ADEXP messages under FMTP, or the equivalent web interface

6.2.3.2 Analysis of Exercise Results

Detail analysis of exercise results can be found in P07.05.04-D52-Validation Report AFUA S1 Edition 00.01.01[21]

The following statements regarding 07.06.01 objectives are stressed in this section:

RTSA information exchange between ASM Support systems has been validated. In this simulation 21 missions were planned for several modules of the German TRA 305 and the Dutch military training areas (MTA), EH-R12A, EH-D02A and EH-D05A in airspace designed according to VPA design principle. The mission planning and the ASM Level 2 processes simulated in the scenario demonstrate possibility for airspace users across borders to request airspace in another country and the execution of cross border CDM process. Scenario shows that RTSA information exchange between ASM Support systems provides common situational awareness across borders and supports the Network efficiency and Military operations

Several indicators and metrics have been used to assess the civil-military collaboration and coordination KPA. One of the most important KPI is the CMC2 (offered fuel and distance saved for civil traffic.).

Based on the information provided, the savings in terms of fuel and distance saved (for civil aircraft) are produced here after:

	Fuel consumption (Kg)	distance saved (NM)
9th of June	410	100,32
10th of June	694	118,86

Table 19: VP-710 Distance and Fuel records

The comparison of the fuel consumption and the distance saved, between the reference scenario (based on initial flight plans) and the solution scenarios (after the changes made on flight plans following the release of the ARES) shown clearly a positive impact on CMC2

It should be recalled here that due to the use of the NMVP in shadow mode, only flights still not in the execution phase at the time of recalculation have been considered for actual re-planning. All the flights already activated have not been considered, decreasing the opportunity to optimum use of the released airspace, consequently, providing the VP-710 to come up with more supportive results to the concept.

Nevertheless the following results have been obtained:

	9th of June	10th of June
Flights subject to the FOC Impact Assessment	34	45
Flights that could potentially benefit from the early release of airspace	22	34
Flights of the List of Eligible Flights accepted by AOLO following NM Impact Assessment	22	34
Flight Plans actually amended (CHG)	7	7
Flight Plans already in execution at the moment of CHG Filing (message skipped)	15	27
% of flight amended compare to eligible	**20%**	**15%**

Acceptability of Roles and Tasks

For the **AMC** and **AMC LARA, NM AOLO/MILO, CADF** and the **FMP** the roles and task of all actors were clear and acceptable. However, AOLO raised the question of the impact on NM of CDM with several FOCs, which would likely happen in real-life operations.

For the FOC representatives the roles and tasks of the FOC were not clear. FOC representatives were not involved in the CDM process with FMP and NM as much as they would have liked to. Procedures for the information exchange with AOLO for the purpose of CDM were not sufficiently described; therefore the CDM process was not satisfactory.

All the actors agreed that CDM should be supported by automation to make it shorter.

The table below shows a short summary of the paragraph above:

Actors	Role and tasks
AMC	OK
NM	OK
FMP	OK
FOC	NOK

Table 20: VP-710 Summary of roles and tasks acceptability results by actor

6.2.3.3 Confidence in Results of Validation Exercise

Refer toP07.05.04-D52-Validation Report AFUA S1 Edition 00.01.01[21]

6.2.4 Conclusions and recommendations

6.2.4.1 Conclusions

Improved collaboration via tool support, increased visibility of Network Performance and enhanced NOP data integration, which eventually may impact AOP data completeness can be considered as validated

- The concept of the Real Time Status of Airspace (RTSA) update has been very favourably accepted by the different actors (Network Manager, Airspace managers (including AMCs), Military Airspace Users, FOCs, and FMPs) who have put forward this cooperation between them. Sharing airspace status was the opportunity to promote the awareness about the different drivers that is behind each user. Technical systems were able to communicate, despite the fact that the implementation of the RTSA was made around technical workaround, which have led to a negative perception, in particular in terms of HP. The design of dedicated tools and an increase in automation level would be considered in recommendations.
- Stakeholders involved in the AFUA concept development and validation activities agreed to validate concept elements by means of already developed prototype systems in order to demonstrate the system interoperability and feasibility of SWIM technical profile TP (B2B) as well as the applicability of data exchange standards (AIXM 5.1)
- Clear benefits in terms of Network Performance mainly fuel savings (environment efficiency) have been proved through this exercise. It also contributed to civil and military cooperation & coordination with more oriented AUs
- It is also noted that Cross-border operations through collaborative airspace planning and Europe-wide shared use of military training areas were validated positively during this exercise, demonstrating the ability of a state to book areas in its neighbour.

6.2.4.2 Recommendations

Regarding VP-710, recommendations have been identified for two Collaborative NOP areas:

Improved Collaboration via Tool Support

VP-710 recommends that due to the limitations of the current NMVP platform, promoting the RTSA through SUUP, the end of V3 maturity level could not be fully assessed in term of tools during this exercise. Specific recommendations for System -Central Airspace Data Function operators have been stated:

- NM system should be able to highlight RTSA information that is different to the plan.
- For the NM system an RTSA update should use a message type that supports the operational needs of NM actors, particularly promote the definition of a RTSA dedicated message able to convey the whole set of airspace status information to the concerned stakeholders.
- NM system could use ADEXP messages under FMTP or the equivalent web RNEST interface message type of interface with ASM systems

Comprehensive integration of AOP and NOP data

Improvements in NOP data integration, which may eventually impact AOPs:

- Detailed procedures for the information exchange should be in place to support the CDM process.
- The system in place should be linked to all relevant CDM partners to enable the exchange of the required information among all actors involved
- Inclusion of flights in execution in the further validation exercises

Summing-up; the project recommends considering, prior to deployment additional activities to close the gaps, mainly by considering the inclusion of flights in execution, increasing the level of automation of the different systems and improving data integration in the NOP

6.3 Validation Exercise VP-713 Report

VP-713 covers Validation activities performed in the framework of the Extended Flight Plan concept (EFPL) part of Business Trajectory Management concept for Step 1.

The current flight plan has been extended to include flight performance and 4D profile information. The EFPL information is used by NM to improve current flight plan validation service. Additionally, EFPL information is used to improve accuracy of NM traffic predictions resulting in more efficient DCB and traffic complexity management processes

6.3.1 Exercise Scope

EXE-07.06.02-VP-713 validation exercise assesses both the operational and technical feasibility of EFPL implementation covering two main areas:

- Flight Planning;
- Demand and Capacity balancing / Predictability

P07.06.01only address objectives to support DCB-0103-A OI Step 1: i.e.; objectives under Demand and Capacity balancing / Predictability

Collaborative NOP for Step 1	***The collaborative NOP in Step 1 will improve predictability through better network situation awareness (richer, more relevant and up-to-date information).***

6.3.1.1 Exercise Level

EXE-07.06.02-VP-713 addresses Validation Objectives at different maturity levels. So, the exercise has been split into two parts:

- Part A: E-OCVM V3 activities performing shadow exercise on real traffic and gaming sessions on test traffic. NMVP Release 19.5 and current CFSPs systems are used.

- Part B: E-OCVM V2 activities performing analytical modelling Release 19.5 and prototypes developed by CFSPs are used

6.3.1.2 Description of the Operational concept being addressed

The Extended flight plan (EFPL) allows the exchange of trajectory information - in addition to ICAO 2012 flight plan information - between Aircraft Operators' Flight Operations Centre (FOC) and ATM in the short-term planning phase through SWIM-based B2B services.

The extended flight plan is an extension of the ICAO 2012 FPL. New information from the airspace users encompasses:

- The 4D trajectory (filed trajectory) as calculated by the FOC flight planning system in support to the generation of the operational flight plan. The 4D trajectory information in not limited to 4D points. It contains additional elements for each point of the trajectory such at speeds, and aircraft mass;
- Flight specific performance data: the climbing and descending capabilities of the aircraft specific to the flight.

The Extended flight plan is submitted by the Airspace User to the European Network Manager (NM) flight plan management service. The NM takes as input the filed trajectory in the Extended flight plan and when relevant applies some changes (e.g. letters of agreement) to produce a trajectory that can be viewed as the most accurate predication of the trajectory to be flown, integrating accurate trajectory information from the AU and ATC constraints information. This resulting trajectory is called the accepted trajectory and is the reference trajectory, once checked the compliance of the flight plan with published ATM constraints. The accepted trajectory, as well as ATC constraints applied by NM to the trajectory, is provided to the AU as part of the NM feedback to the AU EFPL submission. The following diagram illustrates the exchange of information.

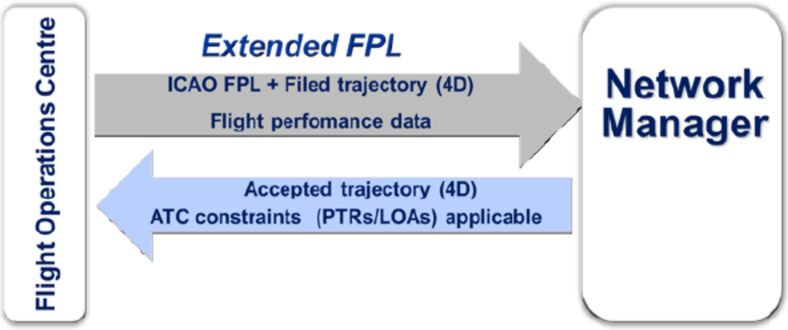


Figure 26: Extended Flight Plan information exchanges

The objective is to check if the EFPL allows to:

- Significantly reduce the differences between the AU and ATM views of the trajectory;
- Improve network predictability.

6.3.1.3 Validation objectives and Hypothesis

Refer to § 2.2.3 and 07.06.02-D88 Step 1 Business Trajectory Validation Plan for VP713 [23] for detailed information on VP-713 Validation Objectives, Success Criteria and Choice of Indicators and Metrics

The following table summarizes 07.06.01 VP-713 Validation Objectives

Objective Id	KPA/ Topics	Hypotheses
OBJ-07.06.01-VALP-GEN1.0100	Operational Feasibility	Any change in stakeholders operational plans can be transmitted to the NOP and the Network Plan can be updated accordingly

Objective Id	KPA/ Topics	Hypotheses
OBJ-07.06.01-VALP-GEN1.0200	Operational Feasibility	All partners involved in operations can have easy access to any NOP data with potential impact on their operations.
OBJ-07.06.01-VALP-EFPL.0100	Support to Network Predictability.	EFPL 4D trajectory information contributes to the elaboration of the Network Operation Plan with improved traffic predictability.
OBJ-07.06.01-VALP-EFPL.0200	Support DCB Assessment	EFPL 4D trajectory information contributes to the elaboration of the Network Operation Plan with improved DCB assessment/predictions

Table 21: Summary of VP-713 Validation Objectives and Hypothesis

6.3.1.3.1 Metrics Linked to EFPL Validation Objectives

Traffic Prediction was mainly quantitatively measured through the comparison of various 4D trajectories provided by the different systems (FOC systems and NM Systems) in order to assess the benefits of EFPL with regards to ICAO flight Plans.

SOL. TRAJECTORY	REF. TRAJECTORY	DELTA WITH REF	ELEMENTS TO BE COMPARED
T_{EFPL}AO4D	Tflown	Delta AO4D	All (see Table 23)
T_{ICAO}DCB	Tflown	Delta DCB Ref	All (see Table 23)
T_{EFPL}DCB_full	Tflown	Delta DCB_full	All (see Table 23)
T_{EFPL}DCB$_{wo}$CDP	Tflown	Delta DCB$_{wo}$CDP	All (see Table 23)
T_{EFPL}DCB$_{wo}$PTR	Tflown	Delta DCB$_{wo}$PTR	All (see Table 23)

Table 22: 4D Reference to Solution Trajectory comparisons

COMPARISON TYPE		METRICS
INDIVIDUAL TRAJECTORY PREDICTION ANALYSIS	**Points profile Comparison**	Overall flight Time / Distance
		Flight elapsed Time / Distance per flight phase (Taxing, SID, en-route, STAR)
		Flight elapsed Time / Distance from Take-off to TOC
		Flight elapsed Time / Distance from TOD to arrival
		Entry Time / Level in a sector crossed
		Flight elapsed Time in a sector.
		TOC (Position/ Altitude / Elapsed Time)
		TOD (Position/ Altitude / Elapsed Time)
		Climbing gradient (rate of climb) in the climbing phase
		Descending gradient (rate of descent) in the descending phase
		SID (Name, Exit point)
		STAR (Name, Entry point)

		When common points are identified, compare Levels and Elapsed Times at these points
	Sectors crossed Comparison	Elementary sectors crossed by trajectories
		Entry condition in sectors: · Entry level in a sector crossed · Entry time in a sector crossed
		Number of flight levels crossed in a sector
		Flight elapsed time in a sector
COUNTS ANALYSIS	**Counts Comparison** (For a few limited fixed horizon time (tbd) and for a very small set of TV (tbd))	Entry counts
		Occupancy counts
		Flight Lists

Table 23: Metrics used for 4D trajectory comparisons

Note: These metrics may be modified during VP´713 analysis. Please refer to VP-713 VALR for further information

TRAJ. NAME	TRAJ. TYPE	DESCRIPTION
$T_{ICAO}DCB$	Reference	Trajectory calculated by Enhanced Tactical Flow Management System (ETFMS) taking into account ICAO information only
Tflown	Reference	Trajectory flown
$T_{EFPL}AO4D$	Solution	Trajectory calculated by the FOC System sent to NMVP
$T_{EFPL}DCB\_full$	Solution	Trajectory calculated by the DCB System (ETFMS) taking into account each element of the EFPL (Default calculation by the ETFMS)
$T_{EFPL}DCB_{wo}CDP$	Solution	Trajectory calculated by the DCB System (ETFMS) without taking into account Climb/Descent Performance data present in the EFPL
$T_{EFPL}DCB_{wo}PTR$	Solution	Trajectory calculated by the DCB System (ETFMS) without taking into account Profile Tuning Restrictions (PTR)

Table 24: Trajectory descriptions in DCB Traffic Prediction

6.3.2 Conduct of Validation Exercise

For full description of the validation preparation see [25] 07.06.02-D55 -Step 1 Business Trajectory Validation report for EFPL

6.3.2.1 Exercise Preparation

See above

6.3.2.2 Exercise execution

6.3.2.2.1 Validation Scenarios

The following table shows the Reference and Solution Scenarios defined by EXE-07.06.02-VP-713, which in support of P07.06.01 validation objectives

SCN-07.06.02-VALP-713A.0002: **Reference Scenario**

Airspace Users send ICAO Flight Plans that are processed on the NMVP Platform in order to build the reference scenario in the same environment as the solutions scenarios and make thinks comparable. The ICAO FPL will be used as reference for Flight Planning.

This is the reference scenario which the solution scenarios has been assessed to

SCN-07.06.02-VALP-713A.0010: **Solution Scenario** Full

Airspace Users send EFPL and NM calculates 4D trajectories based on all EFPL information (AO4D trajectory, ToW, Performance Data) taking into account LOAs PTRs.

This solution scenario enabled to assess the global benefit of the EFPL with regard to the current ICAO based process

SCN-07.06.02-VALP-713A.0050: **Solution Scenario** Mixed Mode

All ICAO FPLs from the Operational environment are taken into account; and when a corresponding EFPL exists the ICAO FPL is substituted by the EFPL.

This scenario allows having the entire traffic (not only the traffic related to the AUs participating to Validation). It is required to validate mixed mode of operations and the impact on regulations.

This solution scenario enabled to assess a mixed mode of operations (EFPL & ICAO together),

6.3.2.3 Deviation from the planned activities

The deviations from the validation plan that have been reported by 07.06.02 regarding VP-713 are the following:

- Due to workload and technical difficulties, the scope of EXE-07.06.02-VP-713 Part A has been was significantly reduced. Therefore, some validation objectives have not been assessed:
  - OBJ-07.06.02-VALP-713A.2030
  - OBJ-07.06.02-VALP-713A.2040
  - OBJ-07.06.02-VALP-713A.2060
- The Shadow Mode exercise was extended to collect more data and allow the participation of Sabre (which faced technical problems during the first session). A second session was thus organised from 23rd to 24th of March 2016 for this purpose but unfortunately the two Sabre customer airlines didn’t participate

6.3.3 Exercise Results

6.3.3.1 Summary of Exercise Results

With regard to P07.06.01 Objectives, the following results have been obtained:

Validation Objective	Validation Objective Title	Success Criteria ID	Success Criteria	Metrics / Indicators	VP-713 results	Validation Status Objective
OBJ-07.06.01-VALP-GEN1.0100	Operational Feasibility	CRT-07.06.01-VALP-GEN1.0103	The Network Manager is able to capture EFPL 4D trajectory information originated by AU and update the NOP accordingly	**MGef1/1061**: Number of EFPL messages and updates	FPL Delay (ICAO DLA equivalent) and Change (ICAO CHG) messages were received on the NMVP via the FPL service interfaces and processed successfully	OK
		CRT-07.06.01-VALP-GEN1.0104	The NOP has been successfully updated when operating in global mix mode; i.e.; EFPLs and ICAO update messages. Supports OBJ-07.06.02-VALP-713A-2050. Satisfied by CRT-07.06.02-VALP-713A.1072	**QGef2/2050**: On-line feedback from IFPS operators related the efficient support of the HMI to mixed mode: EFPL+ ICAO FPL **QGef3**/1072: Positive feedback from IFPS operators on the feasibility to manage ICAO update messages when working in mixed mode	Both IFPS operators agreed that the current HMI will not efficiently support them during mixed mode operations. Nevertheless, during the validation this had no significant negative impact on their performance. The evidence collected showed that mixed mode operations did not have a significant impact on IFPS operators' workload	OK
OBJ-07.06.01-VALP-GEN1.0200	Operational Feasibility	CRT-07.06.01-VALP-GEN1.0203	NOP publishes the necessary data and updates for the AU to build their 4D trajectory (for example publication of PTRs and RAD	**QGef4**:Positive feedback from operational users on the published data to build their 4D trajectories	Positive Feedback	OK
		CRT-07.06.01-VALP-GEN1.0204	The NOP supports the Mixed mode of operations by publishing (via SWIM-B2B and or in the situation display) AO 4D flight trajectories, ICAO flight plans and derived NM calculated trajectories	**QGef5:**Positive feedback from the NM on the support of the NOP to Mixed mode of operations	IFPS operators considered that the introduction of the EFPL did not impact their Situation Awareness The information provided by the EFPL is relevant for the tasks performed by all actors	OK

Validation Objective	Validation Objective Title	Success Criteria ID	Success Criteria	Metrics / Indicators	VP-713 results	Validation Status Objective
		CRT-07.06.01-VALP-GEN1.0205	NOP provides confidentiality of commercially sensitive data (Flight Performance data and ToW). Satisfied by CRT-07.06.02-VALP-713A-1091	**QGef6**/1091: Positive feedback from Aircraft operators for updated information on NM HMIs (CHMI Portal)	Objective partially reached. The FSPD and the ToW were not visible in the summary queries on the CHMI and NOP Portal. However, it is present in the OPLOG information that can be accessed via the CHMI and the NOP Portal.	PARTIALLY OK
OBJ-07.06.01-VALP-EFPL.0100	Support to Network Predictability.	CRT-07.06.01-VALP-EFPL.0101	Assess the level of contribution to the predictability of each element of the EFPL. Satisfied by CRT-07.06.02-VALP-713A-2011	Mef2/2011: Compare TEFPLDCBwoFSPD with Tflown	The use of EFPL (using both the 4D trajectory and flight specific performance data) has in general a balanced impact on traffic volume entry time	OK
		CRT-07.06.01-VALP-EFPL.0102	The 4D trajectories, calculated by DCB, taking into account last update information are closer to the flown trajectories. Satisfied by CRT-07.06.02-VALP-713A-2031	Mef1/2031 Compare TEFPLDCB_full with Tflown	This success criteria has not been addressed, please refer to VALR 713	NOK
OBJ-07.06.01-VALP-EFPL.0200	Support DCB Assessment	CRT-07.06.01-VALP-EFPL.0201	The NOP has received 4D trajectory information from an EFPL, which has been used to better assess traffic demand (with entry traffic counts, Occupancy counts and Flight Lists) supporting the Network Manager in the enhancement of DCB assessment. Satisfied by CRT-07.06.02-VALP-713A-2052	Mef4/2052: Entry/Occupancy counts in ICAO FPL= Entry/Occupancy counts in Mixed mode	Positive results, please refer to VALR 713	OK
		CRT-07.06.01-VALP-EFPL.0202	The impact of EFPL (compared to ICAO FPL) on delays is acceptable or delays are reduced. Satisfied by CRT-07.06.02-VALP-713A-2062	Mef5/2062: Number of flights that EFPL Delays and ICAO FPL Delays are different	This success criteria has not been addressed, please refer to VALR 713	NOK

Validation Objective	Validation Objective Title	Success Criteria ID	Success Criteria	Metrics / Indicators	VP-713 results	Validation Status Objective
		CRT-07.06.01-VALP-EFPL.0203	The impact of EFPL (compared to ICAO FPL) on the number of flights impacted by regulations is acceptable. Satisfied by CRT-07.06.02-VALP-713A-0261	Mef6/2061:Number of EFPL Flights versus number of FPL flights impacted by regulations	This success criteria has not been addressed, please refer to VALR 713	NOK

Table 25: VP713 Summary of Exercise Results

6.3.3.1.1 Results on concept clarification

- This section focusses on detailed analysis for concept, human performance and tool related validation objectives.

6.3.3.1.2 Results on Validation Objectives Related to Collaborative NOP

This section is structured to report on each pre-defined success criterion. Each success criteria starts with a brief text box summarising the conclusion the validation. The colour coding corresponds to the achievement status according to the following criteria:

(green)	OK
(amber)	Either OK or NOK with issues explained
(red)	NOK

6.3.3.1.2.1 OBJ-07.06.01-VALP-GEN1.0100:

Assess that any change in stakeholders operational plans can be transmitted to the NOP and the Network Plan can be updated accordingly.

CRT-07.06.01-VALP-GEN1.0103: The Network Manager is able to capture EFPL 4D trajectory information, originated by AU and update the NOP accordingly

Refer to **CRT-07.06.02-VALP-713A.1061**

FPL Delay (ICAO DLA equivalent) and Change (ICAO CHG) messages were received on the NMVP via the FPL service interfaces and processed successfully

CRT-07.06.01-VALP-GEN1.0104: The NOP has been successfully updated when operating in global mix mode; i.e.; EFPLs and ICAO update messages

Refer to:

- CRT-07.06.02-VALP-713A.2050 in VALR
- CRT-07.06.02-VALP-713A.1072 in VALR

  The evidence collected showed that mixed mode operations did not have a significant impact on IFPS operators' workload

6.3.3.1.2.2 OBJ-07.06.01-VALP-GEN1.0200:

Assess that all partners involved in operations can have easy access to any NOP update with potential impact on their operations.

CRT-07.06.01-VALP-GEN1.0203: The NOP has been successfully updated when operating in global mix mode; i.e.; EFPLs and ICAO update messages

QGef4: Positive feedback from operational users on the published data to build their 4D trajectories

Ref 1032: **IFPS operators** considered that the introduction of the EFPL did not impact their Situation Awareness compared to the current ICAO Flight Plan Validation process

Ref 1063: The information provided by the EFPL (modifications introduced with respect to ICAO FPL) is relevant for the tasks performed by all actors.

IFPS Operators mentioned that in the EFPL message there are whole blocks that they don't even consider to understand why the flight went invalid (like performance data for instance). In this case, EFPL provides them even more information than they need for most operations.

Dispatchers found the information provided by EFPL relevant; they just need that data to be displayed in a more meaningful way so it improves the efficiency in operations

Refer.1062: The system solution for managing EFPL modification is accepted by all affected actors

The system solution to managing the EFPL modification was accepted by all affected actors. Still, as it was mentioned in previously, the EFPL change for AUs side can still be improved with more adequate interface implementations that better support them identifying the FPL changes they have to do in order to get the FPL approved

CRT-07.06.01-VALP-GEN1.0204: The NOP supports the mixed mode of operations by publishing (via SWIM-B2B and or in the situation display) AO 4D flight trajectories, ICAO flight plans and derived NM calculated trajectories

QGef5: Positive feedback from the NM on the support of the NOP to Mixed mode of operations

Ref 1032: **IFPS operators** considered that the introduction of the EFPL did not impact their Situation Awareness compared to the current ICAO Flight Plan Validation process

Ref 1063: The information provided by the EFPL (modifications introduced with respect to ICAO FPL) is relevant for the tasks performed by all actors

CRT-07.06.01-VALP-GEN1.0205: NOP provides confidentiality of commercially sensitive data (Flight Performance data and ToW).

Refer to CRT-07.06.02-VALP-713A.1091

Objective partially reached. The FSPD and the ToW were not visible in the summary queries on the CHMI and NOP Portal. However, it is present in the OPLOG information that can be accessed via the CHMI and the NOP Portal.

Therefore this objective has not been completely achieved

6.3.3.1.2.3 OBJ-07.06.01-VALP-EFPL.0100:

Assess that EFPL 4D- trajectory information contributes to the elaboration of the Network Operation Plan with improved network predictability.

CRT-07.06.01-VALP-EFPL.0101: Assess the level of contribution to the predictability of each element of the EFPL.

Refer to CRT-07.06.02-VALP-713A.2011

Main conclusions that can be derived are:

The use of EFPL (using both the 4D trajectory and flight specific performance data) has in general a balanced impact on traffic volume entry time

CRT-07.06.01-VALP-EFPL.0102: The 4D trajectories, calculated by DCB, taking into account last update information are closer to the flown trajectories

Refer to CRT-07.06.02-VALP-713A.2031

This success criteria has not been addressed

6.3.3.1.2.4 OBJ-07.06.01-VALP-EFPL.0200:

Assess that EFPL 4D trajectory information, contributes to the elaboration of the Network Operation Plan with improved DCB assessment/predictions.

CRT-07.06.01-VALP-EFPL.0201: The NOP has received 4D trajectory information from an EFPL, which has been used to better assess traffic demand (with entry traffic counts, Occupancy counts and Flight Lists) supporting the Network Manager in the enhancement of DCB assessment

Refer to CRT-07.06.02-VALP-713A.2052 in VP-713 VALR

CRT-07.06.01-VALP-EFPL.0202: The impact of EFPL (compared to ICAO FPL) on delays is acceptable or delays are reduced

Refer to CRT-07.06.02-VALP-713A.2062

This success criteria has not been addressed

CRT-07.06.01-VALP-EFPL.0203: The impact of EFPL (compared to ICAO FPL) on the number of flights impacted by regulations is acceptable

Refer to CRT-07.06.02-VALP-713A.2061

This success criteria has not been addressed

6.3.3.1.3 Results per KPA

Refer to 07.06.02 D55-Step1 Business Trajectory Validation Report for EFPL

6.3.3.2 Confidence in Results of Validation Exercise

Refer to 07.06.02-D55 -Step 1 Business Trajectory Validation Report for VP713 [25]

6.3.4 Conclusions and recommendations

6.3.4.1 Conclusions

This exercise clarified the need to include both the 4D trajectory and flight performance data in the EFPL to achieve improvements on the following aspects:

- Flight plan acceptance process improvement by reducing both the rates of wrongly accepted and wrongly rejected flight plans;
- Reduction of trajectory misalignment between the AU and NM actors;
- Traffic predictability improvement.

6.3.4.2 Recommendations

One major unclarified point is related to flight information returned back by NM to the AU in case of flight plan acceptance (the accepted trajectory and PTRs) and how this information could be used by AU to improve trajectory alignment and predictability while not increasing operator workload. This point remains open to be addressed in further validations.

6.4 EXE-13.02.03-VP-749 Validation Report

The validation approach defined in this validation plan aims to validate the maturity level V3 of the Network operational concept defined within Step1. The aim of this validation activity is to elaborate an initial assessment of the benefits of the integration of AOP and NOP, developed conjointly by P07.06.01, P06.03.01 and P13.02.03. The role of the P13.02.03 is to manage the integration and to run experiments using the agreed integrated scenarios.

The validation activities were performed conjointly by P13.02.03 and P07.06.01 (NOP) project members. The way of working was to build a flexible virtual team, drawn from a common P13.02.03 and P07.06.01 resource pool, with clearly defined responsibilities. EUROCONTROL P13.02.03 was the coordinator of this resource pool.

EXE-13.02.03-VP749 validates the integration of multiple AOPs with the NOP through B2B Web Services (SWIM candidates). The integration of AOP and NOP data shall lead to an improvement of predictability which shall serve as an enabler for the local DCB decisions.

This validation Plan is aligned with the SWP7.2 Validation Strategy and Integrated Validation Plan for Step1 [2] and validation objectives are linked with the high level validation strategy objectives.

For more detailed information refer to D383 VALR S1 R5 Vol2 TTM [26]

6.4.1 Exercise Scope

P07.06.01 addresses objectives within EXE-13.02.03-VP749 related with two OFAs:

- OFA05.03.07 Network Operations Planning focusing on the validation aspects related to OI Step DCB-0103-A and well primarily on the integration of multiple AOP's with the NOP.
- OFA05.03.01 Airport Operations Management focusing on the validation aspects related to OI Steps DCB-0310 and AO-0801-A and well primarily on the benefits of AOP/NOP Integration and active participation of Airport stakeholders in the solution of Airport arrival DCB imbalance situations.

It validates the integration of multiple AOPs with the NOP through B2B Web Services (SWIM candidates). The integration of AOP and NOP data shall lead to an improvement of predictability which shall serve as an enabler for the local DCB decisions.

6.4.1.1 Exercise level

This exercise is a shadow mode, performed on the NMVP, using NMOC Release 20.0. The following prototype systems were connected to the NMVP, through NM B2B Web Services (SWIM candidate services):

- 4 AOP systems provided by WP12

6.4.1.2 Description of the Operational Concept being addressed

VP-749 covers two topics, Target Time Management and AOP-NOP Integration, and the exercise is as such a collaborative effort shared between two WP7 Projects, P13.02.03 (covering Target Time Management), P07.06.01 (covering AOP/NOP Integration), and P06.03.01 (covering the AOP and airport DCB related aspects).

AOP/NOP Integration aims to deliver arrival/departure planning information updates between the Airport Operations Plans (AOP) of both ends of the flight and the Network Operations Plan (NOP).

AOP/NOP Integration, thanks to the increased predictability that delivers to AOP and NOP, is a strong enabler for the Target Time Management Concept.

6.4.1.3 Validation objectives and Hypothesis

P07.06.01 validation objectives are divided in two different sets:

- P07.06.01 Generic Objectives identified by P07.06.01 to support DCB-0103-A OI Step.

These objectives are common to all WP7 validation exercises covering DCB-0103-A; they are applied to all Validation Plans, but the selection of Metrics and Indicators were customised to fit the specific environment of each WP7 Primary Project

- P07.06.01 Active Contribution to VP-749 Objectives

Refer to § 2.2.3 for detailed information on VP-749 Validation Objectives, Success Criteria and Choice of Indicators and Metrics

The following table summarises 07.06.01 Validation Objectives

07.06.01 OBJECTIVE ID	Hypothesis
OBJ-07.06.01-VALP-GEN1.0100	Any change in stakeholders operational plans can be transmitted to the NOP and the Network Plan can be updated accordingly
OBJ-07.06.01-VALP-GEN1.0200	All partners involved in operations can have easy access to any NOP data with potential impact on their operations.
OBJ-07.06.01-VALP-GEN1.0300	All stakeholders share the same data so that the collaborative decision making of airport and network management is enhanced.
OBJ-07.06.01-VALP-0749.0100	Network predictability is improved due to sharing of departure and arrival flight information in a timely manner.
OBJ-07.06.01-VALP-0749.0200	Rolling exchange of data between AOP and NOP improves predictability of both AOP, NOP
OBJ-07.06.01-VALP-0749.0300	Rolling exchange of data between AOP and NOP improves DCB process of both AOP, NOP
OBJ-07.06.01-VALP-0749.0400	Rolling exchange of data between AOP-NOP improves situation awareness of AOP, NOP and of any NOP stakeholder
OBJ-07.06.01-VALP-0749.0500	Network predictability is improved due to sharing of knock-on effect of late arrivals on the next rotation
OBJ-07.06.01-VALP-0749.0600	Performance improvements of Airport DCB processes are obtained due to better quality of network predictions for both arrivals and departures
OBJ-07.06.01-VALP-0749.0700	Performance improvements of Airport resource planning are obtained due to better quality of network predictions for both arrivals and departures
OBJ-07.06.01-VALP-0749.0800	Computer-to-computer exchange of data between AOP and NOP will improve the timely and systematic exchange and will reduce the manual operations and telephone coordination required today to exchange the information and to update systems
OBJ-07.06.01-VALP-0749.0900.	The integration of Airports in the arrival management process improves airports arrival predictability and punctuality.

Table 26: Summary of VP-749 Validation Objectives ad Hypothesis

6.4.2 Conduct of Validation Exercise

6.4.2.1 Exercise Preparation

This section summarizes the activities undertaken to prepare properly the execution of the VP-749

The exercise preparation required the involvement of different staff with specific skills and responsibilities. Actors involved in both; the preparation and execution of the exercise, are collected in the table below.

Organisation	Participant	Function

Organisation	Participant	Function
EUROCONTROL	[redacted]	[redacted]
ENAIRE	[redacted]	[redacted]
AENA	[redacted]	[redacted]
INDRA	[redacted]	[redacted]

Table 27: VP-749 Participants

For more detailed information on the preparation activities, definition of technical requirements and System development, refer to D383 VALR S1 R5 Vol2 TTM [26]

6.4.2.2 Exercise Planning

Trials were scheduled to be run during May 2016; weeks 19 to 21, according to the following exercise calendar:

Week 19:

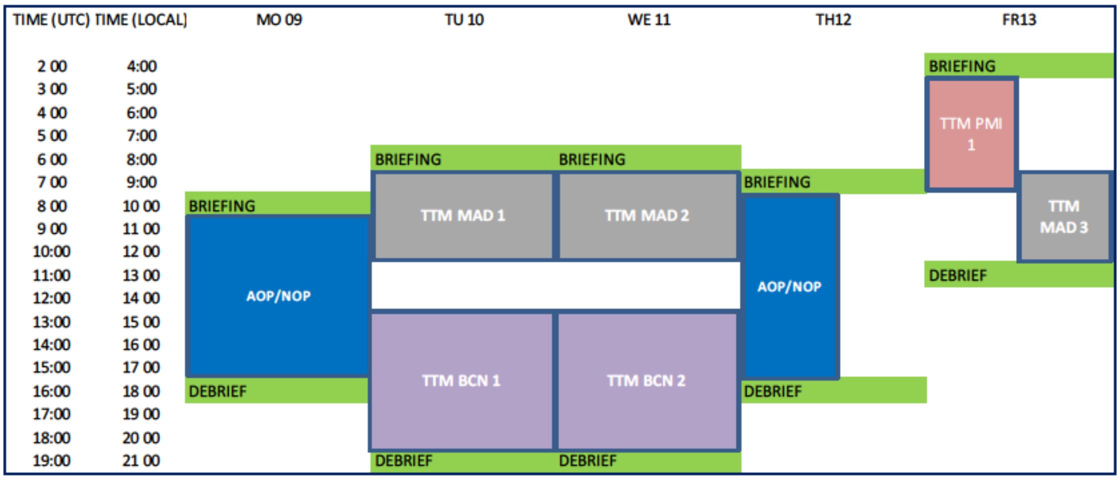


Figure 27: Week 19 trial schedule

Week 20:

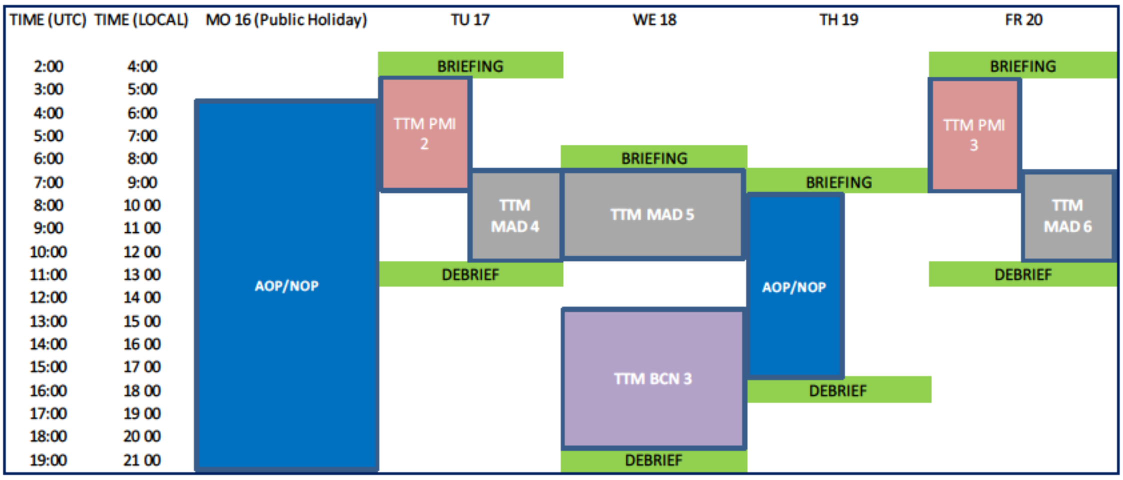


Figure 28: Week 20 trial schedule

Week 21:

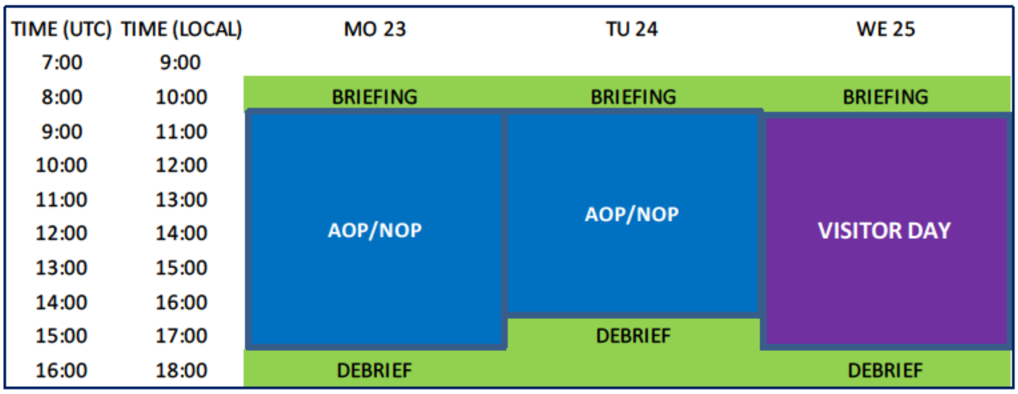


Figure 29: Week 21 trial schedule

6.4.2.2.1 Platform Configuration

The picture below shows a representation of the Validation Platform to be used for the exercise

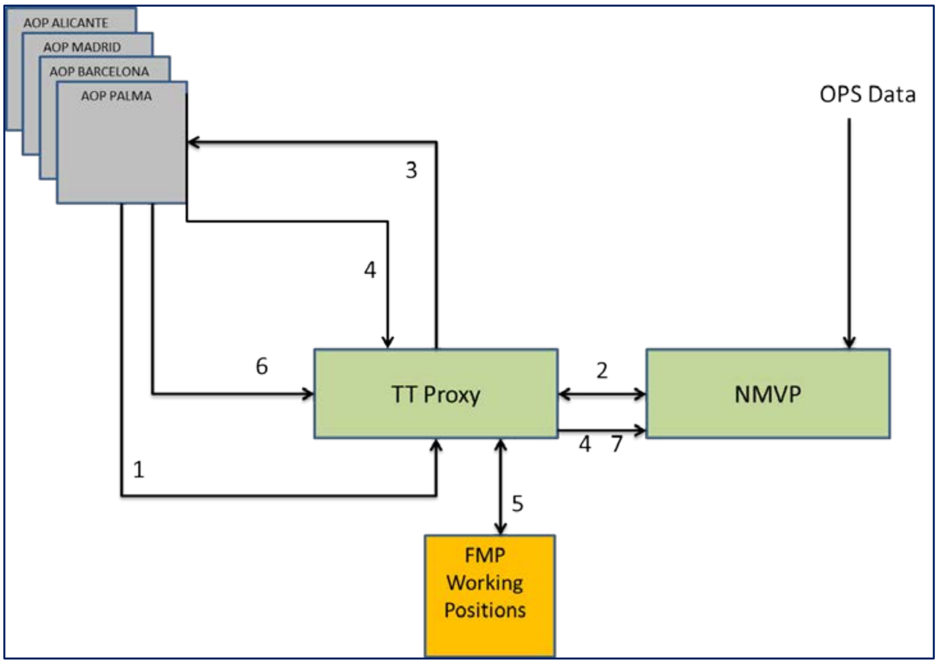


Figure 30: VP749 Validation Platform

In Figure 30: VP749 Validation Platform:

1. The four AOPs are connected through B2B Web Services (SWIM Candidate Services) with the NOP residing in the NMVP. However, the VP749 solution routes all service requests through the TT Proxy Component. The TT Proxy Component either queries the NMVP (2), or provides its own data to serve as reply to the AOP service request. The TT Proxy contains a simulation component which can take over all time related parameters of flights under a TTA from other airports (having a shadow CTOT), or of flights departing from one of the 4 participating airports (having a shadow TTOT). TTA adherence can be simulated, and the TT Proxy has its own dedicated HMI for configuration and supervision purposes.
2. Query/Reply between TT Proxy and NMVP.
3. The TT proxy replies to queries issued by (1). It shall be noted that the Target Time Proxy represents the NOP towards the AOP, and delivers all required services as specified in the AOP/NOP Interface. The presence of the Target Time Proxy is fully transparent to the AOP prototypes.
4. DPI and API messages from the 4 shadow AOP systems are passed through unmodified to the TT Proxy

6.4.2.2.2 AOP/NOP Updating Process

Figure 31 below shows the ELDT / DPI updating cascading process between NOP and AOPs.

1. At time 0 the NMOC (NOP in NMVP) via TT Proxy sends an Estimated Landing Time (ELDT) to Airport 1 upon receiving ATOT information from Origin Airport (Operational if comes from an airport outside of the trial environment)
2. Airport 1 answers back with a Target Take-Off Time (TTOT) to the NOP, based on the AOP A-CDM algorithm
   a. The NOP initiates an updating cascading process sending an ELDT2 (based on the received TTOT1) to the Airport2 (next Airport, a specific aircraft is scheduled to land)

b. Airport 2, answers back to the NOP by an updated TTOT2, based on the received ELDT2

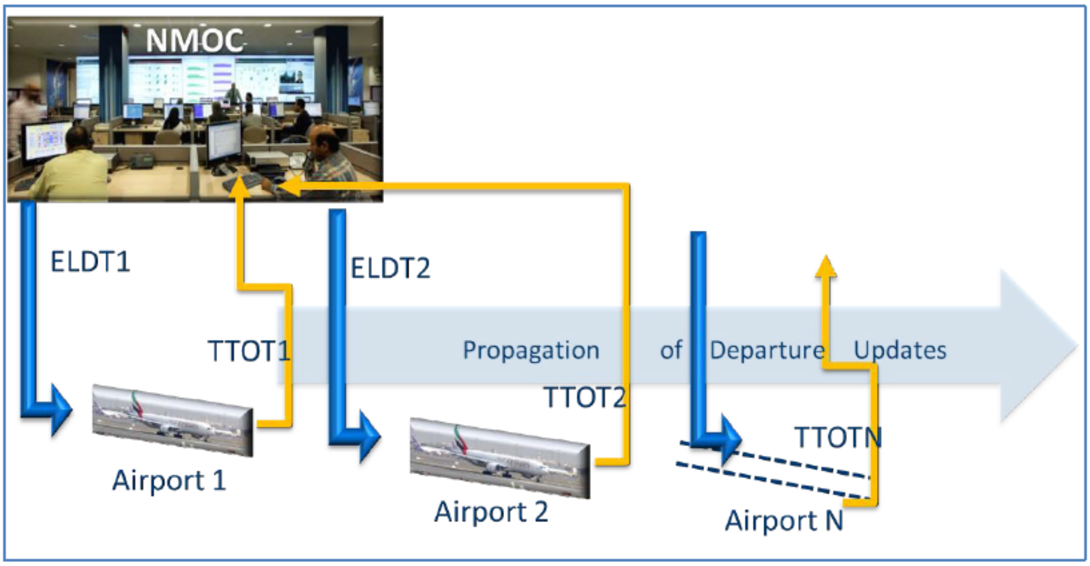


Figure 31: Airport Departure Update Cascading (Airport 1)

3. The procedure continues till all departures from all airports, where that specific aircraft is scheduled to land, have updated their departure Target Take-Off Time

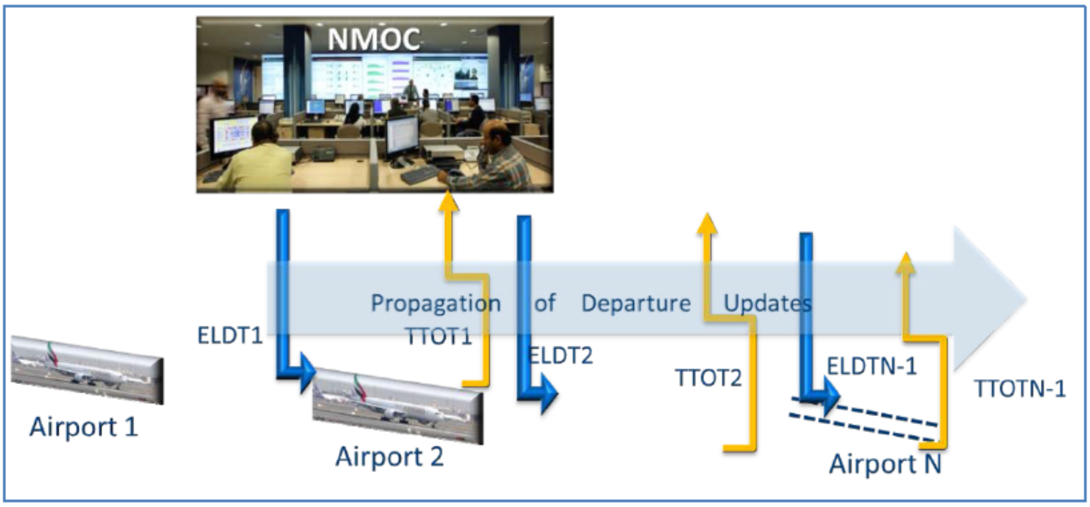


Figure 32: Airport Departure Update Cascading (Airport 2)

4. At time 1 (

5. Figure 32) when the aircraft has landed in the next Airport the process explained in steps 1 to 3 moves one airport forward in the process sequence and repeats the multi-airport update cascading process.

6.4.2.2.3 Training

Two Dry Run sessions were scheduled for April 26th and 27th according to the following agenda:

26th April 2016			
Start Time	Agenda Item	Topics Covered	Who leads
09:00	Welcome and	Welcome, Objectives, Inspection of	Leo, Paco

	Introduction	Equipment and Connections	
10:00	AOP/NOP Tests		Stella, Stefan, Gonzalo, Paco
15:00	Barcelona Target Time Management Tests		Leo, Stefan, Gonzalo, Paco
17:00	Palma Target Time Management Tests		Leo, Stefan, Gonzalo, Paco
19:00	De-Brief		Leo, Paco
20:00	End of Meeting		
27th April 2016			
08:00	Welcome and Introduction	Welcome, Objectives, Inspection of Equipment and Connections	Leo, Paco
09:00	Madrid Target Time Management Tests		Leo, Stefan, Gonzalo, Paco
15:00	Barcelona Target Time Management Tests + Palma Target Time Management Tests		Leo, Stefan, Gonzalo, Paco
19:00	De-Brief		Leo, Paco
20:00	End of Meeting		

The detailed timing of the exercise runs is shown in the following figure

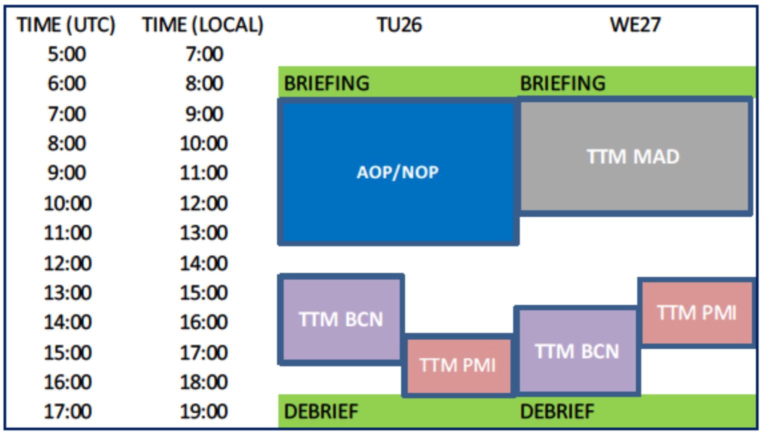


Figure 33: Dry Run exercise timing

6.4.2.3 Exercise execution

6.4.2.3.1 Guidelines

Different Proxy / NMVP configurations are used for AOP /NOP integration and Target Time Management. The configuration settings that applied to AOP-NOP Integration are the following:

- Operational DPIs are received in the NMVP from all Airports except from the 4 participant Airports (ALC, BCN, MAD, PMI)
- No CPR, FSAs, Operational Arrival or Departure estimates are used for / from the 4 Airports, neither the other airports or flights overflying the Spanish zone
- FSA and CPR Information outside the Spanish zone is working as nominal.

- FPL operational messages are received from the IFPS OPS output for all traffic
- Regulations from the Operational System are maintained in the Simulation Platform
- A noise value, which has been extracted from OPS statistics, is applied at TSAT milestone, for flights departing for the 4 participant Airports, to simulate real world variability of the TTOT/ATOT AOP/NOP
- Integration was a Simulation /Shadow mode exercise, which used simulation data combined with Operational data, as reflected in Figure **30**: VP749 Validation Platform

Detailed Proxy and NMVP settings for AOP/NOP were as follows:

Proxy Settings:

- CONTROL_ATOT_FOR_ALL_FLIGHTS_TO_TRIAL_AD

NMVP Settings:

- NO_REAL_WORLD_DPI_4ADP
- NO_REAL-WORLD_DPI_ALL_AD
- NO_CPR_FOR_4AD_COVERED_AIRSPACE
- NO_CPR_AT_ALL

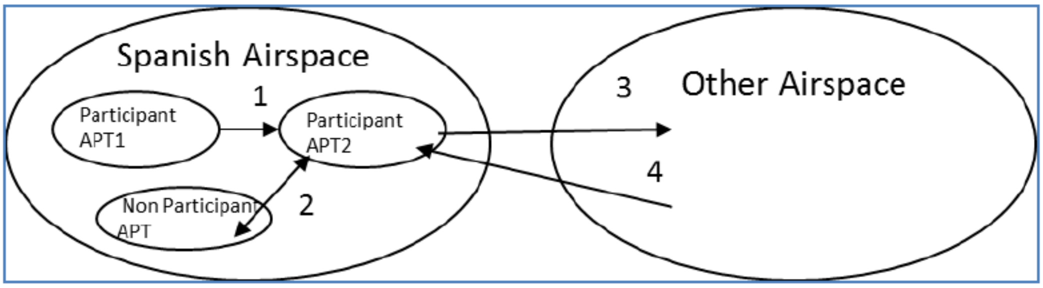


Figure 34: Proxy and NMVP Settings

The table below describes the setting used in the TT Proxy and NMVP corresponding to the example shown in Figure **34**

Flight	ATOT by Proxy with noise	Real World DPI	Real World CPR/FSA
1 Between participant APTs	YES	NO	NO
2 To from non-Participant Spanish APT	NO	N.A (No other Spanish APT CDM)	NO
3 From participant To other Airspace	YES	NO	YES (Except inside Spanish zone)
4 From other Airspace to participant APT	NO	YES	YES (Except inside Spanish zone)

Table 28: TT Proxy and NMVP Settings

Actors involved:

- A small number of airports equipped with an AOP : APOC Supervisor ; Airport Operations Manager
- TMA FMP (only for target times exercises)
- NOP and NMOC: Network Operations Manager

The contribution of P07.06.01 to VP-749 enhancement to the Network's operational planning process is proposed through automated communication of:

- Arrival/departure planning information updates between the Airport Operation Plans (AOP) of both ends of the flight and the Network Operation Plan (NOP)

The following requested initial following conditions were satisfied with four Spanish Airports (Madrid, Barcelona, Alicante and Palma de Mallorca) equipped with an AOP.

- This small number of airports chosen should by preference contain at least one airport having regular DCB imbalance constraints (over delivery of aircraft at runway or reduced airport capacity).
- These airports should be linked by a number of flights using the same airframe (usually identified by the aircraft registration mark)
- AOP and NOP are logically connected by means of SWIM infrastructure

The AOPs shared successfully data with the NOP. This is summaries as follows:

- Updated SID/STAR for flights
    - All AOP systems participating provided the NOP their runway configuration at least in the medium term planning phase or earlier and their updates continuously up to the D day.
    - The NOP recalculates the trajectories based on the runway configuration plan. Additionally NOP showed the runway configuration values in the NOP portal.
- Updated Arrival/departure planning information
    - Every participating AOP provided during the execution day the DPI data and its updates to NOP for all flights departing from that airport.
    - Arrival Planning information and updates contained in the AOP were exchanged by the NOP via the SWIM infrastructure
    - Departure Planning information and updates contained in the AOP were exchanged with the NOP via the SWIM infrastructure
    - The NOP parsed and appropriately updated the NM trajectories and flight information according to the DPI and API information received from the AOP. Flights' ELDTs were calculated (or updated when necessary) and exchanged with the required AOP.
    - The NOP made flight progress information data available to the AOPs and vice versa -the AOP may send to NOP flight progress information as from approach.
    - The AOP used this ELDT to monitor its planned operations and to update the relevant departure planning information (outbound trajectory of the Airport Transit View – ATV) where appropriate. The AOP monitors in a continuous and integrated way incorporating the ELDT updates received from NOP
    - The existing NOP processes uses this information in its Network Impact Assessment and decision making

6.4.2.4 Validation Scenarios

VP-749 was executed according to the following validation scenarios as they have been developed in D47 VALP

6.4.2.4.1.1 Reference & Solution Scenarios

VP-749 covers two topics, Target Time Management and AOP-NOP Integration. Both topics were validated through the same solution scenarios although some different configuration settings were applied.

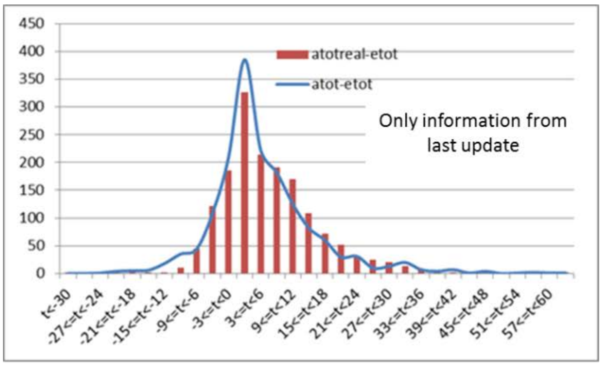
The **Reference Scenario** for AOP /NOP Integration uses data from the Operational System, especially for comparison with CDM data and Actual Take-Off Times (ATOT). Data extracted from FPL (IFPS) messages is used to compare Estimated Take-Off Times (ETOT) with the results obtained from the solution scenario.

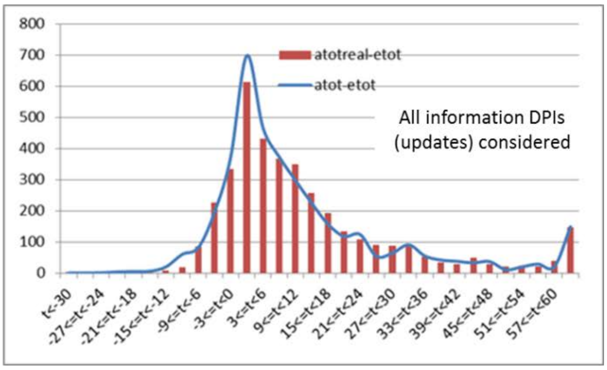
The **Solution Scenario** generates Estimated Landing Times (ELDTs); Target Off-Block Times (TOBTs); Target Take-off Times (TTOTs) and Actual Take-off Times (ATOTs) which are processed in shadow mode in simulation. The updating process is performed by cascading TTOT updates, downstream to all airports involved, following the procedure shown in Figure 31 and
Figure 32

TTOT deviations from ATOT in the **Solution Scenario** are compared with ETOT deviations from ATOT in the **Reference Scenario**. Although ATOTs are also generated (simulated) in the Solution Scenario, Operational ATOTs are used to compare both; ETOT and TTOT accuracy. The idea is to compare the results of the Operational environment and the Simulation environment, against actual Real World behaviour; that is; Operational ATOTs.

Doubts were raised on the convenience of using Simulated ATOTs to assess deviations of Estimates and Target Times. Checks using the available data have been done using simulated ATOTs. Similar results have been obtained, slightly worse using Operational data than Simulated data; therefore results using operational ATOTs for both scenarios are presented in this report, as we believe they are more realistic. This is shown in the two following Histograms, which present ETOT deviations from Simulated Actual Take-off Times versus Operational (real) Actual Take-off Times

In the left histogram, only last flight updates received for flights (prior to their execution) are used. The right hand histogram is built using the available flight updates at all the check-points where information has been recorded as represented in Figure 31 and
Figure 32





The AOP/NOP Integration delivered by P07.06.01, serves as the back-drop for the Target Time Management validation objectives. The increased predictability delivered by AOP/NOP Integration forms an important decision criterion for Airport and ATC DCB processes, and is the driver for the creation of Hotspots. Hotspot creation leads to the launching of the AOP/AIMA Airport Impact Assessment and its results can be taken into account by the FMP for a hotspot resolution plan.

For AOP/NOP Validation Objectives, the Operational System was used as the Reference Scenario, but analysis cannot be based on a flight by flight comparison due to the overall network situation divergence expected to appear. Instead the analysis is based on trends for overall predictability and the emphasis in comparing the estimates just before execution between the reference and solution scenarios.

6.4.2.5 Deviation from the planned activities

Noise is added when required in solution scenario to be able to compare simulated ATOT and OPS.

There was no execution noise added, as it is difficult to determine, to allow comparing the ALDT in simulation world and OPS. The exercise concentrates in the planning phase. Analysis of actual departure times was not done due to the validation methodology. Instead:

- Analysis of predicted departure time along the different milestones of the planning phase has been performed
- Landing times add no value to the results as they are also simulated, taking departure times as reference for the calculation. As consequence, CRTs addressing arrival time information

could not be fully validated. Their validation is only possible by launching an AOP / NOP live trial

CRT-07.06.01-VALP-0749.0100 metric 1.02

"*Flight data updated and profiles calculated with the DPI and API information in short term planning are closer to the actual flown profiles and actual flight data.(In and off block times , take-off and landing estimates, de-icing, terminal procedures, runways, taxi times flight data status …)"*

Comparison is either done:

– In planning phase not with execution but using the estimates in Ops and its updates.
– With final simulation estimates plus departure noise versus OPS actual when the noise is added

Airport Objectives from OFA 05.01.01 (P06.03.01):

Benefits of TTA Management on Airport Performance are covered by P07.06.01 under:

OBJ-07.06.01-VALP-0749.0900: The integration of Airports in the arrival management process improves airports arrival predictability and punctuality

- CRT-07.06.01-VALP-0749.0900: The number of scheduled flights arriving as planned (no delay) is increased
- CRT-07.06.01-VALP-0749.0901: Total reactionary delay of delayed flights is reduced

6.4.3 Exercise Results

6.4.3.1 Data Collection Period

AOP/NOP Integration.-Results were collected over two periods. The second period was not in the initial plan; it was added later, as a software improvement-fix was identified and in order to increase the data sampling for the analysis. The software update improved DPIs, only based on AOP scheduled data; in other words before flight plans are filed and received. This means that in period 1, the horizon over 6h (fewer and fewer flight plans) is affected and the predictability is reduced compared to what it could be. Period 2 includes the software fix.

- Period 1: 21,22,23,24 May .Overall average traffic, except the 22nd that was slightly worse than average
- Period 2: 28, 29 June. Exceptional heavy congestions in the four airports. On 28/06 an average of 42% of the traffic associated to the four airports (departing or arriving) was regulated. The traffic disruptions was due to a French ATC industrial action The Network total delay was around 130.000 minutes on a traffic demand above 31200 flights.

TTA Management.-As already scheduled data was collected during the TTA Management trial runs: Tuesday 10th, Wednesday 11th and Wednesday 18th for Madrid and Barcelona Airports; Friday 13th, Tuesday 17th and Friday 20th for Palma de Mallorca and Madrid Airports

6.4.3.2 Traffic Overview

The following graphs show the percentage of flights affected by regulations per Aerodrome (Figure 35) and the number of regulations affecting flights per aerodrome (Figure 36) during trial days

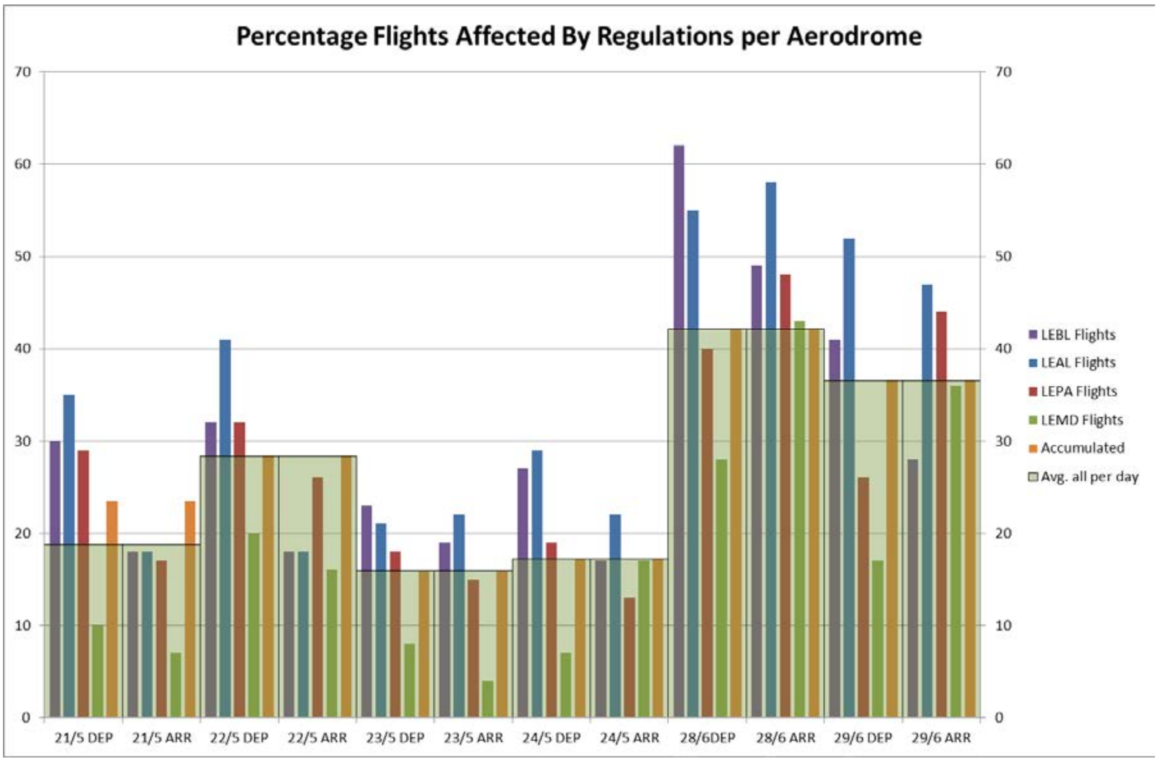


Figure 35: Percentage Flights Affected By Regulations per Aerodrome

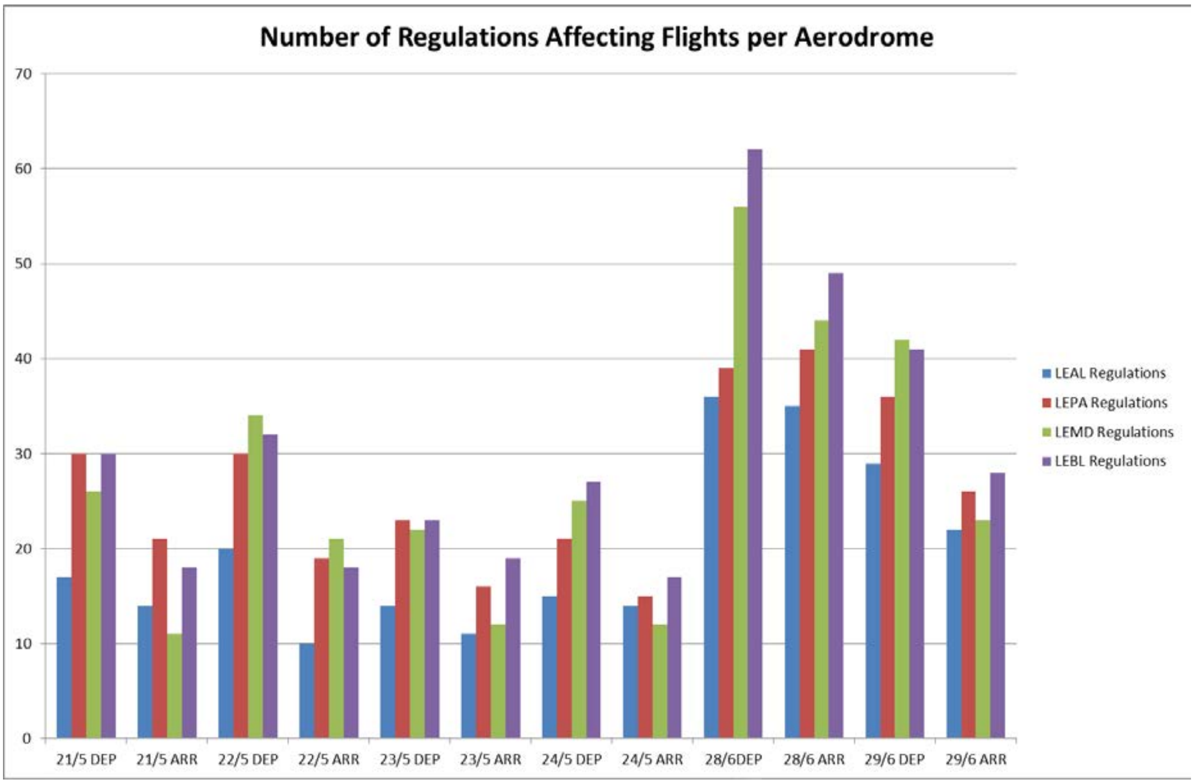


Figure 36: Regulations Affecting Flights per Aerodrome

The following tables show the flight distribution during trial days: Arrivals, Departures, Participant Airports, and Non-Participant Airports;

Count of IFPS_ID								
DEAPRTURES	21-05-2016		22-05-2016		23-05-2016		24-05-2016	
	NMVP	OPS	NMVP	OPS	NMVP	OPS	NMVP	OPS
Departure - Others	25420	24934	27829	27278	30668	30033	30161	29589
Arrival - Others	24069	23598	26415	25890	29334	28721	28787	28241
Arrival - 4 Airports	1351	1336	1414	1388	1334	1312	1374	1348
Departure - 4 Airports	1445	1420	1582	1553	1508	1455	1499	1477
Arrival - Others	1334	1311	1436	1407	1347	1296	1335	1313
Arrival - 4 Airports	111	109	146	146	161	159	164	164
Grand Total	26865	26354	29411	28831	32176	31488	31660	31066
ARRIVALS	21-05-2016		22-05-2016		23-05-2016		24-05-2016	
	NMVP	OPS	NMVP	OPS	NMVP	OPS	NMVP	OPS
Arrival - Others	25403	24909	27851	27297	30681	30017	30122	29554
Departure - Others	24069	23598	26415	25890	29334	28721	28787	28241
Departure - 4 Airports	1334	1311	1436	1407	1347	1296	1335	1313
Arrival - 4 Airports	1462	1445	1560	1534	1495	1471	1538	1512
Departure - Others	1351	1336	1414	1388	1334	1312	1374	1348
Departure - 4 Airports	111	109	146	146	161	159	164	164
Grand Total	26865	26354	29411	28831	32176	31488	31660	31066

Table 29: Flight Composition

	21-May-2016	22-May-2016	23-May-2016	24-May-2016	28-Jun-2016	29-Jun-2016
% Flights departing from and landing at the 4 APT Global % (=out of all day traffic)	0,41%	0,50%	0,50%	0,52%	0,52%	0,53%
% Flights departing from the 4 APT and landing at another APT Global % (=out of all day traffic)	4,97%	4,88%	4,19%	4,22%	4,56%	4,39%
% Flights departing from another APT and landing at the 4 APT Global % (=out of all day traffic)	5,03%	4,81%	4,15%	4,34%	4,47%	4,45%
% Flights departing from the 4 APT and landing at another APT Local % (=out of the departure traffic of the 4 APT)	92,32%	90,77%	89,32%	89,06%	89,72%	89,20%
% Flights departing from another APT and landing at the 4 APT Local % (=out of the arrival traffic of the 4 APT)	92,41%	90,64%	89,23%	89,34%	89,51%	89,33%

Table 30: Flight Composition %

6.4.3.3 Predictability Results

6.4.3.3.1 TTOT versus ATOT: AOP-NOP vs. FPL

The following graphs apply to the 4 airports for the day:

- In period 1: 21,22,23,24 May and
- In period 2: 28, 29 June

Graphs provide the evolution of TTOT vs ATOT by calculating the difference of **E**stimated or **T**arget **T**ake-off **T**imes minus **A**ctual **T**imes. The two sources that are compared are the VP749 logic (TTOT – ATOT) and the flight plan data (EOBT +taxi) - ATOT)

- The X axis is the time horizon that starts at -500 min and ends at 0 (at ATOT or actual take off). TTOT is the best TTOT available at a given time; that is; either TSAT from -240 min onwards and TOBT when earlier than -240 min.
- NOISE.-The effect of applying the ATOT noise or departure noise is mainly to shift both curves by 2min, decreasing the predictability accordingly (by 2min).
- Since both curves are affected in very similar way, we consider that conclusions are applicable and/or transposable; that is; the ATOTs calculated by ETFMS corresponding to Tact-activated Take-off Times.

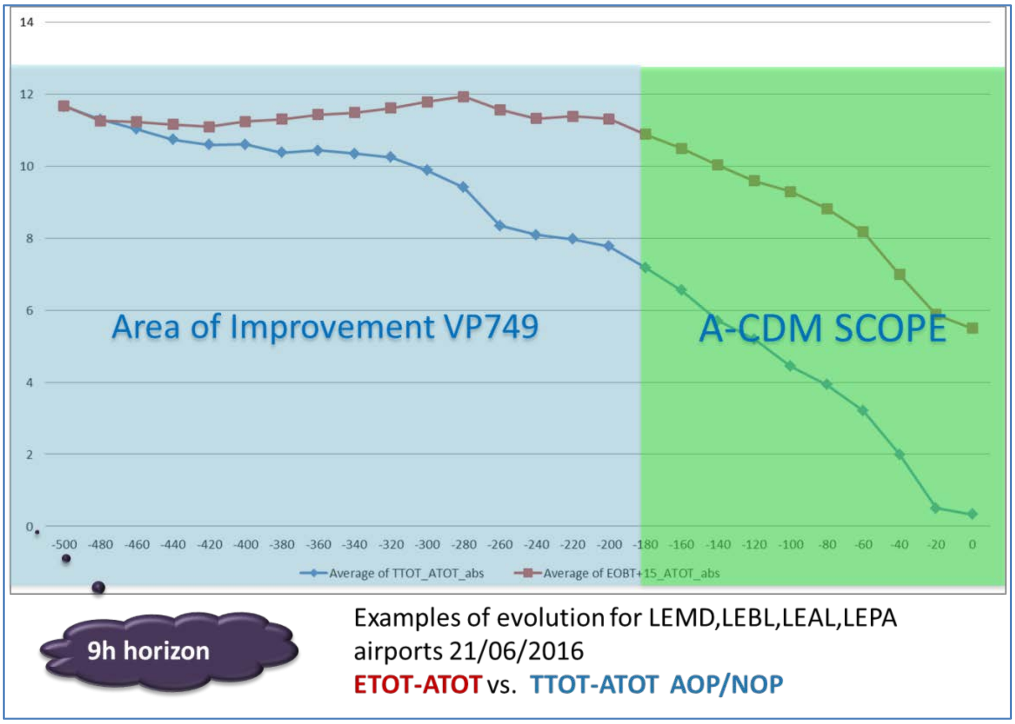


Figure 37: Predictability ALL TTOT→ATOT

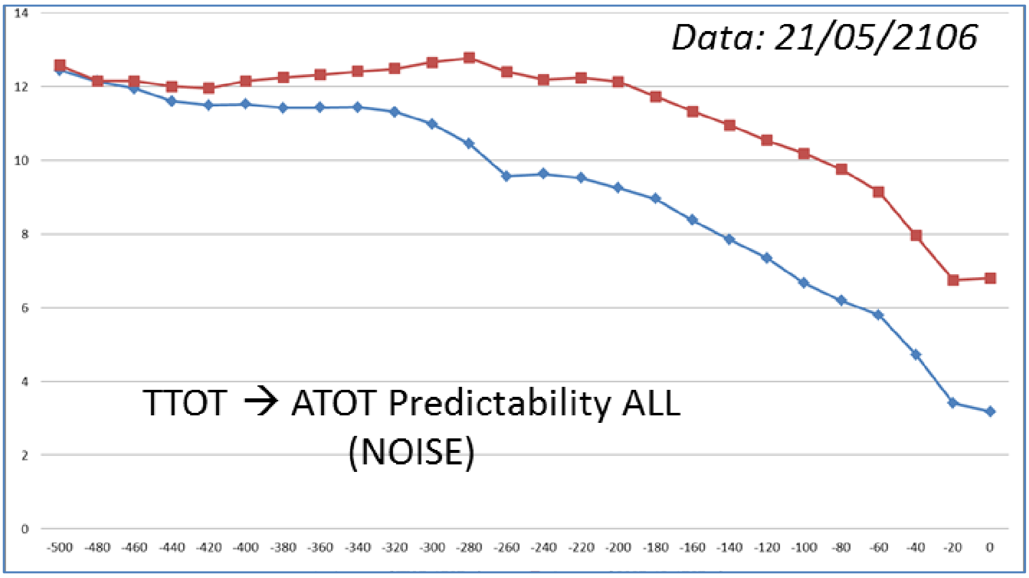


Figure 38: Predictability ALL TTOT→ATOT (NOISE)

The results and analysis are based on the ATOT without noise that is the ATOT calculated by ETFMS corresponding to the Tact-activated

The table gain TTOT vs. EOBT plus taxi time compiles the results of every day for the two periods. It shows the gain in minutes of the average TTOT vs. average EOBT plus taxi-in the different horizon brackets

	Horizon	9h->8h	8h->6h	6h->3h	3h->1h	1h->TO
21-05-2016	EOBT+15 inaccuracy	13,0	11,7	12,0	9,4	6,3
	TTOT inaccuracy	14,8	12,8	10,5	5,9	1,6
	Gain TTOT vs EOBT+15	-1,8	-1,1	**1,5**	**3,5**	**4,7**
22-05-2016	EOBT+15 inaccuracy	18,2	18,1	17,6	14,9	8,9
	TTOT inaccuracy	18,8	17,1	13,6	7,7	2,2
	Gain TTOT vs EOBT+15	-0,6	1,0	**4,0**	**7,2**	**6,7**
23-05-2016	EOBT+15 inaccuracy	11,9	12,5	12,6	10,8	6,4
	TTOT inaccuracy	12,6	12,3	10,1	5,7	1,7
	Gain TTOT vs EOBT+15	-0,7	0,2	**2,5**	**5,1**	**4,7**
24-05-2016	EOBT+15 inaccuracy	9,6	9,8	10,5	9,0	6,5
	TTOT inaccuracy	10,6	9,9	8,4	4,5	1,2
	Gain TTOT vs EOBT+15	-1,0	-0,1	**2,1**	**4,5**	**5,3**
28-05-2016	EOBT+15 inaccuracy	65,2	60,6	57,0	53,0	38,8
	TTOT inaccuracy	48,3	42,1	28,3	15,1	4,8
	Gain TTOT vs EOBT+15	**16,9**	**18,5**	**28,7**	**37,9**	**34,0**
29-05-2016	EOBT+15 inaccuracy	22,5	21,8	22,0	19,5	13,3
	TTOT inaccuracy	22,0	20,8	16,0	10,0	4,2
	Gain TTOT vs EOBT+15	**0,5**	**1,0**	**6,0**	**9,5**	**9,1**

Table 31: Gain TTOT vs. EBOT+TAXI

We observe (excluding the shaded area*) that as from 9 hours before the provided predictability by the AOP in VP749 is better than the predictability based on flight plan data. The gain increases steadily the closer it gets to take off. For normal traffic days there is an average gain of over 1, 5 min in the brackets: -6h to -3h that increases to over 4,3min and gets to 5min – in the last bracket -1h to 0h

In the heavy traffic days, the predictability gain is higher; the worse regulated traffic on the day, the better the gain. For example in –6h to -3h brackets the gain is 4 min, 28 min and 16 min for the 22 May, 28 and 29 June respectably. The gain reaches its maximum in the next bracket -3h to -1h with an average of over 18min. In the last hour the gain remains high but is a little lower due to some flight plan updates that correct the EOBT in the last hour before execution. This effect is more visible in heavy traffic than in normal traffic days.

As a whole the better predictability of VP749 is clearly explained by the rolling exchange of DPI that provide the most up-to-date take off times according to the (heavy) traffic situation; unlike the flight plan messages, updating the EOBT that are sent late or very late and not for all flights.

6.4.3.3.2 Predictability per Airport

The Graphs shown in the following picture shows the predictability gain of using Target (calculated) Times versus Estimated Times based on Flight Plan data. Both Global and specific Airport predictability gains are shown

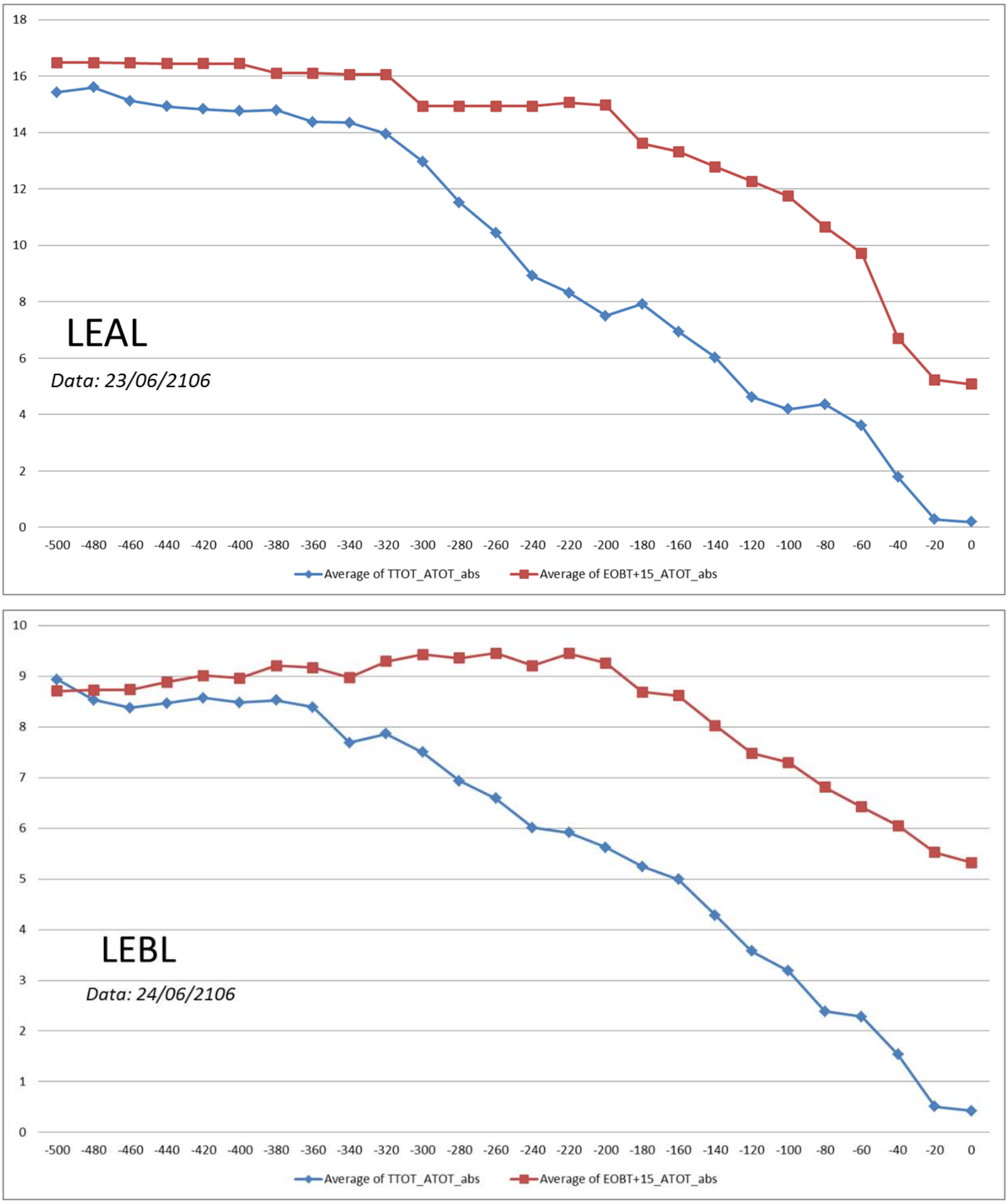


Figure 39: Predictability TTOT - ATOT (LEAL; LEBL)

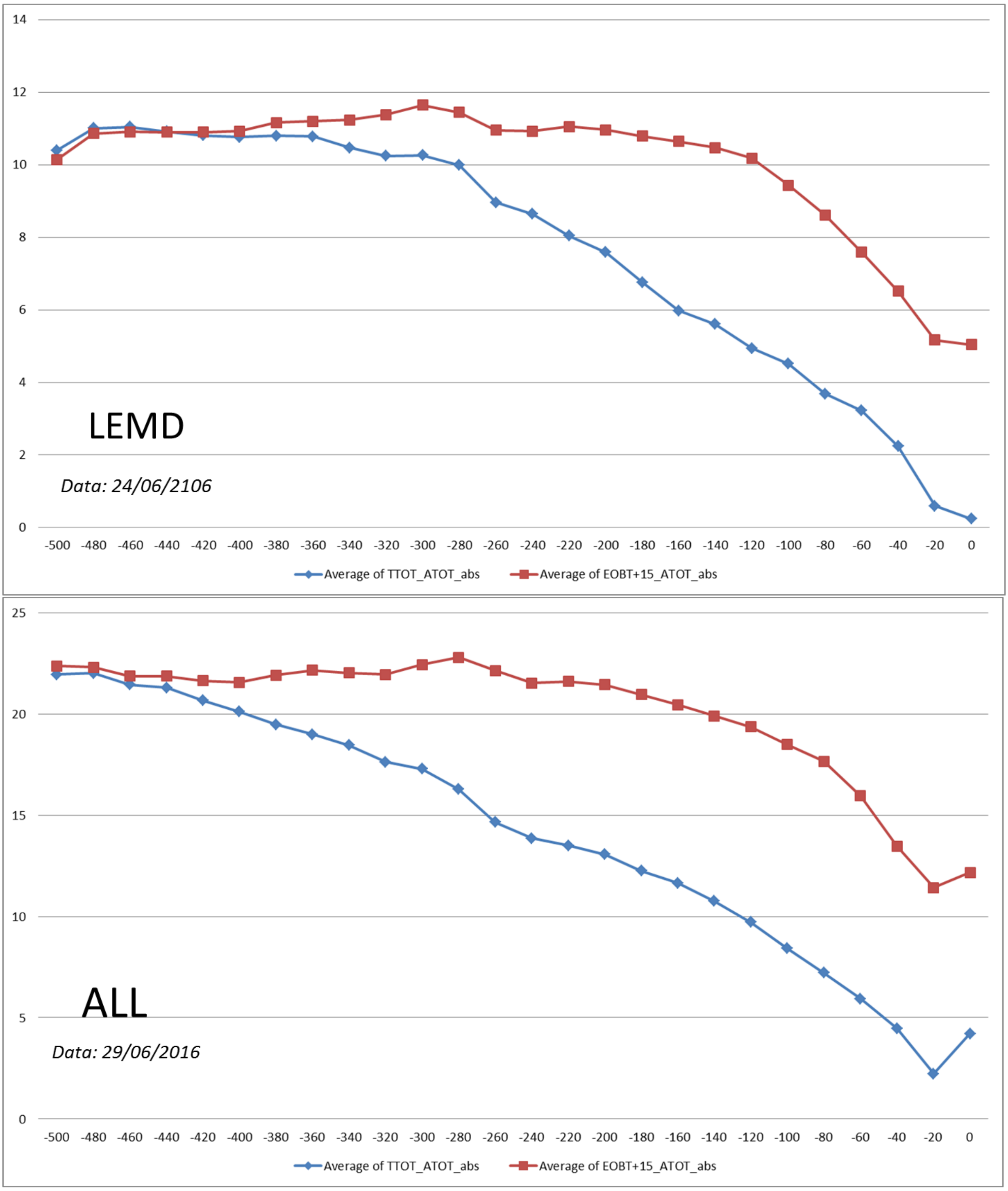


Figure 40: Predictability TTOT - ATOT (LMD; ALL)

6.4.3.3.3 TOBT / TSAT Predictability

The following graphs provide the evolution of the TOBT and TSAT (plus taxi) towards the actual time. Both TOBT and TSAT are values calculated with AOP-NOP Int. -VP749 logic

The first two graphs apply to all (4) airports in different days. Also a couple of graphs are included as examples for a given airport. In addition, zoomed graphs show the period from -260 min for a better appreciation of the differences between TOBT and TSAT.

- The X axe is the time horizon that starts at -1340 min and ends at 0 (at ATOT or actual take off). TOBT is provided by AOP some 23h before ATOT and TSAT4h (240min) before. The TSAT values shown in the graph before -240min. correspond to flights that were delayed (the start of sequence and first TSAT sent is at ETOT -240min but delayed flights stay in sequence longer than 240 min)
- The TOBT and TSAT comparative table compiles the results of every day for the two periods. It shows the inaccuracy in minutes of the TOBT and TSAT in the different horizon brackets. A maximum and minimum value is provided per time bracket.
- Note that compared to graphs and table of TTOT/TOBT+TAXI, the TOBT/TSAT graphs do not include taxi.

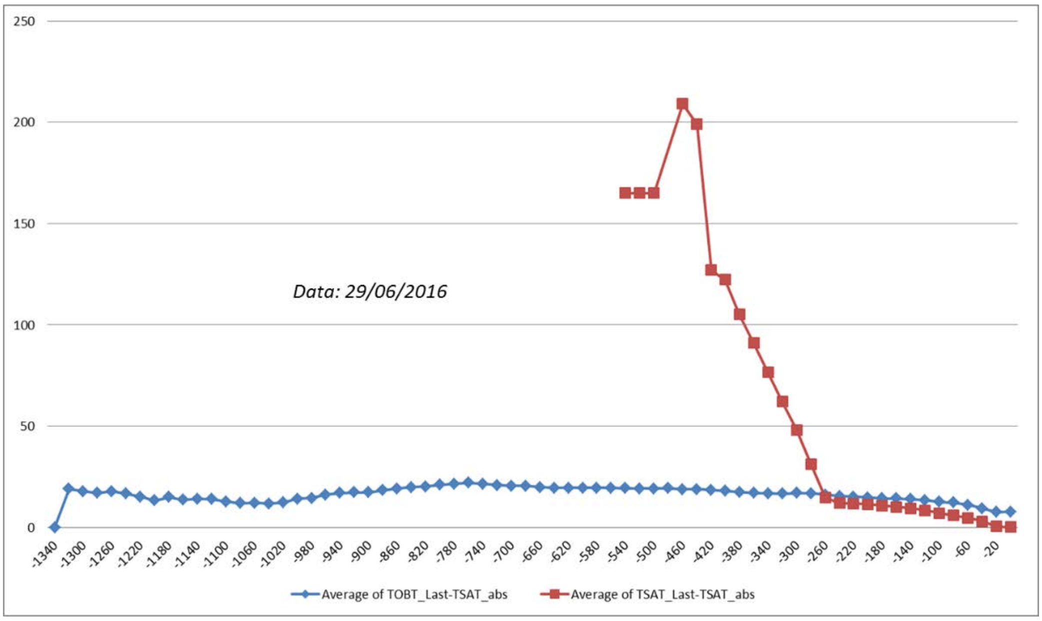
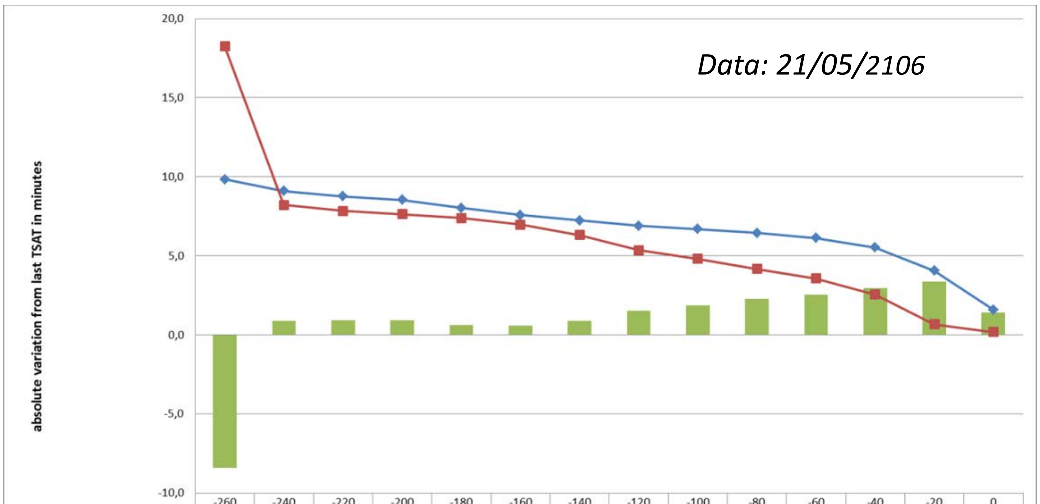


Figure 41: Predictability ALL TOBT / TSAT vs last TSAT



	-260	-240	-220	-200	-180	-160	-140	-120	-100	-80	-60	-40	-20	0
Average of Gain	-8,4	0,9	0,9	0,9	0,6	0,6	0,9	1,5	1,9	2,3	2,6	3,0	3,4	1,4
Average of TOBTvslastTSAT	9,8	9,1	8,8	8,5	8,0	7,6	7,2	6,9	6,7	6,5	6,1	5,5	4,1	1,6
Average of TSATvslastTSAT	18,2	8,2	7,8	7,6	7,4	7,0	6,3	5,4	4,8	4,2	3,6	2,5	0,7	0,2

Figure 42: Predictability ALLTOBT / TSAT vs last TSAT (-260 →0)

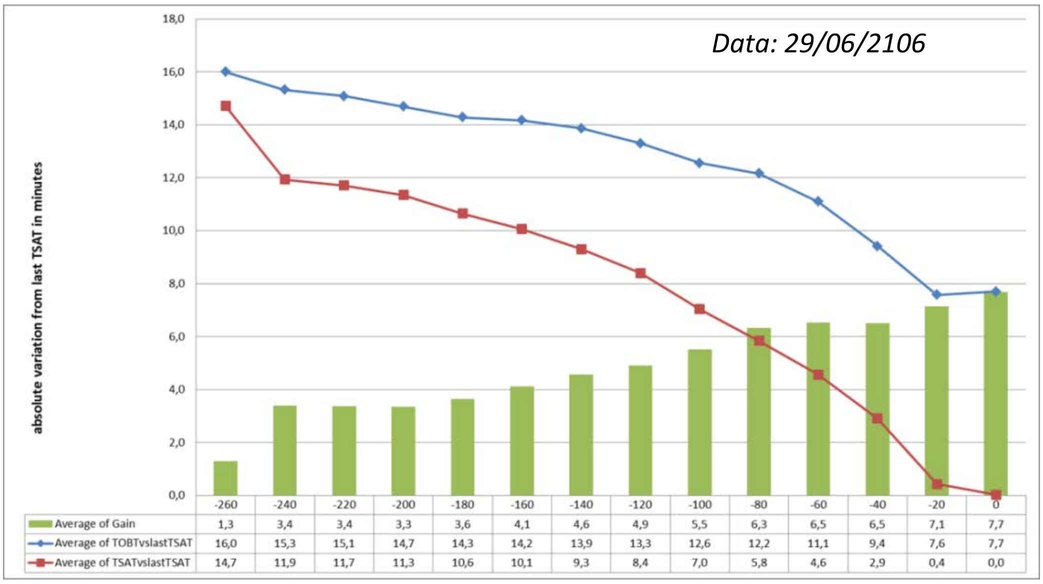


Figure 43**:** Predictability ALL TOBT / TSAT vs last TSAT (-260 → 0)

			18h->15h	15h->12h	12h->9h	9h->6h	6h->3h	3h->1h	1h->TO
21-06-2016	TOBT vs last TSAT	Min	10,4	10,1	10,4	10,0	8,0	6,1	1,6
		Max	12,2	10,8	11,1	10,9	10,0	7,6	5,5
	TSAT vs last TSAT	Min						3,6	0,2
		Max						7,0	2,5
22-06-2016	TOBT vs last TSAT	Min	25,5	20,6	18,0	15,7	10,9	6,9	4,3
		Max	37,2	25,0	19,3	18,8	15,3	10,3	6,0
	TSAT vs last TSAT	Min						4,8	0,3
		Max						9,0	3,2
23-06-2016	TOBT vs last TSAT	Min	14,2	13,0	12,2	11,1	7,9	5,3	2,2
		Max	16,8	14,7	14,3	12,4	10,9	7,4	4,5
	TSAT vs last TSAT	Min						3,3	0,0
		Max						6,5	2,3
24-06-2016	TOBT vs last TSAT	Min	8,9	9,1	8,5	8,1	6,6	4,2	3,0
		Max	12,0	9,7	9,0	8,6	8,4	6,1	3,6
	TSAT vs last TSAT	Min						2,5	0,1
		Max						5,3	1,6
28-06-2016	TOBT vs last TSAT	Min	57,8	55,3	47,6	37,7	36,2	34,2	24,9
		Max	67,3	63,5	59,3	48,1	38,6	38,8	30,1
	TSAT vs last TSAT	Min						9,8	4,9
		Max						18,2	8,1
29-06-2016	TOBT vs last TSAT	Min	11,7	17,3	19,4	17,4	14,3	11,1	7,6
		Max	17,2	22,0	20,8	19,3	17,0	14,2	9,4
	TSAT vs last TSAT	Min						4,6	0,0
		Max						10,1	2,9

Table 32**:** TOBT and TSAT comparison

Observation of TOBT / TSAT predictability indicates:

- Regarding the convergence of TOBT and TSAT, both curves TOBT and TSAT (*as from -4h see previous remark about earlier than 240min*) converge steadily to last TSAT value but TOBT keeps a gap at the end as TOBT is not necessarily updated unlike TSAT is in sequence.
- For normal traffic days the inaccuracy of TOBT is about 12 min between -18h and -16 h and 8 min between -6h and -3 h. The TSAT that starts at -4h reduces the inaccuracy to less than 5min in the period to 3h to -1h.
- For heavy traffic days, 22 May and 29 June, the TOBT inaccuracy is higher i.e.; about 20min between -18h and -16h and 14 min between -6 and -3 h. June 28th was exceptionally a bad day with inaccuracy about 1h between -18h and -16h.

- These results are positive and should be considered together with results of TTOT vs. EOBT +taxi to see the comparison with current situation for non A-CDM airports.
- Regarding the predictability TOBT vs, TSAT,[1] we can conclude that TSAT provides systematically better predictability than TOBT and that the start of sequence earlier (from an avg. -40 min in current A-CDM up to -240min) improves the predictability in the associated extended period – i.e. from -240 min. This applies to normal or heavy traffic days with the remark that the variability between the maximum and minimum TSAT values is higher in the heavy traffic days. Also the exceptionally heavy traffic on the 28 June creates a remaining lack of accuracy of about 5min in the last hour compared to 1 to 2 min for all other days.
- Flights that are delayed remain in sequence longer and if their delay is significant, it creates a noticeable delta between the first and last estimation. This explains the hump shown in the period -240 to -460 in the graph. This is in other words an indication of significant variability on the TSAT allocated to those flights. It is recommended to address this variability issue (see recommendations)

6.4.3.3.4 Traffic Count Predictability

The graph compares OPS and VP749, both supported with historical data in the period when their flight plans have not yet arrived (from -24h to – 3.15 min). In addition, as VP749 has the AOP-NOP data updates it is expected to provide some predictability gain.

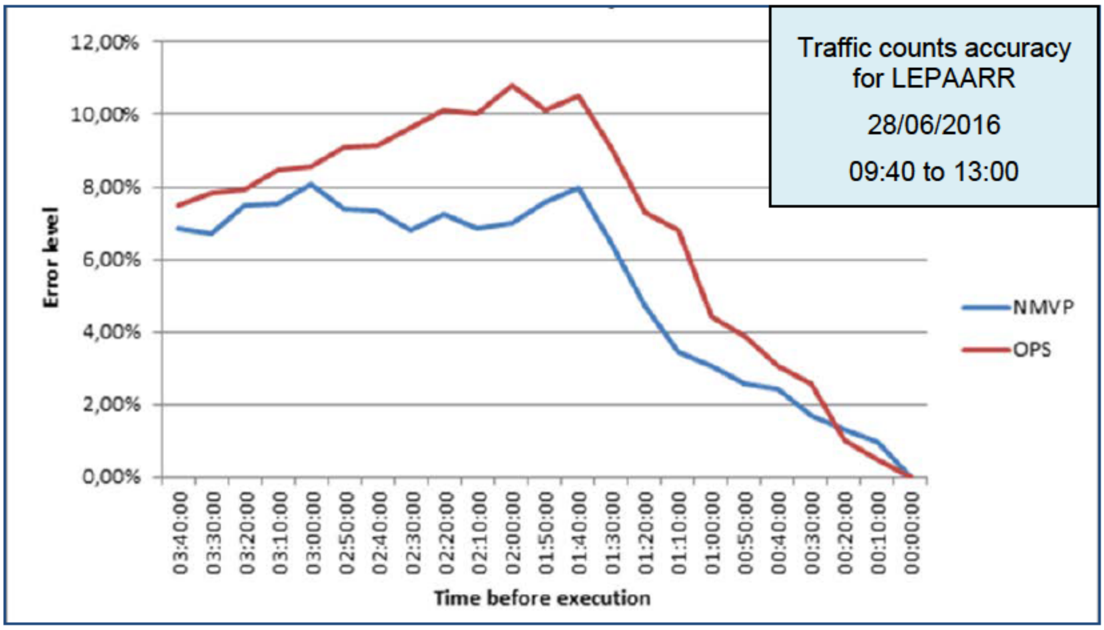


Figure 44: Traffic Count Predictability for LEPAARR

[1] TSAT is calculated by the departure manager based on aircraft TOBTs, existing departure regulations (CTOTs) and departure runway situation; that is; aircraft are taken out from the pre-departure to the runway departure sequence, therefore TSAT is more accurate by process nature *(TWR reply to TOBT proposal)*

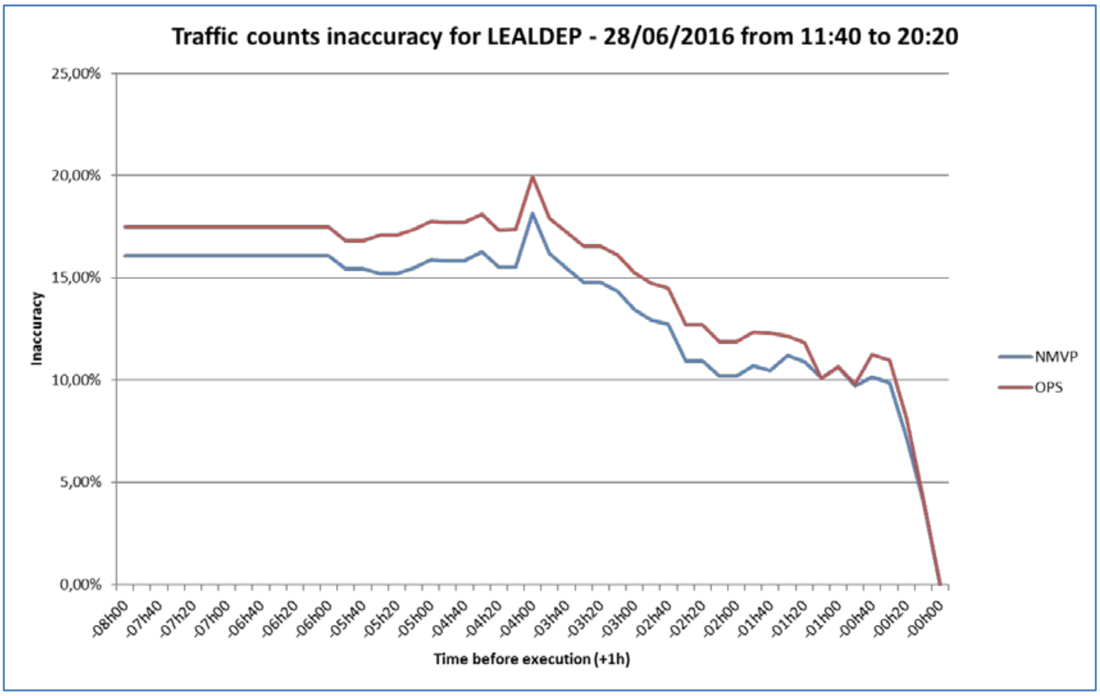


Figure 45: Traffic Count Predictability for LEALDEP

Graphs provide the evolution of error or inaccuracy in the traffic count predictions vs the final count value. The X axis is the time horizon or time before execution that starts at -500 min and ends at 0 (at ATOT or actual take off)

Results were not conclusive. It is understood to be due to the effect execution that plays a big role as around 90% of the traffic in the airport counts is partially outside the 4 participating airports(departing but not landing or landing but not departing). This traffic is affected by FSA and or CPR that alter/correct accordingly the CTFM profile after departure and these profiles are used to build the final count value.

6.4.3.3.5 Predictability TTOT→ATOT: AOP-NOP vs. CDM

The following graphs apply to LEBL airport for some days in period 1: 22, 24 May and period 2: 29 June

- The graph provides the evolution of TTOT vs ATOT by calculating the difference of the estimated or target take-off time minus actual time The three sources that are compared are the VP749 logic: (TTOT –ATOT), the CDM data (TTOT - ATOT) and the FPL (EOBT+15min taxi)
- The X axis is the time horizon that starts at -180 min and ends at 0 (at ATOT or actual take off). TTOT is the direct value provided by CDM and TTOT in AOP-NOP is the TSAT plus the corresponding taxi provided by AOP-NOP DPIs

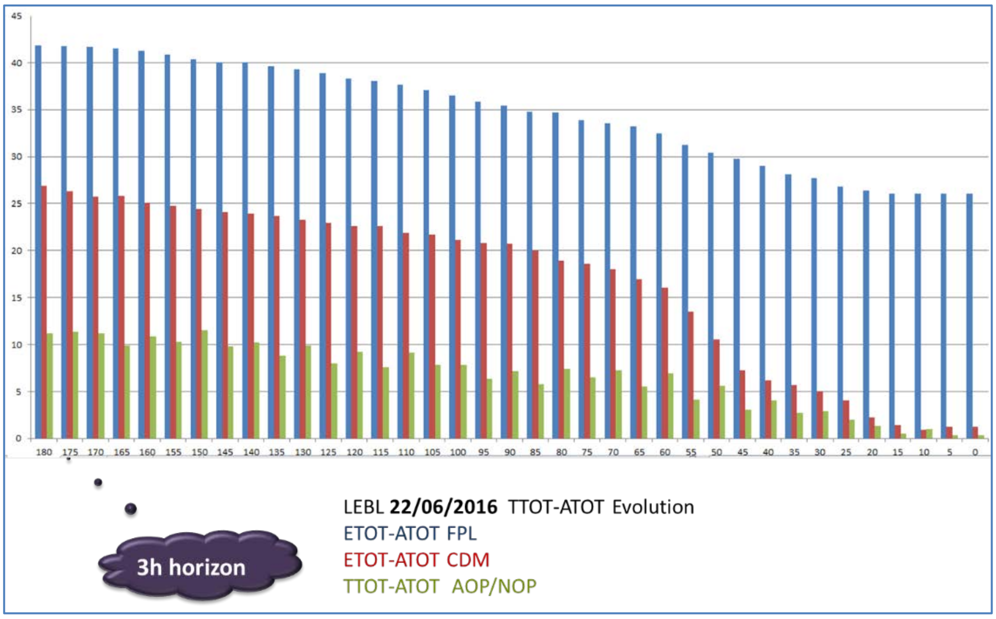


Figure 46: AOP-NOP vs. CDM LEBL 22/06/2016

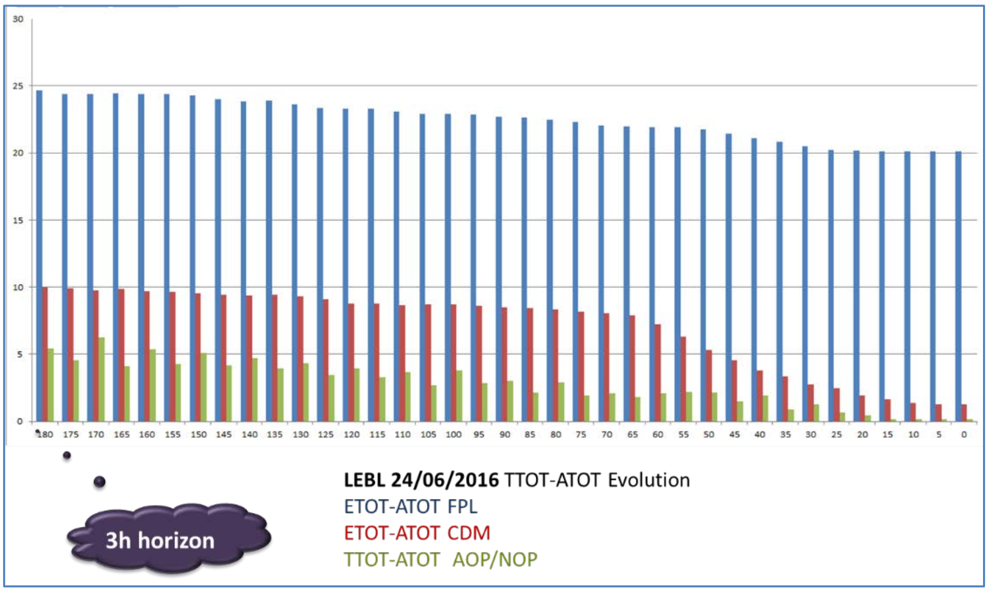


Figure 47: AOP-NOP vs. CDM LEBL 24/06/2016

We observe that for LEBL, there is a significant gain between the AOP-NOP and CDM for normal as for heavy traffic days. The gain is greater for heavy traffic days

It would prove that the rolling exchange of AOP/NOP in the 3h period increases the predictability compare to the current CDM. Hence the gain it is explained by two elements:

- The full use of DPI exchange as from -3h

  Note that the exchange in CDM even if it is possible as from 3h before with Early DPI, it is not always used as it is the case for Barcelona airport.

- The integration of ELDT provided by NOP to adapt the TTOT (not in CDM concept)

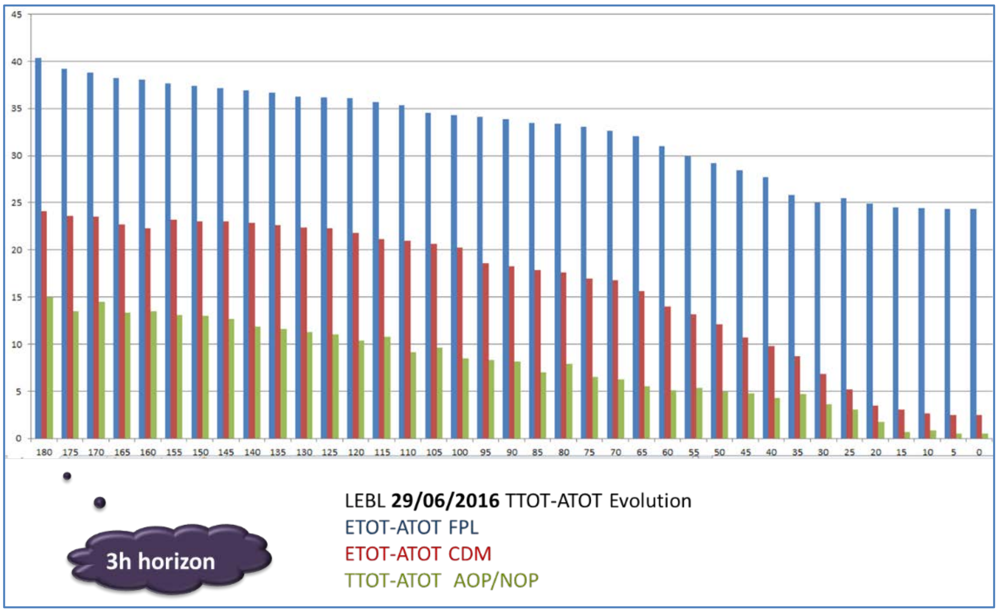


Figure 48: AOP-NOP vs. CDM LEBL 29/06/2016

This gain has only been measured as an indication of how new logic compares to current logic. These results have not been extended to Madrid Barajas (LEMD) as the intention is not to have a formal conclusion in this area of comparison AOP/NOP with CDM as we realise that much more data would need to be analysed. We see however that AOP/NOP represents an enhanced, next step of CDM

6.4.3.4 Number of DPIs

It is higher, as expected, than in OPS for LEBL and LEMD, A-CDM airports following the AOP-NOP rolling concept (longer horizon up to -24h, more dynamic and more data to exchange)

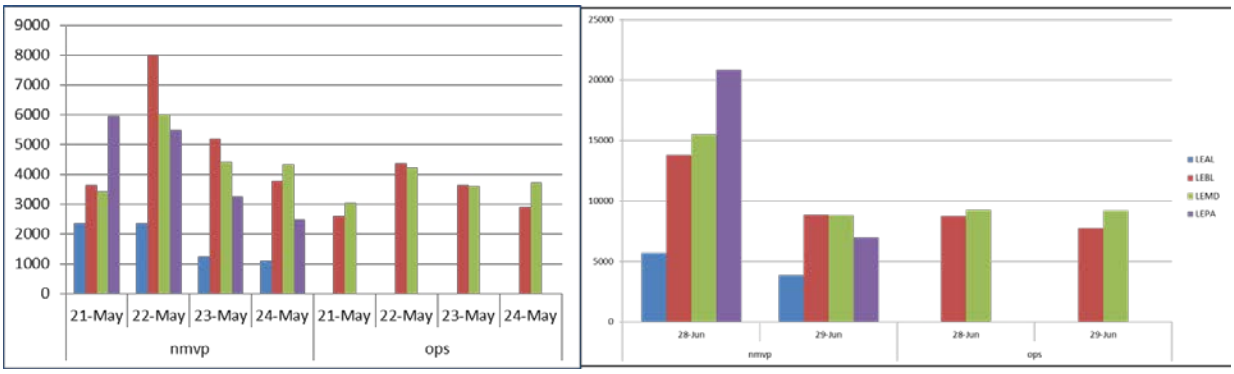


Figure 49: Number of DPIs

6.4.3.5 Multi-Airport AOP-NOP Integration

This analysis focuses on monitoring the evolution of a specific aircraft performing a continuous series of flights between the four participant airports to assess the impact on predictability and accuracy when an interrupted information exchange between the AOP (airport) and the NOP (network) is achieved. The assessment is event triggered; each time an aircraft, performing flights between the participant airports departs, a new assessment of its expected departure times for its next daily planned airport-itinerary, is performed. This is known in this analysis as “Number of Jumps Forward”.

When addressing number of jumps performed by one aircraft, jump number zero corresponds to the flight that is currently being executed; jump 1 corresponds to the next airport that aircraft is expected to depart from, jump 2 to the following airport and so on.

The total sample is composed of 1621 flights, which have performed during one trial day at least two jumps between any of the four participant Airports. The analysis has been limited to 540 minutes prior to departure and 5 jumps, as the amount of cases available beyond those numbers are not representative enough

The following figure illustrates the total number of cases assessed for each jump-forward during the trials

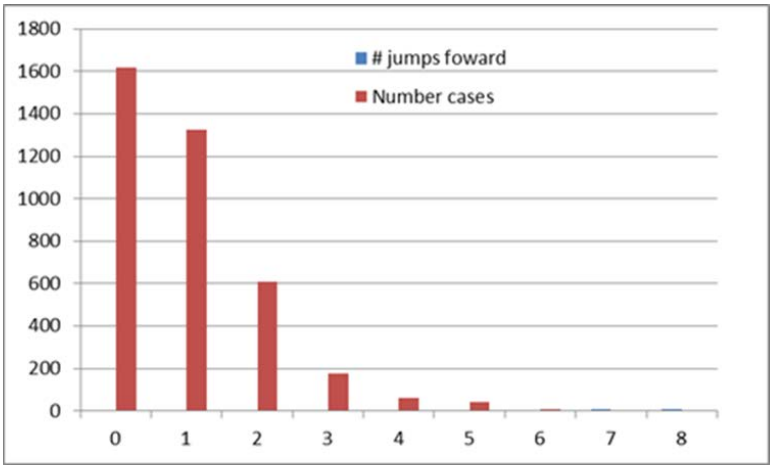


Figure 50: Number of Cases per Jump Forward

The two following figures show Flights assessed per Airline and their Airport Destinations

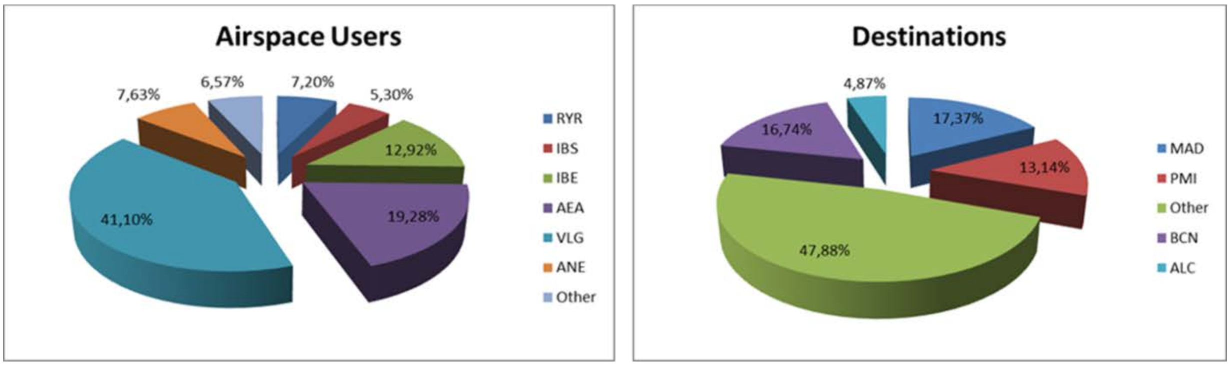


Figure 51: Airspaces Users and their Airport Destinations

The following graphs and their associated tables show both;

- Average accuracy of absolute deviation value of (TTOT-ATOT) versus (ETOT-ATO)
- Predictability measured as the standard deviation of (TTOT-ATOT) versus (ETOT-ATO)

For each of the above metrics, graphs are provided to show improvement in Target Time assessment referenced to the anticipation of the assessment in minutes and the number of jumps forwards

Graphs present TTOT accuracy of aircraft departing from the following jumps to come (1 to 4) measured at the time flights take-off from a previous airport (jump 0).

Time deviation results:

The two tables below show the data obtained for TTOT and ETOT time deviations as a function of time anticipation (Table 33) and number of jumps forward (Table 34)

Sample: 1621 flights			
Time to Take-off	Avg ABS (TTOT-ATOT)	Avg ABS (ETOT-ATOT)	% Improvement
-540	28,76	33,26	13,53%
-510	24,92	31,38	20,59%
-480	31,03	29,50	-5,19%
-450	15,82	20,73	23,68%
-420	19,53	22,38	12,75%
-390	27,55	43,82	37,14%
-360	24,45	31,93	23,43%
-330	16,78	25,78	34,92%
-300	15,62	26,01	39,92%
-270	13,34	23,99	44,41%
-240	16,46	28,38	41,99%
-210	9,78	18,11	46,00%
-180	11,62	19,54	40,54%
-150	8,49	19,43	56,34%
-120	8,36	18,32	54,37%
-90	7,06	21,36	66,97%
0	4,36	9,04	51,80%

Table 33: Time accuracy of TTOT vs. ETOT deviations depending on Anticipation

# Jumps foward	Avg ABS(TTOT-ATOT)	Avg ABS(ETOT-ATOT)	% Improvement
0 (Actual)	4,48	9,03	50,40%
1	10,12	19,63	48,46%
2	14,37	24,54	41,43%
3	23,58	33,48	29,56%
4	30,80	34,10	9,67%
5	35,32	35,39	0,20%

Table 34: Time deviation accuracy depending on Number of Jumps Forward

The two following graphs show the time accuracy of TTOT and ETOT deviations depending on time anticipation of their assessment in the multi-airport approach: in average absolute deviation values (Figure **52**) and improvement percentage (**Figure 53**)

They present in a graphic way the data from the two tables above (Table 33 and Table 34); i.e.:

- Only 1621 flights considered, performed by aircraft arriving and departing from at least two participant airports (LEMD, LEBL, LEAL, LEPA)
- Anticipation in minutes indicates when the TTOT has been made; the greater the anticipation, the greater the number of jumps; e.g.; 540 minutes before take-off indicates that the TTOT assessment has been done for an aircraft departing from an airport 5 jumps ahead from its current position (jump 0)

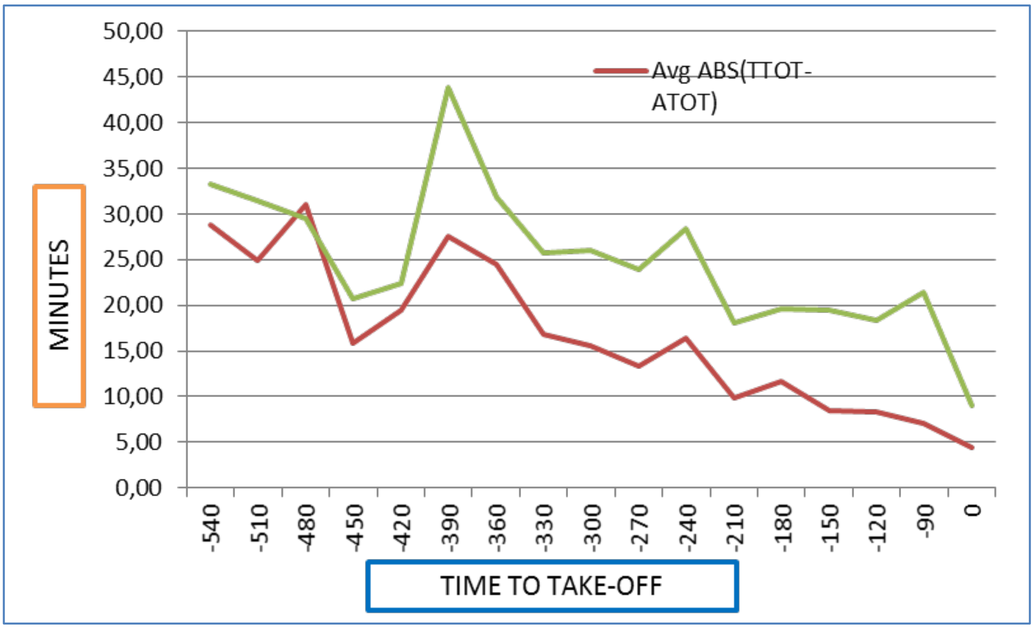


Figure 52**:** Time Accuracy comparison depending on anticipation

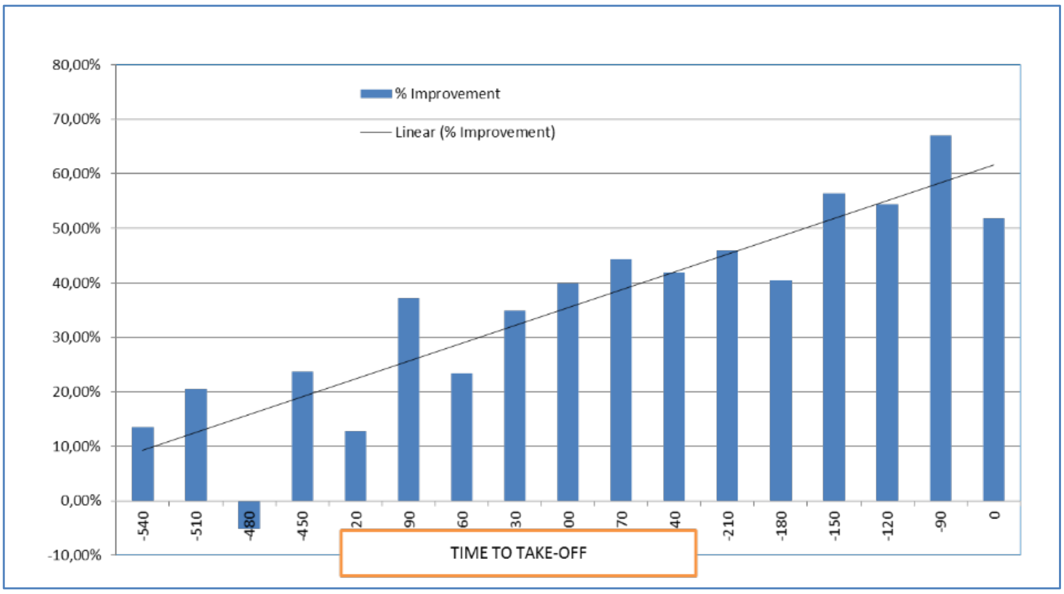


Figure 53: Improvement percentage depending on anticipation

Presenting only anticipation in minutes is not enough as minutes and number of jumps may differ from one aircraft to another, due to:

- Flying times between airports are different
- Aircraft daily itineraries are also different, some including departing towards and returning from different mid-range destinations (European Airports)

The two following graphs show the time accuracy of TTOT and ETOT deviations depending on the number of jumps forward of the assessment: in average absolute deviation values and improvement percentage.

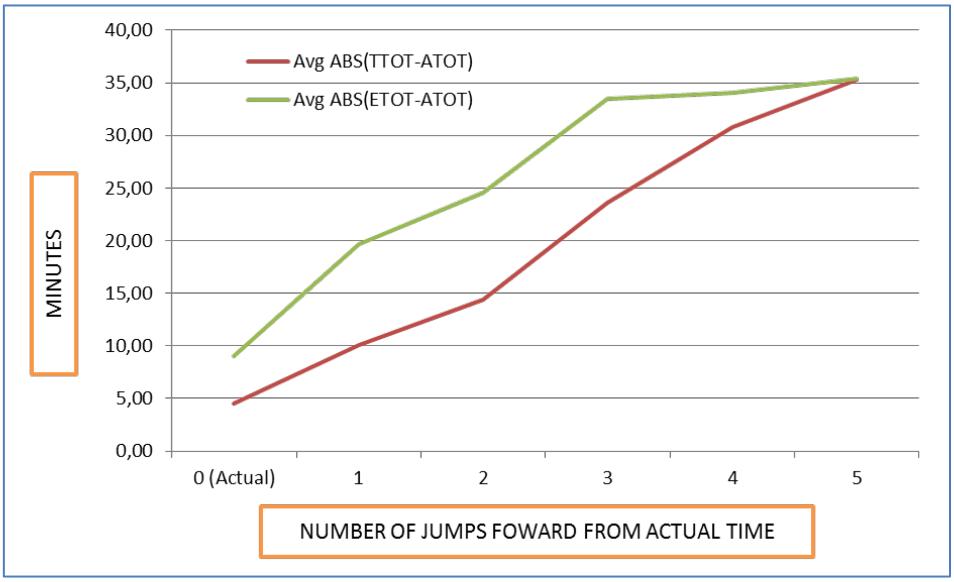


Figure 54: Time Accuracy comparison depending on number of jumps forward

Time accuracy improvement, based on number of jumps forward ranges from 48% for the first jump (departing from the next airport) to 9,67% for aircraft departing from jump 4 (4 airports forward)

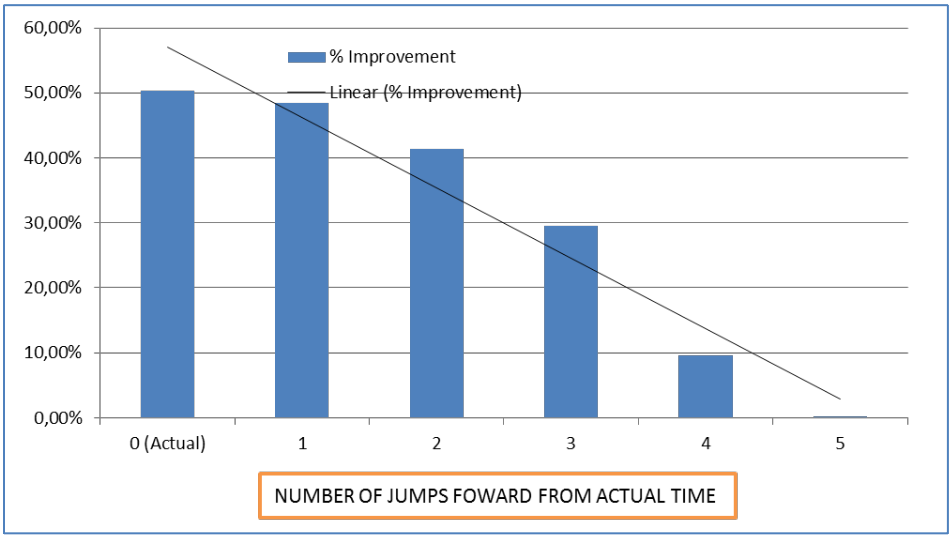


Figure 55**:** Improvement percentage depending on number of jumps forward

Predictability: Standard deviation results

As already stated data is also presented in terms of Standard deviation of (TTOT-ATOT) versus (ETOT-ATO.

The two tables below show the data obtained for TTOT versus ETOT predictability measured as their standard deviation from the operational ATOT as a function of time anticipation (Table **35**) and number of jumps forward (Table **36**)

Sample: 1621 flights			
Time to Take-off	Devst(ABS(TTOT-ATOT))	Devst(ABS(TTOT-ATOT))	% Improvement
-540	22,70	36,15	37,21%
-510	35,39	40,69	13,04%
-480	35,79	31,62	-13,20%
-450	14,15	18,61	23,95%
-420	18,08	23,37	22,65%
-390	33,59	51,51	34,78%
-360	24,90	39,15	36,40%
-330	15,91	27,55	42,26%
-300	19,36	28,70	32,57%
-270	21,49	31,35	31,46%
-240	33,18	31,85	-4,15%
-210	12,49	20,77	39,84%
-180	13,94	19,95	30,12%
-150	10,42	23,20	55,08%
-120	18,88	21,90	13,76%
-90	8,14	17,64	53,86%
0	6,08	10,12	39,91%

Table 35**:** Predictability of TTOT vs. ETOT deviations depending on Anticipation

# Jumps foward	Devst(ABS(TTOT-ATOT))	Devst(ABS(TTOT-ATOT))	% Improvement
0 (Actual)	7,24	10,12	28,42%
1	16,81	24,02	30,02%
2	23,73	28,52	16,77%
3	28,71	36,89	22,18%
4	29,83	36,48	18,24%
5	32,99	37,24	11,40%

Table 36**:** Predictability depending on Number of Jumps Forward

The two following graphs show predictability of TTOT versus ETOT deviations depending on time anticipation of their assessment, measured as their standard deviation from operational ATOTs (Figure **56**) and improvement percentage (Figure **57)**

As already done for graphs presenting average accuracy of absolute deviations, these new graphs present the same raw data contained in the above tables in terms of standard deviation

Table 35 contains standard deviation values depending on time anticipation, while Table 36 contains standard deviation values depending on number of jumps ahead of deviations

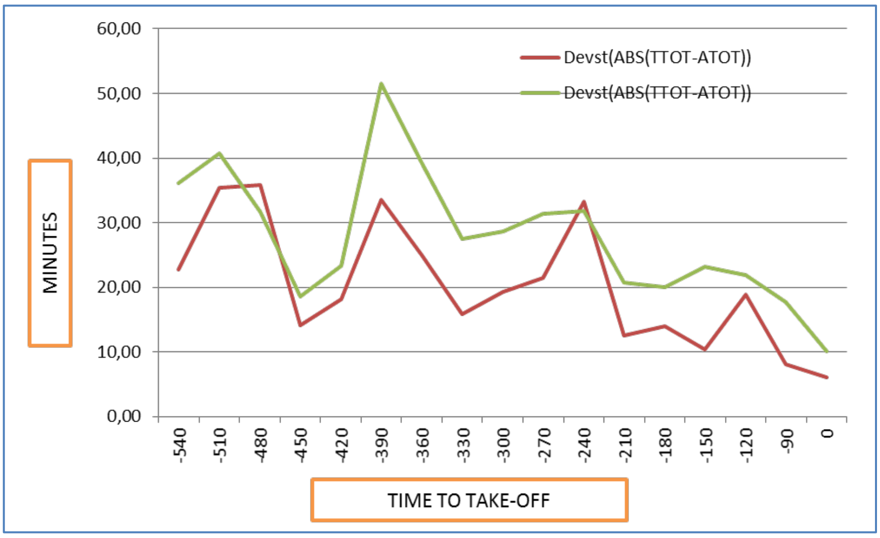


Figure 56**:** Predictability comparison depending on anticipation

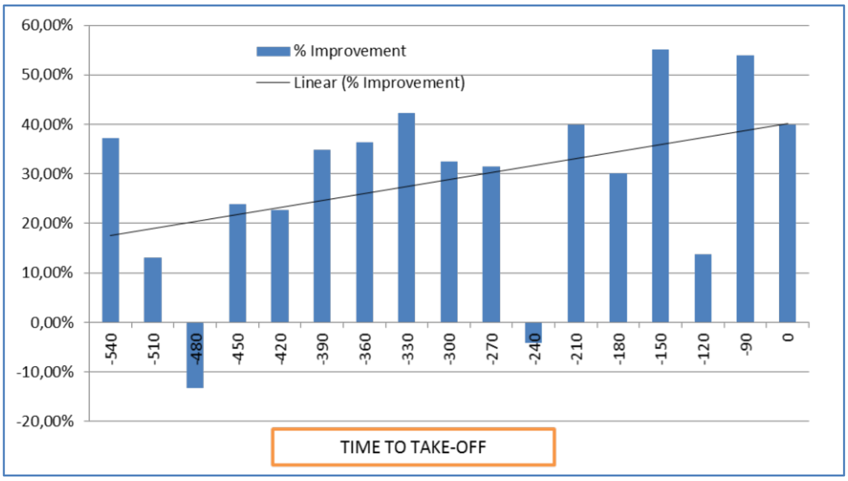


Figure 57**:** Improvement percentage depending on anticipation

The two following graphs show the predictability of TTOT and ETOT deviations depending the number of jumps forward of the assessment, measured as the standard deviation from the operational ATOT (Figure **58**) and improvement percentage (Figure **59**)

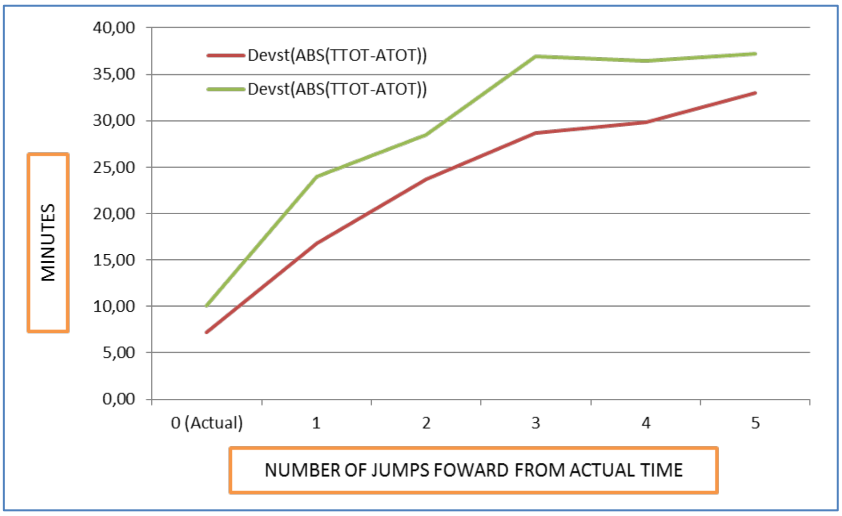


Figure 58**:** Predictability comparison depending on anticipation

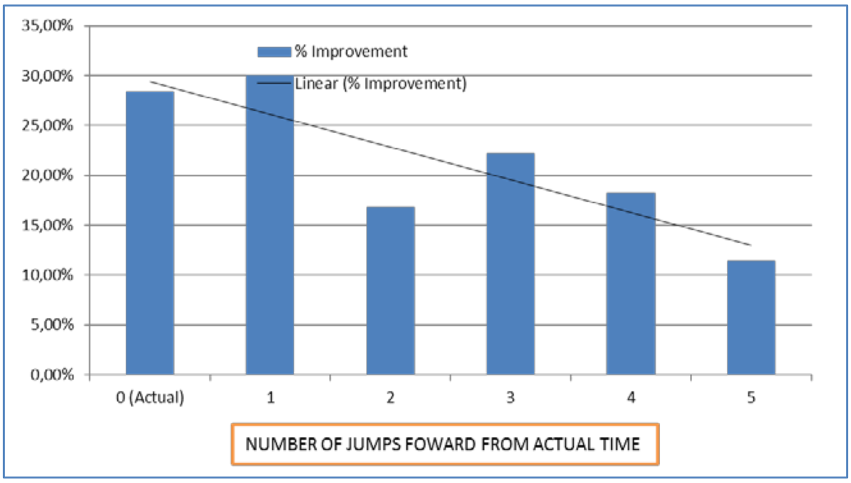


Figure 59**:** Improvement percentage depending on number of jumps forward

Predictability improvement (standard deviation), based on number of jumps forward ranges from 30% for the first jump (departing from the next airport) to 11,40% for aircraft departing from jump 5 (5 airports forward)

This multi-airport approach provides for two thirds of time a more accurate picture than the current single airport approach

6.4.3.6 Airport DCB Process Improvements

The following calculations have been done with the information available at the participant AOPs.

These preliminary results do not pretend to substitute the final result to be provided in relation with the reference scenario, but gives a rough idea about what the results would be like compared to the CASA algorithm,

A CASA solution has been "prototyped" following these (big) simplifications.

- We have supposed a first- in first- out logic (not the exact logic of CASA)
- Those flights that were in the air, regulated or close to departure where not modified (although CASA could modify the regulated ones)
- The same flight list as AIMA has been used

From Table **37** the following comparative results obtained by AIMA and CASA can be extracted:

Results AIMA versus CASA	All Cases	Last Three Cases
ATFM Total delay	-19,30%	-22,30%
Total # delayed flights	-36,64%	-46,58%
Average ATFM delay (delayed flights)	27,37%	45,44%
% arrival flights delayed (compared to schedule)	-13,16%	-21,43%
% departure flights delayed (compared to schedule)	-21,90%	-36,21%
Total arrival delayed (compared to scheduled)	0,36%	14,76%
Total departure delayed (compared to scheduled)	-33,83%	-45,00%
% flights with knock-on effect (delay produced by the measure)	-52,81%	-97,14%
Total departure knock-on effect (minutes of delayed in the departure produced by the measure)	-50,58%	-96,30%

DATA ANALYSIS	AIMA Solution								AIMA	AIMA
Date	# Flights	# delayed flights	ATFM Total Delay	ATFM Average delay	# arrival flights delayed	# departure flights delayed	Total arrival delay of delayed flights	Total departure delay of delayed flights	# delayed departures	Total AIMA departure delays
LEPA20-05-2016	94	27	506,38	18,75	17	9	380,30	123,10	4	67,40
LEMD20-05-2016	139	28	417,5	14,91	30	8	609,00	70,25	1	11,75
LEBL20-05-2016	122	52	1250,53	24,05	74	53	1586,45	1119,08	36	763,58
LEPA_2016 0517_041238	93	34	661,13	19,45	35	13	543,48	117,52	0	0,00
LEMD_2016 0511_101953	118	17	285,78	16,81	46	12	1058,50	116,48	0	0,00
LEBL_2016 0518_134314	113	27	592,87	21,96	29	12	722,50	165,48	1	13,15
Summary (all cases)	679	185	3714,19	20,08	231	107	4900,23	1711,92	42	855,88
Summary (last three cases)	324	78	1539,78	19,74	110	37	2324,48	399,48	1	13,15
DATA ANALYSIS	CASA Simulation								CASA	CASA
LEPA20-05-2016	94	59	589,33	9,99	22	15	312,87	190,70	13	137,50
LEMD20-05-2016	139	37	626,75	16,91	36	15	736,00	283,75	9	224,75
LEBL20-05-2016	122	50	1404,83	28,1	68	49	1808,38	1386,32	32	1014,37
LEPA_2016 0517_041238	93	66	809,5	12,27	48	22	558,45	306,98	19	205,00
LEMD_2016 0511_101953	118	43	465,6	10,83	55	16	1213,15	165,33	8	47,87
LEBL_2016 0518_134314	113	37	706,62	19,1	37	20	254,00	254,00	8	102,45
Summary (all cases)	679	292	4602,63	15,76	266	137	4882,85	2587,08	89	1731,93
Summary (last three cases)	324	146	1981,72	13,57	140	58	2025,60	726,32	35	355,32

Table 37: AIMA Solution versus CASA simulation Results

In summary:

- The number of flights regulated is lower with AIMA than with CASA
- Total ATFM delay is lower with AIMA than with CASA
- Average ATFM delay (for regulated flights) is bigger in AIMA than in CASA
- The number of flights arriving late is lower with AIMA than with CASA (over 20%)
- The aggregated departure delay for delayed flights (from previous leg(s)), compared to their scheduled SOBTs; i.e.; Knock-on Effect delay, is around 50% lower in AIMA than in CASA.
- The number of flights affected by the knock-on effect is more than 50% lower with AIMA than with CASA.
- Total departure delay at the next airport (the one applying the DCB measure) for flights in the DCB imbalance time frame, is more than 30% lower with AIMA than with CASA.

In general, the conclusion from the obtained results are that AIMA produces higher average arrival delays (for delayed flights) for a given measured period, but the overall aggregated delay throughout the consecutive legs is significantly lower compare to CASA.

These results are explained by the AIMA concept development, that “cherry picks” aircraft to be delayed that reduce the knock-on effect, thus improving network predictability and stability

6.4.3.6.1 Results on concept clarification

This section focusses on detailed analysis for concept and tool related validation objectives

6.4.3.6.1 Results on validation objectives related to AOP / NOP INTEGRATION

6.4.3.6.1.1 Summary of Exercise Results

The following table gives the overall results for P07-06-01 contribution to VP-749 trials

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-749 results	Validation Status Objective
OBJ-07.06.01-VALP-GEN1.0100	Any change in stakeholders operational plans can be transmitted to the NOP and the Network Plan can be updated accordingly	**CRT-07.06.01-VALP-GEN1.0106**	AOP changes produced at Airports are captured by the NMOC in Real Time and used to update the NOP accordingly.	**Mgen1.01:**Flight Data from AOP: actual and estimates times for departures and arrivals- in and off block times , take-off and landing, taxi times. ATV (Aircraft Transit View) status	AOP updates have been updated in the NOP via API DPI messages	**OK**
OBJ-07.06.01-VALP-GEN1.0200	All partners involved in operations can have easy access to any NOP data with potential impact on their operations	**CRT-07.06.01-VALP-GEN1.0208**	Positive feedback from operational users from the NOP updates affecting Airports operations, used to update AOPs by the impacted Airports	**Mgen2.01**: Flight Data exchanged in current FUM message i.e. ELDT, CTOT, NM flight status (slot-allocated, suspended, TACT-activated, airborne), etc. Target at fix and targets at landing. Data received	The NM SWIM Flight Management service provides information on flights lists by Aerodrome, Traffic Volume as well as operations to gather detailed information on individual flights	**OK**
OBJ-07.06.01-VALP-GEN1.0300	All stakeholders share the same data so that the collaborative decision making of airport and network management is enhance	**CRT-07.06.01-VALP-GEN1.0303**	NOP updates produced by AOP updates are simultaneously accessed by every affected ATM stakeholder within the Network	**Mgen1.01** Flight Data from AOP: actual and estimates times for departures and arrivals- in and off block times , take-off and landing, taxi times **Mgen2.01** Flight Data exchanged in current FUM message Target at fix and targets at landing	Stakeholders can access updates on flights resulting from API and DPIs via NM SWIM Flight Management service. With this service, they are able to query flight lists and individual flights. They can also query the information using the NOP Portal flight lists	**OK**
OBJ-07.06.01-VALP-0749.0100	Assess the improved network predictability due to sharing of departure and arrival flight information in a timely manner.	**CRT-07.06.01-VALP-0749.0100**	Flight data updated and profiles calculated with the DPI and API information in short term planning are closer to the actual flown profiles and actual flight data.(In and off block times , take-off and landing estimates, de-icing, terminal procedures, runways,	**Maop1.01:** Trends for ETO stabilisation Take off time estimate vs. actual departure. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have a ETO in the +/3 min (estimate vs. actual)	**Maop1.01** Refer to 6.4.3.3.1 predictability provided by VP749 is better than with the flight plan data **Maop1.02** Arrival analysis removed due to simulation	**OK**

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-749 results	Validation Status Objective
			taxi times flight data status …	**Maop1.02:** Trends for ELDT stabilisation Landing time estimate vs. actual. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have an ELDT in the +/- 3 min (estimate vs. actual) **Maop1.03:** Trends for Nr. of DPI messages sent For a given airport. Compare using trends in OPS and with AOP-NOP logic, The frequency of DPI messages (#msg. /hour), the time before the EOBT the e-DPI and DPI messages are sent (EOBT-X min).	methodology (§6.4.2.5) **Maop1.01** DPI number higher than in OPS (§ 6.4.3.4)	
OBJ-07.06.01-VALP-0749.0200	Asses that the rolling exchange of data between AOP and NOP improves predictability of both AOP, NOP	**CRT-07.06.01-VALP-0749.0200**	With the new rolling data exchange, flight data and profiles in NOP reflect at any moment (including the early tactical phase which is not currently covered) the airport environment, resources and assignment (terminal procedures, runways and departure times TTOT/TSAT) better than in the time driven current manner implemented in A-CDM	**Maop1.01** Trends for ETO stabilisation Take off time estimate vs. actual departure. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have a ETO in the +/3 min (estimate vs. actual)	**Maop1.01** See CRT-07.06.01-VALP-0749.0100 and improved traffic count predictability (§6.4.3.3.4) **Mapt.01:** Arrival information (landing; In-Block) removed from analysis ((§ 6.4.2.5) **Mapt.02:** Estimates above Arrival Fix give no relevant information, as they are similar to landing. See above	**OK**
		CRT-07.06.01-VALP-0749.0201	With the new rolling data exchange the traffic counts in NOP for the airports participating provide better values at any moment of the traffic load (comparing estimated vs. actual traffic load). This enhancement in Network traffic demand accuracy improves Network predictability	**Maop1.01** Trends for ETO stabilisation Take off time estimate vs. actual departure. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have a ETO in the +/3 min (estimate vs. actual)		

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-749 results	Validation Status Objective
OBJ-07.06.01-VALP-0749.0200			and the use of available capacity	**Mapt.01** Average (EIBT-AIBT) for flight status vs reference scenario **Mapt.02** Average (ETO-ATO) at last en-route fix for flight status vs reference scenario		
		CRT-07.06.01-VALP-0749.0202	NOP enhanced rolling up to date information, is sent back to all impacted AOPs in a more accurate and timely manner, due to AOPs interlinked trajectory information used in the rolling NOP updating process. This enhancement in airport traffic demand accuracy improves Airport predictability and the use of Airport available capacity	**Maop1.01** Trends for ETO stabilisation Take off time estimate vs. actual departure. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have a ETO in the +/3 min (estimate vs. actual) **Mapt.01** Average (EIBT-AIBT) for flight status vs reference scenario **Mapt.02** Average (ETO-ATO) at last en-route fix for flight status vs reference scenario	Refer to (§6.4.3.3.4 Predictability per Airport. Graphs show the predictability gain of using Target (calculated) Times versus Estimated Times based on Flight Plan data. Both Global and specific Airport predictability gains are shown	**OK**
OBJ-07.06.01-VALP-0749.0300	Asses that the rolling exchange of data between AOP and NOP improves DCB process of both AOP, NOP	**CRT-07.06.01-VALP-0749.0300**	With the new rolling data exchange Network Punctuality is enhanced as the delay per flight is reduced compared to the reference scenario (OPS)	**Maop3.01**: Trends for Traffic Counts at departure and arrival airports stabilisation Entry traffic counts estimate vs. actual. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have a count value in the +/- 10% (estimate vs. actual)	Refer to (§ 6.4.3.3.4) Traffic Count Predictability	**OK**
		CRT-07.06.01-VALP-0749.0301	With the new rolling data exchange, anticipated knowledge of arrival traffic demand improves the allocation of airport resources, thus making better use of Airport available Capacity			
OBJ-07.06.01-VALP-	Asses that the rolling exchange of data between	**CRT-07.06.01-VALP-**	Actions to recover from traffic disruptions are taken with greater anticipation due to continuously	**Maop3.01**: Airport Demand information at AOP and NOP do not differ during	The time scope of departure demand accuracy, is extended	**OK**

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-749 results	Validation Status Objective
0749.0400	AOP-NOP improves situation awareness of AOP, NOP and of any NOP stakeholder	**0749.0400**	crossed AOP-NOP updating of flight data and profiles changes - in and off block times, take-off and landing estimates, de-icing, terminal procedures, runways, taxi times flight data status, ATV status, Turn-around information, IATA identification are exchanged on real time and updated in the AOP and NOP (B2B and B2C). The effect of anticipating decisions is observed to reduce delays (improve punctuality) and recover deviations of flight profiles (increased Flight Efficiency)	execution Compare Airport arrival and departure rolling demand (Number of flights/rolling hour) The time scope of departure demand accuracy, is extended • AIBT-EIBT (EIBTs predicted from -4 hours to - 20 minute from arrival) shared by AOP and NOP • AOBT-TOBT (TOBTs predicted from -4 hours to - 20 minutes from departure) shared by AOP and NOP	Refer to (§ 6.4.3.3.1): TTOT versus ATOT: AOP-NOP vs. FPL We observe (excluding the shaded area*) provided by VP749 is better than with the flight plan data. An average gain of over 1, 5 min in the brackets: -6 h to -3h that increases to over 4,3 min and gets to 5 min – in the last bracket - 1h to 0h As a whole the better predictability of VP749 is clearly explained by the rolling exchange of DPI that provide the most up-to-date take off times according to the (heavy) traffic situation; unlike the flight plan messages updating the EOBT that are sent late or very late and not for all flights	
OBJ-07.06.01-VALP-0749.0500	Assess the improved network predictability due to sharing of knock-on effect of late arrivals on the next rotation	**CRT-07.06.01-VALP-0749.0500**	Aircraft Time Departure information (DPI) is more accurately and timely updated when using Turn-around impact information. This anticipated knowledge of true demand (increased Predictability) by the NOP will enable the enhancement in the use of Airspace available Capacity	**Maop5.01**: Trends for ELDT stabilisation (see VALP-0749.0700) to apply to for the AOP of arrival and AOPs of next legs	Refer to (§ 6.4.3.5): ATV sharing between AOP and NOP Graphs show how accuracy of the demand is improved as per 540 minutes ahead of flight departure and for prediction of up to 5 aircraft jumps forward. Metrics in time accuracy show gains of calculated	**OK**
		CRT-07.06.01-	NOP is able to anticipate landing time estimates (ELDT) to Airports	**Maop5.01**: Trends for ELDT stabilisation (see VALP-0749.0700) to apply to for the AOP		

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-749 results	Validation Status Objective
		VALP-0749.0501	with increased accuracy due to Knock-on effect management. This increase in arrival predictability will enable a more efficient use of Airport available Capacity	of arrival and AOPs of next legs	(TTOT) versus FPL ranging from a minimum of 5,19% to a maximum of 66,97 % Measured in number of jumps forward the gain goes from 0,20% % (5 jumps ahead) to 50,40 (1 jump ahead) Predictability gains show: • Up to 55% in standard deviation • 30% (one jump ahead)-11,40% (5 jumps ahead)	
		CRT-07.06.01-VALP-0749.0502	The link between two CDM airports is feasible, resulting in more accurate and timely information interchanged, thus extending the accuracy time scope (predictability) to over three hours (depending on the number of Airports linked)			
		CRT-07.06.01-VALP-0749.0503	Reactionary delays are reduced, increasing departure Punctuality and Network Predictability			
OBJ-07.06.01-VALP-0749.0600	Assess the performance improvements of Airport DCB processes due to better quality of network predictions for both arrivals and departures	**CRT-07.06.01-VALP-0749.0600**	Overall delay reduction for flights between airports participating to the exercise; i.e.: increased Punctuality	**Maop6.01:** Trends for Traffic Counts at departure and arrival airports stabilisation **Maop6.02:** Entry traffic counts estimate vs. actual. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have a count value in the +/- 10% (estimate vs. actual)	Refer to (§ 6.4.3.3.4): Traffic Count Predictability The graph compares OPS and VP749, both supported with historical data in the period when their flight plans have not yet arrived (from -24h to – 3h15 min) Traffic count predictability for LEPAARR and LEALDEP are shown	**OK**
		CRT-07.06.01-VALP-0749.0601	The objective will be successfully achieved if it contributes to a reduction of differences between Actual and planned RBT duration (in minutes) by reducing variability in estimated operational capacity (PRE), thus reducing uncertainty(PRE) in the allocation of Airport available resources (CAP)			
		CRT-07.06.01-VALP-0749.0602	The objective will be successfully achieved if it contributes to improve the departure sequencing (CAP), reducing Taxi-	Non possible in a simulation environment	Taxi-out is fed from the OPS system to the simulation environment. It can only be assessed in a	**NOK**

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-749 results	Validation Status Objective
			out variance (improved taxi-out Predictability).		live trial exercise	
		CRT-07.06.01-VALP-0749.0603	The objective will be successfully achieved if it contributes to an increase in IFR movements per airspace volume per unit time (most challenging En-Route environment) (CAP).	Non possible in a simulation environment	It can only be assessed in a live trial exercise	NOK
		CRT-07.06.01-VALP-0749.0604	The objective will be successfully achieved if it contributes to an increase in IFR movements per airspace volume per unit time (most challenging TMA environment) (CAP).			
		CRT-07.06.01-VALP-0749.0605	The objective will be successfully achieved if it contributes to a reduction in the average fuel burn per flight (ENV-Fuel EFF)			
OBJ-07.06.01-VALP-0749.0700	Assess the performance improvements of Airport resource planning due to better quality of network predictions for both arrivals and departures	**CRT-07.06.01-VALP-0749.0700**	The objective will be successfully achieved if it contributes to a reduction of differences between Actual and planned RBT duration (in minutes) by reducing variability in estimated operational capacity (PRE) thus reducing uncertainty (PRE) in the allocation of Airport available resources (CAP) .	**Maop7.01:** Trends for ELDT stabilisation Landing time estimate vs. actual. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have an ELDT in the +/- 3 min (estimate vs. actual)	Refer to (§6.4.3.3.4) Airport DCB Process Improvements	**OK**
		CRT-07.06.01-VALP-0749.0701	The objective will be successfully achieved if it contributes to improve the departure sequencing (CAP), reducing Taxi out variance (improved taxi-out Predictability).	Non possible in a simulation environment	Taxi-out is fed from the OPS system to the simulation environment. It can only be assessed in a live trial exercise	**NOK**
		CRT-07.06.01-VALP-	Overall delay reduction for flights between airports participating to the exercise; that is increasing Punctuality\n	Refer to § 6.4.3.5: ATV Sharing between AOP and NOP	In general, the conclusion from the obtained results are that AIMA is not much better in terms of arrival	**OK**

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-749 results	Validation Status Objective
		0749.0702			delay (from Schedule) but it "cherry picks" the aircraft to be delayed in order to reduce the knock-on effect, which in fact benefits Network performance, as less aircraft will depart with less delays in the following legs/jumps	
OBJ-07.06.01-VALP-0749.0800	Assess that the computer-to-computer exchange of data between AOP and NOP will improve the timely and systematic exchange and will reduce the manual operations and telephone coordination required today to exchange the information and to update the systems	**CRT-07.06.01-VALP-0749.0800**	Confirm that there is no housekeeping effort required by NMOC to keep in the NOP displays (CHMI and NOP portal) the runway configurations and capacity data showing the most up to date values and in consistency with AOP.\n	**Maop11.01:** APOC and NMOC VP-749 subjective assessment	Information exchange was performed using B2B (system-to-system connection) which involves no manual intervention: The AOP was automatically updated with NMOC landing estimates NMOC received DPI information from Airports. Number of DPIs was significantly greater than the number provided by A-CDM as the time horizon was extended from 3h to 9 h. before flight departure	**OK**
OBJ-07.06.01-VALP-0749.0900	Assess that the integration of Airports in the arrival management process improves airports arrival predictability and	**CRT-07.06.01-VALP-0749.0900**	The number of scheduled flights arriving as planned (no delay) is increased	**Mapt.03** Number of flights with (AIBT-SIBT)<5 minutes vs number of flight with (AIBT-SIBT)<5 minutes in reference scenario	Refer to (§6.4.3.3.46) Airport DCB Process Improvements Number of arrival Flights delayed for LEPA; LEMD;LEBL: Solution Scenario: 17; 30; 74	Partially OK

Validation Objective	Validation Objective text	Success Criterion ID	Success Criterion Text	Metrics /Indicators	VP-749 results	Validation Status Objective
	punctuality				Reference Scenario:22; 37; 50	
		CRT-07.06.01-VALP-0749.0901	Total reactionary delay of delayed flights is reduced	**Maopt.04** Total departure delay (AOBT-SOBT) for flights with AIBT-SOB>5 vs reference scenario	Refer to (§ 6.4.3.6) Airport DCB Process Improvements Total reactionary delay (minutes) for LEPA; LEMD;LEBL: Solution Sc.: 67,40; 11,75; 763,58 Ref. Sc.: 137,5; 224,75; 1014,37	**OK**

Table 38: Overall table of VP-749 metrics and success criteria

6.4.3.6.1.2 Detailed Exercise Results

P07.06.01 Generic Objectives identified by P07.06.01 to support DCB-0103-A OI Step

OBJ-07.06.01-VALP-GEN1.0100: Operational Feasibility

- **CRT-07.06.01-VALP-GEN1.0106**

AOP changes produced at Airports are captured by the NMOC in Real Time and used to update the NOP accordingly

- **Metrics:**

Mgen1.01: Flight Data from AOP

AOP Updates have been verified to be updated in the NOP. See the following example for API and DPI messages received by ETFMS on MNVPAPI

API Message:

IMAPI FPO803T LEMDDPIO c5053728.
AA527549700005322142016052400014200305643200000000314Received from: LEMDDPIO. Est. Xmit at: 16/05/24 00:01:42. Message description:
-TITLE API-ARCID FPO803T-ADEP EGPD-ADES LEPA-EOBD 160524-EOBT 0555-APISTATUS ESTIMATED-IFPLID AA52754970-IATAFLID 5O803 -TAXITIMEARR 0006-SLDT 160524085400-MTTT 0044-STAR LORES1P-ARCTYP B737-REG FGZTN -RWYARR 24L-ATVSTATUSINBOUND INI

Here, two DPIs:

IMDPI.RYR23UU LEMDDPIO c5063728
AA527533440005242052016052400163900305810590000000315Received from: LEMDDPIO. Est. Xmit at: 16/05/24 00:16:39. Message description:-TITLE DPI-ARCID RYR23UU-ADEP LEMD-ADES EDDB-EOBD 160524-EOBT 0415-DPISTATUS SEQ -IFPLID AA52753344-TOBT 0415-TSAT 0415-TAXITIME 0016-TTOT 0431-SID RBO.1N-ARCTYP B738-REG EIDWW-RWYDEP 36L-IATAFLID FR2526 -FLIGHTSTATUSOUTBOUND INI

IMDPI ANE5753 LEMDDPIO c5073728
AA527422580005018272016052400163900305810610000000315Received from: LEMDDPIO. Est. Xmit at: 16/05/24 00:16:39. Message description:-TITLE DPI-ARCID ANE5753-ADEP LEMD-ADES DAUH-EOBD 160524-EOBT 0415-DPISTATUS SEQ -IFPLID AA52742258-TOBT 0415-TSAT 0417-TAXITIME 0016-TTOT 0433-SID NANDO2N-ARCTYP CRJ2-REG ECMJZ-RWYDEP 36L-IATAFLID YW5753-FLIGHTSTATUSOUTBOUND INI

Here is a DPI changing the SID followed by the ETFMS answer:

IMDPI GSW8625 LEMDDPIO c5013728
AA527454050005102332016052400014300305644310000000295Received from: LEMDDPIO. Est. Xmit at: 16/05/24 00:01:43. Message description:-TITLE DPI-ARCID GSW8625-ADEP LEPA-ADES EDDW-EOBD 160524-EOBT 0815-DPISTATUS SEQ -IFPLID AA52745405-TOBT 0819-TAXITIME 0009-SID MEROS4B-ARCTYP A321-REG HBJOI-RWYDEP 06R-IATAFLID GM8625-FLIGHTSTATUSOUTBOUND INI

HISID_INFO_CHANGE GSW8625
AA527454050005102332016052400014300305644320000000134SOURCE: DPI
SELECTED SID: MEROS4BLEPA
PREVIOUS SID: MEROS2ALEPA
PREFERRED SID: MEROS4BLEPA
PREFERRED SID SELECTED: TRUE
WARNINGS: NONE

OBJ-07.06.01-VALP-GEN1.0200: Operational Feasibility

- **CRT-07.06.01-VALP-GEN1.0208**

Updates affecting Airports operations are used to update AOPs by the impacted Airports

- **Metrics:**

  Mgen2.01: Flight Data exchanged in current FUM message i.e. ELDT, CTOT, NM flight status (slot-allocated, suspended, TACT-activated, airborne), etc.

  The NM SWIM Flight Management service provides information on flights lists by Aerodrome, Traffic Volume as well as operations to gather detailed information on individual flights

  - ✓ queryFlightPlans
  - ✓ retrieveFlight
  - ✓ queryFlightsByKeys
  - ✓ queryFlightsByAircraftOperator
  - ✓ queryFlightsByAerodrome
  - ✓ queryFlightsByAerodromeSet
  - ✓ queryFlightsByAirspace
  - ✓ queryFlightsByPoint
  - ✓ queryFlightsByTrafficVolume
  - ✓ queryFlightsByMeasure
  - ✓ queryFlightsByHotspot

OBJ-07.06.01-VALP-GEN1.0300: Common Situational Awareness

- **CRT-07.06.01-VALP-GEN1.0303**

NOP updates produced by AOP updates are simultaneously accessed by every affected ATM stakeholder within the Network

- **Metrics:**

  Mgen1.01: Flight Data from AOP

  Stakeholders can access updates on flights resulting from API and DPIs via NM SWIM Flight Management service. With this service, they are able to query flight lists and individual flights.

  They can also query the information using the NOP Portal flight lists

  Mgen2.01: Flight Data exchanged in current FUM messages

  Target Fix gives no extra information from landing (which has already been removed from the analysis)

P07.06.01 Active Contribution to VP-749 Objectives

OBJ-07.06.01-VALP-0749.0100: Exchange of DPI and API

- **CRT-07.06.01-VALP-0749.0100**

Flight data updated and profiles calculated with the DPI and API information in short term planning are closer to the actual flown profiles and actual flight data.(In and off block times , take-off and landing estimates, de-icing, terminal procedures, runways, taxi times flight data status

- **Metrics:**

  Maop1.01: Trends for ETOT stabilisation

  Refer to § 6.4.3.3.1: predictability provided by VP749 is better than with the flight plan data

  As a whole the better predictability of VP749 is clearly explained by the rolling exchange of DPI that provide the most up-to-date take off times according to the (heavy) traffic situation; unlike the flight plan messages updating the EOBT that are sent late or very late and not for all flights

Maop1.02: Trends for ELDT stabilisation

Arrival analysis removed due to simulation methodology (§ 6.4.2.5) (provides no additional value)

Maop1.03: Trends for Number of DPI messages sent

DPI number in VP749 is higher than in OPS (§ 6.4.3.4)
It is higher, as expected, than in OPS for LEBL and LEMD, A-CDM airports following the AOP-NOP rolling concept: longer horizon up to -24h, more dynamic and more data to exchange

OBJ-07.06.01-VALP-0749.0200: Rolling exchange of DPI and API–Predictability

- **CRT-07.06.01-VALP-0749.0200**

With the new rolling data exchange, flight data and profiles in NOP reflect at any moment (including the early tactical phase which is not currently covered) the airport environment, resources and assignment (terminal procedures, runways and departure times TTOT/TSAT) better than in the time driven current manner implemented in A-CDM

- **Metrics:**

Maop1.01: Trends for ETO stabilisation

See CRT-07.06.01-VALP-0749.0100 and improved traffic count predictability (§ 6.4.3.3.4)

- **CRT-07.06.01-VALP-0749.0201**

With the new rolling data exchange the traffic counts in NOP for the airports participating provide better values at any moment of the traffic load (comparing estimated vs. actual traffic load). This enhancement in Network traffic demand accuracy improves Network predictability and the use of available capacity

- **Metrics:**

Maop1.01: Trends for ETO stabilisation

See CRT-07.06.01-VALP-0749.0100 and improved traffic count predictability (§ 6.4.3.3.4)

Mapt.01: Average (EIBT-AIBT) for flight status vs reference scenario
Arrival information (landing; In-Block) removed from analysis (§ 6.4.2.5)

Mapt.02: Average (ETO-ATO) at last en-route fix for flight status vs reference scenario

Estimates over fix give no relevant information, as they are similar to the Landing

- **CRT-07.06.01-VALP-0749.0202**

NOP enhanced rolling up to date information, is sent back to all impacted AOPs in a more accurate and timely manner, due to AOPs interlinked trajectory information used in the rolling NOP updating process. This enhancement in airport traffic demand accuracy improves Airport predictability and the use of Airport available capacity

- **Metrics:**

Maop1.01

Refer to (§ 6.4.3.3.2) Predictability per Airport.
Graphs show the predictability gain of using Target (calculated) Times versus Estimated Times based on Flight Plan data. Both Global and specific Airport predictability gains are shown

Mapt.01

See CRT-07.06.01-VALP-0749.0201

Mapt.02

See CRT-07.06.01-VALP-0749.0201

OBJ-07.06.01-VALP-0749.0300: Rolling exchange of DPI and API–DCB

- **CRT-07.06.01-VALP-0749.0300**
- **CRT-07.06.01-VALP-0749.0301**

CRT-07.06.01-VALP-0749.0300 With the new rolling data exchange Network Punctuality is enhanced as the delay per flight is reduced compared to the reference scenario (OPS)
CRT-07.06.01-VALP-0749.0301 With the new rolling data exchange, anticipated knowledge of arrival traffic demand improves the allocation of airport resources, thus making better use of Airport available Capacity

- **Metrics:**

  Maop3.01: Trends for Traffic Counts at departure and arrival airports stabilisation

  Entry traffic counts estimate vs. actual. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have a count value in the +/- 10% (estimate vs. actual)

  Refer to (§6.4.3.3.4) Traffic Count Predictability

OBJ-07.06.01-VALP-0749.0400: Exchange of DPI and API - Situation awareness

- **CRT-07.06.01-VALP-0749.0400**

Actions to recover from traffic disruptions are taken with greater anticipation due to continuously crossed AOP-NOP updating of flight data and profiles changes - in and off block times, take-off and landing estimates, de-icing, terminal procedures, runways, taxi times flight data status, ATV status, Turn-around information, IATA identification are exchanged on real time and updated in the AOP and NOP (B2B and B2C). The effect of anticipating decisions is observed to reduce delays (improve punctuality) and recover deviations of flight profiles (increased Flight Efficiency)

- **Metrics:**

  Maop3.02: Airport Demand information at AOP and NOP do not differ during execution

  The time scope of departure demand accuracy, is extended

  Refer to (§6.4.3.3.41) TTOT versus ATOT: AOP-NOP vs. FPL

  We observe (excluding the shaded area*) that as from 9 hours before, the predictability provided by VP749 is better than with the flight plan data.

  An average gain of over 1, 5 min in the brackets: -6 h to -3h that increases to over 4,3 min and gets to 5 min – in the last bracket -1h to 0h

As a whole the better predictability of VP749 is clearly explained by the rolling exchange of DPI that provide the most up-to-date take off times according to the (heavy) traffic situation; unlike the flight plan messages updating the EOBT that are sent late or very late and not for all flights

OBJ-07.06.01-VALP-0749.0500: ATV sharing between AOP and NOP

- **CRT-07.06.01-VALP-0749.0500**
- **CRT-07.06.01-VALP-0749.0501**
- **CRT-07.06.01-VALP-0749.0502**
- **CRT-07.06.01-VALP-0749.0503**

CRT-07.06.01-VALP-0749.0500 Aircraft Time Departure information (DPI) is more accurately and timely updated when using Turn-around impact information. This anticipated knowledge of true demand (increased Predictability) by the NOP will enable the enhancement in the use of Airspace available Capacity k

CRT-07.06.01-VALP-0749.0501 NOP is able to anticipate landing time estimates (ELDT) to Airports with increased accuracy due to Knock-on effect management. This increase in arrival predictability will enable a more efficient use of Airport available Capacity
CRT-07.06.01-VALP-0749.0502 The link between two CDM airports is feasible, resulting in more accurate and timely information interchanged, thus extending the accuracy time scope (predictability) to over three hours (depending on the number of Airports linked
CRT-07.06.01-VALP-0749.0503 Reactionary delays are reduced, increasing departure Punctuality and Network Predictability

- **Metrics:**

  Maop5.01: Trends for ELDT stabilisation (see VALP-0749.0700) to apply to for the AOP of arrival and AOPs of next legs

  Refer to (§6.4.3.3.4): ATV sharing between AOP and NOP
  Graphs show how accuracy of the demand is improved as per 540 minutes ahead of flight departure and for prediction of up to 5 aircraft jumps forward.

  Metrics in time accuracy show gains of calculated (TTOT) versus FPL ranging from a minimum of 5,19 % to a maximum of 66,97 %

  Measured in number of jumps forward the gain goes:

  - from 0,20% % (5 jumps ahead) to
  - 50,40 (1 jump ahead)

  Predictability gains show:

  - Up to 55% in standard deviation
  - 30% (one jump ahead) to11,40% (5 jumps ahead)

OBJ-07.06.01-VALP-0749.0600: Airport DCB Process Improvements¸

- **CRT-07.06.01-VALP-0749.0600**
- **CRT-07.06.01-VALP-0749.0601**

CRT-07.06.01-VALP-0749.0600 Overall delay reduction for flights between airports participating to the exercise; i.e.: increased Punctuality
CRT-07.06.01-VALP-0749.0601 The objective will be successfully achieved if it contributes to a reduction of differences between Actual and planned RBT duration (in minutes) by reducing variability in estimated operational capacity (PRE), thus reducing uncertainty(PRE) in the allocation of Airport available resources (CAP)

- **Metrics:**

  Maop6.01: Trends for Traffic Counts at departure and arrival airports stabilisation

  Refer to (§6.4.3.3.4): Traffic Count Predictability

  Maop6.02: Entry traffic counts estimate vs. actual. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have a count value in the +/- 10% (estimate vs. actual)

The graph compares OPS and VP749, both supported with historical data in the period when their flight plans have not yet arrived (from -24h to – 3.15 min)

Traffic count predictability for LEPAARR and LEALDEP are shown

- **CRT-07.06.01-VALP-0749.0602**

The objective will be successfully achieved if it contributes to improve the departure sequencing (CAP), reducing Taxi-out variance (improved taxi-out Predictability).

- **Metrics**

  Taxi is fed from the OPS system to the simulation environment. It can only be assessed in a live trial exercise

- **CRT-07.06.01-VALP-0749.0603**
- **CRT-07.06.01-VALP-0749.0604**
- **CRT-07.06.01-VALP-0749.0605**

CRT-07.06.01-VALP-0749.0603 The objective will be successfully achieved if it contributes to an increase in IFR movements per airspace volume per unit time (most challenging En-Route environment) (CAP).
CRT-07.06.01-VALP-0749.0604 The objective will be successfully achieved if it contributes to an increase in IFR movements per airspace volume per unit time (most challenging TMA environment) (CAP).
CRT-07.06.01-VALP-0749.0605 The objective will be successfully achieved if it contributes to a reduction in the average fuel burn per flight (ENV-Fuel EFF)

- **Metrics:**

  They can only be assessed in a live trial exercise

OBJ-07.06.01-VALP-0749.0700: Airport resource planning Improvements

- **CRT-07.06.01-VALP-0749.0700**

CRT-07.06.01-VALP-0749.0700 The objective will be successfully achieved if it contributes to a reduction of differences between Actual and planned RBT duration (in minutes) by reducing variability in estimated operational capacity (PRE) thus reducing uncertainty (PRE) in the allocation of Airport available resources (CAP)

- **Metrics:**

  Maop7.01: Trends for ELDT stabilisation

  Landing time estimate vs. actual. Compare using trends in OPS and with AOP-NOP logic, the leading time required in average to have an ELDT in the +/- 3 min (estimate vs. actual)

  Refer to (§6.4.3.3.4): ATV sharing between AOP and NOP

  Graphs show how accuracy of the demand is improved as per 540 minutes ahead of flight departure and for prediction of up to 5 aircraft jumps forward.

  Metrics in time accuracy show gains of calculated (TTOT) versus FPL ranging from a minimum of 5,19% to a maximum of 66,97 %

  Measured in number of jumps forward the gain goes from 0,20% % (5 jumps ahead) to 50,40 (1 jump ahead)

Predictability gains show:

- Up to 55% in standard deviation
- 30% (one jump ahead)- 11,40% (5 jumps ahead)

➢ **CRT-07.06.01-VALP-0749.0701**

CRT-07.06.01-VALP-0749.07001
The objective will be successfully achieved if it contributes to improve the departure sequencing (CAP), reducing Taxi out variance (improved taxi-out Predictability).

Non possible in a simulation environment

Taxi-out is fed from the OPS system to the simulation environment. It can only be assessed in a live trial exercise

➢ **CRT-07.06.01-VALP-0749.0702**

CRT-07.06.01-VALP-0749.0702
Overall delay reduction for flights between airports participating to the exercise; that is increasing Punctuality\n

Refer to § 6.4.3.5: Multi-Airport AOP-NOP

In general, the conclusion from the obtained results are that AIMA is not much better in terms of arrival delay (from Schedule) but it "cherry picks" the aircraft to be delayed in order to reduce the knock-on effect, which in fact benefits Network performance, as less aircraft depart with less delays in the following jumps

OBJ-07.06.01-VALP-0749.0800: Data exchange improvements and manual effort and coordination reduction

➢ **CRT-07.06.01-VALP-0749.0800**

Confirm that there is no housekeeping effort required by NMOC to keep in the NOP displays (CHMI and NOP portal) the runway configurations and capacity data showing the most up to date values and in consistency with AOP.\n

➢ **Metrics:**

Maop11.01: APOC and NMOC subjective assessment

Information exchange was performed using B2B (system-to-system connection) which involves no manual intervention:

The AOP was automatically updated with NMOC landing estimates

NMOC received DPI information from Airports.

Number of DPIs was significantly greater than the number provided by A-CDM as the time horizon was extended from 3h to 9 h. before flight departure

OBJ-07.06.01-VALP-0749.0900: Airport Arrival Performance

➢ **CRT-07.06.01-VALP-0749.0900**

The number of scheduled flights arriving as planned (no delay) is increased

➢ **Metrics:**

Mapt.03: Number of flights with (AIBT-SIBT) <5 minutes vs number of flight with (AIBT-SIBT) <5 minutes in reference scenario

Refer to (§6.4.3.3.4) Airport DCB Process Improvements

Number of arrival Flights delayed for LEPA; LEMD; LEBL:

Solution Scenario: 17; 30; 74

Reference Scenario: 22; 37; 50

Results for Barcelona Airport in the solution scenario are greater due to the constant arrival demand pattern of Barcelona, with small difference among traffic peaks and values. Furthermore arrival capacity was artificially move down to produce a hotspot

The conclusion is that the algorithm is effective when the difference in demand peaks and valleys is greater, allowing over deliveries to be place in the valley periods

- **CRT-07.06.01-VALP-0749.0901**

Total reactionary delay of delayed flights is reduced

- **Metrics:**

Maopt.04: Total departure delay (AOBT-SOBT) for flights with AIBT-SOB>5 vs reference scenario

Refer to (§6.4.3.3.4) Airport DCB Process Improvements

Total reactionary delay (minutes) for LEPA; LEMD; LEBL:

Solution Sc.: 67,40; 11,75; 763,58

Ref. Scenario. 137,50; 224,75; 1014,37

6.4.3.6.2 Results per KPA

The following sections present the mains results per KPAs

6.4.3.6.2.1 Predictability

Predictability has been widely addressed during the exercise, as it is considered as the main performance driver for the rest of KPAs, specially Punctuality and Capacity

Gains in predictability have been assessed focusing in two main predictably drivers:

- Improved accuracy of Departure Times via TTOT assessment
- Expanded Time horizon of predictions, from the current – 3 Hours to -9 hours, taken from the planned departure times

Section 6.4.3.3: "Predictability results", widely addresses the analysis of trial samples and results, both per Airport and Globally

6.4.3.6.2.2 Punctuality

Punctuality performance is directly driven up by the improved predictability. From the results it can be concluded that an anticipated and more accurate knowledge of changes in demand facilitates early corrective measures to be applied in a Real Operational Environment.

As the trial was performed in shadow mode, only the potential improvement can be assessed

Nevertheless, the participation of Airports in Target Time Management, shows the reduction in number of flights arriving delayed in those cases when the traffic peaks creating the over delivery are sensibly greater than the valley periods

In all circumstances, independently of the arrival DCB pattern knock-on delays (Network delays) were highly reduced. See §6.4.3.6

Based on the results of Table **37:** AIMA Solution versus CASA simulation Results Arrival and Departure Punctuality Index for both Casa and AIMA Solutions can be obtained:

Assuming that all delays are greater than 5 minutes and that it is the reference value used for punctuality index, the following results are obtained:

Cases AIMA Solution	Total Flights	# Arrival Flights	# Departure Flights	*Arrival (5') Punctuality	*Departure (5') Punctuality

		Delayed	Delayed	Index	Index
Summary All Cases	679	231	42	66%	94%
Summary Last Three Cases	324	110	1	66%	99,7%
CASA SOLUTION					
Summary All Cases	679	266	89	61%	87%
Summary Last Three Cases	324	140	35	57%	89%

* Punctuality Index = Percentage of Flights delayed less than 5 minutes

6.4.3.6.2.3 Capacity

Impact on Capacity follows a similar logic to the already expressed under Punctuality: An anticipated and enhance accuracy of changes in demand should allow all stakeholder's involved to apply more efficient measures to cope with DCB imbalanced situations:

- Better hotspot detection: both duration and traffic count precision
- Anticipation in re-allocation of resources by Airports, Airspace Users and Handling agents

In summary, a better use of the available capacity can be obtained:

6.4.3.6.3 Results impacting regulation and standardisation initiatives

N/A

6.4.3.7 Analysis of Exercise Results

The analysis of the exercises results, including rationale of the results has been already performed throughout sections §6.4.3.3 to § 6.4.3.6

6.4.3.8 Confidence in Results of Validation Exercise

The confidence in the results is aligned to the possibilities and limitations imposed by the validation technique used: in this case shadow mode. For VP749 it means that during planning phase the confidence is high but when validation objectives involved directly or indirectly some elements of execution, the confidence is low.

An example of limitation and therefore of low confidence is the traffic count predictability at departure, as some flights departing at the end of the counting period and flights partially outside the 4 participating airports are affected/altered by execution. A more evident example is the delays. Apart from those objectives, which limitation is already documented in relevant chapters, the confidence on the validation objectives results is high.

Refer to 6.4.3.8.2: Significance of Validation Exercise Results

6.4.3.8.1 Quality of Validation Exercise Results

The high amount of trials and the number of monitored flights gives a high confidence on the results

- 2 dry runs and 6 complete trial days
- Above 26.000 arrival and departures flights per trial day
- 1.621 aircraft performing a minimum of two jumps per day between any of the four participant Airports

In addition to the wide traffic sample:

- The post-analysis performed during the debriefing sessions showed similar behaviours and conclusions

- Parameters adjustments (e.g. alarm thresholds) agreed in the debriefing sessions allowed to analyse the changes in processes behaviour and, thus, provided a better understanding of the cause and effect relationship in the tune-up changes.
- Specific alarmed flights could be checked in real time with the corresponding Airport to confirm the consistency of the AOP data and the real situation.

6.4.3.8.2 Significance of Validation Exercise Results

The fact that the trial has been run in shadow mode adds some distortion to results, as the comparative analysis needs to be done at the moment of the assessment in the planning phase. During execution, operational and shadow mode environments run separately. Operational world benefits from real time updates during execution; in shadow mode traffic evolution is simulated in the NMVP platform adding some noise based on statistical data, so Actual Take-off times form the two different environments are not quite the same.

In other measurements, such as Traffic Count Predictability the contribution of the participant airports to the traffic flow under analysis is below 10% of total traffic so benefits are diluted within the rest of the flights in the traffic sample. Results in this case will depend on the number of Airports integrating their AOPs into the NOP.

In TTA management, a reliable reference scenario could not be used. The intent of trying to replicate hotspot solutions by CASA simulations in ERNEST have shown very little reliability

To solve this problem a CASA solution has been “created” following some (big) assumptions, which at least ensure that traffic samples are the same in both Reference (CASA) and Solution (AIMA) scenarios, and that in both cases hotspots has been solved.

Refer to D383 VALR S1 R5 Vol2 Target Time Management [26] for more detailed description on the different set-ups used for AOP-NOP integration and TTA Management scenarios

In any case the number of trials, the size of traffic samples and the clear performance enhancements obtained, both in Predictability and Punctuality, ensure that most of the success criteria have been met.

Additional live trial should be run to confirm the results obtained in this exercise

6.4.4 Conclusions and recommendations

6.4.4.1 Conclusions

These are detailed conclusions that can be drawn from VP749 exercise.

Predictability TTOT → ATOT: AOP-NOP vs. FPL

The predicted take of times (TTOT) provided by AOP in a horizon of up to 24 before departure, were compared against the actual take off time (ATOT) to assess the predictability provided by AOP-NOP. This was compared against the predictability achieved when using flight plan data only.

- Predictability provided by VP749 is better than the obtained with flight plan data. Gain increases steadily the closer it gets to take off;
- In heavy traffic days, the predictability gain is higher: the worse the day the better the gain;
- The better predictability of VP749 is clearly explained by the rolling exchange of DPIs that provide the most up-to-date take-off times according to the (heavy) traffic situation.

TOBT versus TSAT Predictability

The predictability Target of Block times (TOBT) provided by AOP in a horizon of up to 24h before departure, were compared against the predictability of the TSAT provided by AOP in a horizon of up to 4h before departure.

- Regarding TOBT vs. TSAT predictability, the conclusion is that TSAT provides systematically better predictability than TOBT and that the start of CASA sequence earlier (from an avg. -40 min in current A-CDM up to -240min in VP749) improves predictability in the associated extended period; i.e.; from -240min.

This applies to normal or heavy traffic days with the remark that the variability between the maximum and minimum TSAT values is higher in heavy traffic days;

- Flights that are delayed remain in sequence longer and if their delay is significant, it creates a noticeable delta (variability) between the first and last estimation.

Traffic Count Predictability

The predicted traffic count values for a given reference time in the future were collected at regular sampling intervals and compared to the actual traffic count value. The results were not conclusive.

It is understood to be due to the effect execution that plays a big role as around 90% of the traffic in airport counts is partially outside the 4 participating airports(departing but not landing or landing but not departing). This traffic is affected by FSAs and or CPRs that alter/correct accordingly the CTFM profile after departure and these profiles are used to build the final count value

Predictability TTOT→ATOT: AOP-NOP vs. CDM

The predicted take of times (TTOT) provided by AOP in a horizon of up to 24 before departure, were compared against the actual take off time (ATOT) to assess the predictability provided by AOP-NOP. This was compared against the predictability achieved with current CDM

For LEBL (CDM Airport), there is a gain between the AOP-NOP and CDM, both in normal and heavy traffic days, meaning the gain is greater in heavy traffic days.

- Note that the exchange in CDM even if it is possible as from 3h before with Early DPIs, it is not always used as it is the case in Barcelona airport;
- This gain has only been measured as an indication of how new logic compares to current logic. These results have not been extended to LEMD. Hence there is NOT enough data to draw any conclusion on the predictability gain AOP-NOP versus CDM.

Multi Airport Integration

Benefits of Multi-Airport approach versus single Airport approach can be summarised as follows:

- Time accuracy improvement, based on number of jumps forward ranges from 48% for the first jump (departing from the next airport) to 9,67% for aircraft departing from jump 4 (4 airports forward);
- Predictability improvement (standard deviation), based on number of jumps forward ranges from 30% for the first jump (departing from the next airport) to 11,40% for aircraft departing from jump 5 (5 airports forward);
- This multi-airport approach provides for two thirds of time a more accurate picture than the current single airport approach.

Airport DCB Process Improvements

In general, conclusion from the obtained results (see A.3.1) are that AIMA produces higher average arrival delays (for delayed flights) for a given measured period, but the overall aggregated delay throughout the consecutive legs is significantly lower compare to CASA.

These results are explained by the AIMA concept development, that “cherry picks” aircraft to be delayed that reduce the knock-on effect, thus improving network predictability and stability.

6.4.4.2 Recommendations

Based on the obtained results from VP-749 P07.06.01 (AOP/NOP Integration) and OFA05.01.01 (Airport DCB Process Improvement), the following recommendations can be made:

- Refine pre-departure sequence logic in AOP (allocation of TTOT and TSAT) to deal more efficiently with CTOT improvements provided by CASA (being addressed in PJ24);

- Delays and Traffic count predictability that cannot be measured in a v3 will be addressed before industrialisation in a live trial. (already planned in SESAR2020 PJ24);
- Reduce the TTOT variability (e.g. variability between an earlier TTOT prediction and a later one) originating from the early (-240min) exchange of departure times between CASA and AOP;
- Pfd (planned flight data in NM) that were used in the exercise provided an essential element in support to predictability before FPL is filed. However Pfds are not yet part of NM OPS system. For the roadmap of AOP-NOP concept towards operation, evolution in two steps is recommended:
  - Step 1 Full horizon of FPL and not pfd. This implies that the exchange of DPI and API will start as soon as the FPL is available in the NOP. Unlike today -with DPI only accepted 3h before departure;
  - Step 2. Include Pfd. This permits to extend the DPI and API exchange up to -24h before departure.
- Traffic count predictability and delays that cannot be measured in a v3 will be addressed before industrialisation in a live trial (already planned in SESAR2020 PJ24).
- AIMA has proven to provide benefits compared to CASA in solving Airport DCB situations by Airports in TTA management. However regarding the delay comparison between both, it has not been possible to use an accurate Reference Scenario to compare CASA and AIMA total delay. A live trial will be conducted to confirm or deny the VP749 results.

7 References

7.1 Applicable Documents

[1] Template Toolbox 03.00.01
https://extranet.sesarju.eu/Programme%20Library/SESAR%20Template%20Toolbox.dot

[2] P07.02 D30 Step 1 VALS, Ed.03.00.01
https://extranet.sesarju.eu/WP_07/Project_07.02/Project%20Plan/Step1/07.02-D30-Step%201%20R5%20VALS.docx

[3] Requirements and V&V Guidelines 03.01.00
https://extranet.sesarju.eu/Programme%20Library/Requirements%20and%20VV%20Guidelines.doc

[4] Templates and Toolbox User Manual 03.01.01
https://extranet.sesarju.eu/Programme%20Library/Templates%20and%20Toolbox%20User%20Manual.doc

[5] European Operational Concept Validation Methodology (E-OCVM) - 3.0 [February 2010]

[6] EUROCONTROL ATM Lexicon
https://extranet.eurocontrol.int/http://atmlexicon.eurocontrol.int/en/index.php/SESAR

7.2 Reference Documents

The following documents provide input/guidance/further information/other:

[7] C.03-D03-Regulatory Roadmap Development and Maintenance Process 00.01.01
https://extranet.sesarju.eu/WP_C/Project_C.03/Project%20Plan/WA2%20-%20Regulatory%20Roadmap/Task%202.1%20-%20Regulatory%20Roadmap%20Process/C.03-D03-Regulatory%20Roadmap%20Development%20and%20Maintenance%20Process.doc

[8] C.03-D02-Standardisation Roadmap Development and Maintenance Process 00.01.05
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[9] SESAR Business Case Reference Material 00.01.02
https://extranet.sesarju.eu/Programme%20Library/Forms/Procedures%20and%20Guidelines.aspx

[10] SESAR Safety Reference Material 00.02.01
https://extranet.sesarju.eu/Programme%20Library/Forms/Procedures%20and%20Guidelines.aspx

[11] SESAR Security Reference Material-Level1 00.04.02
https://extranet.sesarju.eu/Programme%20Library/Forms/Procedures%20and%20Guidelines.aspx

[12] SESAR Environment Reference Material 00.01.00
https://extranet.sesarju.eu/Programme%20Library/Forms/Procedures%20and%20Guidelines.aspx

[13] SESAR Human Performance Reference Material 00.01.00
https://extranet.sesarju.eu/Programme%20Library/Forms/Procedures%20and%20Guidelines.aspx

[14] D07 Guidance on list of KPIs for Step 1 Performance Assessment Edition 00.01.00
https://extranet.sesarju.eu/WP_B/Project_B.05/Project%20Plan/B.5.1%20PERFORMANCE%20ASSESSMENT%20METHODOLOGY%20AND%20GUIDANCE/04_D07-

Guidance%20on%20list%20of%20KPIs%20for%20Step%201%20Performance%20Assessment/D07_Guidance%20on%20list%20of%20Key%20Performance%20Indicators%20for%20Step%201.doc

[15] 07.06.01-D47 Step 1 Validation Plan 2015 Edition 00.01.02. https://extranet.sesarju.eu/WP_07/Project_07.06.01/Project%20Plan/Step%201/Validation%20Plan/07%2006%2001-D47%20Step%201%20Validation%20Plan%202015_00.01.02%20_Final.docx

[16] 07.02-D29-Step1 Release 4 DOD 00.04.01 https://extranet.sesarju.eu/WP_07/Project_07.02/Project%20Plan/Step1/07.02-D29-Step%201%20Release%205%20DOD.docm

[17] 13.02.03-D303 OSED Step1 R6 00.05.01 https://extranet.sesarju.eu/WP_13/Project_13.02.03/Project%20Plan/Step%201/OSED/13%2002%2003-D303%20OSED%20Step1%20R6.docx

[18] OSED for Advanced Flexible Use of Airspace in Step 1, D45, Edition 00.03.07 https://extranet.sesarju.eu/WP_07/Project_07.05.04/Project%20Plan/STEP%201/OSED/07.05.04-D45%20S1%20AFUA%20OSED.doc

[19] SESAR P07.05.04 D48 S1 FAM VALP v00.03.00 https://extranet.sesarju.eu/WP_07/Project_07.05.04/Project%20Plan/STEP%201/VALP/07.05.04-D48%20S1%20FAM%20VALP.docx

[20] SESAR P13.02.03 D342 VALP S1 R5 00.01.03 https://extranet.sesarju.eu/WP_13/Project_13.02.03/Project%20Plan/Step%201/VALP/P13.02.03-D342%20VALP%20S1%20R5.docx

[21] P07.05.04-D52-Validation Report AFUA S1 Edition 00.01.01 https://extranet.sesarju.eu/WP_07/Project_07.05.04/Project%20Plan/STEP%201/VALR/P07.05.04-D52-Validation%20Report%20AFUA%20S1.docx

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[23] 07.06.02-D88 -Step 1 Business Trajectory Validation Plan for VP713 00.01.00 https://extranet.sesarju.eu/WP_07/Project_07.06.02/Project%20Plan/Trajectory-Step%201/BT%20Validation%20Plan/07.06.02-D88%20-Step%201%20Business%20Trajectory%20Validation%20Plan%20for%20VP713.docx

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Appendix A KPA Templates

N/A

Appendix B Detailed Conclusions and Recommendations

A.1 VP700 MET-NOP Int.

In the integration MET-NOP, in particular in DCB, include scenarios in STAM that apply for SIGMET

It could be a simple filtering according to a FL band or more complex like based on aircraft type or weight –only some type of aircrafts because type or equipment can cope with a given type of SIGMET (significant weather)

Include also in the counts representation the SIGMET impact assessment.

An easy way would be to use the same representation of colours in the counts graph display i.e. .every bar in the traffic count graph would have the same colour than the AoI contour being monitored on the map.

This would answer in its simplest form the request from MUAC that would like to know the network weather impact assessment. To complete the implementation, the network management system would also provide via B2B the Airspace-Id of the AoI and its colour contour (weather network impact assessment) so that it can be drawn on their local map implementation.

Jet Stream phenomena should be integrated as well.

For further future, consider in MET-NOP, the integration with DAC (Dynamic Airspace Configuration) .The SIGMET would be considered a parameter for the combination of the building blocks to create the dynamic airspace configuration.

A.2 VP-700 Network KPIs

- Improvements system/tool oriented:
  - Missing a direct link to flight list in the tool It is needed for further performance analysis during execution and for selective data recording on post operational analysis
  - Accumulating figures from two or several airports in one display on the tool it is not useful as it is difficult to distinguish the different contribution. Keep them in different displays.
  - Correction not to have negative delay: Only positive delays are delays; if negative delays are added a false delay result is obtained
  - Punctuality should be expressed in Percentage of flights arriving or departing on time
  - On time parameters need to be editable (e.g. ± 3 minute; ± 5 minutes)
  - Automate the queries by saving them for future re-use.
- For future concept propose to the user trade off performance indicators to help him in his decisions (e.g. Punctuality vs. efficiency etc..)
- In addition to the trade-off between the performance areas, there would be one more dimension that is the trade- off of the different actors involved- like ANSPs and AUs. as different local actors may have different priorities amongst themselves and network.
- Include density graph or heat map showing the demand and capacity assessment, deviations between load and demand, estimated and actual, etc.
- Access to archive data via B2B would allow for enhanced trend analysis and comparisons between current traffic situations extrapolated to the near future and benchmarked against a reference situation in the past
- Support trade off performance between different actors involved

  In addition to the trade-off between the performance areas, there would be one more dimension that is the trade- off of the different actors involved- ANSPs and AUs.

One could imagine a system of tokens that would be assigned to every ANSP. For example in case of conflict between network overall performance and local performance, If the ANSP contributes to improve performance area at network level in detriment of its own interest i.e. higher cost if requires an extra sector open, then it receives an extra token, Table 37 otherwise could be either remain unchanged or lose one token depending on the network impact. This could be validated in a gaming V2 is

- Density graph or heat map showing the demand and capacity assessment
- Move towards an alert driven model where the user can be notified of a problem that according to one or multiple criteria deserves attention and/or action and some proposals would be presented (e.g. from a catalogue with some criteria like “impact”, cost, confidence.)
- Alerts should consider several parameters contributing to traffic demand like density (entry counts or probabilistic counts), initial complexity (determined by flows or city-pairs), weather, reservation areas status with their different weights and the thresholds to compare to capacity .The alert should indicate the factors that create the problem and propose one or several solutions to reduce or solve the problem. For example a proposal of a scenario of flow rerouting or a re-sectorisation.

A.3 VP749

A.3.1 Conclusions.

The main conclusions that can be drawn from the exercise are summarised in the following paragraphs

Predictability TTOT → ATOT: AOP-NOP vs. FPL

- Predictability provided by VP749 is better than the obtained with flight plan data. Gain increases steadily the closer it gets to take off.
- In heavy traffic days, the predictability gain is higher: the worse the day the better the gain
- The better predictability of VP749 is clearly explained by the rolling exchange of DPIs that provide the most up-to-date take-off times according to the (heavy) traffic situation

TOBT versus TSAT Predictability

- Regarding TOBT vs. TSAT predictability, the conclusion is that TSAT provides systematically better predictability than TOBT and that the start of CASA sequence earlier (from an avg. -40 min in current A-CDM up to -240min in VP749) improves predictability in the associated extended period; i.e.; from -240min
  - o This applies to normal or heavy traffic days with the remark that the variability between the maximum and minimum TSAT values is higher in heavy traffic days
- Flights that are delayed remain in sequence longer and if their delay is significant, it creates a noticeable delta (variability) between the first and last estimation

Number of DPIs

As expected it is higher than in OPS for the two A-CDM airports (LEBL and LEMD), following the AOP-NOP rolling concept:

- With longer horizon, up to -24h, more dynamic and more data to exchange

Traffic Count Predictability

Results were not conclusive.

It is understood to be due to the effect execution that plays a big role as around 90% of the traffic in airport counts is partially outside the 4 participating airports(departing but not landing or landing but not departing). This traffic is affected by FSAs and or CPRs that alter/correct accordingly the CTFM profile after departure and these profiles are used to build the final count value

Predictability TTOT→ATOT: AOP-NOP vs. CDM

For LEBL (CDM Airport), there is a gain between the AOP-NOP and CDM, both in normal and heavy traffic days, meaning the gain is greater in heavy traffic days

- Note that the exchange in CDM even if it is possible as from 3h before with Early DPIs, it is not always used as it is the case in Barcelona airport
- This gain has only been measured as an indication of how new logic compares to current logic These results have not been extended to LEMD

Multi Airport Integration

Benefits of Multi-Airport approach versus single Airport approach can be summarised as follows:

- Time accuracy improvement, based on number of jumps forward ranges from 48% for the first jump (departing from the next airport) to 9,67% for aircraft departing from jump 4 (4 airports forward)
- Predictability improvement (standard deviation), based on number of jumps forward ranges from 30% for the first jump (departing from the next airport) to 11,40% for aircraft departing from jump 5 (5 airports forward)
- This multi-airport approach provides for two thirds of time a more accurate picture than the current single airport approach

Airport DCB Process Improvements

The following results have been obtained:

- The number of flights regulated is lower with AIMA than with CASA
- Total ATFM delay is lower with AIMA than with CASA
- Average ATFM delay (for regulated flights) is bigger in AIMA than in CASA
- The number of flights arriving late is lower with AIMA than with CASA (over 20%)
- The aggregated departure delay for delayed flights (from previous leg(s)), compared to their scheduled SOBTs; i.e.; Knock-on Effect delay, is around 50% lower in AIMA than in CASA.
- The number of flights affected by the knock-on effect is more than 50% lower with AIMA than with CASA.
- Total departure delay at the next airport (the one applying the DCB measure) for flights in the DCB imbalance time frame, is more than 30% lower with AIMA than with CASA.

In general, conclusion from the obtained results are that AIMA produces higher average arrival delays (for delayed flights) for a given measured period, but the overall aggregated delay throughout the consecutive legs is significantly lower compare to CASA.

These results are explained by the AIMA concept development, that "cherry picks" aircraft to be delayed that reduce the knock-on effect, thus improving network predictability and stability

A.3.2 Recommendations

Based on the obtained results from VP-749 P07.06.01 (AOP/NOP Integration) and OFA05.01.01 (Airport DCB Process Improvement), the following recommendations can be made

- Improve pre-sequence logic in AOP to deal with CTOT improvements (Optimal CTOT)
- Early start of (CASA) sequence has given positive results in predictability within the -240min. However in heavy traffic days there is some variability that should be improved.

  In addition the hump phenomenon in the period -460 to -240 caused by flights affected by important delays should also be addressed.

- The recommendation is to reduce the variability as it produces some spurious effect on the affected flights, as previously described. In order to do that the proposal is to modify the principle of when a flight is allocated a TSAT. Instead of allocating a TSAT at -240 min before departure, the flight would get its TSAT when its inbound leg is in status departed. In this way we would allocate TSATs to flights with higher level of confidence and we expect to reduce variability.
- The first DPI providing the TSAT to TACT would trigger the rolling exchange with CASA (TTOT/CTOT) if the flight is regulated as in VP749, regardless of its time difference being a fix parameter (-240min)
- Pfd (planned flight data in NM) provide an essential element in the concept for predictability before FPL is filed. However Pfds are not yet part of NM OPS system. For the roadmap of AOP-NOP concept towards operation, evolution in two steps is recommended:
    - 1.With full horizon of FPL
    - 2.With Pfd as well (up to -24h)
- To conduct a Live trial to measure delays and traffic count predictability and confirm the results of VP749
- AIMA has proven to provide benefits compared to CASA in solving Airport DCB situations by Airports in TTA management. However regarding the delay comparison between both, it has not been possible to use an accurate Reference Scenario to compare CASA and AIMA total delay. More investigation or possibly a live trial should be conducted to confirm the VP749 results.

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