# SESAR PJ09 OSED-SPR-INTEROP – Part I

| | |
|---|---|
| DeliverableID | D2.1.023 (S1) + D3.1.023 (S2) + D4.1.023 (S3) |
| ProjectAcronym | PJ09 DCB |
| Grant: | 731730 |
| Call: | H2020-SESAR-2015-2 |
| Topic: | Advanced DCB |
| Consortium coordinator: | EUROCONTROL |
| Edition date: | 3 June 2019 |
| Edition: | 00.02.01 |
| Template Edition | 02.00.00 |

Founding Members
EUROPEAN UNION EUROCONTROL
SESAR JOINT UNDERTAKING

# Authoring & Approval

## Authors of the document

| Name/Beneficiary | Position/Title | Date |
|---|---|---|
| Gilles Gawinowski/EUROCONTROL | Project Member | |
| Hamid Kadour/EUROCONTROL | Project Member | |
| Stefan Steurs/EUROCONTROL | Project Member | |
| Stella Saldana/EUROCONTROL | PJ09.03 Project Lead | |
| Charlotte Chambelin/DSNA | Project Member | |
| Aurélie Abert/DSNA | Project Member | |
| Nicolas Suarez/ENAIREE | PJ09.02 Project Lead | |
| Bertrand Bousquet-Hourat/EUR | Project Member | |
| Ralph Terrein/EUROCONTROL | Project Member | |
| Cruz Garcia De Dios/EUROCONTROL | Project Member | |
| Alexander Lau/DLR | Project Member | |
| Jan Berling/DLR | Project Member | |
| Rasoul Sanaei/DLR | Project Member | |

## Reviewers internal to the project

| Name/Beneficiary | Position/Title | Date |
|---|---|---|
| Soenke Mahlich/EUROCONTROL | PM | |
| Etienne De Muelenaere/ EUROCONTROL | PCIL | |
| Peter Choroba/EUROCONTROL | Solution 1 Lead | |
| Nicolas Suarez/ENAIRE | Solution 2 Lead | |
| Stella Saldana/EUROCONTROL | Solution 3 Lead | |
| Bertrand Bousquet-Hourat | Solution 3 Member | |
| Gilles Gawinowski | Solution 3 Member | |
| Hamid Kadour | Solution 3 Member | |
| Ralph Terrein | Solution 3 Member | |
| Cruz Garcia De Dios | Solution 3 Member | |
| Jan Berling/DLR | Project Member | |
| Alexander Lau/DLR | Project Member | |
| Rasoul Sanaei/DLR | Project Member | |

## Document History

| Edition | Date | Status | Author | Justification |
|---|---|---|---|---|
| 00.00.01 | 4 July 2017 | Initial Draft | PJ09 Team | Creation of Drafted version |
| 00.00.02 | 28 August 2017 | Refined Draft | PJ09 Team | Update |
| 00.00.03 | 27 Oct 2017 | Refined Draft | PJ09 Team | Internal Review |
| 00.01.00 | 21 Dec 2017 | Interim OSED | PJ09 Team | External Review |
| 00.01.02 | 1 March 2018 | Working Draft | PJ09 Team | Demand Prediction : concept+requirements, AU Priority (A-PRIO) |
| 00.01.03 | 29 March 2018 | Working Draft | PJ09 Team | Constraint Optimisation topic |
| 00.01.04 | 30 April 2018 | Working Draft | PJ09 Team | Remove CTOT<br>SJU comments on ops requirements |
| 00.01.05 | 28 June 2018 | Working Draft | PJ09 Team | Text for EATMA models<br>INTEROP Annex |
| 00.01.07 | 18 July 2018 | Working Draft | PJ09 Team | Update Requirements |
| 00.01.08 | 30 July 2018 | Working Draft | PJ09 Team | Text for EATMA models |
| 00.01.09 | 25 Sept 2018 | Working Draft | PJ09 Team | Update IER Requirements<br>Update Network Performance<br>UC DAC/INAP<br>Model & UC Resilience<br>Margins of Manoeuvre<br>Vizualization Probabilistic Count & Imbalance Confidence Index |
| 00.01.10 | 24 Oct 2018 | Working Draft | PJ09 Team | PFP Prediction<br>Requirements Trace<br>Constraint Reconciliation Update<br>UC Optimization<br>Update Severity Indicator |

| | | | | |
|---|---|---|---|---|
| | | | | Update AU Simple Preference |
| 00.01.12 | 10 Dec 2018 | Working Draft | PJ09 Team | Internal Review |
| 00.01.13 | 30 Jan 2019 | Working Draft | PJ09 Team | Previous/new operating method<br>EATMA tables<br>Additonal ops requirements<br>Performance requirements<br>Stakeholder expectations<br>Benefits mechanisms |
| 00.02.00 | 4 March 2019 | Final Draft | PJ09 Team | Optimisation Requirements<br>Resilience Requirements<br>Safety Requirements |
| 00.02.01 | 3 June 2019 | Final Version | PJ09 Team | Security Requirements<br>EATMA tables<br>Internal/external review |

# PJ09 DCB

PJ09 DCB

This OSED is part of a project that has received funding from the SESAR Joint Undertaking under grant agreement No 731730 under European Union’s Horizon 2020 research and innovation programme.

## Abstract

The current edition of this document describes:

- The detailed operational environment (§3.2)
- The detailed operating methods (§3.3)

of new concepts of PJ09 Advanced DCB

In the S2020 concept, key for the improvement of Demand Capacity Balancing is the development of collaborative processes and common situation awareness facilitated by decision support tools at local and regional levels based on the principal “think global, act local”.

Project PJ09 Advanced DCB is addressing the performance driven balancing of traffic demand and ATM capacity in a collaborative process with all ATM stakeholders and Airspace Users involved. In this context, PJ09 acts as a bridge function between a number of S2020 projects (such as PJ01, PJ04, PJ07, PJ08) ensuring effective networking of local Airspace Users and ATM planning functionalities in the SESAR 2020 horizon.

The major objective of the PJ09 Advanced DCB concept is to evolve the existing DCB process to a powerful distributed network management function which takes full advantage from the SESAR Layered Collaborative Planning, Trajectory Management principles and SWIM Technology to improve the effectiveness of ATM resource planning and the network performance of the ATM system in Europe.

# Table of Contents

# List of Tables

## List of Figures

# 1 Executive Summary

The major objective of the PJ09 Advanced DCB concept is to evolve the existing DCB process to a powerful distributed network management function which takes full advantage from the SESAR Layered Collaborative Planning, Trajectory Management principles and SWIM Technology to improve the effectiveness of ATM resource planning and the network performance of the ATM system in Europe.

PJ09 Advanced DCB shall develop and validate the following three SESAR Solutions:

- PJ09-01 Network Prediction and Performance

- PJ09-02 Integrated Local DCB Processes

- PJ09-03 Collaborative Network Management Functions

In S2020 Wave1, the scope addressed the 6hrs - 10 min timeframe.

The operational concepts described here above are:

- Solution PJ09.01: Network Prediction and Performance

    - **Demand Prediction** : The proposed demand prediction improvement aims at qualifying and improving the Traffic Demand Forecast by adding probabilistic information.To provide a methodology to quantify the uncertainties of the Demand Prediction in the 6hrs-10 min time horizon. The uncertainty of the Trafic Demand is quantified using a probabilistic count approach. It is based on a probabilistic distribution of trajectories (3D, time) with quantification of uncertainties in model parameters (flight status, cdm/no cdm airports, ...). The demand data together with the improved PFD including better route information, historical data, and the confirmation of demand by AOP forms the network predicted demand picture.

    - **Local & Network Consolidated Predicted Worload** : Depending on the timeframe and related uncertainties, different predicted workload methodologies are proposed to manage different granularity of issues:

- Traffic density management aiming at managing that there are not too many flights in a traffic volume,
- then traffic complexity management aiming at keeping an acceptable level of complexity induced by flights in a traffic volume.

It has been proposed :

- A local complexity methodology
- An Imbalance Confidence Index (ICI) indicating the level of certainty of the predicted imbalance (count, complexity). This Imbalance Confidence Index will be obtained from the processing of the traffic demand prediction and its associated uncertainties.

ANSPs/INAPs identify local imbalances based on theirs local methodologies (entry/occupancy counts, complexity, ). These partial local imbalances are shared with NM and need consolidation to assess the imbalance situation at network level. To ensure the interoperability of the local methodologies, it is proposed to consider consider the severity value of the imbalances as elements to be shared. To support such a capability, an imbalance repository is developed to collect all the local imbalances figures from ANSPs. This Imbalance Repository Service aggregates the local imbalance figures in order to provide a consolidated network imbalance view.

- **Network Performance** : The Advanced DCB provides capabilities to support the collaborative decision-making under consideration of the different stakeholder perspectives from Airspace Users, Airports, ANSPs and NM. A Stakeholder can express dynamically and precisely to the performance framework their individual needs that others stakeholders can try to accommodate. It move the performance to quantitative and dynamic (e.g. AUs will be able to express their non-linear cost) approach.
  - To guide the NMf decision-making to resolve the hotspots in nominal situations
  - To guide the NMf decision-making to recover critical situations at the network level (Resilience)

- Solution PJ09.02: Integrated Local DCB processes
  - **Spot Management** : Regardless the methodology used (EC, OC, weighted complexity, complexity…), the imbalance are characterized with Traffic Monitoring Values (TMV). These thresholds represent different objectives (safety, rate optimisation, critical & crisis situation ….) and are related to different meanings and different category of Spot :HotSpot Initially introduced in SESAR1 with the peak and sustain thresholds. It aims at preventing

excessive ATC workload and to ensure that the traffic delivered to ATC controllers will always be manageable in the safe limits of workload. It represents potential indications in term of controller workload, and implicitly potential non-critical safety risks. OptiSpot : It aims at preventing bunch (without safety issue) and to ensure that the traffic delivered to ATC controllers will always be manageable in an organised and smoothed way. It aims also at providing room for better use of spare capacity. It defines the context of an optimisation issues. Thus, an Optispot is triggered by TMV (rate marks) violation. CriticalSpot and CrisisSpot : It aims at detecting the change of the state of the system from nominal to critical and crisis states. TMV-resilience is defined with two thresholds (critical, crisis) It defines the context of critical or crisis issues marked out by a CriticalSpot or a CrisisSpot. Thus, an CriticalSpot is triggered by TMV (critical marks) violation and a CrisisSpot is triggered by TMV (crisis marks) violation

- **INAP function** : Local DCB actors and Extended ATC Planning actors works within an INAP (Integrated Network and ATC Planning) providing the full capabilities to manage imbalances through assessment of evolving traffic situations and evaluations of opportunities, in order to apply the best performing option between the Dynamic Airspace Configuration, Flow Managements measures (synchronization, sequencing) and Trajectory measures.

- **CORSE Catalogue** : The Complexity Reduction Service (CORSE) proposes a full set of methodologies and measures to cover the resolution of problems dealing with safety and optimisation issues to manage traffic density, traffic organisation and traffic interferences in the E/R and Arrival/Departure phases.
  A myriad of functions (ATC, ACC TMA, APT, AU) propose at the same time corrective short-term measures with overlaying horizons which can be affected by concurrent strategies. For this reason, the interaction between DCB and the other ATC, TMA and APT activities needs to be properly managed in order to avoid interfering concurrent actions.

- **Target-Time Management** : To manage the hotspot resolution, INAP or NM can constrain the Time of Entry of flights into the hotspot or the time on a specific waypoint (i.e.the COP, not necessarily being a coordination point between two sectors)with TTO (Target Time Over the congested E/R point) and TTA (Target Time of Arrival at congested Airport) in order to smooth the traffic. Because the Target Time (TTO/TTA) is managed in two different ways depending on whether the TTO/TTA has been prepared in the SBT elaboration and refinement or in the RBT revision processes, it is proposed to distinguish and to introduce :
  - TTO/TTA (Target Time Over/Target Time at the Arrival) for measures managed in the SBT elaboration phase

        - tTTO/tTTA (tactical Target Time Over/tactical Target Time at the Arrival)for measures managed in the RBT revison phase

    - **Synchronization** : A myriad of functions (ATC, ACC TMA, APT, AU) propose at the same time corrective short-term measures with overlaying horizons which can be affected by concurrent strategies. For this reason, the interaction between DCB and the other ATC, TMA and APT activities needs to be properly managed and synchronized in order to avoid interfering concurrent actions.

- Solution PJ09.03: Collaborative Network Management
    - **Collaborative Framework** : This framework proposes mechanism to support collaborative design involving differents actors between the regional (NM) and/or the sub-regional/local DCB (INAP) and/or the Airport (APOC) and/or AU (FOC) to manage a common agreement on the best accommodation of DCB solutions both for safety issues and areas of opportunities for optimization. Mechanisms like coordination and delegation of role and responsibility have been developed.

    - **Local Constraint Reconciliation & Global Optimization** : two different approaches depending on whether DCB manages a normal or critical situation. These different contexts imply a clear definition and allocation of roles and responsibilities for INAP and NM, and different local and network DCB mechanisms.

        - The Nominal context activates local optimizations. Local INAP actors will play the main role deciding the local solution to apply. In such a context, local methodologies (udpp, aima, cop sequencer, ad-hoc STAM, ….) are used with a constraint reconciliation mechanism in order to manage the local interfering constraints. The resulting DCB solutions optimize the local business needs but might be sub-optimum at the global level. The Constraint Reconciliation mechanism  ensures the collection of the locally planned DCB Target-Time solutions to determine the global consistency and to detect which flight trajectories will be affected by multiple constraints interferences and provides a Network Consolidated Constraint (NCC) to the local-DCB actors

        - The Critical context activates the global optimization. NM actor will play the main role deciding the solutions to apply at the global level. In such a context, one global methodology (CASA, CRO, Interactive Regulation, …) is used (global optimisation). The resulting DCB solution is an optimized solution at the global level. It supports the NM business needs to recover efficiently a global nominal situations

- **Collaborative NOP** : Enriched DCB information has been proposed.
  - AU Simple preference to indicate a preferred action for a flight in case of DCB constraints (or to be offered opportunities).They will be considered by airports in the process of assigning TTAs, within the selection of flights logic and equally they will be considered by LTM/INAP in the process of STAM or TTO assignment within the selection of flights logic.
  - Impact Severity Indicator : The airport will send to the NOP as part of Arrival Plan Information and its updates the Impact severity indicator a flight which indicates the impact that the associated SBT will have on the airport planning when a deviation from the scheduled in-block time may occur.
  - Congestion Indicator : Network what-if processes congestion indicator consolidated at the network level aiming at simulating the impact of a trajectory in regards with a specific predicted imbalance methodology (Occupancy Count, Complexity…). The what-if can be processed on different scales from a local to a regional view.
  - Provision of arrival and departure information in support of network predicted demand

# 2 Introduction

## 2.1 Purpose of the document

This document provides the requirements specification, covering functional, non-functional and interface requirements related to SESAR PJ09. It covers the three PJ09 solutions aiming at providing a single document with a more consistent and integrated PJ09 view.

The SESAR Solution Development Life Cycle aims to structure and perform the work at project level and progressively increase SESAR Solution maturity, with the final objective of delivering a SESAR Solution datapack for industrialisation and deployment. The SPR-INTEROP/OSED represents one of the key parts of this SESAR Solution datapack.

The SPR-INTEROP/OSED is composed of different parts:

- SPR/INTEROP-OSED – Part I (this volume)
- SPR/INTEROP-OSED – Part II Safety Assessment Report (SAR)

Part I of this document provides the Safety and Performance Requirements (SPR) and Interoperability Requirements (INTEROP), related to a SESAR Solution that will be validated during validation activities. They are presented in the context of the Operational Service and Environment Definition (OSED) which describes the environment, assumptions, etc. that are applicable to the SPR and INTEROP requirements.

The document is completed by appendices including:

- The Benefit and cost Mechanisms, showing how the SESAR PJ09 Solution elements contribute (positively or negatively) to the delivery of performance benefits and the costs.
- Parts II to V provide the series of assessments performed at SESAR PJ09 Solution level that justify the SPR and INTEROP requirements.
- Part II: The Safety Assessment Report describes the results of the safety assessment work for the SESAR PJ09 solutions. Due to regulatory obligations it should be expected that a Safety Assessment is required for any proposed change to the system, although the depth of such an assessment will depend on the nature of the change.
- Part IV: The Human Performance Assessment Report describes the results of the Human Performance assessment work for the SESAR PJ09 solutions.
- Part V: the Performance Assessment Report (PAR) that consolidates the performance results obtained in different validation activities at SESAR Solution level.

- SPR/INTEROP – OSED Template – Part IV Human Performance Assessment Report (HPAR)
- SPR/INTEROP – OSED Template – Part V Performance Assessment Report (PAR)

## 2.2 Scope

This is the OSED for PJ09 describing the concepts of advanced DCB to be put in place to optimize the Air Traffic Flow.

PJ09.01 is covering the below OIs with the aim to reach mentioned maturity levels at the end of SESAR2020 Wave 1.

| OIs | Initial Maturity level | Target Maturity level at the end of Wave 1 | OIs description |
|---|---|---|---|
| DCB-0211 | V1 | V2 (in R8) | Traffic & Demand Forecast in 4D Trajectory Management Context |
| CM-0103-B | Initial V2 | V2 (in R8) | Automated Support for Traffic Complexity Assessment |
| DCB-0212 | V1 | iV2 (in R9) | Network Performance Assessment for Distributed Network Operation |

**Table 1 PJ09 Solution 01 Maturity levels table**

PJ09.02 is covering the below OIs with the aim to reach mentioned maturity levels at the end of SESAR2020 Wave 1.

| OIs | Initial Maturity level | Target Maturity level at the end of Wave 1 | OIs description |
|---|---|---|---|
| DCB-2013 | V1 (in R7) | V2 (in R9) | Consolidation and Facilitation of Target Times between local DCB, Airport CDM and Extended Arrival Management |
| DCB-0210 | V1 | V1<br>(V2, V3 in Wave 2) | Full Integration of Dynamic Airspace Configuration into DCB |
| CM-0104-B | V1 | V2 (in R8) | Automated Controller Support for Trajectory Management in Dynamic Airspace Management environment |
| CM-0302 | V1 | V2 (in R8 | Ground based automated Support for Managing Traffic Complexity across several Sectors |

**Table 2 PJ09 Solution 02 Maturity levels table**

PJ09.03 is covering the below OIs with the aim to reach mentioned maturity levels at the end of SESAR2020 Wave 1.

| OIs | Initial Maturity level | Target Maturity level at the end of Wave 1 | OIs description |
|---|---|---|---|
| AUO-0108 | V1 | V2 (in R8) | Most Penalizing Delay based on reconciliation between DCB and Airport CDM |
| DCB-0103-B | V1 | V2 (in R9) | Collaborative Network Operations Plan |
| DCB-0214 | V1 | V1<br>(V2, V3 in Wave 2) | DCB What-If Network Impact Assessment |
| DCB-0215 | V1 | V1<br>(V2, V3 in Wave 2) | Consolidation of imbalances and arbitration of Trajectory Management solutions |

**Table 3: PJ09 Solution 03 Maturity levels table**

## 2.3 Intended readership

This document is aimed at the following stakeholders:

- The SJU and EUROCONTROL;
- The Transversal PJ22, PJ19 projects;
- The PJ07, PJ08, PJ04, PJ06, PJ01, PJ18
- AU representatives

## 2.4 Structure of the document

This document is divided into 5 chapters:

- Chapter 1 gives a general description of the document structure and scope;
- Chapter 2 gives an introduction
- Chapter 3 gives a description of the operational concept; detailed operating method; description of the operational environment; description of the operational processes/use-cases;
- Chapter 4 gives a description of operational requirements; INTEROP requirements, SPR requirements
- Chapter 5 indicates the references.

This document includes also 1 annex:

- ANNEX 1 describes the cost and benefit mechanisms

## 2.5 Glossary of terms

| Term | Definition | Source of the definition |
|---|---|---|
| CrisisSpot | The CrisisSpot is a 4D volume (defined in time and space) representing a crisis situation, within which specific DCB procedures will apply, led by NM. In a crisis situation, NM leads the coordination and decision making, coordinates the solutions (contingency plans) to recover to a nominal situation, share the impact and predicted network states with other stakeholders. A crisis situation represents a non nominal and unplanned event. | PJ09 |
| CriticalSpot | The CriticalSpot is a 4D volume (defined in time and space) representing a critical situation, within which specific DCB procedures will apply, with active NM support for resolution. | PJ09 |

| | | |
|---|---|---|
| | In a critical situation, NM can propose solutions (based on a dedicated catalogue of measures and predefined scenarios) to recover to a nominal situation, share the impact and predicted network states with other stakeholders. A critical situation represents a non nominal and planned event. | |
| HotSpot | The HotSpot is a 4D volume (defined in time and space) representing a potential DCB imbalance (not critical as not impairing Safety), identified by ANSP(s) and potentially NM. This imbalance is shared with partners, and ANSPs define solutions, supported by Collaborative Decision Making process and tools (either in strategical and pre-tactical phases, or in tactical phase with INAP). A hotspot situation represent a nominal, safety non critical and planned event. | OSED P13.02.03 SESAR1 |
| Impact Severity Indicator | It represents the impact severity in term of cost related to a DCB constraint | PJ09 |
| AU Margins of Manoeuvre | AU Business Needs are expressed in the form of margins of manoeuvre in time. Points of the AU trajectory are expressed with time tolerance [min, max] indicating the margins of manoeuvre acceptable or not acceptable for the AU cost. | PJ09 |
| NMf | Network Manager function represents the actors (NM, INAP) involved in the management of the Network | OSED P13.02.03 SESAR1 |
| OptiSpot | The OptiSpot is a 4D volume (defined in time and space) representing a traffic situation where opportunity for optimization has been identified by ANSP (INAP). An ATFCM situation yet to be optimized represents a nominal, safe and planned event. | PJ09 |
| Performance Indicator | PIs are defined in the SESAR performance framework and relate to performance benefits in specific KPAs. However, no | SESAR 2020 project Handbook |

| | | |
|---|---|---|
| | validation targets are assigned to PIs. SESAR Solutions projects use the results of validation exercises to report performance assessment in terms of the PIs, reporting the expected positive and negative impacts. Certain PIs are mandatory for measurement and reporting by Solution projects. | |
| Reactionary Delay | Reactionary delays: Delays incurred by delays affecting previous flights and using the same aircraft. | OSED P13.02.03 SESAR1 |
| Non Linear Cost | AU non-linear cost reflects the operational cost of the delay and represents the cost structure due to events (connection, transit, VIP, …), resources management (curfew, pilot and crew constraint, maintenance, ….) | PJ09 |
| Scenario | Scenarios are an ATFCM solution to network capacity bottlenecks or specific operational needs of an ANSP | PJ09 |
| TTO/TTA | TTO/TTA (Target Time Over/Target Time at the Arrival) for measures initiated in the SBT elaboration phase | PJ09 |
| tTTO/tTTA | tTTO/tTTA (tactical Target Time Over/Target Time at the Arrival) - Target Time elaborated and shared during execution phase of the flight, through RBT Revision. | PJ09 |

**Table 4: Glossary of terms**

## 2.6 List of Acronyms

| Acronym | Definition |
|---|---|
| **AIMA** | Airport IMpact Assessment |

| | |
|---|---|
| **APOC** | Airport Operations Center |
| **APT** | Airport |
| **ATC** | Air Traffic Control |
| **ATM** | Air Traffic Management |
| **ATSU** | Air Traffic Service Unit |
| **ATT** | Achievable Target Time |
| **AU** | Airspace User |
| **CI** | Congestion Indicator |
| **CFSP** | Computerised Flight Plan Service Providers |
| **CNS** | Communication Navigation and Surveillance |
| **CONOPS** | Concept of Operations |
| **COP** | Coordination Point |
| **CORSE** | Complexity Reduction SErvice |
| **CR** | Change Request |
| **CTOT** | Calculated Take Off Time |
| **CWP** | Controller Working Position |
| **DCB** | Demand and Capacity Balancing |
| **DCB** | Dynamic Demand and Capacity Balancing |
| **EATMA** | European ATM Architecture |
| **E-ATMS** | European Air Traffic Management System |
| **EC** | Executive Controller |
| **eFPL** | Electronic Flight Plan |
| **FBT** | Forecast Business Trajectory |
| **FOC** | Flight Operation Center |
| **HPAR** | Human Performance Assessment Report |
| **ICI** | Imbalance Confidence Index |
| **INAP** | Integrated Network Management and (Extended) ATC Planning |
| **iNWP** | Innovative Network Working Position |
| **INTEROP** | Interoperability Requirements |
| **KPA** | Key Performance Area |
| **LTM** | Local Traffic Manager |

| | |
|---|---|
| **MIP** | Most Important Problem |
| **MPC** | Most Penalizing Constraint |
| **MSP** | Multi-Sector Planner/ Multi-Sector Planning (Controller) |
| **NMf** | Network Management Functions |
| **OI** | Operational Improvement |
| **OPAR** | Operational Performance Assessment Report |
| **OSED** | Operational Service and Environment Definition |
| **PAR** | Performance Assessment Report |
| **PC** | Planning Controller |
| **PFP** | Preliminary Flight Plan |
| **PIRM** | Programme Information Reference Model |
| **RBT** | Reference Business Trajectory |
| **QoS** | Quality of Service |
| **SAC** | Safety Criteria |
| **SAR** | Safety Assessment Report |
| **SBT** | Shared Business Trajectory |
| **SecAR** | Security Assessment Report |
| **SESAR** | Single European Sky ATM Research Programme |
| **SJU** | SESAR Joint Undertaking (Agency of the European Commission) |
| **SPR** | Safety and Performance Requirements |
| **SWIM** | System Wide Information Model |
| **TAM** | Total Airport Management |
| **TDI** | Trajectory Deviation Indicator |
| **TC** | Tactical Controller (also called Executive Controller) |
| **TS** | Technical Specification |
| **TTA** | Target Time of Arrival for measure initiated in the SBT Elaboration phase |
| **TTO** | Target Time Over for measure initiated in the SBT Elaboration phase |
| **tTTA** | Tactical Target Time of Arrival for measure initiated in the RBT Revision phase |

| | |
|---|---|
| **tTTO** | Tactical Target Time Over for measure initiated in the RBT Revision phase |
| **UDPP** | User Driven Priorization Process |

**Table 5: List of acronyms**

# 3 Operational Service and Environment Definition

## 3.1 SESAR PJ09 Solution 01: Network Prediction and Performance Functions

Network Prediction and Performance relies on shared situational awareness with respect to demand, capacity and performance and has an impact on regional, sub-regional and local demand and capacity balancing (DCB) processes. It consists of improved traffic and demand forecast based on SBT and the computation of confidence indexes. Prediction of DCB constraints and complexity issues will be based on the definition of metrics and algorithms for prediction, detection and assessment of traffic complexity, thus improving the accuracy and credibility of the diagnosis and awareness of hotspots. Network Operations will be monitored through Network Performance KPA/KPI while a Network impact assessment will analyse trade-offs and facilitate collaborative decision making processes.

<table>
<tr><th>OI Step code</th><th>OI Step title</th><th>OI Step coverage</th></tr>
<tr><td>CM-0103-B</td><td>Automated Support for Traffic Complexity Assessment</td><td>Initial maturity: Initial V2<br>Target maturity: V2<br>Reused validation materials: SESAR 1 Solution #19:<br>Support to ATC in identifying, assessing and resolving local complexity situations through early implementation of measures, based on real time integrated process.</td></tr>
<tr><td colspan="3">Automated tools adapted to Step 2 operations (planning and execution): including user preferred trajectory and 4D data, continuously monitor and evaluate traffic workload and complexity in defined airspace volumes according to predefined parameters. These tools will provide accurate and timely prediction on upcoming congestions and appropriate input to tools handling hotspots/ complexity resolution.</td></tr>
</table>

| OI Step code | OI Step title | OI Step coverage |
|---|---|---|
| DCB-0211 | Traffic & Demand Forecast in 4D trajectory Management Context | Initial maturity: V1<br>Target maturity: V2<br>Reused validation materials: None |

| |
|---|
| The aim of this OI is to benefit from the shared iterative SB/MT development and provides enhanced and continuous Traffic/Demand Forecast services from long term planning to execution phases in 4D Trajectory Management context.<br><br>It includes the development of 4D trajectory based forecast methodology (build on 2D, 3D and 4D trajectory data provided by the AUs), operational workflows, and the appropriate infrastructure which provide European airspace planners and airspace users with a common and consistent picture of European air traffic demand that will meet their planning and monitoring needs.<br><br>It includes as well improved traffic predictability thanks to the elaboration of the probabilistic demand, the consideration of planned DCB measures and the consideration and processing of airspace users shared flight information (including a set of confidence indexes and their interpretation) in support of the traffic demand enrichment. |

| OI Step code | OI Step title | OI Step coverage |
|---|---|---|
| DCB-0212 | Network Performance Assessment for Distributed Network Operation | Initial maturity: V1<br>Target maturity: V2<br>Reused validation materials: None |
| Network Operations performed at local, sub-regional and regional levels will be continuously monitored through Network Performance KPA/KPI. Stakeholders will be allowed to evaluate the impact of their intentions and decisions on capacity and QoS performance (flight efficiency, predictability, flexibility) at Network Level, using what if tools and Network Impact Assessment function. Network impact assessment will facilitate collaborative decision making processes to reduce adverse network effect (e.g. increase of sectors workload) and anticipate effective corrective measures to achieve the Network Performance Targets. | | |

**Table 6: SESAR Solution PJ.09-01 Scope and related OI steps**

| Id | High Level CONOPS Requirement Description | CONOPS section |
|---|---|---|
| S09-01-HLOR-01 | The Network prediction and performance processes within a continuum from planning through to execution, shall provide increased efficiency by:<br>· Assessment of performance of network operations performed at local/sub-regional/regional levels are continuously monitored through network performance KPA/KPI, with stakeholders able to evaluate the impact of their intentions and decisions on capacity and Quality of Service performance;<br>· Automated tool supporting the INAP actors in a multi-sector/unit environment to manage traffic complexity in order to alleviate traffic complexity, density and traffic flow problems by planning individual trajectories using advanced planning tools;<br>· Incorporation of enhanced meteorological data; | |

| | | |
|---|---|---|
| | · Exploitation of the shared iterative SB/MT development providing continuous traffic demand forecast from long term planning to execution phases in order to allow enhanced business trajectory forecast methodology (probabilistic demand) to provide a standardised confidence indicator and define common operational usage of 4D trajectory forecast. | |

**Table 4: High Level CONOPS requirements related to SESAR Solution PJ.09-01**

### 3.1.1 Deviations with respect to the SESAR Solution(s) definition

| OI Step Code | OI Step title | Deviation |
|---|---|---|
| CM-0103-B | Automated Support for Traffic Complexity Assessment | None |
| DCB-0211 | Traffic & Demand Forecast in 4D trajectory Management Context | None |
| DCB-0212 | Network Performance Assessment for Distributed Network Operation | None |

## 3.2 SESAR PJ09 Solution 02: Integrated Local DCB Processes Functions

Integrated Local DCB Processes see the seamless integration of local network management with extended ATC planning and arrival management activities in shortterm and execution phases. It represents the core functionality for the Integrated Network ATM Planning (INAP) process through an enhanced Local DCB tool set. The solution will improve the efficiency of ATM resource management, as well as the effectiveness of complexity resolutions by closing the gap between local network management and extended ATC planning.

| OI Step code | OI Step title | OI Step coverage |
|---|---|---|
| CM-0104-B | Automated support to INAP (Integrated Network Management and Extended ATC Planning) function | Initial maturity: Initial V2<br>Target maturity: V2<br>Reused validation materials: P04.07.01, where INAP was described as a function assisted by automation that plans and organises air traffic within an area of operation. |

| |
|---|
| Local DCB actors and Extended ATC Planning actors are working within an INAP (Integrated Network Management and Extended ATC Planning) working environment providing access to all capacity and flow/trajectory management options and shared ATFCM/ATC situation awareness on both DCB and ATC sides.<br><br>The local roles within INAP (corresponding to Local Traffic Management and Extended ATC Planning) will be able to assess and resolve local complex situations (e.g. hotspots) through assessment of evolving traffic situation and evaluation of opportunities, in order to identify and manage the best performing option between Dynamic Airspace Configuration measures, flow management measures and trajectory measures (e.g. strategic de-confliction/synchronization).<br><br>The NM role is consolidating the local actions (problem notification, planned solution) in order to provide a Network View.<br><br>This OI includes the set-up of an automated interface and related procedures between Local NM function and ATC Planning, to optimize the ATM resource management and improve the effectiveness of complexity resolutions through collaborative rules and decision approach involving all the relevant actors. |

| OI Step code | OI Step title | OI Step coverage |
|---|---|---|
| CM-0302 | Ground based Automated Support for Managing Traffic Complexity Across Several Sectors | Initial maturity: Initial V2<br>Target maturity: V2<br>Reused validation materials: SESAR 1 Solution #19, which addressed the need for development and implementation of a real-time integrated process for managing the complexity. |
| The system supports INAP actors for smoothing flows of traffic and de-conflicting flights across INAP AoR (thus covering a part or the whole of an ATSU AoR).<br><br>ATC Planning Control roles are assisted in alleviating traffic complexity, facilitating traffic sequencing, and optimizing traffic flows thanks to:<br><br>* Finer ATFCM measures taken in a timeframe particularly close to the time of occurrence of the complexity situation, which allows for more reliable and efficient analysis, better focused measures which are more likely to have the desired impact, without unwanted side effects<br><br>* Support to ATCOs on CWPs to facilitate decision making process and implementation of the ATFCM measures (on the basis of Best Effort principle). | | |

| OI Step code | OI Step title | OI Step coverage |
|---|---|---|
| DCB-0210 | Full integration of Dynamic Airspace Configurations into DCB | Initial maturity: V1<br>Target maturity: Initial V2 |

| | | |
|---|---|---|
| | | Reused validation materials: SESAR 1 Solution #18 and P07.05.04, whose aim was to integrate DAC, Dynamic Airspace Configuration, into DCB processes. |
| The aim of this OIs is to elaborate the complete DCB solution that includes Dynamic Airspace Configurations combined with 4D constraints to optimally adapt the capacity to the demand and minimise demand adjustments.<br><br>Integrated Airspace/4D constraints solutions are obtained through an iterative optimisation and CDM processes involving local, sub-regional and regional levels.<br><br>ATM resource (including airspace and ground resources) management efficiency will be improved through a seamless integration of Airspace Management functions and Dynamic Airspace Configurations (DAC) into the advanced DCB and ATC planning processes. | | |

| OI Step code | OI Step title | OI Step coverage |
|---|---|---|
| DCB-0213 | Consolidation and facilitation of Target Times between local DCB, Airport CDM and Extended Arrival Management | Initial maturity: V1<br>Target maturity: Initial V2<br>Reused validation materials: SESAR 1 Solution #18 whose aim was to integrate the DCB measures which allow implementing a smooth planned sequence efficiently, based on the dissemination of a TTO and TTA to the concerned actors. |
| In case of Airport and Extended Arrival sequencing induced constraints are overlaying Network constraints, collaborative trajectory revision may be required for ensuring reconciliation of local DCB measures (STAM measures - e.g. locally applied Target Times, Miles-In-Trail, Minimum Departure Intervals) with Airport CDM and traffic sequencing activities (E-AMAN, XMAN).<br><br>Expected benefits from the reconciliation include coherency between the different processes, enhanced predictability from common usage of most up-to-date flight data by all users, including impact of already applied constraints, and minimised impact on Airspace Users operations. | | |

**Table 7: SESAR Solution PJ.09-02 Scope and related OI steps**

| Id | High Level CONOPS Requirement Description | CONOPS section |
|---|---|---|
| S09-02-HLOR-01 | Integrated local DCB processes shall provide to all actors in the INAP environment access to all flow, trajectory and capacity options by: | |

| | | |
|---|---|---|
| | · Automated tool supporting the local DCB and Extended ATC Planning actors in traffic complexity/ATC workload assessment at the planning and execution phases in order to increase capacity by providing timely and accurate prediction on upcoming congestions and providing appropriate input to tools handling hotspot/complexity resolution.<br>· Seamless integration of airspace management functions and dynamic airspace configurations;<br>· Support of the identification, assessment (including the use of 'what if' modelling) resolution of local complexity in a dynamic airspace management environment;<br>· Collaborative flight planning and constraints management;<br>· Improvement of situational awareness. | |

**Table 4: High Level CONOPS requirements related to SESAR Solution PJ.09-02**

### 3.2.1 Deviations with respect to the SESAR Solution(s) definition

| OI Step Code | OI Step title | Deviation |
|---|---|---|
| CM-0104-B | Automated support to INAP (Integrated Network Management and Extended ATC Planning) function | Working environment does not provide access to all capacity and flow/trajectory management options and shared ATFCM/ATC situation awareness on both DCB and ATC sides. |
| CM-0302 | Ground based Automated Support for Managing Traffic Complexity Across Several Sectors | Support to ATCO in CWP has not been thoroughly tested |
| DCB-0210 | Full integration of Dynamic Airspace Configurations into DCB | Operational Concept developed, but no working prototype has been developed for testing the integrated use of DAC and INAP |
| DCB-0213 | Consolidation and facilitation of Target Times between local DCB, Airport CDM and Extended Arrival Management | Target Time measures have not been tested. Same for airport involvemented and Extended Arrival Management. |

## 3.3 SESAR PJ09 Solution 03: Collaborative Network Management Functions

Collaborative Network Management Functions allow for network management based on transparency, performance targets and agreed control mechanisms. The solution enables a real-time visualisation of the evolving AOP/NOP planning environment (such as demand pattern and capacity bottlenecks) to support airspace user and local planning activities. Network Operations planning and execution is managed by an agreed set of rules and procedures (including what-if), guiding subsidiary DCB and UDPP measures under consideration of trade-offs and network performance targets. Collaborative 4D constraints management integrates AUs priorities and preferences, reconciliation of DCB measures with Airports, ACCs, AU and NM, relying on the Multiple Constraints Resolver process.

| OI Step code | OI Step title | OI Step coverage |
|---|---|---|
| AUO-0108 | Most Penalizing Delay based on reconciliation between DCB and Airport CDM | Initial maturity: V1<br>Target maturity: V2<br>Reused validation materials: Tbd from Validation Plan PJ.03 |
| Reconciling DCB measures with Airport requires that A-CDM Most penalising delays are taken into account as other congestion points in the network. Currently CDM airports are not considered regulation and are not entered as possible most penalising regulation. This means 2 flights delayed at the same CDM airport may see their CTOT imposed by other regulations without the possibility to swap them. | | |

| OI Step code | OI Step title | OI Step coverage |
|---|---|---|
| DCB-0103-B | Collaborative NOP for Step 2 | Initial maturity: V1<br>Target maturity: V2<br>Reused validation materials: Tbd from Validation Plan PJ.03 |
| The NOP is developed as one continuum from planning to execution, providing common awareness on imbalances, hotspots, DCB measures and CDM status and improved accuracy and reliability of shared data and prediction.<br><br>It will provide the means for monitoring the planning processes and related collaborative decision-making. It will be expanded to support airspace configurations planning, collaborative flight planning (incl. SBT, RBT, UDPP) and to support on-line network performance monitoring. It will provide a prognosis of network performance and enables stakeholders to assess the impact of their intentions and actions vs. agreed overall optimum. The NOP draws on the latest available information shared via SWIM and managed to the required level of service. | | |

| OI Step code | OI Step title | OI Step coverage |
|---|---|---|
| DCB-0214 | DCB What-if Network Impact Assessment | Initial maturity: V1<br>Target maturity: V1<br>Reused validation materials: Tbd from Validation Plan PJ.03 |
| Network impact assessment relies on What-If capability to support decision making processes in the context of UDPP, A-CDM and other APOC processes. The availability of query mechanisms and what-if functionalities will provide all operational stakeholders with operational information to support their needs (e.g. SBT planning, DCB decision making and approval processes). | | |

| OI Step code | OI Step title | OI Step coverage |
|---|---|---|
| DCB-0215 | Consolidation of imbalances and arbitration of Trajectory Management solutions | Initial maturity: V1<br>Target maturity: V2<br>Reused validation materials: Tbd from Validation Plan PJ.03 |
| Measures from Airports (including Multi-APOC), ACCs, AUs and NM will be integrated and coordinated within SBT and RBT mechanisms to ensure the stability and performance of the network. The integration of these 4D constraints issued from multiple sources will be optimised through new rules and mechanisms (including AU Margins of Manoeuvre and preference, 4D Targets and Tolerance Windows, arbitration of TM solutions) that will replace current slot allocation (based on first planned/first served principle). SBT planning and trajectory management will rely on dynamically updated 4D constraints providing a common baseline for AU and ATM Network operations to reach agreement on the SBT and the required SBT tolerances | | |

**Table 8: SESAR Solution PJ.09-03 Scope and related OI steps**

| Id | High Level CONOPS Requirement Description | CONOPS section |
|---|---|---|
| S09-03-HLOR-01 | The Collaborative NOP shall provide, in a continuum from planning up to execution, network stability, increased capacity and increased efficiency by:<br>· Conciliating multiple constraint resolution strategies from all the stakeholders in order to identify the best measure given nature, scope and time horizon;<br>· Monitoring Network performance;<br>· Drawing latest information shared via SWIM;<br>· Providing stakeholders with access to enhanced "What-if" functionalities. | |

**Table 4: High Level CONOPS requirements related to SESAR Solution PJ.09-03**

### 3.3.1 Deviations with respect to the SESAR Solution(s) definition

| OI Step Code | OI Step title | Deviation |
|---|---|---|
| AUO-0108 | Most Penalizing Delay based on reconciliation between DCB and Airport CDM | None |
| DCB-0103-B | Collaborative NOP for Step 2 | None |
| DCB-0214 | DCB What-if Network Impact Assessment | None |
| DCB-0215 | Consolidation of imbalances and arbitration of Trajectory Management solutions | None |
| SDM-0401 | Sub-Regional DCB Common Service (Business Improvement) | None |

## 3.4 Detailed Operational Environment

The key developments of SESAR operational concepts relevant to the development of DCB, are as follows:

- Demand Prediction
- Predicted Workload
- Network Performance
- Hotspot Management
- INAP function
- CORSE Catalogue
- Target Time Management
- Synchronisation
- Constraint Reconciliation
- Collaborative Framework
- Collaborative NOP

### 3.4.1 Operational Characteristics

| Operational interactions per context (NOV-2) | Operating Environment |
|---|---|
| Complexity | Network |
| Comment | |
| The operational concept described in this document refers to the DCB process described in SESAR1 WPB4.2 High Level Process Model , (chap 5 ATM Phases ). | |
| Demand Prediction | Network |

| Comment | |
|---|---|
| The operational concept described in this document refers to the DCB process described in SESAR1 WPB4.2 High Level Process Model , (chap 5 ATM Phases ). | |
| Network Performance | Network |
| Comment | |
| The operational concept described in this document refers to the DCB process described in SESAR1 WPB4.2 High Level Process Model , (chap 5 ATM Phases ). | |

| Operational interactions per context (NOV-2) | Operating Environment |
|---|---|
| CORSE Catalogue | Network |
| Comment | |
| | |
| INAP Function | Network |
| Comment | |
| | |
| Preference & Margins of Manoeuvre Management | Network |
| Comment | |
| | |
| Synchronisation | Network |
| Comment | |
| | |
| Target Time Management | Network |
| Comment | |
| | |
| Traffic Complexity Management | Network |
| Comment | |
| | |

| Operational interactions per context (NOV-2) | Operating Environment |
|---|---|
| AOP-NOP Integration | Network; |
| Comment | |
| The operational concept described in this document refers to the DCB process described in SESAR1 WPB4.2 High Level Process Model , (chap 5 ATM Phases ). | |
| Collaborative Framework | Network; |
| Comment | |
| The operational concept described in this document refers to the DCB process described in SESAR1 WPB4.2 High Level Process Model , (chap 5 ATM Phases ). | |
| Collaborative NOP | Network; |

| | |
|---|---|
| Comment | |
| The operational concept described in this document refers to the DCB process described in SESAR1 WPB4.2 High Level Process Model , (chap 5 ATM Phases ). | |
| Constraint Optimisation | Network; |
| Comment | |
| The operational concept described in this document refers to the DCB process described in SESAR1 WPB4.2 High Level Process Model , (chap 5 ATM Phases ). | |
| Constraint Reconciliation | Network; |
| Comment | |
| The operational concept described in this document refers to the DCB process described in SESAR1 WPB4.2 High Level Process Model , (chap 5 ATM Phases ). | |
| FF-ICE | Network; |
| Comment | |
| The operational concept described in this document refers to the DCB process described in SESAR1 WPB4.2 High Level Process Model , (chap 5 ATM Phases ). | |
| Hotspot Management | Network; |
| Comment | |
| The operational concept described in this document refers to the DCB process described in SESAR1 WPB4.2 High Level Process Model , (chap 5 ATM Phases ). | |

### 3.4.2 Roles and Responsibilities

The roles and responsibilities have been defined using the exercise EXE-09.02-01 VALR (including the RASCI matrix) (hat describes in detail the roles and responsibilities.

| Node | Responsibilities |
|---|---|
| Air Traffic Flow and Capacity Management | The ATFCM node is responsible for the demand and capacity balancing activities. |

| Operational interactions per context (NOV-2) | | Operating Environment |
|---|---|---|
| Complexity | | Network |
| Node | Node instance | Node instance description |
| Air Traffic Flow and Capacity Management | INAP | The INAP function encompasses some of the activities of the LTM in short-term to execution, the activities of the EAP(s) and the activities linked to decomplexification managed by PC on CWPs, in a seamless and closely intertwined manner. These local ATM actors, working on different timeframes and associated levels of uncertainty and granularity, will render better service to Airspace Users, in close connection with NM, thanks to shared situational awareness regarding the problems identification, solution means and performance objectives |
| Air Traffic Flow and Capacity Management | Regional ATFCM | The Regional ATFCM function encompasses some of the DCB activities at the ECAC level providing a consolidated Network View (Collaborative NOP) and Services to manage DCB problems/solutions. |

| Operational interactions per context (NOV-2) | | Operating Environment |
|---|---|---|
| Demand Prediction | | Network |
| Node | Node instance | Node instance description |

| Operational interactions per context (NOV-2) | | Operating Environment |
|---|---|---|
| Network Performance | | Network |
| Node | Node instance | Node instance description |

| Operational interactions per context (NOV-2) | | Operating Environment |
|---|---|---|
| Hotspot Management | | Network; |
| Node | Node instance | Node instance description |
| Air Traffic Flow and Capacity Management | INAP | INAP is responsible to detect, analyze—imbalances and potentially declare a hotspot (TFV, start time, end time) , or share any relevant information with partners via the Collaborative NOP.<br>INAP can create, update and delete hotSpots and any other local element defined in the Collaborative Framework and operationally worth sharing. |

| | | |
|---|---|---|
| Air Traffic Flow and Capacity Management | Regional ATFCM | Regional ATFCM is responsible to collect all the hotSpots and the other local relevant elements identified in the Collaborative Framework and to make this information visible to the NMF actors and other partners involved in the Collaborative DCB processes. |

| Operational interactions per context (NOV-2) | | Operating Environment |
|---|---|---|
| CORSE Catalogue | | Network |
| Node | Node instance | Node instance description |
| ATS Operations | ATC | ATCOs on CWPs might:<br>- receive requests for implementation of STAMs designed by the INAP actor(s) with CORSE support, when they are in charge of the implementing sector(s),<br>- benefit from measures designed by the INAP actor(s) with CORSE support to relieve them from the workload generated by excessive complexity when they are in charge of the off-loaded sector(s),<br>- handle more flights than initially planned for sake of more balanced complexity/ workload distribution, after implementation of measures designed with CORSE when they are in charge of the on-loaded sector(s). |
| Air Traffic Flow and Capacity Management | INAP EAP | The EAP is the primary user of CORSE, as the objective of the service is to support resolution of local complexity imbalances before the ATCOs on CWPs have to cope with them. |
| Air Traffic Flow and Capacity Management | INAP LTM | As part of the INAP roles, the LTM might have access to CORSE functionality, even though the service has mainly been designed for EAP usage. Resolution support coming from CORSE will be made available for both EAP and LTM roles (in case 2 different actors endorse these roles), to ensure coordination and common situation awareness. |
| Air Traffic Flow and Capacity Management | Regional ATFCM | Regional ATFCM will be made aware of complexity resolution proposal and implementation of measures, either before they are implemented, when there is sufficient time for CDM and coordination, or when they are implemented, in the case of STAMs designed very shortly before the complexity imbalance is known to the ATC. |

| Operational interactions per context (NOV-2) | | Operating Environment |
|---|---|---|
| INAP Function | | Network<br>En Route<br>TMA |
| Node | Node instance | Node instance description |
| ATS Operations | ATC | ATC operations, handled by ATCOs on Control Working Positions, are by definition closely intertwined with INAP activities, as the primary objective of INAP is to bridge the gap between ATC and ATFCM.<br>All along INAP workflow, from the detection and analysis of the DCB/ complexity imbalance to the coordination and implementation of measures by ATC, the sharing of common situation awareness, based on the same data sources and process transparency, ensures that ATC and INAP Actors are working closely together. |
| Air Traffic Flow and Capacity Management | INAP EAP | Within INAP, the Extended ATC Planning Role stands between the Local Traffic Management Role and the Planning Control Role, and works in close coordination with these two roles, based on shared situation awareness and tools.<br>• Monitor internal and external constrictions, complexity and workload<br>• If necessary balance workload, individually optimise entering flights on the planned route and within given dynamic constraints (Target Times, target levels, target speeds, CTO), or coordinated for a new route.<br>• Co-ordinate re-Routing options with adjacent control areas/sectors.<br>• Mitigate real time traffic complexity and balance workload by applying constraints e.g. level capping, top of descent advisories, Target Times, levels or speeds, miles in trail procedures etc. |
| Air Traffic Flow and Capacity Management | INAP LTM | The Local Traffic Management role exercised at local level contributes to the Network Management Function, and is part of INAP. LTM act as the coordinating link between the ANSP, sub-regional and regional flow and airspace management, with a leading role in the INAP processes in ATFCM execution phase (and appropriately in the short term planning phase for flights close to execution).<br>LTM monitors the situation at local level and anticipates hotspots and workload issues, assessing their impact, looking for optimisation, coordinating solutions with relevant partners using CDM process whenever possible, implementing them (or delegating the implementation to the adequate actors).<br>In execution and as appropriate within the short term planning phases, the Local Traffic Management Role works closely with |

| | | |
|---|---|---|
| | | EAP (if implemented as an actor), Supervisors and ATC actors (through INAP function). |
| Air Traffic Flow and Capacity Management | Regional Network Management | The Network Manager, or Regional Network Management Role, acts as a facilitator for an efficient overall network management by all ATM stakeholders, providing a framework to allow INAP and Airspace Users actors to share information (Network View), to coordinate (CDM) and to prepare scenarios to be used at network level when necessary.<br>During the execution phase, the Network Manager assures that every stakeholder has proper access to the Network view. He also assures the stability of the NOP (Network Operations Plan), in partnership with the sub-regional and local layers (INAP), with a view on performance impact assessment.<br>Regional Network management will also ensure that the DCM measures proposed by INAP are correctly transmitted to AUs in the form of proposals to refine SBTs or RBT revisions, shared via the NOP. |

| Operational interactions per context (NOV-2) | | Operating Environment |
|---|---|---|
| Preference & Margins of Manoeuvre Management | | Network |
| Node | Node instance | Node instance description |

| Operational interactions per context (NOV-2) | | Operating Environment |
|---|---|---|
| Synchronization | | Network |
| Node | Node instance | Node instance description |
| ATS Operations | ATC (Upstream) | The synchronization process is transparent to ATC, who has access only to the result of the process, being a single constraint to be applied to a flight.<br>As rules for synchronization will ensure that constraints already transmitted to AUs via ATC will prevail, the process will not negatively impact ATC workload (prerequisite is to avoid changes that would need to be made to the instructions already given to flight crew. |

| | | |
|---|---|---|
| Air Traffic Flow and Capacity Management | INAP / Extended AMAN | The INAP in charge of the ATSU where an Extended AMAN is active, is responsible to coordinate with upstream ER ATSUs the delay absorption strategy to better accommodate arrival flows together with the rest of the traffic.<br>The synchronization process, fully automated, will ensure that once transmitted to the ATC and Flight Crew, the measure linked to E-AMAN will prevail on any subsequent measure that might need to be apply for other DCB imbalances. |
| Air Traffic Flow and Capacity Management | INAP EAP (Upstream) | When several compatible constraints need to be applied to a single flight, one of which coming from an Extended AMAN, the INAP from upstream En Route ATSU will receive the result of the synchronization process, in the form of a single constraint for the flight, without any need for manual intervention. |
| Air Traffic Flow and Capacity Management | Regional ATFCM | Synchronization is transparent to Regional ATFCM, as fully processed by automation, whenever constraints are compatible for a flight. The result of synchronization is made available to all partners via the NOP. Regional ATFCM starts getting actively involved when synchronization has failed, and there is a need for Constraint Reconciliation. |

| Operational interactions per context (NOV-2) | | Operating Environment |
|---|---|---|
| Target Time Management | | Network |
| Node | Node instance | Node instance description |
| ATS Operations | ATC | • Target-Time (TTO/TTA) implemented in the SBT Elaboration phase :<br>ATS Operation do not manage TTO/TTA adherence management in the execution phase (not mandatory). On the other side, TTO/TTAs are implicitly part of the RBT, the execution of which is to be facilitated by ATC . It is based on the reasonable effort principle for which ATC, apart from separation purposes, comply with RBT execution. In particular, ATC will consider the impact of any trajectory modification in regards to the RBT achievement.<br><br>• Target-Time (tTTOA/tTTA) implemented in the RBT Revision phase :<br>In order to manage a hotspot resolution, INAP proposes tTTO/tTTA to ATC for implementation. At the appropriate time, and whenever possible, ATC implement the INAP requests by issuing to the Flight Crew the necessary instructions related to the tTTO/tTTA. The ATC tTTO/tTTA clearance sent to the Flight Crew is in the form of a speed instruction representing a linear |

| | | |
|---|---|---|
| | | absorption of delay to target a point of rendez-vous (tTTO/tTTA).<br><br>The tTTO/tTTA information is displayed on the ATC position. In addition, the translation of these tTTO/tTTA in the form of speed changes (mach number) is also displayed. The ATC monitors the proper execution of the speed instruction. |
| Airspace User Ops Support | AU | AU is informed about TTO/TTA elaborated in the SBT elaboration frame. The AUs can re-plan the SBT in order to avoid the penalties avoiding the hotspot or they can re-file the EET. |
| Flight Deck | Flight Crew | • Target-Time (TTO/TTA) implemented in the SBT Elaboration phase :<br>The Flight Crew do not manage TTO/TTA.<br><br>• Target-Time (tTTOA/tTTA) implemented in the RBT Revision phase :<br>Due to the mandatory aspect of the ATC clearance the tTTO/tTTA adherence management in the execution phase is mandatory. The Flight Crew complies with the clearance and execute the trajectory vis a vis the speed instructions. |
| Air Traffic Flow and Capacity Management | Local ATFCM (INAP) | In order to manage a hotspot resolution, INAP proposes :<br>• TTOs/TTAs are elaborated in the frame of the SBT and the information is disseminated to the NMf and AU actors.<br>NM determines the NCC (Network Consolidated Constraint), i.e. the TTO/TTA slot that can be implemented.<br>• tTTO/tTTA to ATC for implementation. At the appropriate time, and whenever possible, ATC implement the INAP requests by issuing to the Flight Crew the necessary instructions related to the tTTO/tTTA. |
| Air Traffic Flow and Capacity Management | Regional ATFCM | |

| Operational interactions per context (NOV-2) | Operating Environment |
|---|---|
| Traffic Complexity Management | Network |

| Node | Node instance | Node instance description |
| --- | --- | --- |
| En-Route/Approach ATS | ATS Unit (ENR/APP) | Instance of the En-Route/Approach ATS node in the Traffic Complexity Management |
| Flight Deck | Flight Deck | Instance of the Flight Deck node in the Traffic Complexity Management. |
| Air Traffic Flow and Capacity Management | Sub-regional/Local ATFCM | Instance of ATFCM node in the context of the INAP function (Enhanced ATFCM). |

| Node | Responsibilities |
| --- | --- |
| Air Traffic Flow and Capacity Management | The ATFCM node is responsible for the demand and capacity balancing activities. |
| Airport Operations | The Airport Operator is the legal entity responsible for safe operations at the airport.<br>It is responsible for compliance with the conditions of the airport operation laid down by the National and Super-national bodies.<br>This includes the physical condition of the runways, taxiways, aprons and terminal facilities, security at the airport as well as creating and maintaining a good relationship with local / national authorities and neighbouring communities .<br>It also includes assurance that the scale of equipment and facilities provided are adequate for the activities which are expected to take place at that Airport, as well as provision of staff that are competent and where necessary, suitably qualified (licensing of vehicles and companies on airside). |
| Airport Ops Support | Perform all the airport ops support activities, including analysis of airport resources, long term planning of infrastructures, coordination of airport slots, management of airport resources on the day of operation (gates, vehicles, stands, de-icing...), information sharing and CDM, etc.<br><br>[RELATED ACTORS/ROLES]<br>Airport Operator, Airport Slot Negotiator |
| Airspace User Operations | Airspace User Operations represent all the activities undertaken by those organisations and individuals who have access to and operate in the airspace which is managed for ATM purposes in accordance with ICAO and national procedures. For the purpose of this document only those actors directly involved in ATM operations are described.<br>The main types of civil Airspace User Operations are:<br>· Scheduled Airline Operations / Organisation (A). The most extensive organization for Airspace User Operations is run by Airlines with a worldwide network. The daily operations of |

| | |
|---|---|
| | these Airlines, with up to thousands of flights per day all over the world, require a lot of flexibility. In order to give the best possible service to their passengers, maintaining punctuality and a high quality of service, Airlines have to run and to maintain a complex organization. This category regroups Cargo, Regional, Network, Charter and Low cost operators.<br>· Business Aviation Operations / Organisation (BA). Another important segment of Airspace Users is Business Aviation, which concerns the operation or use of aircraft by companies for the carriage of passengers or goods as an aid to the conduct of their business.<br>· Military Aviation Operations / (MA). Determined by strategic objectives dealing with National and International security and defence policies and commitments, the operation or use of military/State aircraft (combat aircraft, military air transport aircraft, tankers, AWACS, training aircraft, helicopters…) concern Air defence and policing flights, Search and rescue, instructional and training flights, combined air operations as part of complex scenarios and UAS operations for which special use of airspace may be needed.<br>· General Aviation Operations / Organisation (GA), which operates civilian aircraft for purposes other than commercial passenger transport, including personal, business, and instructional flying, represents another type of Airspace Users.<br>Depending on the size and organization of the Airspace User, the roles and tasks defined in this document may move from one actor to another, or may be consolidated into one actor, depending on the actually existing actors within the Airspace User organization. As an extreme example, the subset of General Aviation focused on personal transport does not normally have any organization except the pilot, so this actor will be responsible for all the tasks related to this/her individual flight. On the other hand General Aviation does not have to deal with many tasks which are important for the operations of other Airspace Users. |
| Airspace User Ops Support | Performs all the necessary activities to support AU ops, including the strategic and tactical planning of AU operations, participation to related CDM processes and UDPP, update of AOP with AU information, ground handling.<br><br>[RELATED ACTORS/ROLES]<br>Flight Schedule Planner, Airline Operations and Control Centre (AOCC), Wing Operations Centre (WOC), etc. |

| | |
|---|---|
| ATS Operations | Air traffic service (ATS) include variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service). Air Traffic control service is provided for the purpose of preventing collisions between aircraft, and on the manoeuvring area between aircraft and obstructions. Furthermore it's provided for expediting and maintaining an orderly flow of air traffic. (based on ICAO Doc 4444) |
| Flight Deck | Performs all the on-board AU operations including flight execution/monitoring according to agreed trajectory, compliance with ATC clearances/instructions, etc.<br><br>[RELATED ACTORS/ROLES]<br>Flight Crew |

| Operational interactions per context (NOV-2) | | Operating Environment |
|---|---|---|
| AOP-NOP Integration | | Network; |
| Node | Node instance | Node instance description |
| Airport Operations | APOC | APOC exchanges departure (extended DPI) and arrival planning information (API) per flight departing or arriving at the airport. |
| Airspace User Operations | AU | AU submits extended flight plan to confirm the flight and replaces the predicted flight in the NOP and AOP. |
| Air Traffic Flow and Capacity Management | Regional ATFCM | Regional ATFCM exchanges ELDT (estimated landed time) as well as other relevant flight information related to their status, details and profiles in the NOP |

| Operational interactions per context (NOV-2) | | Operating Environment |
|---|---|---|
| Collaborative Framework | | Network; |
| Node | Node instance | Node instance description |
| Airport Ops Support | APOC | The APOC function encompasses the management of Hotspot (including preparation and implementation of DCB Measures) for arrival flows. |
| ATS Operations | ATC | The ATC function encompasses the management of DCB constraints, implementing DCB Measures for RBT. |
| Airspace User Ops Support | AU | The AU function encompasses the management of DCB constraints, assessing SBT/RBT impact, coordinating with NMf actors, providing preference and priorities and proposing alternate trajectories. |

| | | |
|---|---|---|
| Air Traffic Flow and Capacity Management | Extended AMAN | The Extended AMAN function encompasses the management of Arrival flow in the TMA area, applying absorption delay technics to sequence flights. |
| Flight Deck | Flight Crew | The Flight Crew function encompasses the management of STAM Measures (ATC Clearances). |
| Air Traffic Flow and Capacity Management | Local ATFCM (INAP) | The INAP function encompasses some of the activities of the LTM in short-term to execution, the activities of the EAP(s) and the activities linked to decomplexification managed by PC on CWPs, in a seamless and closely intertwined manner. These local ATM actors, working on different timeframes and associated levels of uncertainty and granularity, will render better service to Airspace Users, in close connection with NM, thanks to shared situational awareness regarding the problems identification, solution means and performance objectives. |
| Air Traffic Flow and Capacity Management | Regional ATFCM | The Regional ATFCM function encompasses some of the DCB activities at the ECAC level providing a consolidated Network View (Collaborative NOP) and Services to manage DCB problems/solutions. |

| Operational interactions per context (NOV-2) | | Operating Environment |
|---|---|---|
| Collaborative NOP | | Network; |
| Node | Node instance | Node instance description |
| Airport Operations | APOC | APOC will send to the NOP as part of Arrival Plan Information and its updates the Impact severity indicator a flight which indicates the impact that the associated SBT will have on the airport planning when a deviation from the scheduled in-block time may occur. It also handles the elaboration of delegated DCB solutions for TTAs. |
| Airspace User Operations | AU | AU will send to the NOP via the eFPL and its updates the AU simple preferences for the flight (during a first phase they will be shared only by ICAO field 18 RMK)<br>AU simple preferences indicates a simple AU preferred action for a flight in case of DCB constraints (or to be offered opportunities).They will be considered by airports in the process of assigning TTAs, within the selection of flights logic and equally they will be considered by LTM/INAP in the process of STAM or TTO assignment within the selection of flights logic. |

| | | |
|---|---|---|
| Air Traffic Flow and Capacity Management | Local ATFCM (INAP) | Local ATFCM analyses the traffic situation and elaborates adequate DCB solutions taking into account AU Flight Simple Preference. The DCB solution elaboration can be delegated to APOC for TTAs. |
| Air Traffic Flow and Capacity Management | Regional ATFCM | Regional ATFCM validates and integrates the extended flight plan and shares the resulting computed traffic demand and network impact assessment with all NOP stakeholders, in particular with the integrated local DCB working position and the airport of destination in order to improve situation awareness and in support of decision making. |

| Operational interactions per context (NOV-2) | | Operating Environment |
|---|---|---|
| Constraint Optimisation | | Network; |
| Node | Node instance | Node instance description |

| Operational interactions per context (NOV-2) | | Operating Environment |
|---|---|---|
| Constraint Reconciliation | | Network; |
| Node | Node instance | Node instance description |
| Airport Operations | APOC | The APOC function manage DCB measures requesting time-based constraints and receiving from NM the Network Consolidated Constraint (NCC). |
| Airspace User Operations | AU | When using the UDPP mechanism, the AU function manage DCB measures requesting time-based constraints and receiving from NM the Network Consolidated Constraint (NCC). |
| Air Traffic Flow and Capacity Management | Local ATFCM (INAP) | The INAP function manage DCB measures requesting time-based constraints and receiving from NM the Network Consolidated Constraint (NCC). |
| Air Traffic Flow and Capacity Management | Regional ATFCM | The Regional ATFCM function collects the local DCB measures (time-based) constraints and provides the NCC (Network Consolidated Constraint) information to NMf actors. |

| Operational interactions per context (NOV-2) | | Operating Environment |
|---|---|---|
| FF-ICE | | Network; |
| Node | Node instance | Node instance description |

| | | |
|---|---|---|
| Airspace User Operations | AU | |
| Air Traffic Flow and Capacity Management | Local ATFCM (INAP) | |
| Air Traffic Flow and Capacity Management | Regional ATFCM | |

### 3.4.3 Technical Characteristics

| **Technical constraint** | **description** |
|---|---|
| None. | |

### 3.4.4 Applicable standards and regulations

| Standard Name | Standard Description | Standard Enabler | Comment |
|---|---|---|---|
| Use Case (NOV-5) | Predicted Imbalance | | |

| Standard Name | Standard Description | Standard Enabler | Comment |
|---|---|---|---|
| Use Case (NOV-5) | EAP Hotspot Management in Full Autonomy | | |
| Use Case (NOV-5) | EAP Resolution of Downstream Hotspot with LTM coordination | | |
| Use Case (NOV-5) | EAP Resolution of Local Hotspot with LTM coordination | | |
| Use Case (NOV-5) | INAP Resolution of Optispot with En-Route (Cop-Organizer or Seq) and Extended AMAN | | |
| Use Case (NOV-5) | DCB Measures prepared in the RBT Revision process | | |
| Use Case (NOV-5) | DCB Measures prepared in the SBT Elaboration process (Execution Phase) | | |
| Use Case (NOV-5) | DCB Measures prepared in the SBT Elaboration process (Planning Phase) | | |

| Standard Name | Standard Description | Standard Enabler | Comment |
|---|---|---|---|

| | |
|---|---|
| Use Case (NOV-5) | Network prediction in pre-tactical/tactical day and Airport planning |
| Use Case (NOV-5) | Hotspot Arrival Management using TTA prepared in the RBT Revision process |
| Use Case (NOV-5) | Hotspot Arrival Management using TTA prepared in the SBT Elaboration process |
| Use Case (NOV-5) | Hotspot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Full Delegation |
| Use Case (NOV-5) | Hotspot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Limited Delegation |
| Use Case (NOV-5) | Hotspot En-Route Management using TTA prepared in the RBT Revision process |
| Use Case (NOV-5) | Hotspot En-Route Management using TTA prepared in the SBT Elaboration process |
| Use Case (NOV-5) | Optispot Arrival Management using TTA prepared in the RBT Revision process with Extended AMAN Autonomy |
| Use Case (NOV-5) | Optispot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Full Autonomy |
| Use Case (NOV-5) | Optispot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Full Delegation |
| Use Case (NOV-5) | AU Simple Flight Preference for STAM En Route |
| Use Case (NOV-5) | AU Simple Flight Preference for TTA with Airport |
| Use Case (NOV-5) | Constraint Reconciliation |
| Use Case (NOV-5) | Enriched DCB information for AUs |
| Use Case (NOV-5) | STAM AU Counter Proposal |
| Use Case (NOV-5) | Spot Management |

## 3.5 Detailed Operating Method

### 3.5.1 Previous Operating Method

#### 3.5.1.1 Network Prediction and Performance

Network Prediction

In the method used today, the most advanced elements are:

- Demand Prediction based on DDR (Demand Data Repository) processing
- Imbalance Prediction based on count methodologies (Entry Count, Occupancy Count) and initial complexity methodologies

This data provision includes predicted sector occupancy, and sectors entries, over the subsequent few hours from 'now' time. However, experience has shown this information to be inaccurate to such an extent that it is used as a guide only. INAP actors rely upon a mixture of unreliable data and experience to manage DCB solutions.

The target prediction horizon shall be 6H00 to 0H10 before the start of the traffic monitoring reference time. This time frame depends upon data source. This reference time is the start time of the period during which we are forecasting the traffic demand.

#### Network Performance

The Network Monitoring process does not take fully into account the Network performance principles in the current Operating Method.

SESAR Step 1 developed some initial ideas to give more visibility to network performance through Network Performance KPIs in the on-line Network Monitoring process, showing how some performance trends in specific network local actors could have an impact later on other one.

Some kind of graphical representation of some KPIs can support the NMf for the on-line monitoring and the analysis and eventual anticipation of network disruptions.

There is not yet enough insight and knowledge on the way that the Network Performance has to be presented to support the different network actors reaching agreement on actions that ensure the best possible individual and network performance results.

There is no monitoring of the performance robustness and resilience in order to detect and predict trends reflecting the evolution of nominal, critical and crisis situations.

### 3.5.1.2 Integrated Local DCB Processes

Pre-INAP control organisation is composed of an FMP (part of its activities) and CWP (usually two controllers to control a sector: PC/TC in the traditional organisation). In addition to the standard tasks in pre-tactical ATFCM phase (until the day before the day of operations), the FMP is involved in short-term planning/execution phase on the day of operations, though at an earlier stage than the CWP. A gap exists therefore between pure ATC domain and ATFCM domain, with the results that at time horizon of around 2-1hr (it is variable across ACCs) , local traffic flow measures to solve flow congestion or complex traffic, such as STAM (Short-Term ATFCM Measures) are difficult to implement due to the lack of adequate roles and tools to analyse the traffic at a short-term horizon and identifies solution.

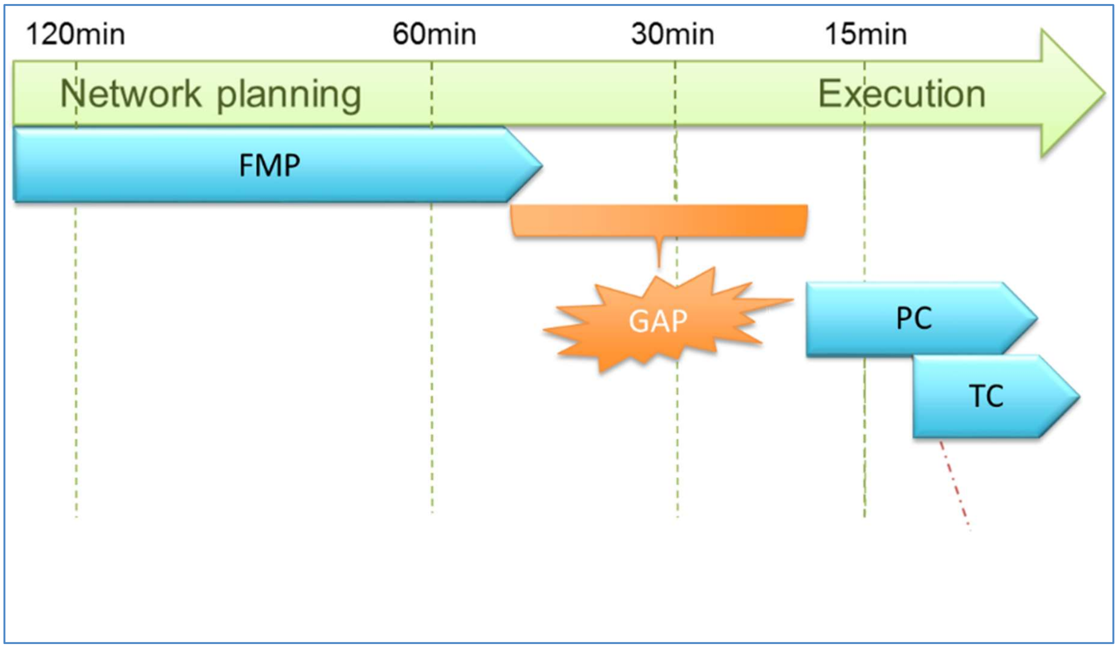



**Figure 1 : Gap identified between ATFCM (FMP) and ATC (PC+TC) domains**

## Flow Management Position (FMP)

The following paragraph describes the FMP activities connected with the control room during short-term planning/execution phase, which is the scope of PJ09.02 solution.

On short-term planning/execution phase, the FMP staff on duty monitors the measures elaborated at the short-term planning level, such as regulations or scenarios. (S)he works closely with the ATSU Supervisor and the Network Management operation centre- NMOC, part of the directorate for Network Management-DNM and under the authority of the Supervisor or by delegation.

The FMP staff on duty looks for the highest adequacy between capacity and forecast demand, thanks to close monitoring and analysis.

(S)he Improves capacity by sector re-configuration, ASM negotiations…

(S)he manages demand via all ATFCM measures described in ATFCM manuals (refer to ATFCM Manuals from EUROCONTROL).

The FMP staff on duty also follows and improves ATFCM measures elaborated during short-term planning phase in order to cope with real time traffic situation:

- By monitoring traffic counts
- By proposing short-term planning measures in order to improve traffic smoothness

Complexity is monitored in an ATSU by the FMP, as it is the only instance having a global view on the overall load. The FMP monitors a TC workload through CHMI data (occupancy counts and flow counts). Actions to alleviate complexity (sectors splitting, delays on departures…) can be initiated by the Supervisor under FMP advisory.

| ATM Phase | Role for the FMP | Tasks for the FMP |
|---|---|---|
| short-term planning/execution | Monitoring ATFCM Measures | Coordinates actions with the FMD |
| | | Coordinates actions with the Supervisor |
| | Improves initial ATFCM Measures | Monitors Traffic Counts compared to capacity monitoring values<br>Monitors occupancy counts compared to instant load ( local data) |
| | | Proposes Level Capping, and all kind of adapted measures to the actual traffic |
| | | Excludes when possible traffics from regulations |
| | Adapt the capacity and the demand | Acts as ATFCM's advisor to the supervisor in choosing the most adapted sector configuration |
| | | Initiates new ATFCM Measures |

**Table 9: FMP role in short-term planning/execution Phase**

### Controller Working Positions (CWP)

For a better understanding of the previous operating method, the treatment of flights on a CWP has been detailed below (for a traditional PC/TC organisation):

When flight data come up on a position, and when they are consulted for the first time by controllers, the flight is integrated. Integration can include also visual check of the position of aircraft on the radar screen.

At this step, the planner looks for possible conflicts and makes the TC aware of those possible conflicts. The planner can also delay this action, in order to have a more precise idea of future positions of aircraft and then warn his TC in case of conflicts

The short-term planning/execution integrates flights and consults his radar to check position of aircraft, exposition those involved in conflicts detected by the TC.

The PC and the TC draw up together the conflict resolution: they choose the safest and most effective trajectories changes in order to keep separation minima.

When conflict resolution requires trajectory changes within adjacent sectors the PC asks those sectors for their approval, i.e.: he coordinates the trajectories changes. Once all necessary approvals are collected, the PC or the TC solves the conflict: he gives aircraft clearances corresponding to the resolution elaborated above. He also checks on his radar that separation is maintained until aircraft can join again their initial tracks.

### Hotspot Management

The current NM system provides services to collect and disseminate hotspot information.

It does not support

- other category of problems OptiSpot (area for opportunities/optimisation), CriticalSpot/CrisisSpot (area for critical/crisis situations):
- hotspot monitoring (to detect hotspot resolution deviation)

#### Target Time Management

The current NM system provides capabilities to support the collection, calculation and dissemination of Target-Time (CTOT/TTO/TTA) for the SBT elaboration

However, it does not support

- the collection and dissemination of Target-Time for the RBT revision The adherence monitoring of Target-Time in the execution phase

### 3.5.1.3 Collaborative Network Management Functions

#### Collaborative Framework

The current NM system supports advances capabilities to support the collaborative framework providing services to

- disseminate imbalance (Entry Count, Occupancy Count),
- collect and disseminate hotspot and DCB Measures information
- support the coordination and implementation of DCB measures amongst NM, INAP, APT and AU

However, it does not support the delegation mechanism and INAP-ATC coordination/implementation.

#### Multiple Constraint Reconciliation

The current NM system can only manage multiple target Time constraints issued by the CASA regulation. This reconciliation is based on the Most Penalizing Regulation (MPR). However it cannot handle multiple target Time constraints when issued by different local systems (No CASA regulation). This prevents mixing the assignment of Target Time from different local sources.

#### Collaborative NOP

The current NM system support advanced capabilities for the Collaborative NOP providing

- Imbalance repository
- Hotspot repository
- DCB Measures repository
- Enriched NOP-AOP information (API)

However, it does not yet support more advanced capabilities such:

- The provision of what-if capabilities to simulate alternate SBT/RBT based on Performance Indicators
- The provision of what-else capabilities to simulate alternate SBT/RBT based on Performance Indicators
- The provision of NCC (Network Consolidated Constraint)
- The provision of AU priorities and preferences

### 3.5.2 New SESAR Operating Method

This chapter has been structured into 15 topics covering the 3 PJ09 solutions

| Solution | Topic |
|---|---|
| PJ09.01 | Demand Prediction |
| PJ09.01 | Predicted Workload |
| PJ09.01 | Network Performance |
| PJ09.02 | INAP functions |
| PJ09.02 | CORSE Catalogue |
| PJ09.02 | Target Time Management |
| PJ09.02 | Synchronisation |
| PJ09.02 | Preference & Margins of Manoeuvre Management |
| PJ09.02 | Spot Management |
| PJ09.03 | Collaborative Framework |
| PJ09.03 | Constraint Reconciliation |
| PJ09.03 | Constraint Optimisation |
| PJ09.03 | Collaborative NOP |
| PJ09.03 | Flow Management & Flight Planning Integration |
| PJ09.03 | AOP-NOP Integration |

**Table 10 : Topics covering PJ09 Solutions**

#### 3.5.2.1 Demand Prediction

Traffic demand forecasts are generated successively along the planning phases and the predictability is expected to increase as getting closer to operations, as more complete and more accurate information becomes available.

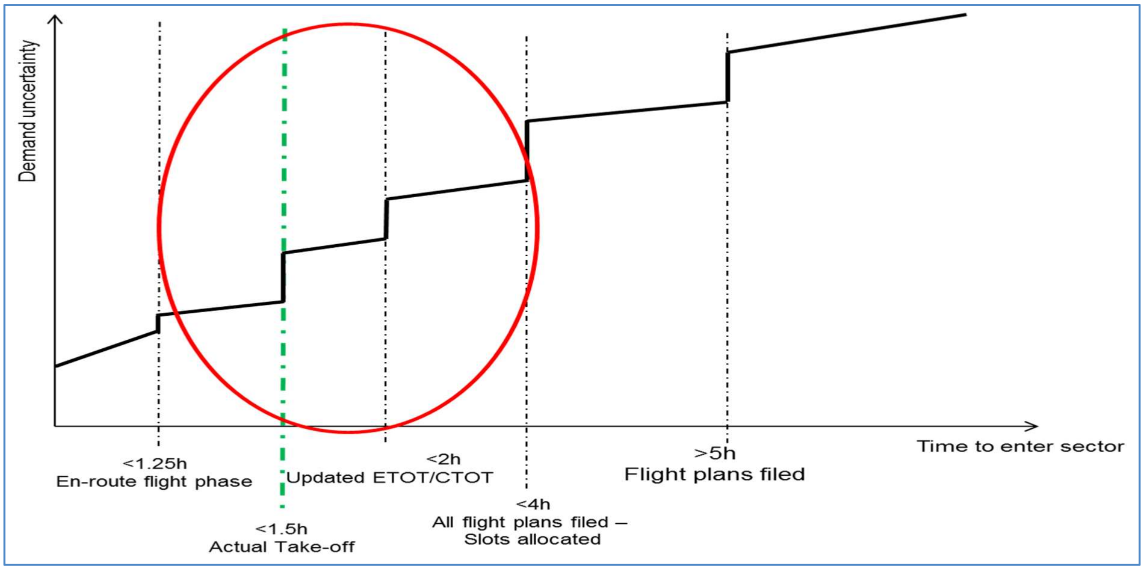



**Figure 2: Demand Uncertainty**

The proposed network prediction improvement aims at qualifying and improving the Traffic Demand Forecast by adding probabilistic information. This Forecast Demand is derived from:

- flight intentions as they are scheduled by airports and airspace users,
- data mining and big data queries analysing archive data,
- constraint versus opportunity balancing at the flight and flow level.

The objectives of the demand prediction improvement are twofold:

- To provide a methodology to quantify the uncertainties of the Demand Prediction in the 6hrs-10 min time horizon.
- To provide a methodology to improve the demand prediction

##### 3.5.2.1.1 Quantification of the uncertainties

The proposed methodology is based on a probabilistic distribution of trajectories (3D, time) with quantification of uncertainties in model parameters (flight status, cdm/no cdm airports...) to determine:

- Ground Departure time distribution
  Inaccurate Take-Off Time (TOT) is seen as a major source of uncertainty. The ground departure time distribution takes into account the main identified factors: A-CDM and Non-A-CDM airports, Time and date of departure, regulated and non-regulated traffic, time ahead (to take-off).
- Airborne Flight distribution (3D)

Inaccuracies shortly after Take-Off Time are considered another relevant source of errors. The post departure 3D distribution takes into account the main identified factors: SID route uncertainty with a special focus on the first 10-20 min of the flight, en-route trajectory deviations (lateral and vertical), the characteristics of the sector and the impact of distance between the departure airport and sector (link to ATOT-ETOT error)

These Ground and Air models are based on a statistical probability approach and will be integrated to provide a complete model in the 6 hrs – 10 min timeframe.

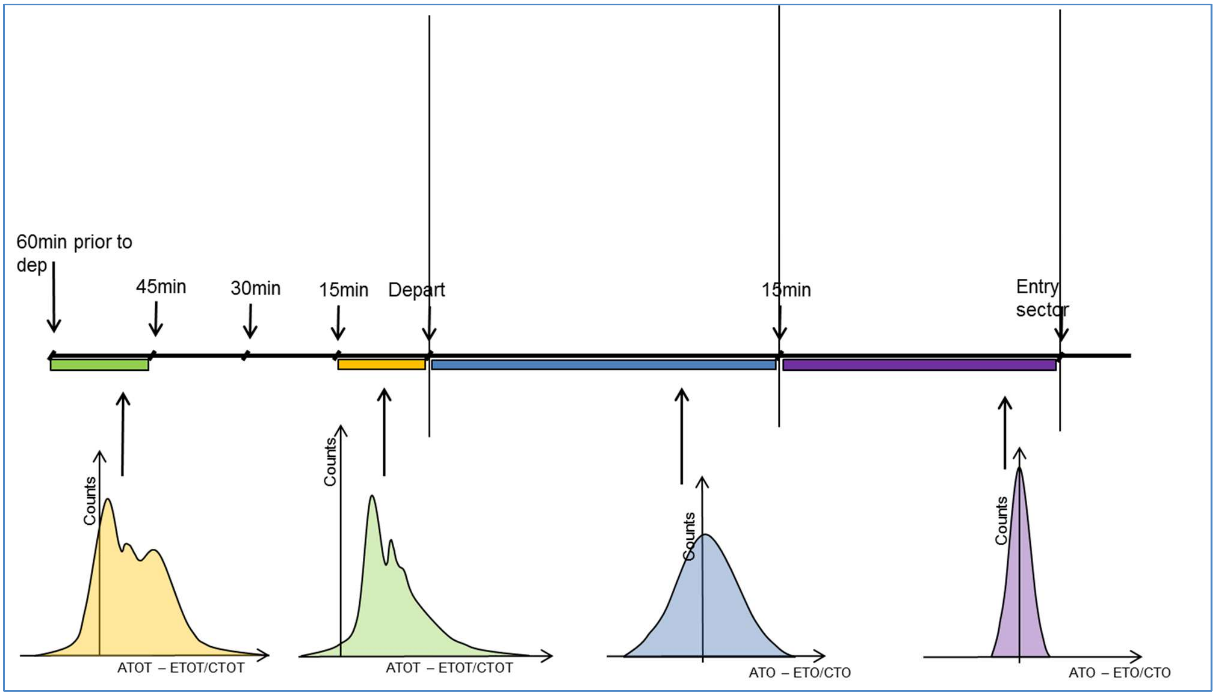



**Figure 3: Integration of the exemplary Uncertainty Models (look ahead distributions)**

The distribution of the probability that a flight will be at a position at a certain time will result in a value smaller than 1.

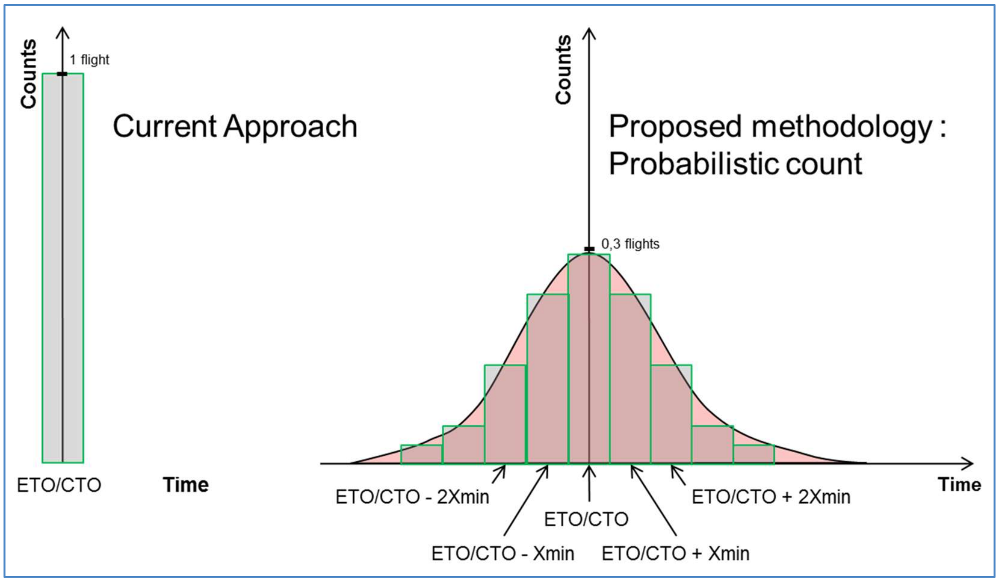



**Figure 4: Probabilistic Count Methodology**

It means that in case a probabilistic traffic count indicates a value of 30, it may be composed of 50 probabilistic flights with an average probability value of 0.6.

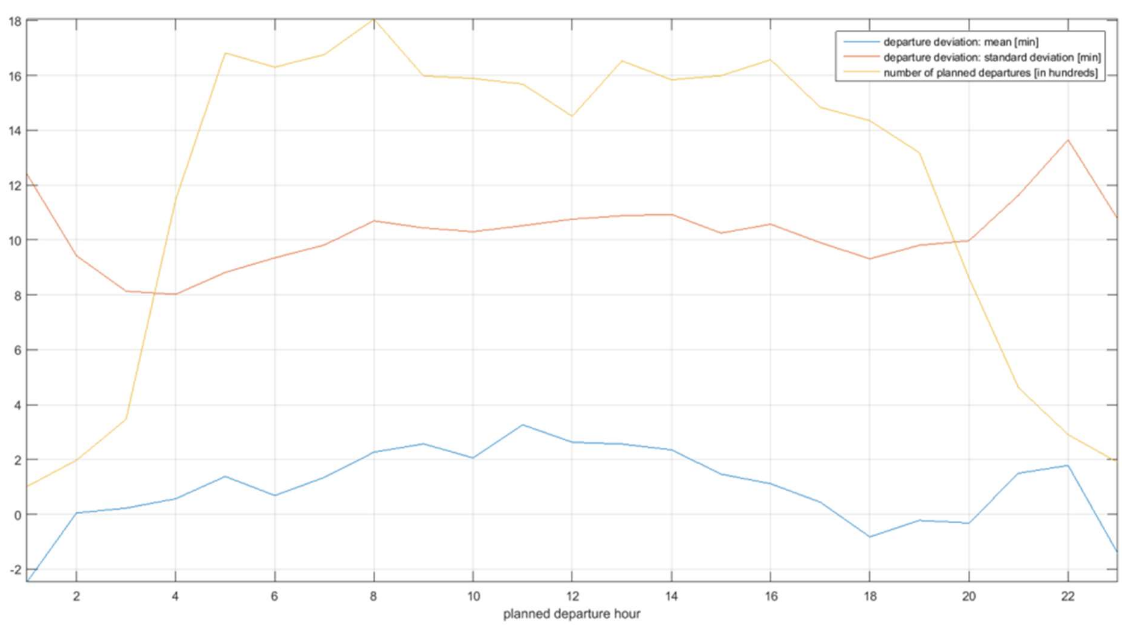



**Figure 5 : Exemplary departure deviation metrics for a single day**

The different distributions for look ahead time, departure aerodrome, time of day etc. result in the distribution for each flight. The individual flight distributions are integrated in probabilistic entry counts.

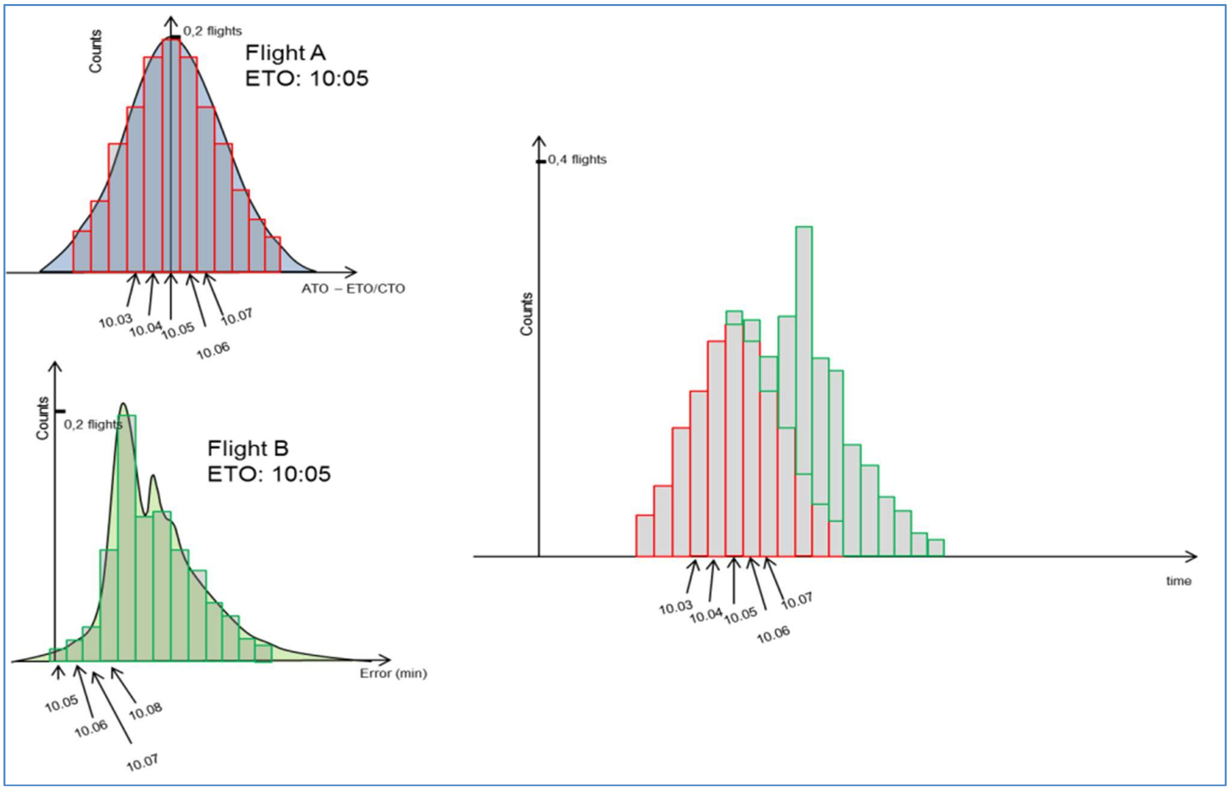



**Figure 6: Integration of exemplary Probabilistic Counts to Probabilistic entry counts**

It allows to provide a vizualization of the probabilistic counts displaying the count with 2 sigmas standard deviation resulting of the cummulative individual flight distribution.

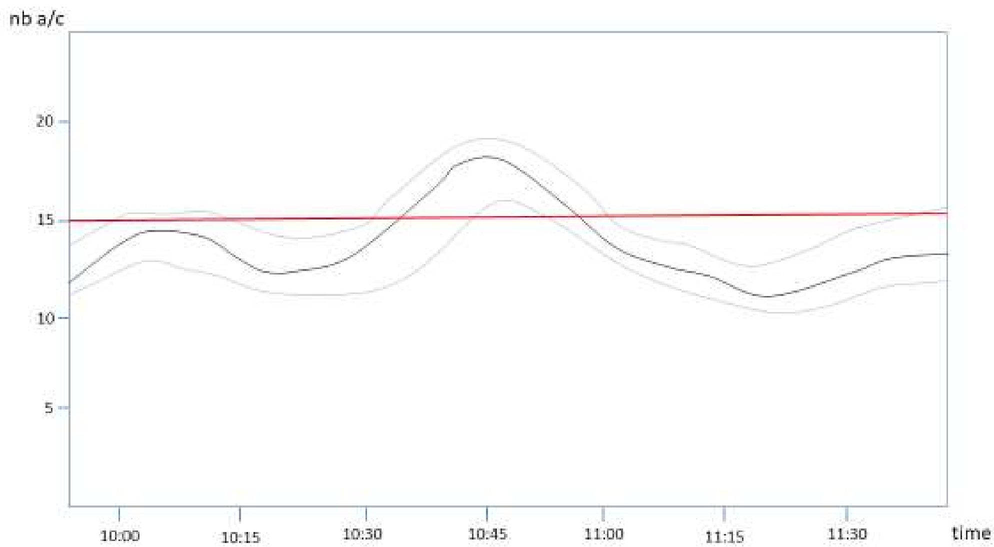



**Figure 7 : Vizualization of the Probabilistic Counts**

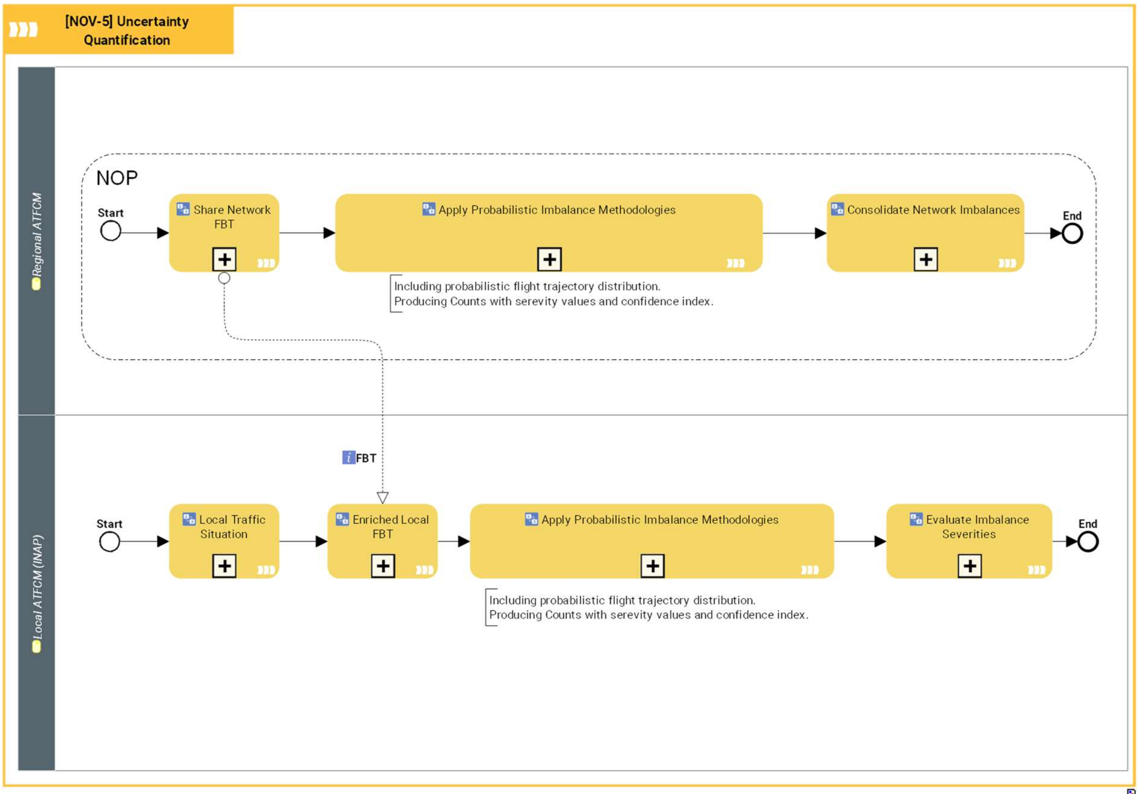



**Figure 8 : Uncertainty Quantification**

| Activity | Description |
|---|---|
| Apply Probabilistic Imbalance Methodologies | The NMf actor applies a probabilistic imbalance methodology to translate traffic demand into a 'traffic load' information that represent the value of the ATCO mental workload. |
| Consolidate Network Imbalances | It collects the local imbalance figures to build an imbalance consolidated network view. |
| Enriched Local FBT | The NMf actors aggregates local traffic situation and FBT to build a traffic demand. |
| Evaluate Imbalance Severities | The NMf actor evaluates the imbalance severities in order to determine the type of actions to trigger to resolve the imbalance. |
| Local Traffic Situation | It concerns the local Flight Data Processing System providing SBT/RBT. |
| Share Network FBT | The NM system provides the FBT information to NMf actors |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Share Network FBT o--> Enriched Local FBT | Local ATFCM (INAP) | FBT | |

#### 3.5.2.1.2 Demand Prediction Improvement

The current 'as filed'-Trajectory-based approach to Demand Prediction is incompatible with the needs for early, reliable, and accurate traffic situation assessment. In the current ATFCM DCB context of SESAR 2020 Wave 1, it has been observed that the flight plans are filed late, and do not reflect the consequences with regards to DCT clearance and other flight execution efficiency improvements, but reflect the business intentions including uncertainties of take-off, fly over, and arrival times.

To improve this situation, Demand Prediction could be complemented with Trajectory elements that are reasonably likely to correspond to the Airspace User response, taking into account the context and conditions.

The likelihood of the itinerary to be close to the choice the Airspace User will make is determined by applying conditions to the data that corresponds to the current context. The conditions to determine the itinerary include the Priorities and Preferences from the Airspace Users, if any. The mechanism to exchange Priorities and Preferences for forecasting purposes is not the subject of PJ09 but should be defined in the context of PJ07.

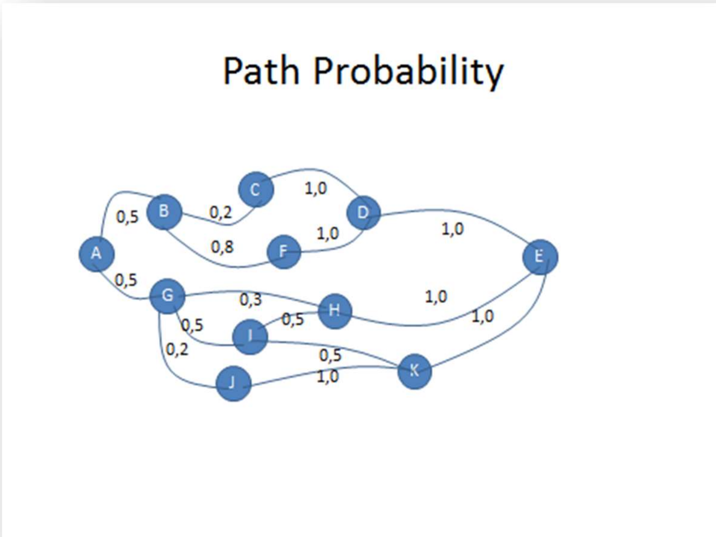
These conditions are compared to historical data that either embeds or correlates to the state and events of the past, the historical context.

It is assumed that when the conditions at present are similar or identical to the conditions in the past, that the Airspace User response will be similar and result in an itinerary that is similar to be followed.

The Demand Prediction as it stands will currently support 1 itinerary definition per flight. The model can be enriched to collect all possible paths (or all equivalent paths) that a flight can execute and for each of them indicate a prediction indicator that tells the user which is the more likely and the less likely as in the following figure.

We can represent all the paths between the ADEP and ADES as a **directed network graph.** Each node represents an active Airspace (by definition they cannot overlap). The edges that connect these nodes can represent different properties: elapsed time, distance, fuelburn, route charges, etc.

The likelihood that a certain path is taken gives the weight of the probability. The sum of all probabilities outgoing from a node is always 1. The probability of a path is the product of the probability of all the traversed edges. For example:




- A-B-C-D-E = 0,1
- A-B-F-D-E = 0,4
- A,G,H,E = 0,15
- A,G,I,H,E = 0,125
- A,G,I,K,E = 0.125
- A,G,J,K,E = 0,1

Still we need to select one to allow assessing the load the flight causes; and how it influences the traffic situation.

We can develop the network graph based on the points that the flight traverses or we can also draw it in function of the airspaces that it traverses. The advantage of airpsaces is that we can also select the granularity, from ES to CS to ACC and since airspaces have certain dimensions we can avoid creating edges for slightly different Flight Levels or for any intermediate variation that bears no conseuquence on the entry or occupancy counts.

A node based graph on points could also be simplified by only considering the co-ordination points (COP). In a FRA context we could consider to use the transition points only (at NAS boundary or whatever boundary is defined).

Each node can have conditions. One could attach:

- Time conditions: at some given time the use of an edge is prohibited or enforced
  - when a certain ARES is active
  - when there is a different path for weekends/busy fridays versus week periods
  - …
- Aircraft property conditions:
  - an edge cannot be selected for a certain aircraft type
  - an edge is preferred for a certain aircraft operator
  - …
- Measure conditions
  - How likely it is there will be a regulation or STAM

- How likely it is a flight will get a DCT
- How likely it is the flight will be FL-capped
- ...

We can also add properties to an edge:

- The minimum/maximum/typical flown distance
- The minimum/maximum/typical elapsed time
- Route Charges
- ...

**Note:**

- The likelihood of the itinerary to be close to the choice the Airspace User will make is determined by applying conditions to the data that correspond to the current context. The first factor to consider is to eliminate those itiniraries that are impossible (or quasi impossible – i.e. the cost is far outside the acceptable range)
- These conditions are compared to historical data that either embeds or correlates to the state and events of the past, the historical context (as far as predictions go, new airspace designs cannot be related to a historical context)
- It is assumed that when the conditions at present are similar or identical to the conditions in the past, that the Airspace User response will be similar and result in the same itinerary to be followed. The extent to which the conditions are similar can be expressed as a 'condition correlation coefficient'. The extent to which the traffic corresponds to the correlated itineraries can be expressed as a 'prediction correlation coefficient'. Both factors have a value in the range 0 to 1, where 1 indicates an absolute correlation.
- In this context discrimination, the Preferences and Priorities determined by the Airspace User will also be included.[1]

All attributes collected are represented as statistical distributions incuding buffer times and uncertainties(probability) that are reflecting the context and intentions of all the stakeholders.

Finally, after the traffic has been re-processed to reflect the highest correlation 'forecast trajectories', the forecast network impact allows a probabilistic demand prediction.

ATFCM measures could be adapted to the new information structures.

Optimising ATFCM measures is allowed to deal with new imbalances that could result from traffic avoiding the measure altogether, or from traffic implementing the desired changes as required by the

[1] How this is achieved is to be elaborated in a future version of the OSED.

measure. Additionally pre-agreed scenarios have to be applied to the Traffic Forecast so the forecast trajectory that is affected by the scenario is updated to conform to it.

The Predicted Demand will be qualified by a Prediction Quality Index to indicate how likely it is that the real traffic situation will match with the predicted traffic situation. In this way we can see the variation in function of the time horizon. A word of caution is needed. The PQI can be very high when there are no flights predicted and there are actually no flights at all. The PQI value can be very volatile, this could be due to pop-up and pop-out traffic.

- Pop-up traffic: traffic for which we could not make a prediction as there was no flight data available at the time of the prediction, or it entered the observed location and period
- Pop-out traffic: traffic for which we had a prediction, but that is no longer within the observed period and/or location

## Goal in Context

PJ09.01 aims at improving the Traffic Demand Forecast by:

- Introducing a Forecast Business Trajectory
- To enhance the prediction of Flight Intentions
- With itineraries that are selected by similar or identical context or provided by PFP in an FF-ICE context
- Adjusted by statistical information on buffer and time variability; and
- Reflecting the pre-agreed ATFCM scenario's;
- Including most likely Airspace User responses to the traffic situation
- Using forecasted Airspace Configuration and Capacity data
- To detect demand vs. capacity imbalances
- That lead to further adjustments of the trajectory and forecast solutions to solve these imbalances
- Resulting in a Network Impact Forecast

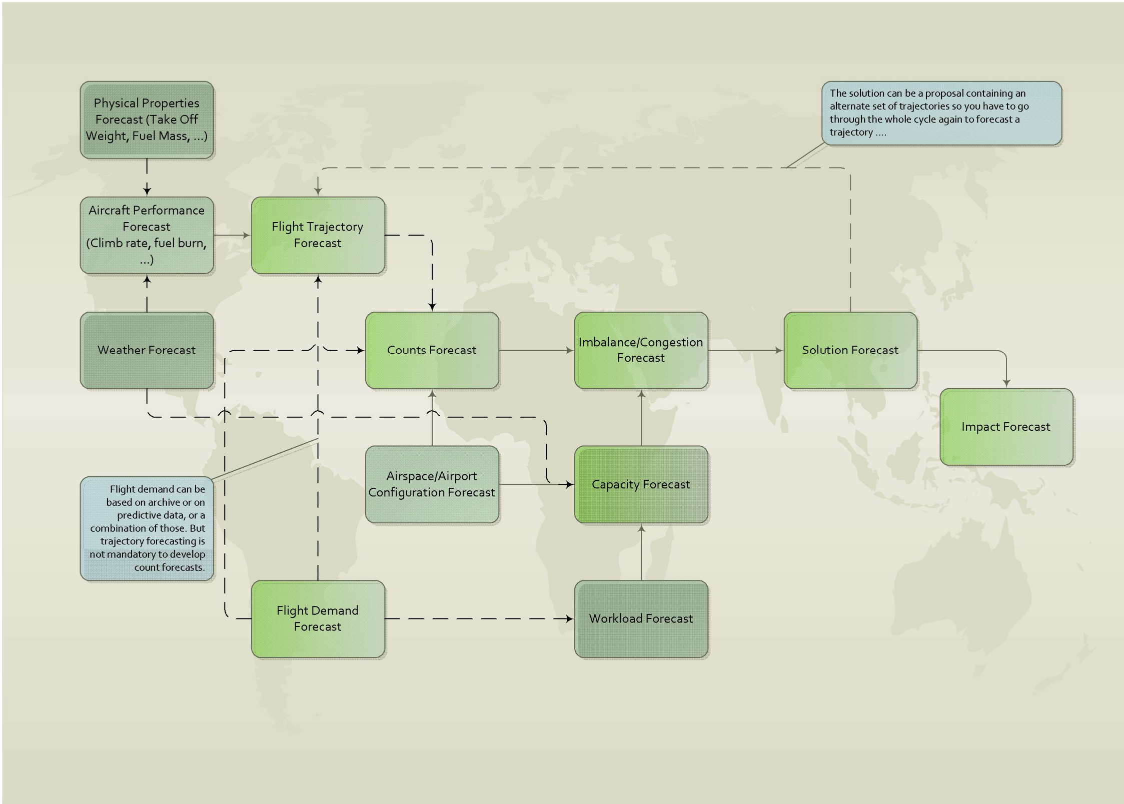



**Figure 9: Full cycle of predictive demand**

The term ‘full cycle’ refers to the fact that all forecasting activities are executed as a loop until a satisfactory outcome (impact) has been achieved through continuous refinement of solutions and their impact on flight trajectories.

The targeted time horizon is potentially from D-6 to 00H10 minutes before the reference time of sector entry.

## The Predictive Demand Model

### Flight Demand Forecast

The flight intentions are gathered in a Demand Forecast Repository. This is a collection of PFP, airport slots, historical data, and DDR providing the most likely approximation

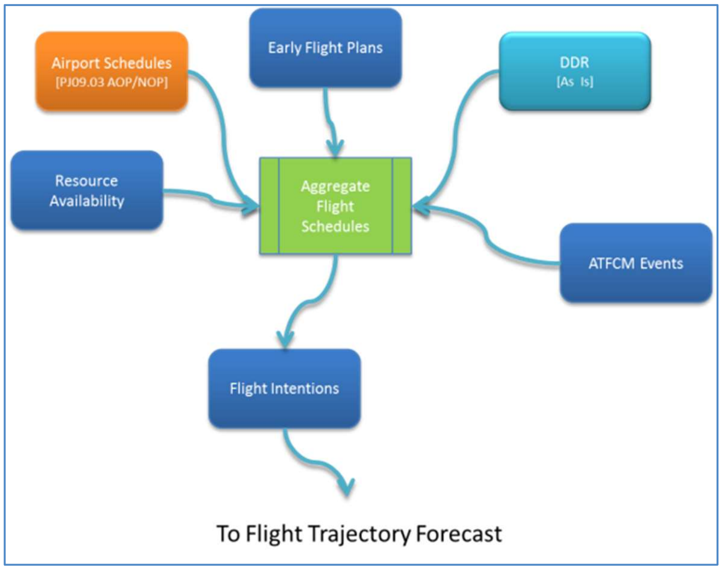



**Figure 10: Flight Demand forecast model**

Historical data is not used directly in terms of adding flight intentions but to act as a diagnostic and a trend indicator. Trends allow to determine if the predicted number of flights is within a certain range (depending on growth estimates, seasonal variation, etc.) and diagnostics allow to detect sudden and unpredictable numbers that fall outside a range of confidence (to detect missing sources of data, software problems, etc).

The state-of-the-art implementation is called the DDR Demand Data Repository. This implementation is missing short-term ATM information updates.

The preliminary plans in DDR are provided by:

- AU - Airline Scheduling Information from INNOVATA (weekly)
- AU - RPL
- SSIM - participating AU
- Airport - Airport Slot List EUACA (daily)
- Airport - Airport plans from non-EUACA
- ICAO/IATA flight ID mapping - Traffic Growth Rate (seasonal)
- Russian Federation outbound traffic from the Russion ATM Center (daily)

The preliminary plans in DDR will be amended or replaced by the trajectory data coming from FF-ICE planning services amended with:

- a probabilistic view on ATFCM constraints (PTR, Sectorisation, …), and

- trajectory adjustment that results from foreseen predefined scenarios

Flight intention is usually composed of the following data fields:

- Flight ID,
- departure date,
- departing and destination airports,
- EOBT (Estimated Off Block Time),
- ETA (Estimated Time of Arrival – in block time ),
- aircraft operator,
- aircraft type,
- type of flight,
- and date of last information update.

Several thousands of intentions are received, stored, updated  daily. This information is useful to anticipate as early as possible what will be further defined and communicated through flight plans.

PJ09.01 shall deliver a Demand Forecast model that enhances the DDR with up-to-date ATM information on flight schedules, including:

- ATFCM events (special events, military exercises, …) leading to additional or reduced demand;
- Airport schedules identifying flight cancellation or early progress information ;
- Resource Availability (infrastructure, …) as a consequence of maintenance, incidents;
- Early Flight Plans which can be filed up to 6 days in advance, although not distributed until EOBT – 20h.

### Forecast Business Trajectory

Based on the flight intention and the context contained in the Demand Forecast, PJ09.01 shall introduce a Forecast Business Trajectory [FBT] to model the 4D profiles of the flights using the forecasted Aircraft Performance.

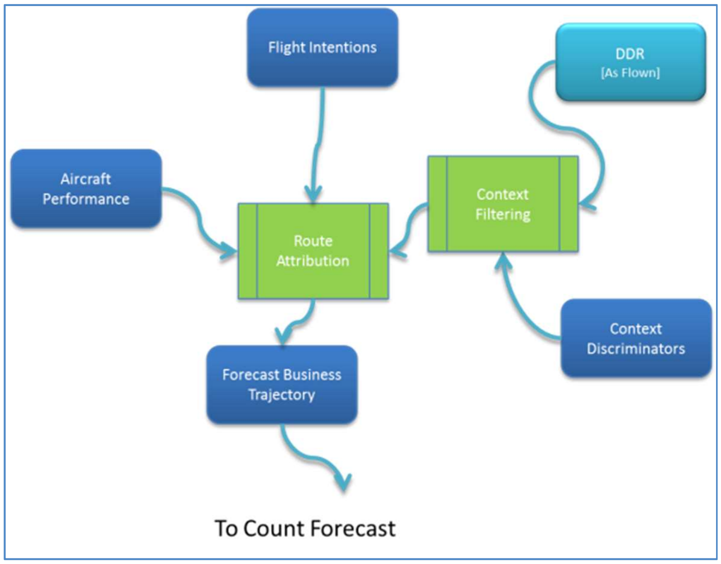



**Figure 11: Trajectory Demand forecast model**

This initial FBT will be populated with PFP data if/when available, otherwise substituted by an appropriate flight plan derived from a past flight plan or generated trying to match the circumstances of the forecasted situation for that flight. The context may include:

- Airspace Reservations as per AUP/UUP;
- Applicable ATFCM Scenarios and Measures already planned.
- Weather

Additionally, the route will be completed with:

- Appropriate terminal procedures according to the forecasted weather conditions and runway configuration;
- Appropriate Track System information according to the forecasted weather conditions for North or South Atlantic tracks.

Should there be no suitable result from the filtering; the route attribution will generate a FBT itself based on the Shortest Constrained Route model.

The FBT at this stage is compliant with the flight plan validation rules

The FBT differs from the SBT in that initially it is not provided by the Airspace User, it is either derived from historical data or calculated. And once a PFP or SBT is provided, this will or may be modified to reflect the impact of forecasted solutions.

### Count Forecast

Based on the FBT, the Count Forecast will compute the Traffic Demand for each relevant location. The relevant locations are determined by the active Traffic Volumes. Traffic Volumes can be activated by static definition of their TV Activation Plan, or dynamically in response to specific sector opening times that are input through the Airspace Configuration Plan.

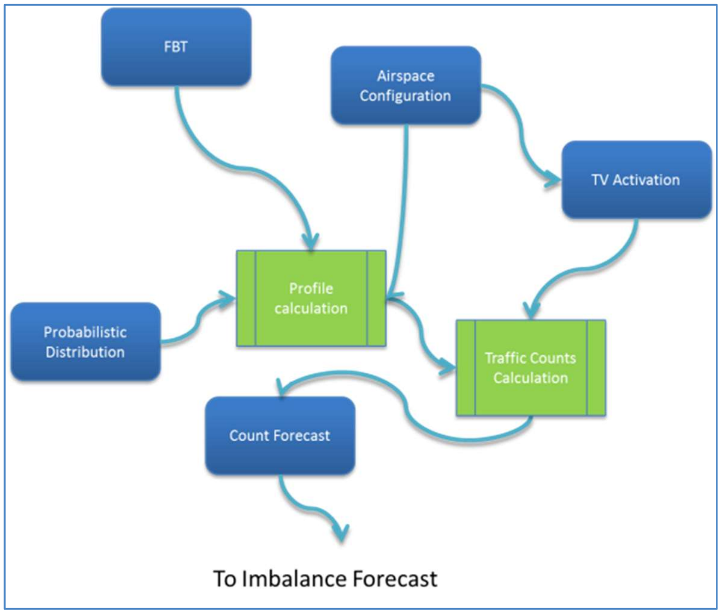



**Figure 12: Count forecast model**

The Count Forecast can be based on deterministic time of entry in the reference location or on a probabilistic distribution.

PJ09.01 will add a probabilistic distribution based on:

- The aircraft operator category (Main, LCC, Charter, Military, Business)
- The airport of departure (CDM or non-CDM)
- The past performance history:
  - TOT Punctuality
  - FlyTime variability
- ‘Affected by’ Measure
- Time of operations
  - Departure time
  - Weekday
  - Month

The probability of the count will be indicated by a bracket indicating the 90% range probability of the count minimum and maximum values. This indicator is the Prediction Quality Indicator[2] [PreQI]

The usability of the PreQI for operational decision making has not been proven and the validation of this concept will clarify the usefulness to decision making.

Probability distributions average the behaviour of the measurements under all kind of disturbances. Exceptional events which occur too infrequently to predict pose another level of uncertainty. If a critical situation occurs, the systems' response follows varying distributions. Moreover, complex interdependencies between probabilistic variables are considered.

### Imbalance Forecast

The Count Forecast is that basis for the Traffic Demand Forecast, but a realistic forecast takes into account the capacity limitations of the Airspace Configuration. The airspace configuration contains all

[2] See "Assessing Prediction Systems " by Kitchenham , MacDonell, Pickard, Shepperd https://www.researchgate.net/profile/Martin_Shepperd/publication/228862557_Assessing_Prediction_Systems/links/0fcfd50c6512fcc9a5000000.pdf

relevant information regarding the capacity, activation, and timing of the sectors, traffic volumes, aerodromes, etc.

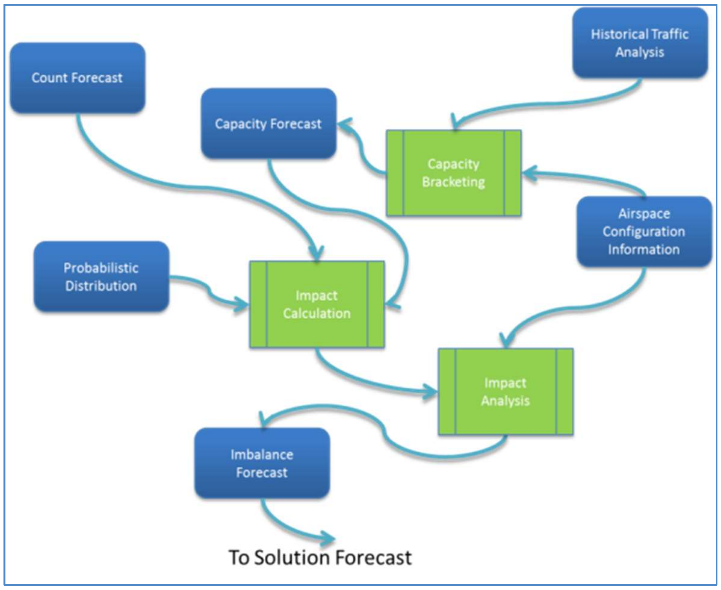



**Figure 13: Imbalance forecast model**

A Capacity Forecast model is introduced that provides the thresholds and ranges of acceptable, manageable, or problematic traffic density. This allows to determine together with the count forecast whether an imbalance may occur.[3]

The capacity forecast is driven by the different system implementations at ANSP level be it ATC, Airport, and other levels of responsibility; and the traffic density thresholds will vary greatly by context and depend on these implementations.

The Imbalance Forecast requires a capacity forecast that integrates the local and network views to provide a network wide capacity view.

This model should allow for traffic density thresholds to be defined from a very local to a network level at different time horizons corresponding to the different views that the different actors have on the traffic situation; and shared with the ATM community in real time.

---

[3] For this edition of the OSED, the capacity values are considered to be correct, complete, and accurate. This means that the probability of the capacity being correct equals '1'. The implication of this is that an imbalance forecast is predictable purely based on the probability of the demand forecast and does not require a probabilistic capacity. It is recommended that we improve the concept to reflect also complexity to for imbalance detection (even if we don't have a final answer to how to measure complexity, the trade-off with complexity is important to consider in the definition with pure numerical capacity).

The resulting imbalances are considered as input for the Imbalance Repository.[4]

The imbalance and probability of occurrence are subsequently evaluated as to the impact they have on the network performance and the Imbalance Forecast results.

Traffic Density is proposed to be used as a term instead of "count" because it allows to express it as a fraction, a probability, a statistical property, a function, … whatever is appropriate. It doesn't have to be a numeric value.

The density calculation could be a complex function or a simple function; whatever is deemed appropriate but it steers away from using 'count' which often is seen as a discrete value that is a natural number.

Traffic Density could be expressed as a number, a range of values e.g. [0;1[, a number of well defined states, a stochastic number with mean value and standard deviation, ...etc.

### Solution Forecast

The purpose of the Solution Forecast is to update the FBTs with alternative routes (in 4D, a delay is considered to be an alternate route in terms of time) where imbalances (or congestions) are determined as disruptive by the Imbalance Forecast.

[4] The function of the Imbalance Repository is not defined here. How the Imbalance Forecast can be absorbed or used in conjunction with the Imbalance Repository remains to be elaborated.

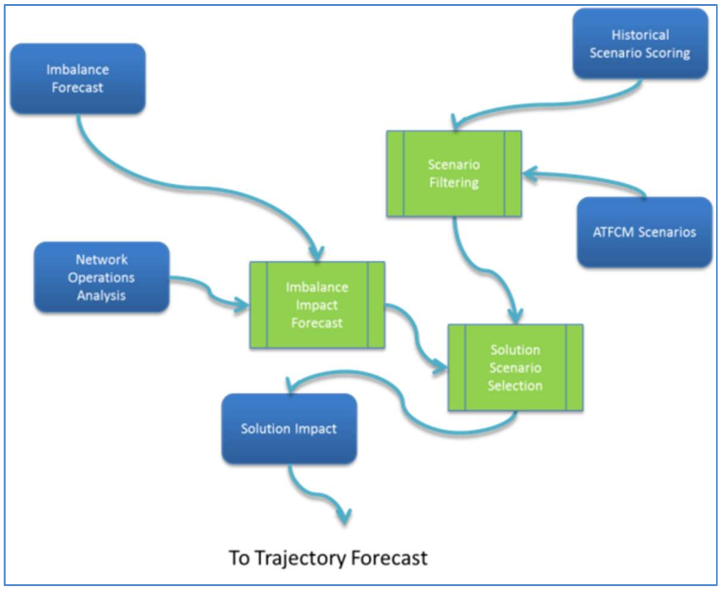



**Figure 14: Solution forecast model**

The solution of the imbalance is a decision based approach that can be governed by business rules but that requires additional intelligence to be gathered – as in a self-learning solution – monitoring and analysing past operator activity – and eventually leading to concrete advice for the LTM.

Solutions may be known as ATFCM Scenarios from a scenario repository that already includes the conditions in which the scenario has been applied and with an indicator of its relative success such that selecting solutions to be applied is facilitated.

All the scenarios that are determined to be effective are applied and the affected flights are recalculated starting from the Forecast Business Trajectory.

### Network Impact Forecast

The Network Impact Forecast re-uses the Network Performance KPAs/KPIs applicable to the DCB solution space. In view of assessing the quality of the forecast, the network impact is expressed in the same way as for network monitoring activities; there should not be any difference in the KPI/KPA definition apart from the fact that a forecast has a margin of credibility that has to be expressed as an index.  This index reflects the likelihood that the forecasted network impact will be as specified for the given circumstances and conditions.

A multiple pass of applying the solutions and recalculating the forecasted trajectories that are affected by the forecasted measures can result in further optimisations of the forecasted solution measures. At the last pass the Impact Forecast is concluded to be optimal and acceptable. The stability of the system needs to be guaranteed such that multiple passes stop when the improvements are insufficient or when a deterioration is detected.

A multiple pass is not mandatory but can contribute to further improvements of the forecast when the Traffic Demand is expected to change significantly. This will reflect, for instance, a pro-active avoidance of the consequences of the ATFCM measures by the Airspace Users.

We could describe this approach as "tuning". It attempts to close the feedback loop by anticipating the Airspace User response to the forecast solution. We may for instance apply a factor of active avoidance where for instance AU react to delays by refiling a flight plan that reroutes the flight around the problem area. Or in case of a rerouting, we apply a 'most likely' itinerary to update the Forecast Business Trajectory. In either case the Count Forecast will change and may change the Imbalance Forecast requiring updates to the chosen Solution Forecast.

Of course we must apply this re-iteration with care because there is variability in the traffic that makes very accurate forecasts impossible and it is costly in terms of effort and time. A single re-iteration is often required because of the unclear interaction of all the measures, but unless this leads to major changes in counts and imbalances, we should not re-iterate.

The forecast is done for the collection of all solutions rather than optimising solution per solution. This stems from the fact that if solution A solves problem X and solution B solves problem Y, it cannot be assumed that solutions A+B solve the problem X+Y (see most penalising concept of regulations for instance).

At the last pass the Network Impact Forecast is concluded to be optimal and acceptable.[5] How to achieve a collaborative agreement with all the stakeholders that this Network Impact is acceptable is not defined in a Demand Forecast related use case. It is a function of the Collaborative NOP.

## Other Models

The weather forecast model, the aircraft performance model, and the workload model are not elaborated as part of DCB.

[5] The interfaces with the systems and tools used by the NM the LTM/EAP, and other actors still need to be elaborated. In the current NM System implementation there is no integrated view that allows to mix FBT with SBT and RBT. The interface with INAP and the integration of the local systems to provide data to and consume data from the Demand Forecast will be subject to a separate use case still to be provided in a future version of the OSED. Also, how the AOP will use the probabilistic Traffic Forecast information needs to be elaborated in a future version of the OSED.

#### 3.5.2.1.3 Preliminary flight prediction

Flight count and preliminary flight trajectory predictions are already addressed above.

In order to complement, we will address some specific characteristics:

- Comparison of historical file pairs internal to the Network Manager, from the planning phase (PREDICT) and from the initiation of the tactical phase (TACT)
- Use of a PREDICT flight data file generated at “any time” during the planning phase, extending the actual last PREDICT flight data file beyond D-1.
- Application of the prediction to the full en-route trajectory/flight profile. The prediction model and prediction engine shall be scalable to match ECAC-wide predictions.
- Going to Flight demand predictions to become probabilistic.
- Side information made available to drive the prediction beyond PREDICT flight data as input and (PREDICT, TACT) historical pairs. Explicit information on the environment to be made available to the prediction engine. Explicit side information on airspace structuresto be also made available, route availabilities or airspace restrictions or any aeronautical information during the related AIRAC cycle. The assumption is made that the traffic volumes are static. Impact of a regulation to be taken into account directly. Occurrence of any unusual circumstances is made explicit. The environment and context will be guessed by the prediction engine.

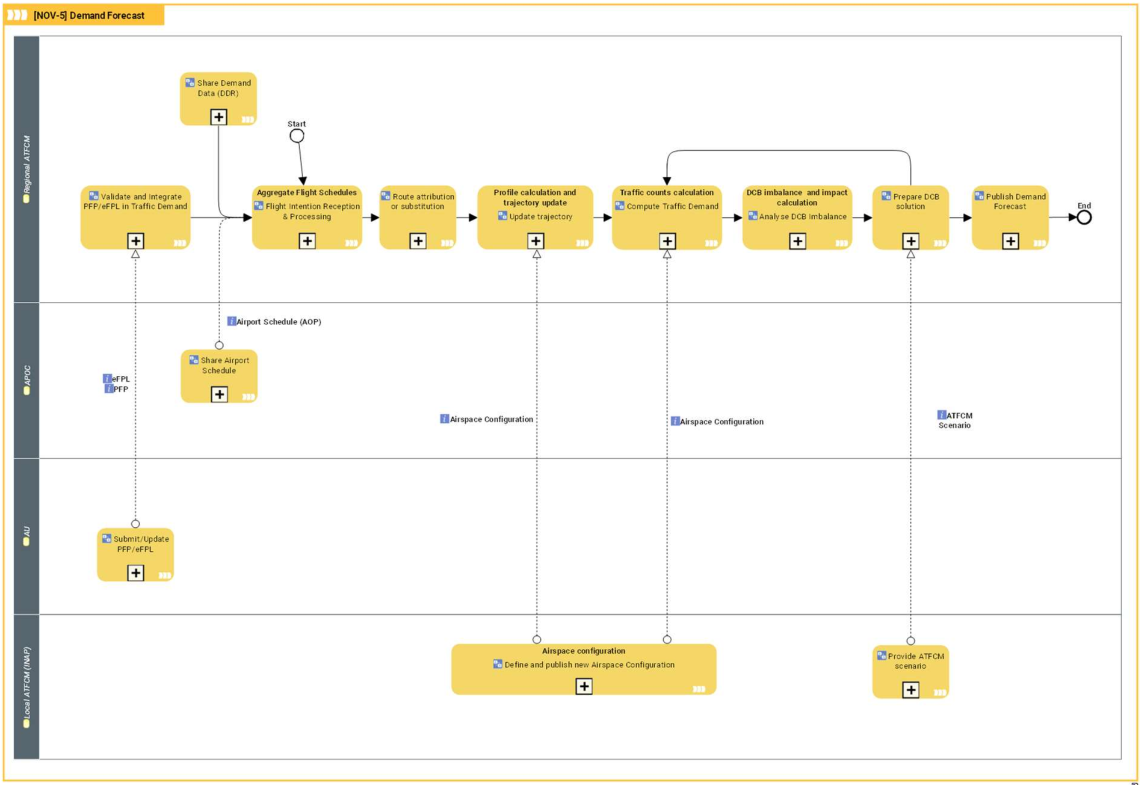



**Figure 15 : EATMA Model Demand Forecast**

| Activity | Description |
|---|---|
| Analyse DCB Imbalance | The Local Traffic Manager and/or the Flow Manager analyse the demand versus the given resources and capabilities in his area, in order to foresee the resulting problems. |
| Compute Traffic Demand | Computes a 4D view of the demand from all flights in the network. |
| Define and publish new Airspace Configuration | Airspace configuration is published |
| Flight Intention Reception & Processing | This activity involves receiving and processing flight intentions from the AU's FOC. Flight intention processing consists of checking the nominal preferred route (s) syntactically and for consistency against the ATM Environment and Constraints as maintained by Network Management systems. Also this activity includes generating trajectory information, using as input the nominal preferred route information, |

| | |
|---|---|
| | as well as information on airport slots, historical flights, traffic forecasts and published ATM Constraints, for the purpose of generating consolidated early flight information . Any nominal preferred route errors found are sent back to the FOC. The consolidated early flight information is then sent to the activities that maintain the Network Management flight database, compute traffic demand, and elaborate DCB measures. |
| Prepare DCB solution | The NMf local actors prepare DCB measures to resolve the hotspot. |
| Provide ATFCM scenario | ATFCM scenario is provided |
| Publish Demand Forecast | Demande Forecast is published |
| Route attribution or substitution | Route is allocated |
| Share Airport Schedule | Airport schedule is disseminated to Collaborative NOP |
| Share Demand Data (DDR) | DDR is shared |
| Submit/Update PFP/eFPL | The AU generates a PFP/eFPL or updates a PFP/eFPL with changes to the previous one. The AU submits the PFP/eFPL to the NMF for operational acceptability. |
| Update trajectory | ATS unit updates the trajectory estimates in the Flight Object using the latest actual progress of the flight.<br>Note. - This may be performed automatically or may be triggered by the controller depending upon the local implementation. |
| Validate and Integrate PFP/eFPL in Traffic Demand | Validate the submitted PFP/eFPL against the Airspace Constraints and integrate the PFP/eFPL in traffic demand. If the submitted PFP/eFPL violates Static Airspace Constraints, set the Planning Status indicating that the PFP/eFPL is not operationally acceptable, including the violated Static Airspace Constraints. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Provide ATFCM scenario o--> Prepare DCB solution | Regional ATFCM | ATFCM Scenario | |
| Local ATFCM (INAP) | Airspace configuration o--> Traffic counts calculation | Regional ATFCM | Airspace Configuration | AIRM_Change_Request |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| AU | Submit/Update PFP/eFPL o--> Validate and Integrate PFP/eFPL in Traffic Demand | Regional ATFCM | eFPL | |
| AU | Submit/Update PFP/eFPL o--> Validate and Integrate PFP/eFPL in Traffic Demand | Regional ATFCM | PFP | |
| APOC | Share Airport Schedule o--> Aggregate Flight Schedules | Regional ATFCM | Airport Schedule (AOP) | |
| Local ATFCM (INAP) | Airspace configuration o--> Profile calculation and trajectory update | Regional ATFCM | Airspace Configuration | AIRM_Change_Request |

### 3.5.2.2 Predicted Workload

INAP function timeframe is being considered [6h-20min]. This timeframe corresponds to the entry time in the controled area.It has been agreed as follows:

- Timeframe of operation for LTM [6h-20min]
- Timeframe of operation for EAP [2h-15min] - Operational Work
- Timeframe of operation for ATC Sector Planner [15-real-time]

For the following tools/functions to be able to work with enough data quality, this is the timeframe agreed:

| SPECIFIC CASES | TIMEFRAME |
|---|---|
| Airspace configuration change needed | [6h-2h] |
| The imbalance is so strong that it cannot be solved by STAM Measures | [3h] |

| | |
|---|---|
| STAM/ /CORSE Measure | [3h-20 min] |
| Timeframe before TTOT (to allow CDM aiport to generate their sequence) | [3h-40 min] |

**Table 11 : Timeframe for some INAP-related tools/functions/methodologies**

Depending of the timeframe and related uncertainties, different imbalance methodologies are proposed to manage different granularities of issues:

- Traffic density management aiming at managing that there are not too many flights in a traffic volume.
- Traffic complexity management aiming at managing that there is not too much complexity induced by flights in a traffic volume. Complexity management shall act in the 3h-20min time horizon. Complexity should be calculated as soon as quality data is available.
- Traffic interaction management aiming at managing that there are not too many interactions of a certain type (adapted to the local specificities of the TV/ flows under analysis)

For each filter, there are dedicated methodologies to detect at the right level of granularity the predicted imbalance problems.

  - Traffic density detection: count methodologies (Entry count, Occupancy count).
  - Traffic complexity detection: complexity methodologies (specific local indicators, e.g. nb of climbing flights, % airborne flights, ….).
  - Traffic interaction detection: Extended Interaction Detection.

These methodologies constitute the Imbalance Prediction Service which is an important building block to monitor current and assess future network imbalances.

It should be noted that MTCD (Medium-Term Conflict Detection) and STCA (Short-Term Conflict Alert) are not part of the 'Imbalance Prediction Service' and represents finer methodologies for the ATC layers.

These different methodologies covering a 6hrs - 20 min timeframe are integrated in a seamless process to offer a continuous predicted imbalance capability. Each methodology is offering:

- An Imbalance Confidence Index indicating the level of certainty of the prediction in order to trigger the best methodology at the right time. This Imbalance Confidence Index will be obtained from the processing of the traffic demand prediction and its associated uncertainties.
- Monitoring values aiming at detecting the deviation between the measured traffic imbalance and a reference of an acceptable predicted workload. That reference would depend on :

  - The thresholds set on per sector basis
  - A reference regards to the sustain/peak complexity/difficulty ATCO can accept
  - Experience (expert judgment of ATCOs), Human Factors, complexity simulations and historical data

These imbalance methodologies reflect with different granularities the ATC controller workload that represents the main functional limitation on the capacity of the ATM system.

Concerning the complexity methodology, it is important to define the granularity level requested to work with. Complexity Granularity is defined as "*the level of detail (volume or division) with which complexity can be predicted, measured and evaluated, which is directly related to the confidence index of the demand data available. The closer to the execution phase, the more accurate the complexity prediction will be*".

Granularity relates to the number of factors or elements that the user or system considers when determining complexity, considering both airspace and time horizon. Additional elements will lead to finer resolution of the complexity model: the coarser the model, the coarser the result obtained.

At ATC level working within INAP, Complexity should be defined at Traffic Volume (TV) level. When a complexity situation is predicted, the Imbalance Confidence Index (ICI) will support the decision-making process as it will be displayed at sector level in the ATCOs systems showing individual contributions to workload per flight and giving an indication of how efficient a measure is. It will only appear on request, to avoid an excess of information. ICI should be provided by the EAP on demand from the ATCOs, especially complexity evolution on the next 15-30 minutes in order to anticipate de-banding In any case, ATCOs would also need to be trained to read and understand such data.

This ICI is defined as "*a measure of how certain the prediction (calculated value of complexity in terms of a probability) is and what is the likelihood that it will change*". Decision making will be more efficient knowing the Imbalance Confidence Index: either there is the right level of information to fulfil the objective, either there is not, and in that case, the decision will be postponed or an another strategy will be used. If the Imbalance Confidence Index is high, then the user can have more confidence in their decision making, and maybe concentrate their efforts on elements where the Imbalance Confidence Index is lower.

An innovative HMI (generic HMI that can be applied to local/sub-regional/regional) to represent the imbalance information is developed aiming at providing an efficient and user-friendly front-end system to operators in order to visualize:

- Local Complexity & Network consolidated complexity;
- Combination of several methodologies (density, complexity, interferences);
- Imbalance Confidence Index and uncertainty figures in a probabilistic environment;
- Zoom on complexity factors;
- Zone of complexity & interactions (radar-like position);
- Flight-list related imbalances.

The detailed operating method is focused to the description of the local complexity methodology and the network consolidated imabalance. In addition the visualization of information provided to the front-end actors is described.

IMPORTANT:

- Count methodologies are still existing and are integrated in the global frame;
- Extended Interaction Detection methodologies will be described in Wave 2.

#### 3.5.2.2.1 Local Complexity

SESAR has defined complexity as *"…measure of the difficulty that a particular traffic situation will present to an air traffic controller…"* [SESAR JU. *"STEP1 V3 Final Complexity Management OSED,"* October 10, 2016]. Altogether, the characterization of complexity is a combination of features, and functionalities that describes what complexity is, but not what it means and how it could be used. This document does not elaborate on the features and functionalities of complexity, but rather on its meaning and its usage. This approach will provide the information required to use complexity within DCB at both local and network levels.

Even though complexity looks deceivingly easy to define, it is not. Complexity does not only depend on a fixed set of parameters, it also depends on a set of application scenarios. This implies that the definition of complexity should be flexible enough as to be able to be applied in several application scenarios and consequently should also be usable by other conceptual elements as an enabler. From this discussion, it ensures that complexity is not in itself a conceptual element; it is rather a methodology that describes how the impact of a particular traffic situation is estimated and used within DCB. Thus, to use complexity within a DCB environment, we need to characterise and scope it.

- Local complexity characterization

To characterise complexity, we need to establish a timeframe, identify the factors that contribute to it and provide procedures to its estimation within several different environments. We also need to identify what we can do with it, providing scenarios for manual and automatic assessment, and differentiate between future complexity values (defined as "estimations" in this document) and past or actual complexity values (defined as "calculations" within this document).

- Local complexity usage

Regarding its usage, there are three elementary things that can be done with complexity: (a) manage it (to reduce or distribute it); (b) Get an indication of the required level of granularity required for decision-making to implement specific solution scenario (assuming that higher levels of complexity, require higher levels of granularity and reduced levels of uncertainty); and (c) Monitor the system, raising the required alarms and alerts and increasing resiliency.

- Local complexity scope

The last element pertaining to the definition of complexity is its application scope. The local complexity scope addresses an ANSP area of operation, and it is concerned with the productivity and efficiency, focusing on safety and workload. Its main aim is to optimise local network performance through the identification and implementation of DCB solutions at the local level.

This scope is completed with the granularity or level of detail required to integrate the different complexity assessment and calculation methodologies that will need to coexist. Granularity ensures a common understanding of the complexity levels that enables a consistent and fair process to select and implement solutions. It also supports the early deconfliction process in a seamless, efficient and consistent manner.

##### 3.5.2.2.1.1 Local complexity assessment methodology

Even though the concept of operations document is not strictly concerned with the specific calculation and estimation methods, currently there are three approaches to estimate / calculate complexity:

- Dynamic Density. This is a formula based calculation method that is based on the summation of a series of predefined factors with associated weights, this is a good method to provide estimations into well-known situations (e.g. trajectories with low uncertainty levels) and not so good when confronted with new operational concepts, high-uncertainty or when there is no operational experience available.
- Cognitive workload. This estimation and calculation method consists of a set of formulas that consider the cognitive workload associated to the performance of the specific atomic controller actions, effectively measuring a person's ability to perceive and respond to variables based on prior experience and prior developed personal constructs. This method is built around the detection of events associated with the control of a flight. It is good to provide estimations into high-uncertainty situations and with new concepts. Additionally, it provides an excellent calculation of the complexity of already flown flights (for which there is a complete radar track). This method is not so good in short-term situations that do not have a reliable statistical description.
- Systems engineering. Included in this category are all those methods (such as social graph network theory or Lyapunov's coefficients) that provide a representation of the complexity. The majority of these methods are computational intensive and are considered (in general) as long-term research items.

#### 3.5.2.2.1.2 Synthetic local complexity levels

The use of Local Complexity should not be considered in complete isolation. Independently of their calculation method, local Complexity values should ensure the same understanding of the issues by all involved actors, including neighbouring ANSPs. In order to identify and share the impact of local complexity onto the network and the local scopes in a harmonized and unambiguous way, a synthetic indicator for local complexity should be designed. As such, it would consist of four colours / levels that have a predefined set of criteria that provide a clear indication of its impact. The proposal is to use:

- Level 1 or "green": This level indicates that the complexity is lower than established local or network thresholds. A Level 1 or Green value indicates that more aircraft are welcome into the area of measurement (although with each new aircraft, the complexity level will be recalculated).
- Level 2 or "yellow": At this level, complexity is close to the established local and network thresholds. A level 2 or yellow value indicates that the addition of aircraft to the area of measurement should be analysed with care.
- Level 3 or "orange": This level indicates that complexity is at the established local and network thresholds. A level 3 or orange value indicates that no additional aircraft should be sent into the area of measurement.
- Level 4 or "red" This level indicates that the complexity value is over the established threshold. Aircraft planned through this volume should be removed and sent elsewhere.

This approach will ensure that Complexity can be understood and used at the different scopes (network and local) without having to consider the equivalence between different calculation or estimation methods. In the Local scope, synthetic complexity levels will be used to identify hotspots (situations in which complexity is above a certain local threshold), and to distribute the complexity across a set of sectors using dynamic sectorisation.

Use Case "hotspot identification" describes how a local operator identifies a hotspot, and communicates with the network manager and other local operators to identify an optimum solution.

Use Case "distribution of complexity using dynamic sectorisation" describes how a local operator assesses and distributes complexity over a specific airspace to ensure that all estimation areas have a Level 2 or lower complexity level.

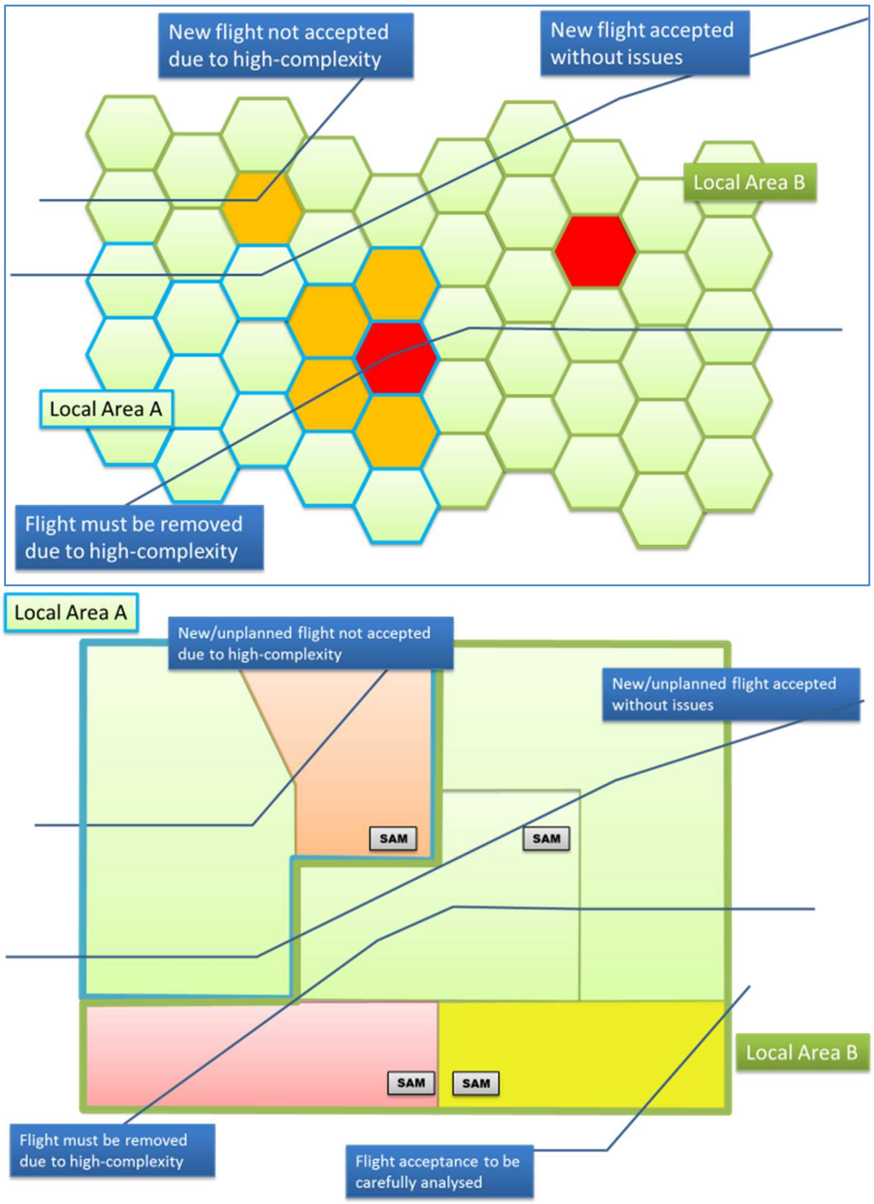



**Figure 16: flight selection based on sector load and complexity**

### 3.5.2.2.2 Consolidated Network Imbalances

ANSPs/INAPs identify local imbalances based on their local methodologies (entry/occupancy counts, complexity,… ). These local imbalances are shared with NM and need consolidation to assess the imbalance situation at network level.

To ensure the interoperability of the local methodologies, it is proposed to consider the severity value of the imbalances as elements to be shared in the form of {Green, yellow, Orange and Red} values.

To support such a capability, an imbalance repository is developed to collect all the local imbalances figures from ANSPs. This Imbalance Repository Service aggregates the local imbalance figures in order to provide a consolidated network imbalance view.

The Congestion Indicator (CI) represents the visualization of the consolidated Network Imbalance for a RBT/SBT (PFP or flight plan) (cf. figure below). It enables a view of all the imbalances that are affecting a SBT/RBT. This helps in understanding the trajectories that can be targeted for solution and also allows for efficient selection and implementation of measures.

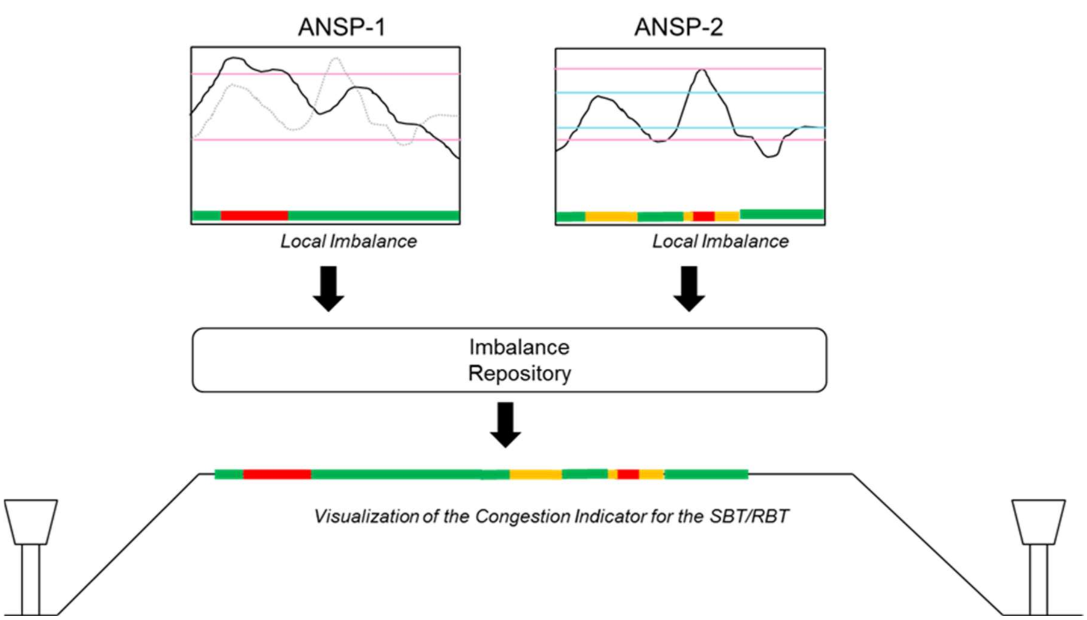



**Figure 17: Visualization of the Congestion Indicator**

The Congestion Indicator allows to compare different SBT/RBT alternatives and different DCB constraint alternatives. For example (figure below) NM, INAP, APT or AU can compare the Congestion Indicator figures values between two alternatives (SBT1, SBT2) in order to optimise the DCB constraints and flight trajectories.

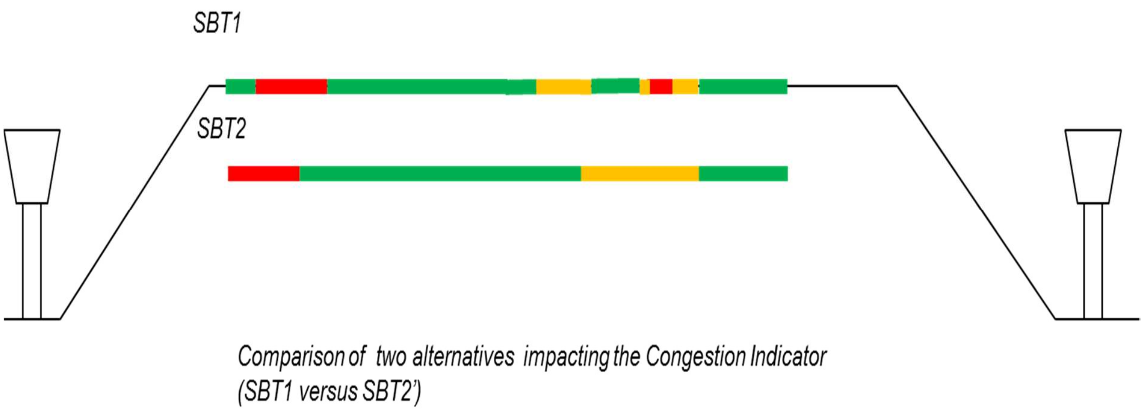



**Figure 18: Network imbalance consolidation**

**IMPORTANT :** In wave 1, the Congestion Indicator (CI) takes into account either entry count, occupancy count or both and is provided as part of the 'Enriched DCB information' in solution PJ07.01.

### 3.5.2.2.3 EATMA Model of the Predicted Workload

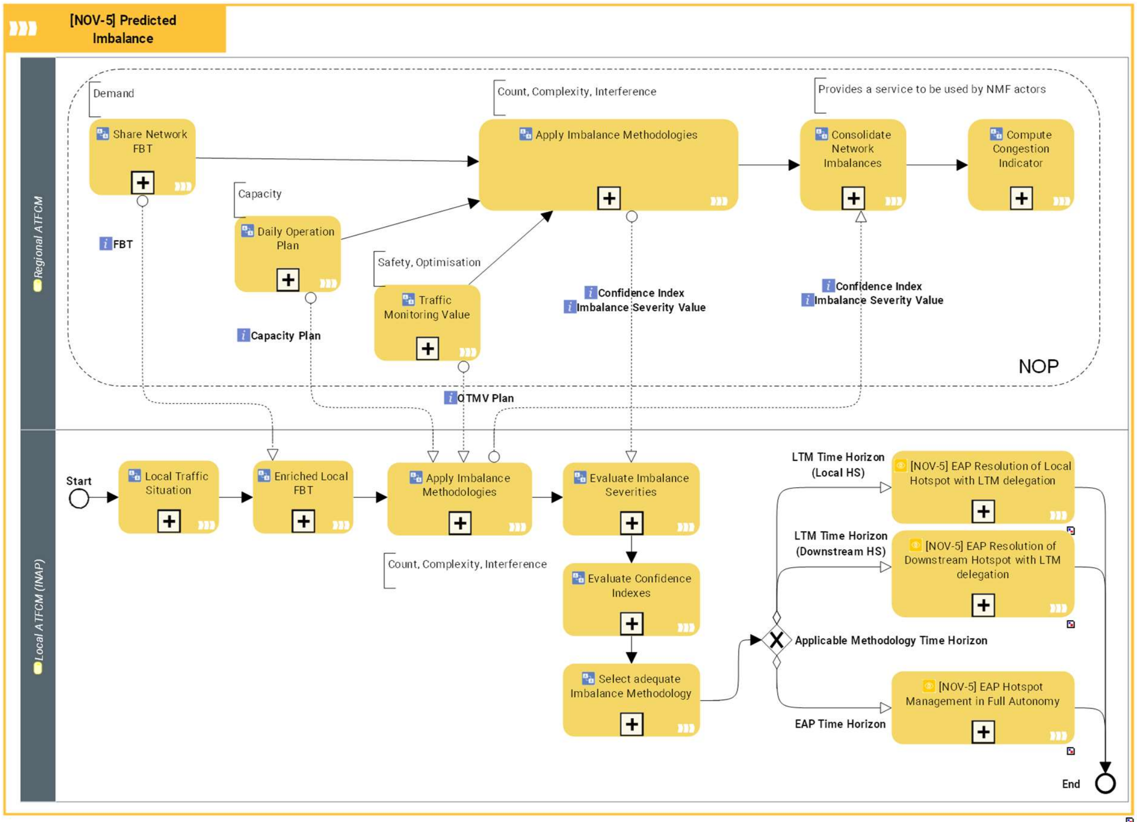



Figure 19: EATMA Model – Predicted Imbalance

| Activity | Description |
|---|---|
| Apply Imbalance Methodologies | The NMf actor selects an imbalance methodology (Entry Count, Occupancy Count, Complexity, ….) to translate traffic demand into a 'traffic load' information that represents the value of the anticipated ATCO mental workload. |
| Compute Congestion Indicator | It builds the consolidated imbalance figure for a SBT/RBT providing the severity of the congestion (green, orange, red) |
| Consolidate Network Imbalances | It collects the local imbalance figures to build an imbalance consolidated network view. |
| Daily Operation Plan | It provides the capacity figures. |
| EAP Hotspot Management in Full Autonomy | The resolution of the imbalance is performed by the EAP actor in full autonomy, it means that this actor manages the hotspot from the problem identification to the implementation of the solutions. |

| | |
|---|---|
| EAP Resolution of Downstream Hotspot with LTM coordination | The LTM actor identifies the hotspot, and shares their analysis with downstream ATSU, leading to the allocation of the responsibility for the hotspot resolution to the downstream EAP, for sake of flight efficiency. |
| EAP Resolution of Local Hotspot with LTM coordination | The LTM actor identifies the hotspot, and shares their analysis with the EAP leading to the allocation of the responsibility for the hotspot resolution to the EAP, for sake of flight efficiency. |
| Enriched Local FBT | The NMf actor aggregates local traffic situation and FBT to build a traffic demand. |
| Evaluate Confidence Indexes | The NMf actor evaluates the confidence index that quantifies the imbalance uncertainties in order to determine how likely is the problem to occur and evaluate the need to trigger actions to resolve it. |
| Evaluate Imbalance Severities | The NMf actor evaluates the imbalance severities in order to determine the type of actions needed to resolve the imbalance. |
| Local Traffic Situation | It concerns the local Flight Data Processing System providing SBT/RBT. |
| Select adequate Imbalance Methodology | The NMf actor selects an imbalance methodology (Entry Count, Occupancy Count, Complexity, ….) to translate traffic demand into a 'traffic load' information that represents the value of the anticipated ATCO mental workload. |
| Share Network FBT | The NM system provides the FBT information to NMf actors |
| Traffic Monitoring Value | Traffic Monitoring Value represents thresholds to characterize different types and severities of imbalances (safety, rate optimisation, critical & crisis situation) |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Apply Imbalance Methodologies o--> Consolidate Network Imbalances | Regional ATFCM | Confidence Index | |
| Local ATFCM (INAP) | Apply Imbalance Methodologies o--> Consolidate Network Imbalances | Regional ATFCM | Imbalance Severity Value | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Apply Imbalance Methodologies o--> Evaluate Imbalance Severities | Local ATFCM (INAP) | Confidence Index | |
| Regional ATFCM | Apply Imbalance Methodologies o--> Evaluate Imbalance Severities | Local ATFCM (INAP) | Imbalance Severity Value | |
| Regional ATFCM | Share Network FBT o--> Enriched Local FBT | Local ATFCM (INAP) | FBT | |
| Regional ATFCM | Traffic Monitoring Value o--> Apply Imbalance Methodologies | Local ATFCM (INAP) | OTMV Plan | |
| Regional ATFCM | Daily Operation Plan o--> Apply Imbalance Methodologies | Local ATFCM (INAP) | Capacity Plan | |

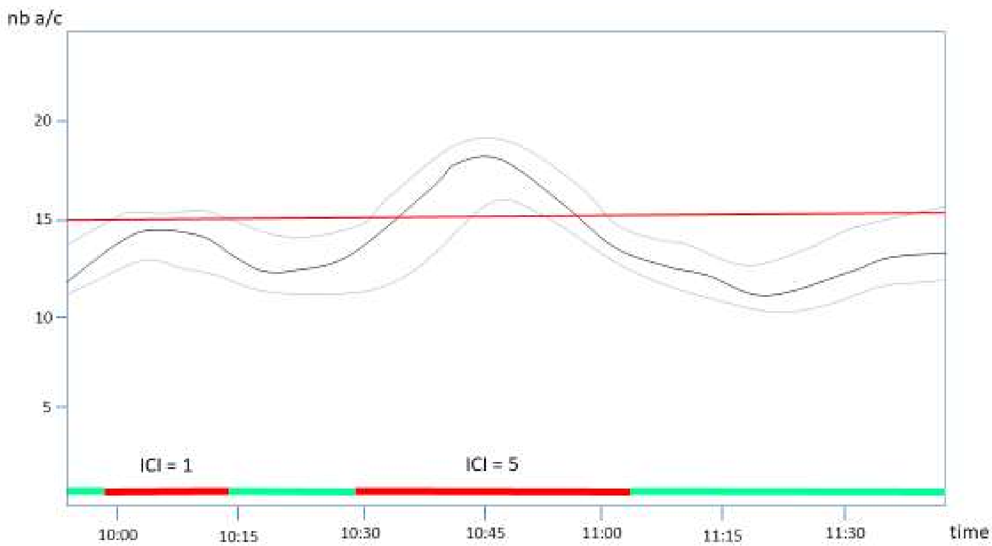
#### 3.5.2.2.4 Visualization of Predicted Imbalance with a Confidence Index

The predicted Imbalance is generated using the probabilistic count and defined thresholds. It categorises the imbalance severity (Congestion Indicator) and provides an Imbalance Confidence Index (ICI). The Imbalance Confidence Index (ICI) quantifies the probability of the imbalance occurrence. It is a key element in order to support more clearly the stakeholders in the decision-making process and allow them to trigger the right decision at the right moment.

It is proposed to value the Imbalance Confidence Index as the following :

| Probability | Confidence Index | Level of probability |
|---|---|---|
| Very High | 5 | >86 % |
| High | 4 | 85% - 70% |
| Medium | 3 | 69% - 55% |
| Low | 2 | 54% - 30% |
| Very Low | 1 | < 30% |

It is proposed to vizualize the imbalance severity (green, orange, red) with Confidence Index value (ICI : 5,4,3,2,1) as the following :




### 3.5.2.3 Network Performance

The Enhanced DCB provides capabilities to support a collaborative decision-making under consideration of the different stakeholders perspectives from Airspace Users, Airports, ANSPs and NM.

Compared to the current process, it creates a paradigm shift with all stakeholders expressing dynamically and precisely to the performance framework their individual needs to accommodate. It moves the performance to a quantitative approach.

This management of collaborative local solutions requires new Network Performance mechanisms based on specific DCB-related Performance indicators :

- Visible and shareable Network Performance Indicators reflecting the stakeholders individual performance criteria (ANSP, APT, AU, NM) that others actors can unambiguously interpret and accommodate

- Defined thresholds for network state (nominal, critical, crisis) management and trade-offs during nominal state guiding the solution decision-making, respecting acceptable limits to declare different network states.

In wave 1, the scope of the Network Performance addresses the management of Performance Indicators in the short-term and execution phases:

- To guide the NMf decision-making to resolve the hotspots in nominal situations
- To guide the NMf decision-making to recover critical situations at the network level (Resilience)

#### 3.5.2.3.1 Nominal Situations

##### 3.5.2.3.1.1 Performance Indicators

The challenge is to identify visible and shareable Performance Indicators for each individual stakeholder, that other actors can accommodate, while taking into account their own constraints.

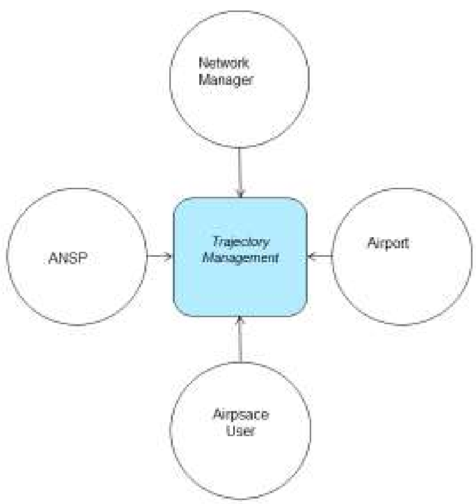



**Figure 20 : Identification of Shareable Performance Indicators**

PI FOR ANSP

The main issue for INAP is to manage and resolve the DCB imbalances. It is proposed to provide and to share with the other stakeholders a simplified view of imbalance figures in the form of a 'Congestion Indicator' representation. It represents the 'ATCO Load Indicator' which is applicable using any imbalance methodology : Entry Count, Occupancy Count, complexity, …. The Congestion Indicator (CI) expresses the severity of the imbalance :

- Green : no imbalance (no severity)
- Orange : medium imbalance (medium severity)
- Red : severe imbalance (high severity)

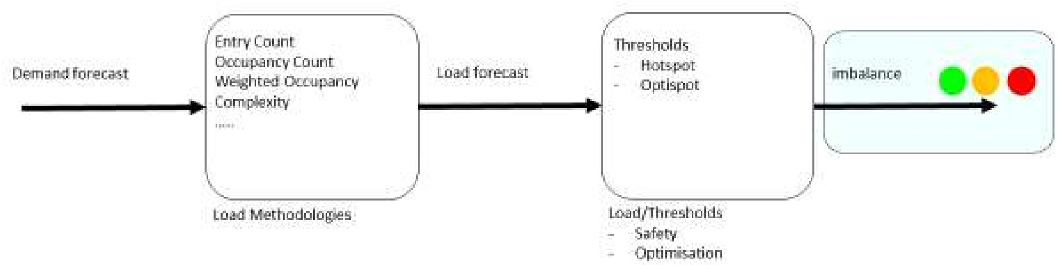



**Figure 21 : Provision of the Congestion Indicator**

The Congestion Indicator colored the segments of the SBT/RBT according to the imbalance severity. It allows external actors (e.g. AU) to take decisions for alternate trajectories taking into account the imbalance context in order to avoid crossing high severity imbalance areas and de facto minimizing the INAP impact.

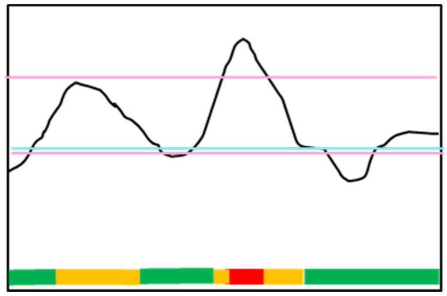


**Figure 22 : Congestion Indicator**

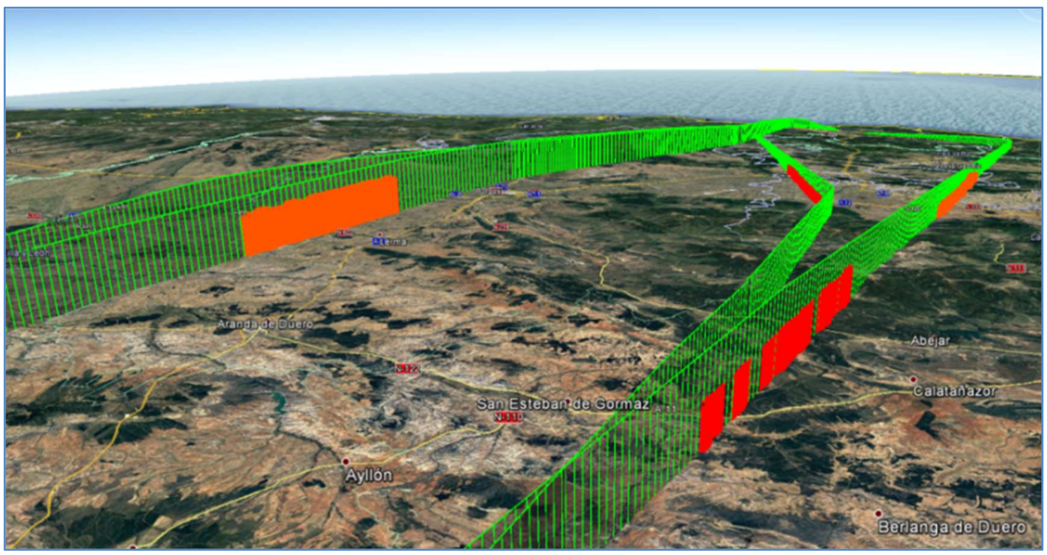



**Figure 23 : What-if assessing the SBT/RBT Congestion Indicator**

PI FOR AU

Since SESAR1, two mechanisms have been investigated to express the AU business needs through AU preference and AU priority. However, these mechanisms have not yet demonstrated their feasibility.

- AU Preference : PJ07.01 was not able to identify a use-case demonstrating added-value/benefits/feasibility to manage AU Preference.
- AU Priority : PJ07.02 manages priority at the local level for departure/arrival only. But there is no mechanism to propagate AU Priority in the INAP environment in an unified/standardised approach

In consequence, PJ09 proposes a simple solution to express the critical-cost of a flight : It is about a generic mechanism based on margin of manoeuvres disclosed by the AUs to help INAP and APT and minimise the impact of DCB measures in their operations. It allows AU to indicate the critical-cost threshold (i.e. Curfew, reactionary delay, airspace closure, …). It is admitted that this approach is not perfect because it allows to reflect only partially the AU cost without equity mechanisms, however, it seems very simple and feasible.

This AU cost can be translated into a simplified view using margins of manoeuvre to express

- Green : the situation is OK
- Orange : the situation is not ok in term of cost but acceptable
- Red : the situation is not ok in term of cost and not acceptable

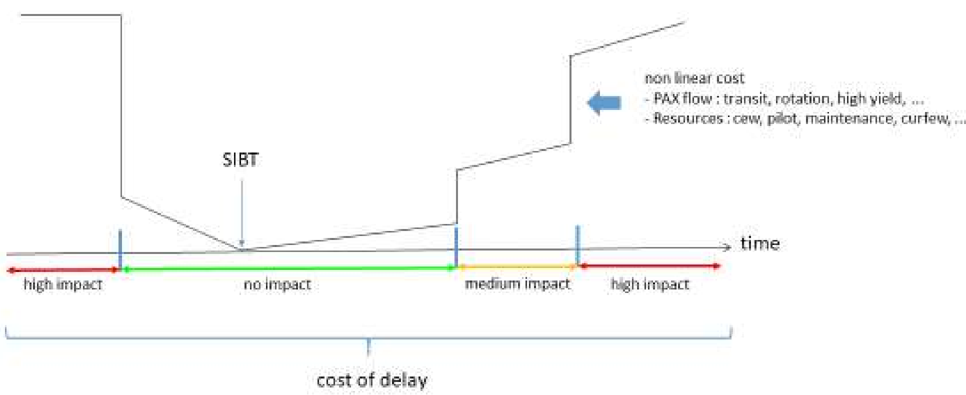



**Figure 24 : AU non-linear cost**

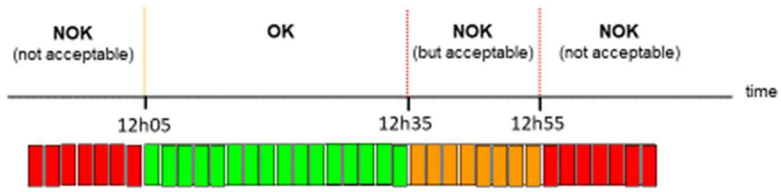



**Figure 25 : AU Margins of Manoeuvre**

PJ09 proposes to use the information about the impact on visible time-constraint as a proxy of the impact of AU cost. Some visible time-constraints could be generated by automatic systems:

- From ANSPs (and military): sectors and routes that will be available or closed
  - E.g.: some flights are sometimes cancelled because they receive an ATFCM slot that push them into a period of time in which some sectors or routes are closed
- From Airports**:** curfews, rotation periods, good part of the reactionary delay, airport capacity constraints, airport preferences...
- From AUs: AUs could override/update the margins of manoeuvre if need it (via “shared” time-constraints)
  - Automation is expected to work well for a large number of flights; for specific needs not covered by automation, the flight dispatcher could update the time-constraints manually (e.g., for crew management needs, aircraft changes due to unexpected maintenance, or other schedule-protecting strategies).

If time-constraints using margins of manoeuvre are visible to INAP and APT, a DCB solution could be found with the overall performance.

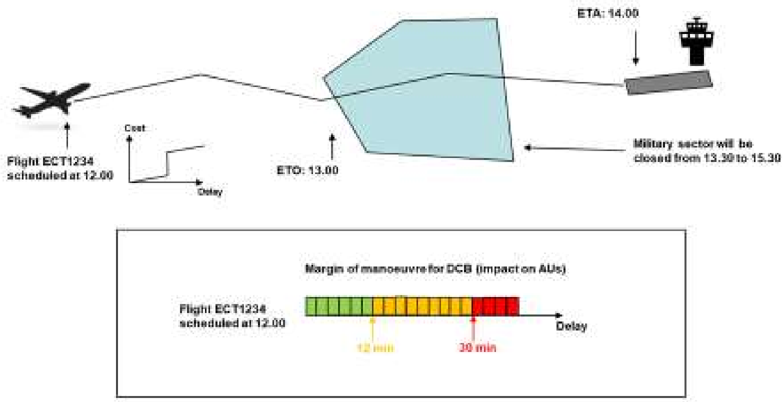



**Figure 26 : AU margins of manoeuvre to guide INAP and APT assigning DCB constraints**

PI FOR AIRPORT

In SESAR1, Airports manage arrival hotspot performing an Airport Impact Assessment (AIMA) in order to assign assign TTA to flights to smooth the arrival. This AIMA model reflects the margins of manoeuvre  that supports the airport turnaround operation. This implies that an on-time arrival flight with a wide margin for delay could be sacrificed for a more needy flight.

| AIMA-turnaround | Airport | Airport Impact Assessment Feedback | Network Manager |
|---|---|---|---|
| On time Arrival (no impact) | -tolerance for arrival ≤ Arrival Deviation ≤ +tolerance for arrival → arrival on time, no impact on AOP and severity "0 + Airline contribution", no proposal for improvement window. | AIMA message<br>• Severity=0<br>• Deviation=No<br>• Improvement window=0 min | No action |
| Early Arrival (no impact) | Arrival Deviation < -tolerance for arrival→ early arrival, no impact on AOP and severity=0 ", no proposal for improvement window. | AIMA message<br>• Severity=0<br>• Improvement window [TTA; TTA+Arrival Deviation] | There is no request to allocate a new TTA but this flight is a potential candidate for swapping or shifting to improve the TTA of any other arrival flight at the destination airport. |
| Late Arrival (no impact) | Arrival Deviation > +tolerance for arrival→ late arrival<br>Next Departure Deviation <+tolerance for departure → no departure delay<br>, impact on AOP and severity=1".<br>The proposal for improvement is – X minutes (X represents the Arrival Deviation) | AIMA message<br>• Severity=1<br>• Improvement window [TTA-Arrival Deviation; TTA] | Action to try to allocate a new TTA |
| Early Arrival (with impact) | Arrival Deviation < -tolerance for arrival → early arrival, impact on AOP and severity=1,2 or 3.<br>The Impact Assessment model proposes a window improvement of X minutes. | AIMA message<br>• Severity=1,2 or 3<br>• Improvement window [TTA; TTA+X] | Action to try to allocate a new TTA |

| | | | |
|---|---|---|---|
| Late Arrival (with impact) | Arrival Deviation > +tolerance for arrival➔ late arrival<br>Next Departure Deviation >+tolerance for departure ➔ departure delay<br>, impact on AOP and severity=2 or 3“.<br>The proposal for improvement is – X minutes (X represents the Arrival Deviation) | AIMA message<br>• Severity=2 or 3<br>• Improvement window [TTA-Arrival Deviation; TTA] | Action to try to allocate a new TTA |

**Table 12 : Airport Impact Assessment**

This information defines values for the margins of manoeuvre :

| Case | Turnaround Assessment | Sev | Margin (Min,Max) | NMOC action interpretation |
|---|---|---|---|---|
| C1 | Late arrival with **impact** | 2,3 | [-XX,-YY] | **Reduce C1 delay** |
| C2a | Late arrival no impact | 1 | [0,-YY] | **Reduce C2a delay** |
| C2b | Late arrival no impact | 0 | [0,-YY] | **Reduce C2b delay to improve C6 and C5a** |
| C3 | On time arrival no impact | 0 | [-XX,+YY] | **Increase C3 delay to improve C1, C2a, or**<br><br>**Reduce C3 delay to improve C6 and C5a** |
| C4 | On time arrival no impact | 0 | [0,0] | **Ignore** |
| C5b | Early arrival no impact | 0 | [0,+YY] | **Increase C5b delay to improve C1 and C2a** |
| C5a | Early arrival no impact | 1 | [0,+YY] | **Increase C5a delay** |
| C6 | Early arrival with **impact** | ~~1,~~2,3 | [+XX,+YY] | **Increase C6 delay** |

**Table 13 : Airport Margins of Manoeuvre**

It is proposed to propagate this information to others stakeholders so that they can take it into account and accommodate actions, in particular upstream INAPs if they have to assign additional DCB constraints to flights to manage their own ACC overloads.

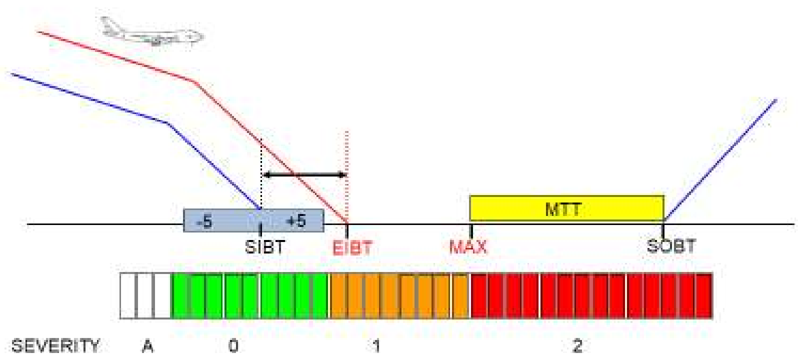



**Table 14 : Margins of Manoeuvre reflecting the Airport needs**

The Airport and Airspace User can establish a collaboration to update/overwrite the margins of manoeuvre to reflect the performance needs from different perspectives.

PI FOR NM

It is proposed to focus on the NM need to maintain the nominal state and recoverfrom critical and crisis states in the best optimal performance scheme. It is proposed to provide and to share with the others stakeholders the resilience figures. It shows the Network state prediction

- Green : Nominal area
- Orange : Critical area
- Red : Crisis area

It allows the others stakeholders to anticipate the network situation and to perform what-if to assess the impact of DCB actions and to understand how DCB solutions is contributing to the Network Resilience. This resilience part is described in the chapter below.

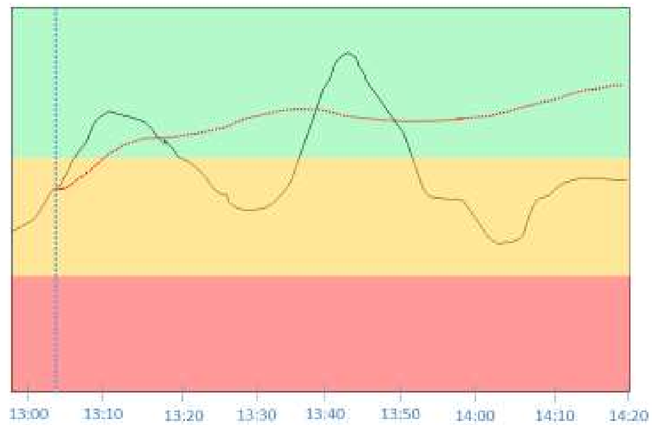



**Figure 27 : Network State Prediction**

#### 3.5.2.3.1.2 Performance Thresholds

In the frame of performance management, thresholds are generally applied to indicate the state of a system or a sub-system. During nominal situations, thersholds can be defined for a multitude of layers.

Locally, individual stakeholders need an indication, if their intended decision will support their performance. This constitutes a pro-active performance paradigm. On the regional level, KPIs are needed to indicate the impact of local decisions to the network.

It is not necessarily needed to distinguish between local, sub regional and regional indicators but rather to allow to communicate how local decisions can affect performance at another local area in the network in a more transparent way. This is covered by the collaborative definition of PI related thresholds.

An intuitive definition of two thresholds is planned to define:

- Nominal performance state (green)
- Critical performance state (orange)
- Crisis performance state (red)

Thresholds shall be defined collaboratively and relatively, which means that indicators need to be specified so that a relative comparison to a pre-defined reference can be performed. The reference may be adapted according to specific operational situations, like e.g. peak- and low-peak times.
Thresholds shall represent operational stakeholder "margins of manoeuvre", which are dynamic in time and related to individual flights or processes. Therefore, they do not necessarily represent an objective network status, for which an evaluation of a DCB reference dataset is applied. This reference is provided by regulation data. The number and duration of regulations provides an information base to identify individual PI thresholds and therefore a specific network state with an associated basic proceedural attitude to remain in maintaining individual business needs or to recover from non-nominal network states.

###### 3.5.2.3.1.3 Trade-off

Compared to defined PI thresholds, trade-offs between indicators are applied to project local performance indication to the network layer. This means to compare and balance the operational states of e.g. different ACCs. To guarantee a comparability, only equal PIs at different network areas shall be compared.

It is intended to increase transparency/understanding throughout the network by

- showing the PI trades of different areas,
- to raise awareness of undesirable effects within other network areas,
- to understand causal relations of performance increase and undesirable effects along the timeline (meaning that a positive performance impact now can lead to a negative impact within the same airspace/airport at a later time)

To guide a trade-off process between performance PIs among the whole network, the NM function needs to steer the sharing of information by emphasing/selecting/prioritizing which KPIs at which locations are considered to be compared and arbitrated against each other.

Related to different network states, PI trade-offs shall provide transparency during the nominal network state to assess the consequences of activities. This means, that to reduce delay or to resolve one hotspot, imbalances and delay may arise as a consequence elsewhere.

During crisis state, trade-offs between resilience PIs representing different ways for network state recovery can help to select between different recovery options.

#### 3.5.2.3.2 Network State Determination

The major KPI for understanding and measuring the network performance and determine the network state is ATFCM delay. While the importance of measuring and monitoring ATFCM delay is inevitable, the new approach is to include the concept of network resilience.

Despite the fact that network operations consider a huge number of flight operations together with a vast dispersion of regulations, it should also be noted that ATM operations are to a high share driven by recursive events.

It is therefore highly important to provide a mutual understanding of the network state to understand whether the network is in a nominal situation or if it is facing adverse impacts leading to a critical network state.

The proposed network resilience perspective improves network situational awareness by monitoring network performance indicators of the current network states.

To understand the evolution from nominal to critical network states, an evaluation of historic regulation data is performed to identify trend and patterns of network states transformation. In a first approach, this is based on the evolution of network regulations.

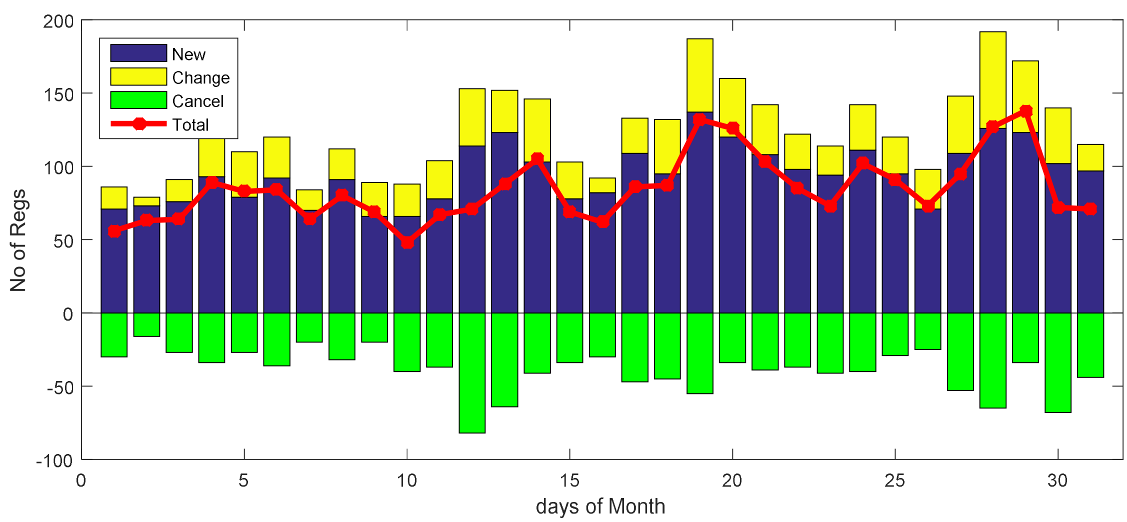



**Figure 28 : Number of new, changed and cancelled regulations throughout May 2017**

To include multiple DCB actors, it is important to notice that new indicators have to be introduced to avoid total dependency on delay. If for example the performance criterion for an AU is only delay, the first priority for delay minimization will likely be short-haul flights to avoid reactionary delay. However if further cost types are considered AUs will more likely also prefer long-haul flight at higher priority levels.

Based on the statistics of network behaviour, it is important to identify acceptable tolerances/thresholds of disruptions in network operations. This allows also for quantifying features like confidence levels, which may serve as input for threshold identification.

Figure 28 shows the evolution of two regulation types in May 2017, namely ATC capacity and ATC routing. The figure provides different ranges of 25 and 75 percentiles. These percentiles may serve as supportive data for thresholds of network state definition by evaluating regulation data of active regulations in the network based on historic regulation datasets.

In fact, following the initial survey on ATFCM, another set of evaluations on each regulation type is done that is illustrated by figure 28 (evolution of two regulation types in the same data span as figure 27). Such figures are plotted to understand different types of disruptions. Box-plots are used to identify outliers in each graph. Based on estimated distributions, each blue box separates data points that happen to be in the interval for 25% above and below mean values (25 and 75 percentiles). In figure 28 a red plus is a day in May 2017 that is considered to be an outlier regarding the estimated whiskers (dotted lines in box plots). These days are captured for further analysis to verify the relationship between Network events or major weather conditions and use of specific regulation type (bottom-up approach). The idea of these percentiles serve as supportive thresholds for network state definition, which are related to the DCB network function to improve network situational awareness.

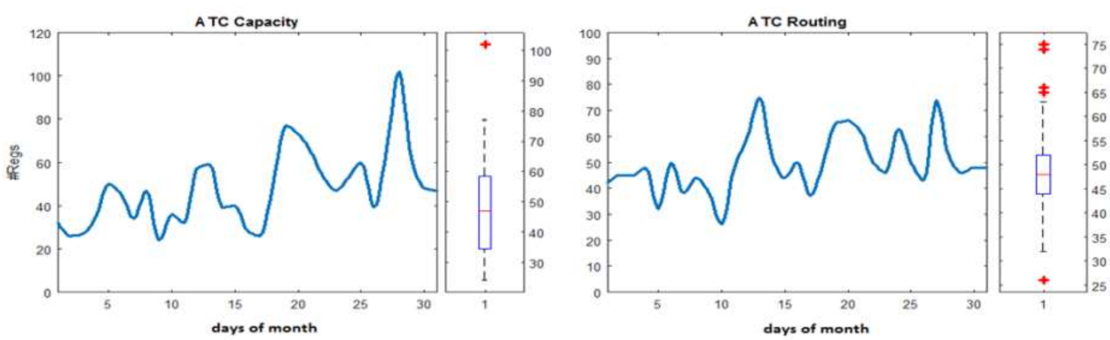
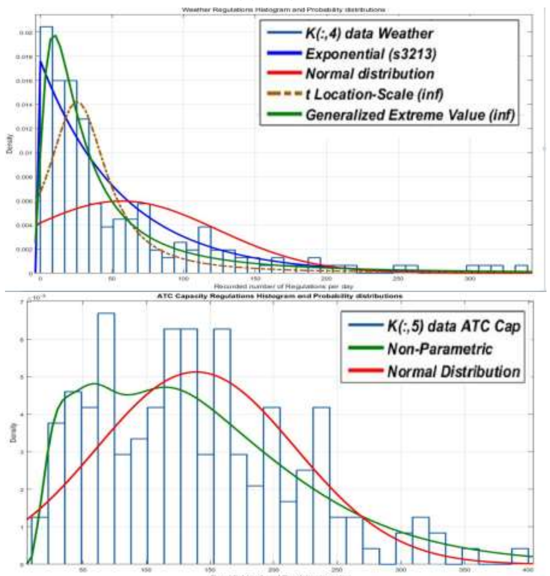



**Figure 29 : Regulation statistics for network state identification**

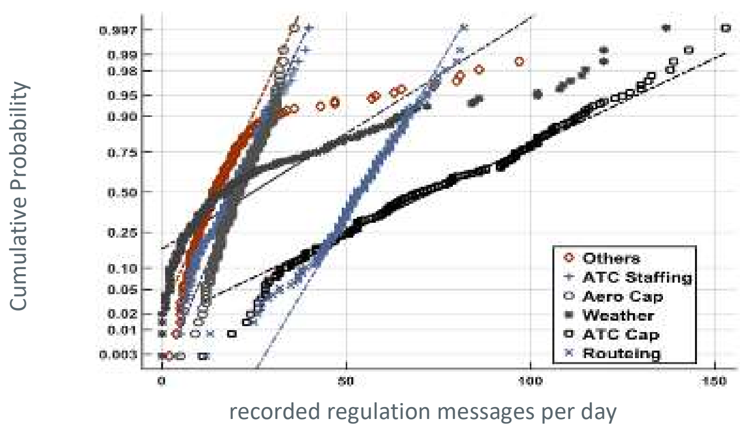
Characteristics of each regulation type is proved to be an asset in understanding the type of network disruptions. Therefore a detailed analysis is performed to cluster different regulation types (ATFCM regulation are categorized to 14 types based on different causes).

Figure 29A is showing different distributions of published Weather regulations and ATC Capacity regulations for 6 months of 2017 (May to end of Oct.). For each regulation type, different probability distributions are fitted on the data as colored curves. As expected each regulation type has its own characteristics in comparison to others. However, some regulation types can be categorized in a cluster with general chracteristics.

Weather ATC capacity




A : Clustering of Regulation Types




B: Simultaneous comparison of ANM data against Normal distribution

**Figure 29 Comparison of different ATFCM regulation types**

Figure 29B gives a better impression over general similarities between different regulation types. For example the dispersion similarities between probability distributions of Aerodrome capacity and ATC staffing regulation are evident.

Conducted survey on two characters of ANM messages (different message and regulation types) proved their contribution to network state definition. The third characteristic that cannot be ignored is the reference time scale. To support DCB decision making, making, different time scales (daily, monthly and seasonal) have to be considered in parallel to identify abnormal trends that can be fed into specific network impact scenarios. Those impacting events may have recognizable statistical patterns, which can be identified by matching statistical ATFCM data with network impact scenarios.

**3.5.2.3.3** As proposed, it is essential to gain more levels of control over network operations. Therefore, on top of the ATFCM delay as a network metric for network performance, it is proposed to introduce new indicators, so that other consequences of DCB decisions (i.e. regulations) become clearer.**Network Resilience**

The concept of network resilience not only covers the nominal network states but explicitly the critical network states. When the network state degraded to critical or even crisis mode, the **common** agenda for **all stakeholders** is to immediately support action for network recovery.

The resilience concept can be distributed in four main steps, in which different network states F(t) are shown over time. Those steps relate to network states:

- **Stable undisturbed nominal network state:** This network states represents a reference mode of network operations. No disruptive impacts on network performance.
- **Slight network disruptions:** disruptive event occured. Threats are beginning to cause stress in the system, e.g. by initiating secondary stage network reactions. This phase is characterized by **Robustness**, which describes network stability and resistance against disruptive events. The term Robustness hints that these scenarios can be predicted to happen frequently during the short-term planning/execution phase and consequently this reflects the Robustness of network operations.
- **Critical network state:** Minor disruptions and lacks of performance manifested throughout the network. Performance indications decreased to the critical network states. The conditions are severe enough to cause critical levels for performance indicators. This means that based on the proposed features of KPIs (magnitude and time to recover) the network situation is called critical as the first level of threshold has been crossed. Moreover, in case of a critical situation the NM function is considered as the actor with the highest priority in decision making.

- **Crisis network state:** Major disruptions and network failures exist. Network performance decreases to the crisis status. The acceptable response time is more limited than in a critical or nominal situation. The recovery from a crisis is considered to be a 2 step procedure: first to quickly improve network operations at higher costs to push the situation into a critical mode (in fact the major safety loss is handled by The European Aviation Crisis Coordination Cell (EACCC)) and secondly to revive the network from the critical state with solutions which are more beneficiary of *trade-offs* between DCB actors.

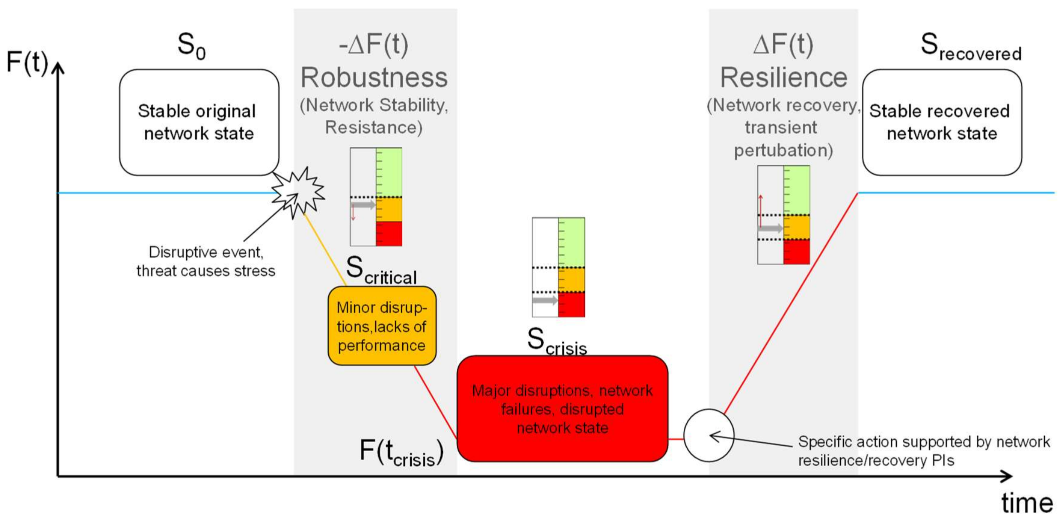



**Figure 30 : Network resilience concept**

During a network crisis, the most important network characteristic is performance-based **Resilience**. This type of resilience is the ability of a network to absorb restrictive impacts by reorganizing or changing the operational mode to get back onto a recovery path to stable network operations.

Thereby, network recovery is guided by specific indicators to find the most effective path back to nominal operations. Those indicators are based on selected nominal PIs and focus on their individual features during the resilience process, which are mainly

- the **magnitude** of the disruption to be measured on the PI profile, and
- the **time to recover** also based on the PI profile.

Both features are most likely important to be measured on DCB related PIs, which provide information on the status and the resilience of a broader region of the network. The investments to minimize e.g. the time to recover may be traded with the duration of the recovery path itself. However, it shall be of interest of all stakeholders to find an effective resilience path. Therefore, this process is guided by the NM function, which needs to have the needed information on the resilience behaviour of the whole network. Individual priorities can only be considered, as long as they are in line with the set of actions representing the defined resilience path.

While delay represents the temporal aspect of disruptions, performance based resilience is capable of showing the behaviour of the network actors facing a disruption in the network. This perspective helps decision makers to gain a better knowledge of how their proposed recovery actions affect network operations. As an example Fig. 31 illustrates the temporal dimension of disruption and recovery action along with the magnitude of occurred disruptions. The magnitude is given to enable the realization of disruption severity and recovery action.

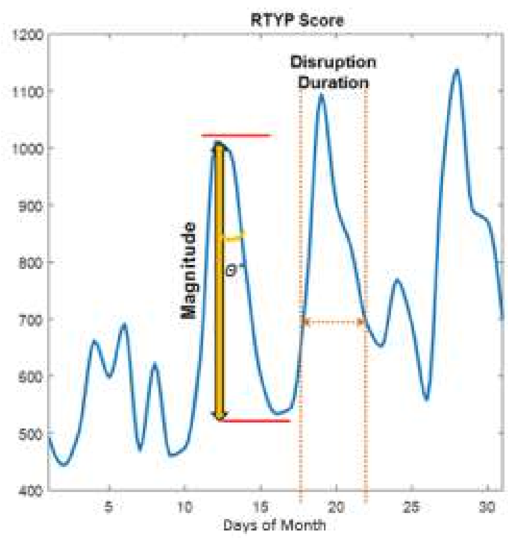



**Figure 31 : Performance-based resilience described by disruption magnitude and duration**

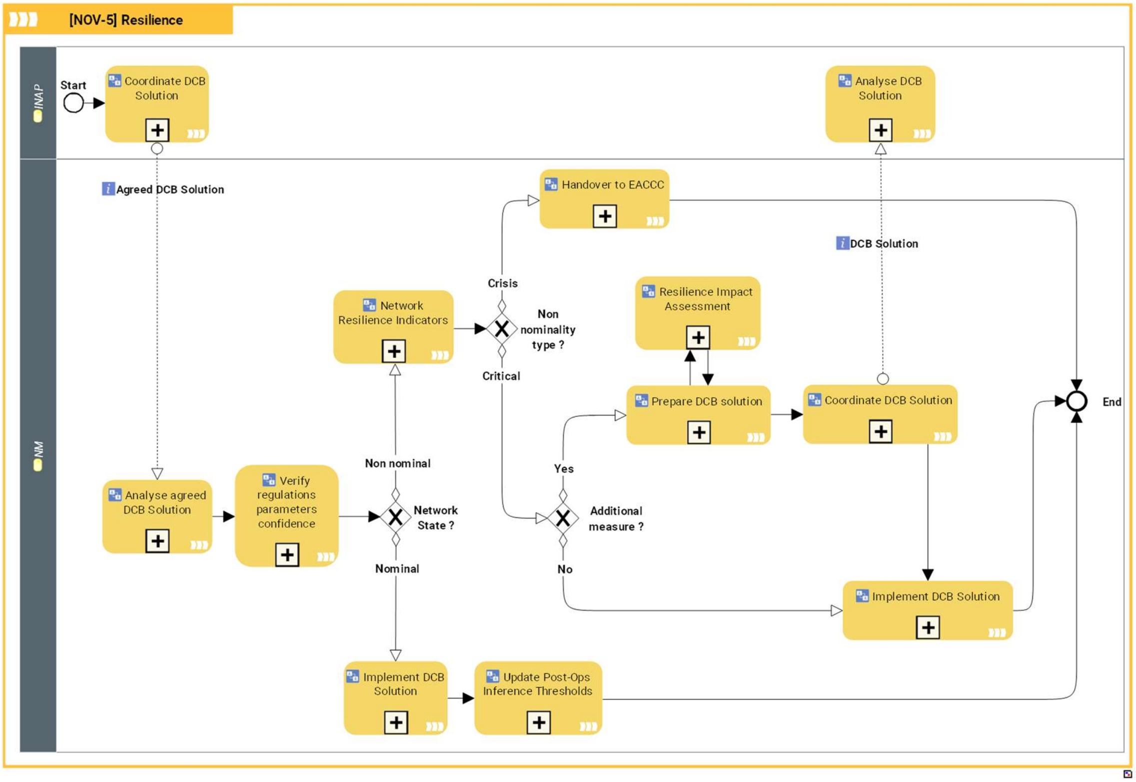



**Figure 32 : EATMA Model : Network Resilience**

| Activity | Description |
|---|---|
| Analyse agreed DCB Solution | Parameters are collected from the list of requested regulations from NMVP (Proposed ANM list) |
| Analyse DCB Solution | The Local Traffic Manager and/or the Flow Manager analyses the DCB solution. |
| Coordinate DCB Solution | The Flow Manager (INAP) coordinates the DCB solution with concerned actors. |
| Handover to EACCC (European Aviation Crisis Coordination Cell) | In case of network crisis. |
| Implement DCB Solution | Local actor implements the agreed DCB solution. |
| Network Resilience Indicators | Provide situational awareness by providing values of resilience indicators and clarify the type of network state with general verbal expressions. |
| Prepare DCB solution | The NM local actors prepare DCB measures to resolve the hotspot. |
| Resilience Impact Assessment | Prepared set of modified DCB measures by NM will be fed into the same process to enable comparison between different proposed sets of measures (ATFCM regulations). |

| | |
|---|---|
| Update Post-Ops Inference Thresholds | Once the network state is regarded as nominal, the list of regulations will be regarded as referenced post-ops data for future days. |
| Verify regulations parameters confidence | Verify regulations parameters against statistical inferences of Post-Ops (include lag-time, duration thresholds). In other words, the deviation of regulation parameters between current list of regulations and previous records for each regulation type per FMP is measured (comparing the behaviour of each FMP). |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| NM | Coordinate DCB Solution o--> Analyse DCB Solution | INAP | DCB Solution | |
| INAP | Coordinate DCB Solution o--> Analyse agreed DCB Solution | NM | Agreed DCB Solution | |

#### 3.5.2.3.4 Network Performance Monitoring

The new Network Monitoring process needs to take into account that the new ATM processes will be based on Trajectory Based Operations, on 4D Trajectory Management, with focus on planning and intervention by exception.

The focus will be progressively moved away from airspace-oriented problem detection and solving to individual trajectories within the context of the whole. This move will need to be progressive and the supporting tools may need to be compatible with both operating ways.

The new Network Monitoring process will be one of the Optimised ATM Network Services that combine dynamic Demand and Capacity balancing (incorporating Advanced Airspace Management) with optimised airspace user operations (incorporating preference criterias). This Optimised ATM Network Services rely on a dynamic collaborative NOP/AOP elaboration that provides a seamless view of the network stats integrating the enroute and airport perspectives from the planning phases to the execution and post-ops analysis. This collaborative NOP/AOP can be also at the core of the Network Monitoring process.

Starting from the planning phases, the new Network Monitoring process provides access to demand data as available including FF-ICE data from its earlier instances in the form of a PFP. This demand data together with the improved PFD (including better route information), historical data and flight plan, and the confirmation of demand by the AOP forms the network predicted demand picture.

This demand picture is available via SWIM to the different actors that present it in their local and individual tools specifically design to perform planning at regional, subregional and local level.

The demand data can be then be globally characterised with some probabilistic/uncertainty parameters and individually and locally with some complexity/workload attributes and an initial Dynamic Airspace configuration management can be performed and the first advanced DCB results can be available for all actors.

At any time in the D-1 to 20 min timeframe, the consolidated network states view that results from assembling all ANSPs planning processes can be used by the Airspace User, that could look at/and receive the results of the What-if capabilities in the known DCB/network situation for PFP/flight plan.

The following figure provides an intitial view of some of the tasks from the NM perspective:

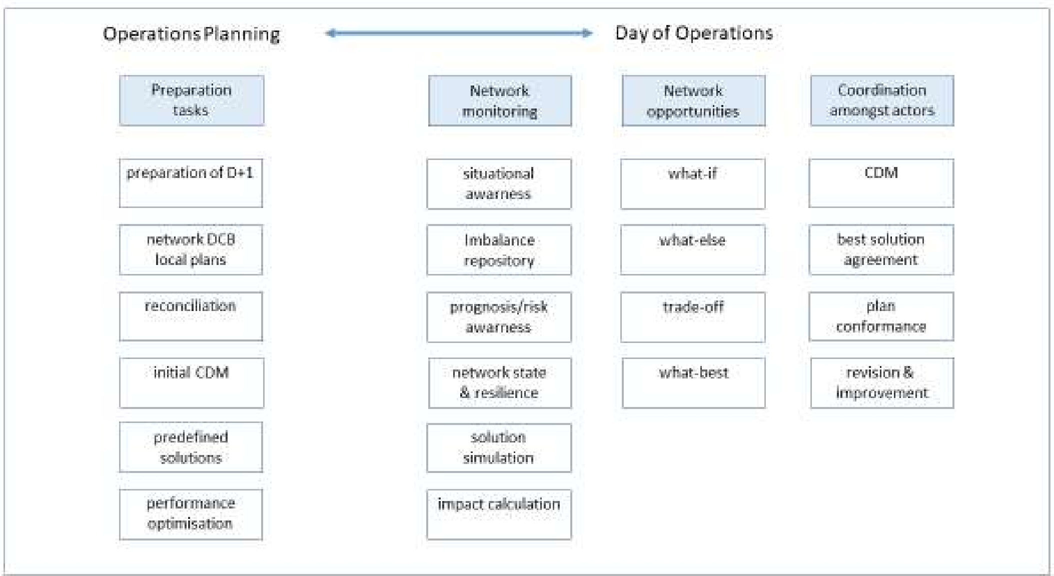



**Figure 33: Tasks/activities towards a Network Performance driven ATM**

The Network monitoring tool will have its role within a shared responsibility ATM service providing visibility and access to all the actors.

The Network monitoring tool uses SWIM technology to build customised HMIs according to the different user needs at different moments for different processes.

The new Trajectory-based ATM Network Operation Performance monitoring includes the ability to:

- Carry out Holistic Network Planning Management at different timeframes on a seamless manner for the reconciliation of key planning processes across all network levels Airspace Management; DCB; Airport Sequencing; and Flight Operations Planning;

- Through DCB and impact assessment accurately anticipate the potential imbalances and simulate its solutions including the need for traffic constraints, looking for managing measures in such a way that impact the affected trajectories to the minimum extent;
- 
- Monitor at the Regional Level that the overall Network capacity provision meets as efficiently as possible the quantified demand, through the observation of the forecasted and actual capability and traffic balance and its effect on selected performance indicators;
- Monitor the outcome of local assessment of workload/complexity and its resolution by INAP, and the related impact on network performance and safety;
- Monitor the execution of the Network Operations Plan and arbitrate/integrate subsequent change requests, with the aim of minimising any adverse impact.

###### 3.5.2.3.4.1 Flight Trajectory centric view

The Network Monitoring process is based on an extended trajectory view. The trajectory view is progressively and continuously built. It reflects the planned and confirmed trajectory for an airframe in a seamless way.

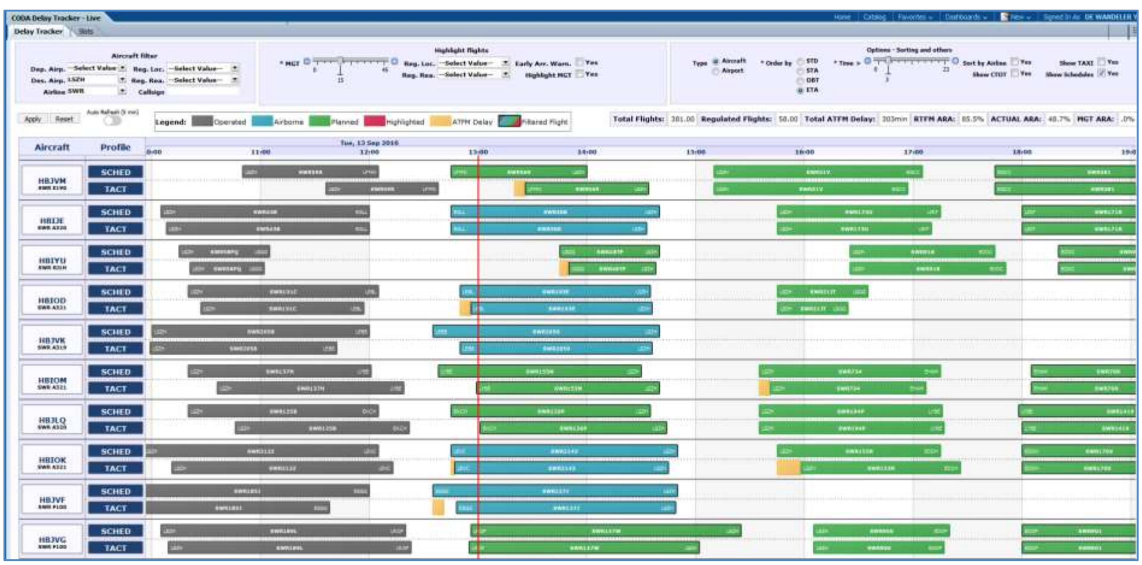



**Figure 34: Monitoring the complete trajectories both in planned and execution views**

The trajectory view builds upon the planned and actual demand. When the timeframe requires, the view can be enriched with the integration of confidence index that improves the demand prediction.

This trajectory view reflects as well in some graphical way the impact that it has for different actors.

For example:

- AUs can provide some trajectories a preference/prority attribute.
- Airports can provide some trajectories and a criticality factor.

- ANSPs can provide their complexity/workload attributes.

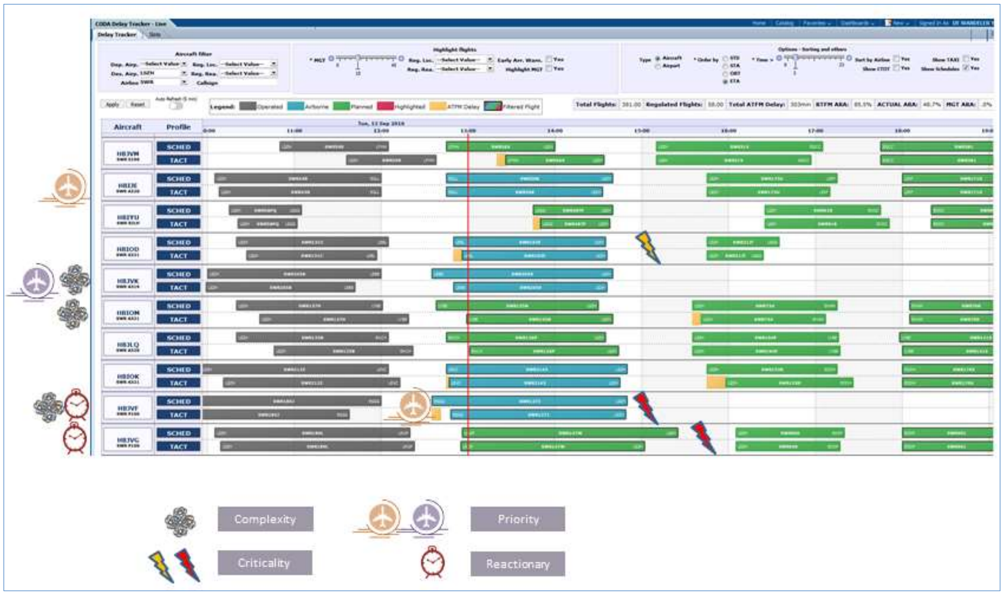



**Figure 35: Introducing ATM actors attributes into trajectories**

Further information can be added to a trajectory, in relation to its consolidated complexity.

**Figure 36: Integrating ANSPs consolidated imbalances**

And further information can be added to a trajectory, to display that it is subject to eDPI in extended horizon or to TTA.

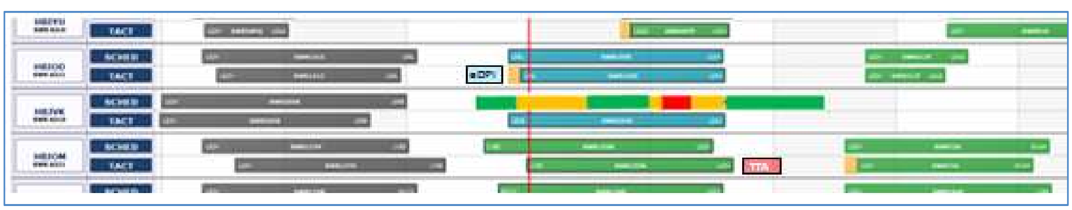



**Figure 37: Integrating Airport eDPI and TTA**

#### 3.5.2.3.4.2 CDM role – Collaborative Framework

The ATM actors role is fundamental in achieving the target Network Performance and to ensure individual needs.

The Network Monitoring may highlight to all actors issues where a collaborative response is needed.

#### 3.5.2.3.4.3 Network Performance Monitoring Tool

The Network Performance Monitoring Tool

- Provides meaningful awareness of network situation to achieve transparency and trust in CDM;
- Provides meaningful performance indicators variations as part of the “what-if” resulting of any actor applying a given solution or action;
- Provides meaningful performance indicators variations as part of the “what-else” resulting of any actor looking for alternative solutions to a proposed one;
- Supports monitoring the efficiency of the implemented initiatives and comparison with the targets assigned as part of the ATM Performance framework.
- Provides access to predefined scenarios performance indications.

##### *3.5.2.3.4.3.1 Characteristics/functionalities:*

The characteristics and functionalities of the Network Performance Monitoring Tool are :

- Customisable / able to provide different views, filtered views.
- Provides alarms.
- Rolling picture at different timeframes (from short-term planning to execution) of the performance moderated by the necessary uncertainty parameters.
- Relation to targets
- Trade-offs.
- Thresholds.
- Network states & resilience
- Compatibility of roles and responsibilities
- Overall goal of achieving maximum performance
- Facilitating the local performance
- Facilitating the achievement of SBT/RBT trajectory objectives
- Making the most of other services and improvements
- Interoperability of tools: regional, subregional and local and different actors and for different activities.
- Easy monitoring of areas with constraints and potential constraints
- Easy access to what-if, what-else and what-best tools
- KPIs as the common reference for all actors
- Crisis Management
- Needs to integrate the planning, execution and post OPS particularities:
- SWIM based

##### *3.5.2.3.4.3.2 HMI*

The following images are based on existing ideas and/or tools being explored or under operation today.

They are just used to provide illustration to the activities and views that can be provided.




Figure 38: **Network Performance Monitoring**

There are three main areas that are part of the ATM Network performance Monitoring.

###### 3.5.2.3.4.3.2.1 Network Overview

- Provides the basis for the monitoring.
- Trajectories are in the core, there is an alert/notification mechanism.
- There is a representation of airspace situation (Network situation display).
- There is a representation of complexity.
- There is a follow up of active measures (regulations, STAM, etc.)
- There is an indication of real time performance both in graphical and textual way.

###### 3.5.2.3.4.3.2.2 Improvement - Simulations

- Provides visibility to NM selected and agreed ongoing actions aiming at improving the network performance.
- Opportunities.
- What-if, what-else
- Solution repositories (scenario, etc.)
- There is an indication of impact through performance recalculation and visibility

Within monitoring service, a what-if and a what-else functions are included to allow a full analysis of the proposed solutions:

- **What-if** to evaluate the efficiency of the solution selected for example by the INAP actors;
- **What-else** to confront the solutions with their environment, e.g.: constraints, network states and performance;

- and **What-best** to look for solutions that have less impact on their environment, e.g.: less constraints, less cases affected, improved network states and improved performance. When possible, catalogue of solutions.

Catalogue of solutions (application of scenarios) will have identified performance impact for affected actors amongst its attributes.

3.5.2.3.4.3.2.3 Collaboration - CDM

- Shared ATM network.
- Common view of issue under resolution
- Views of local impact through local tools
- There is an indication of impact in different actors and trade-offs needs.

### 3.5.2.4 Hotspot Management

#### 3.5.2.4.1 Type of Traffic Monitoring Values

Regardless the methodology used (EC, OC, weighted complexity, complexity…), the imbalances are characterized with Traffic Monitoring Values (TMV). These thresholds represent different objectives (safety, rate optimisation, critical & crisis situation ….) and are related to different meanings. In wave 1, several TMV features are addressed and correspond to different types of spot:

- TMV-safety: Initially introduced in SESAR1 with the peak and sustain thresholds. It aims at preventing excessive ATC workload and to ensure that the traffic delivered to ATC controllers will always be manageable in the safe limits of workload. It represents potential indications in term of controller workload, and implicitly potential safety risks. Today, TMV-safety are defined with two thresholds (peak, sustain). It defines the context of a safety potential issue in nominal situations marked out by a **Hotspo**t. Thus, a hotspot is triggered by TMV (safety marks) violation.
- TMV-resilience: It aims at detecting the change of the state of the system from nominal to critical and crisis states. TMV-resilience is defined with two thresholds (critical, crisis) It defines the context of critical or crisis issues marked out by a CriticalSpot or a CrisisSpot. Thus, an CriticalSpot is triggered by TMV (critical marks) violation and a CrisisSpot is triggered by TMV (crisis marks) violation
- TMV-rate: It aims at preventing bunch (without safety issue) and to ensure that the traffic delivered to ATC controllers will always be manageable in an organised and smoothed way. It aims also at providing room for better use of spare capacity. It defines the context of an optimisation issue marked out by an **Optispot**. Thus, an Optispot is triggered by TMV (rate marks) violation.

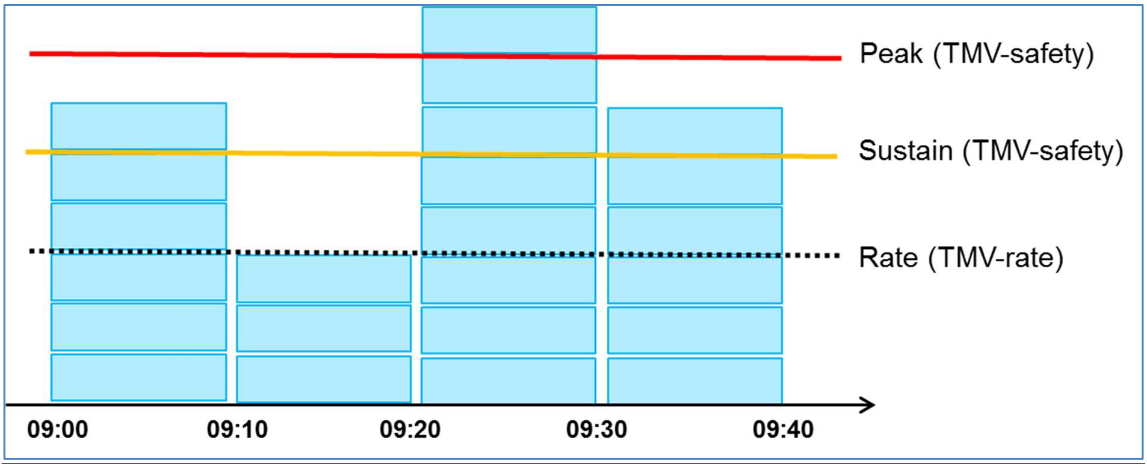



**Figure 39: TMV for Hotspot Management**

Thus, we consider different categories of spots. A spot attribute categorizes the problem to be managed: CrisisSpot, CriticalSpot, Hotspot and Optispot. This new feature allows introducing different levels of priority amongst the spot to be managed and allow determining the Most Important Problem (MIP).

For each spot category, there is a corresponding Catalogue of Solutions. It means that each solution and DCB measure inherits of the spot category.

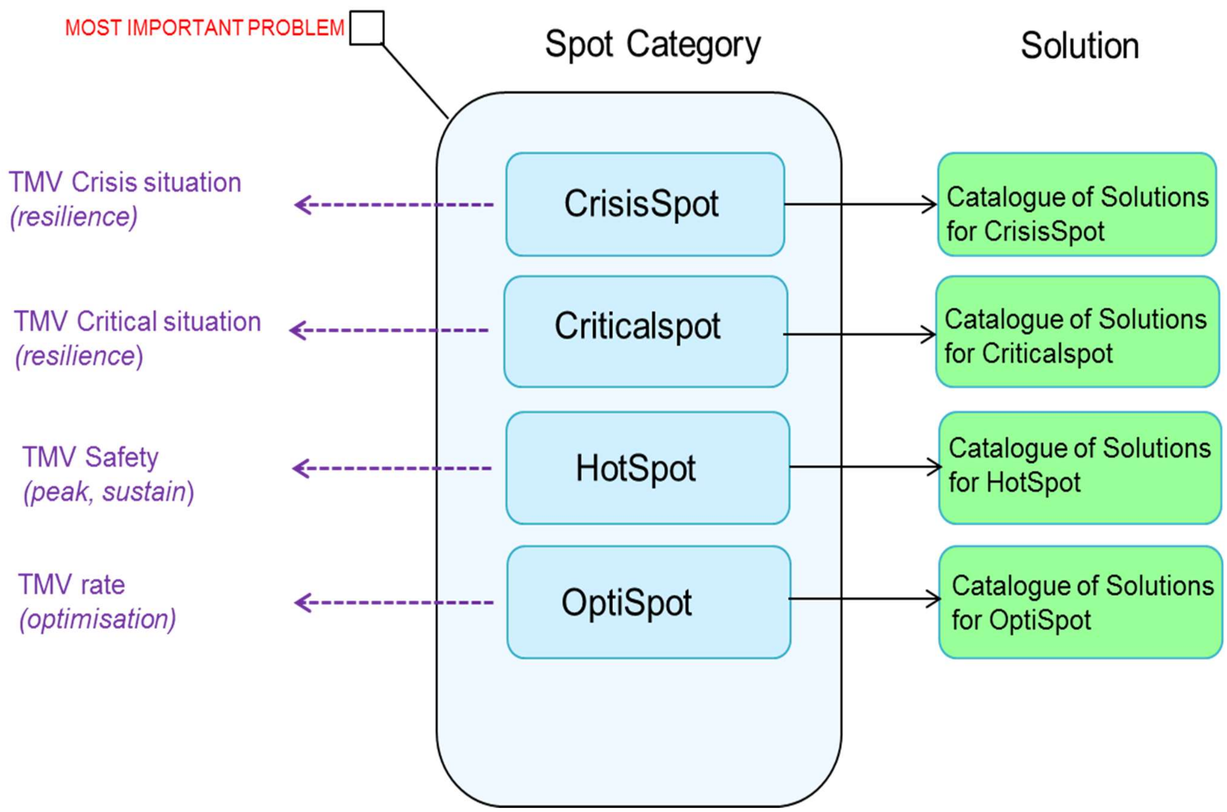



**Figure 40: Spot Category**

#### 3.5.2.4.2 Spot-centric Management

The objective of the DCB actors is to identify the area of spot. It must be distinguished between the initial spot and the final spot including the initial period and the recovery period (when is managed by delay measures).

The initial spot corresponds to the initial imbalance identified:

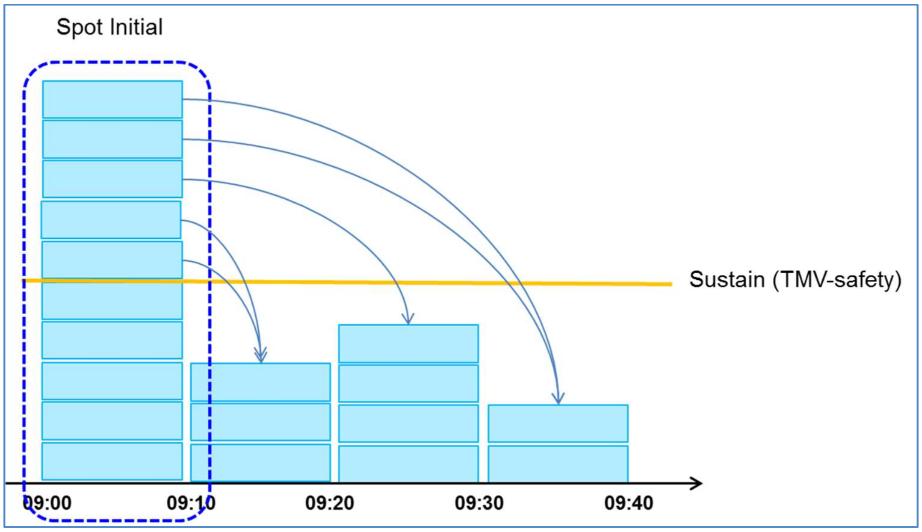



**Figure 41: Initial spot**

The final hotspot includes the recovery period and corresponds to the traffic initially contained in the Initial Spot and smoothed in the available TFV capacity.

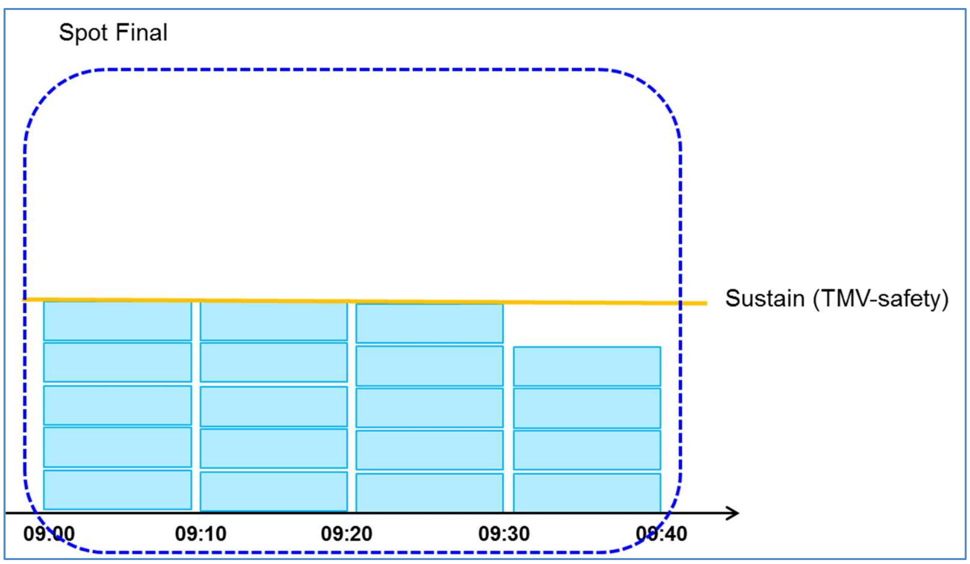



**Figure 42: Final spot = Initial spot and Recovery Period**

Once the solution has been prepared and implemented, the Spot Final is monitored to ensure that the DCB solution is properly executed and is not deviating. In order to support this monitoring, a TMV-monitoring is set. It will trigger an automatic alert in case of deviations. Such monitoring mainly aims at ensuring that the spot resolution is progressing correctly and to take additional corrective actions if necessary.

Note : The flight Target Time deviation is not monitored at the individual level but this information is processed for the purpose of the automatic hotspot deviation alert.

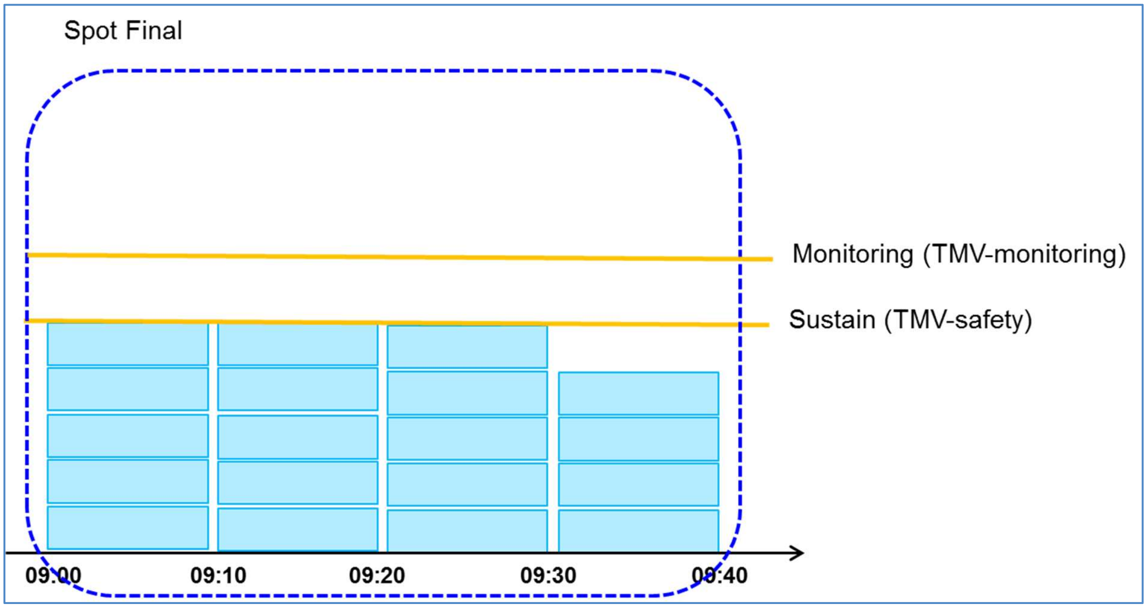



Figure 43: Spot Monitoring

### 3.5.2.4.3 EATMA Model of the Hotspot Management

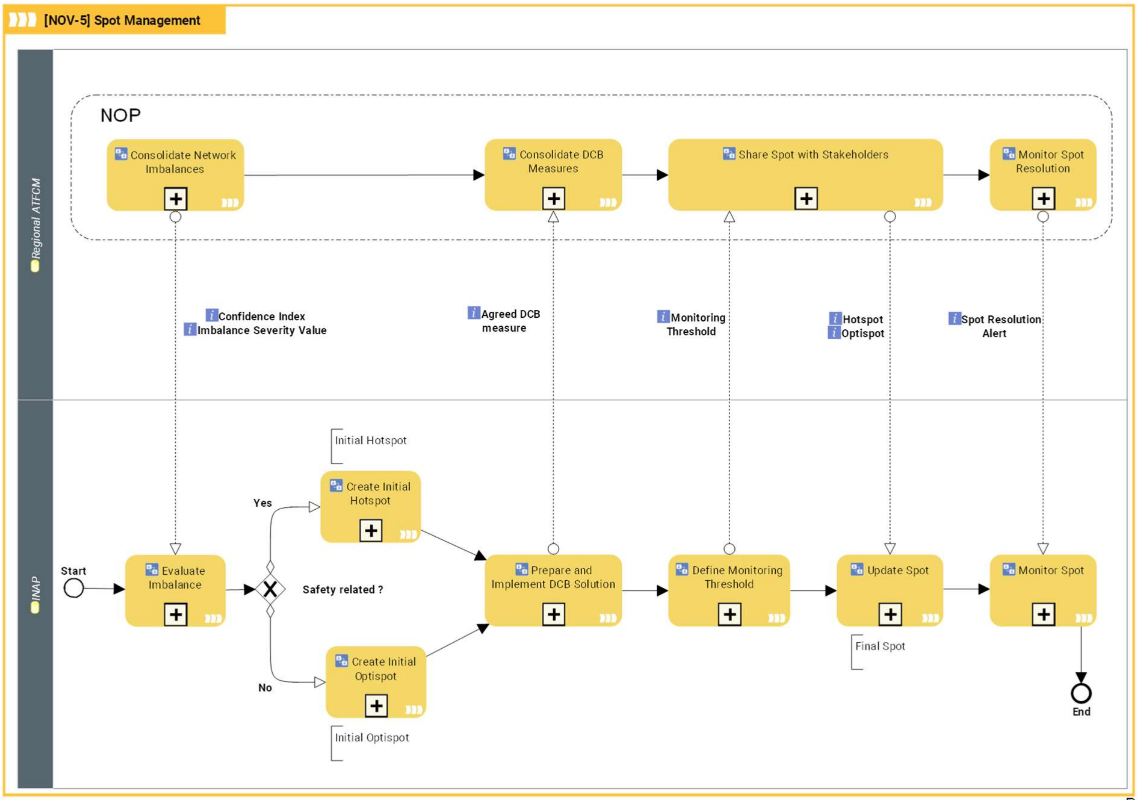



Figure 44: EATMA Model – Hotspot Management

| Activity | Description |
|---|---|
| Consolidate DCB Measures | This function collects all the proposed DCB constraints from local NMf actors. |
| Consolidate Network Imbalances | This function collects all the local and regional imbalances in order to provide a network consolidated view |
| Create Initial Hotspot | This function allows INAP to create a hotspot |
| Create Initial Optispot | This function allows INAP to create an optispot |
| Define Monitoring Threshold | This function allows INAP to define the TV Monitoring Threshold |
| Evaluate Imbalance | The NMf actor evaluates the imbalance in order to determine the type of actions to trigger to resolve the imbalance. |
| Update Spot | This function update automatically the hotspot duration to include the recovery period due to the smoothing effect of the proposed DCB solutions |

| | |
|---|---|
| Monitor Spot Resolution | This function allows INAP to monitor the proper resolution of the hotspot |
| Prepare and Implement DCB Solution | This function allows INAP to prepare and implement a DCB solution |
| Share Spot with Stakeholders | This function allows the Regional ATFCM to distribute the Spot information to stakeholders |
| Update Spot | This function allows the Regional ATFCM to update automatically the hotspot duration in including the recovery period due to the smoothing effect of the DCB solution |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| INAP | Define Monitoring Threshold o--> Share Spot with Stakeholders | Regional ATFCM | Monitoring Threshold | |
| Regional ATFCM | Share Spot with Stakeholders o--> Update Spot | INAP | Hotspot | |
| Regional ATFCM | Share Spot with Stakeholders o--> Update Spot | INAP | Optispot | |
| Regional ATFCM | Consolidate Network Imbalances o--> Evaluate Imbalance | INAP | Confidence Index | |
| Regional ATFCM | Consolidate Network Imbalances o--> Evaluate Imbalance | INAP | Imbalance Severity Value | |
| Regional ATFCM | Monitor Spot Resolution o--> Monitor Spot | INAP | Spot Resolution Alert | |
| INAP | Prepare and Implement DCB Solution o--> Consolidate DCB Measures | Regional ATFCM | Agreed DCB measure | ATFMMeasure |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| INAP | Prepare and Implement DCB Solution o--> Consolidate DCB Measures | Regional ATFCM | Agreed DCB measure | ATFMMeasure |

#### 3.5.2.5 INAP Function

The INAP function encompasses some of the activities of the LTM in short-term to execution, the activities of the EAP(s) and the activities linked to decomplexification managed by PC on CWPs, in a seamless and closely intertwined manner. These local ATM actors, working on different timeframes and associated levels of uncertainty and granularity, will render better service to Airspace Users, in close connection with NM, thanks to shared situational awareness regarding the problems identification, solution means and performance objectives.

EAP role has been introduced in SESAR 1: solution 09.02 will further investigate and validate this role, together with associated responsibilities, working methods and toolset, towards full integration with local Network Management function and ATC within INAP. LTM (Local Traffic Manager) replaces the FMP with additional responsibilities and tools, working in close collaboration with the EAP and sharing the same situation awareness, based on common information sources and extensive means of communication. CWPs are also involved in the INAP process, notably the PC through new interactions with the EAP, extending the PC's situation awareness beyond the scope of his/ her Area of Interest.

It is important to note that EAP is a role, and not necessarily a dedicated actor: depending on local management of staff, EAP and LTM roles could very well be ensured by a single person.

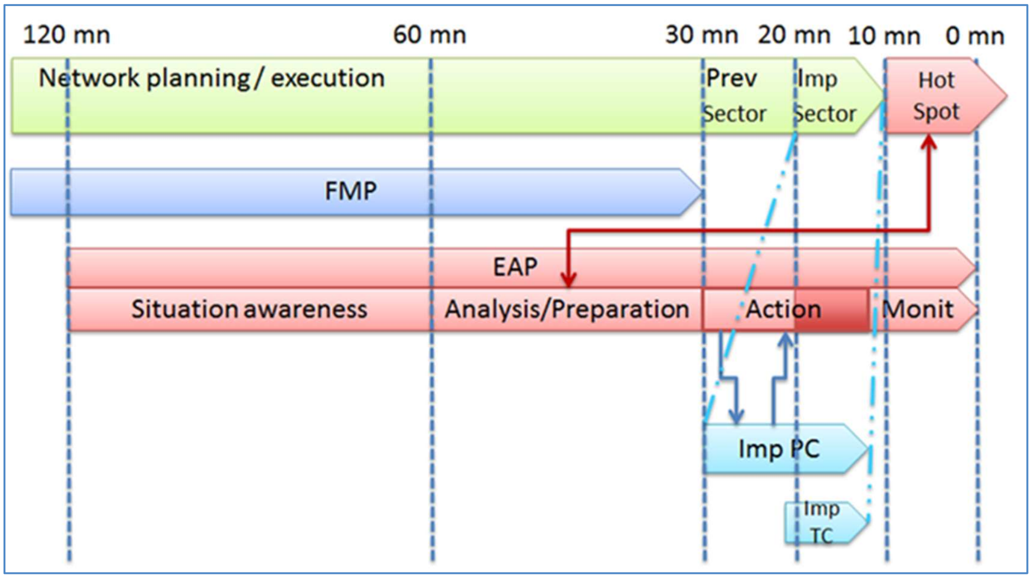



**Figure 45 EATMA Model - INAP with EAP role**

Note: In the figure above, “Prev” stands for Previous sector (upstream from the ‘Implementing sector’, in charge of the implementation of the measure, in order to off-load the sector where the hotspot has been identified.
‘Imp PC’ stands for Implementing Planning Controller
‘Imp TC’ stands for Implementing Tactical Controller

#### 3.5.2.5.1 Extended ATC Planning (EAP)

The EAP role alleviates the LTM workload by working with him/her on flows.

The EAP acts in their given EAP Area (which can cover several ATC areas of responsibility within the ATSU), under close coordination with the LTM, as the LTM has a global view over the whole ATSU’s area.

The primary characteristic of EAP role is to work in close contact with ATCOs on CWP, anticipating and solving as much as practicable complexity imbalances that might arise or remain in very short timeframe before entry of traffic in ATCOs AoR, thanks to analysis and resolution capabilities with finer level of granularity (high certainty and real time update of traffic prediction). To reach this objective, specific EAP training and/ or rating scheme could be applied to satisfy local organization needs.

Depending on the expected level of traffic complexity and local procedures, EAP position can either be collapsed with LTM position, or be ensured by a specific EAP actor (when needed). The EAP is indeed not systematically an additional staff in the ATSU, it is a role, which covers a set of services/functions and which can be assumed by different people (like Planning Controller, Multi Sector Planner or LTM) in the ATSU, as a standalone role or in combination with another INAP role.

It is also important to note that any dDCB measure initiated by EAP will have to remain fully coherent with the wider Network Management view, highlighting the need for continuous coordination with the LTM and the neighbouring ATSUs in order to allow for global Network optimization.

The main responsibilities and tasks of the EAP role are depicted here below:

- EAP works in the short-term planning/execution ATFCM phase in cooperation with the LTM function and under the authority of the Supervisor, acting on flights (until approximately 30 min before the effective problem to solve), co-monitoring hot spots evolution and elaborating measures to be applied through a CDM process with the LTM. Is in charge of identifying all possible improvements to the traffic situation at ATSU level, in order to comply with the real time operational situation.
- Once an optimized scenario has been decided by LTM, the EAP selects the individual flights on which to perform the predefined ATFCM or ATC actions and propose them to the relevant sector team planner controller (PC).
- The EAP role is responsible for the mitigation of the real time complexity by inter alia managing number of potential strategic conflicts through a dedicated tool.
- EAP is responsible for selecting accurate actions through a list of pre-defined scenarios in coordination with the LTM, which will provide better use of actual capacity, by balancing capacity/workload to the benefit of its multi sector area of responsibility (EAP Area):
    - Cherry picking in case of bunch phenomenon to redistribute the traffic to less loaded sectors or to solve complexity inside the Hotspot
    - Early descent, late descent, or delayed climb to avoid a specific sector ( in its EAP Area)
    - FL balancing to adjust traffic load between layers of airspace
    - Use of flexible division of Flight level, which can be associated with the dynamic FL allocation scheme
    - Rerouting, in order to balance the workload between sectors in nominal situations or taking in consideration specific weather conditions or unexpected military activity (or non-activity). This implies a coordination with LTM, as it has a network effect beyond the EAP Area.
- EAP can contribute to the implementation of miles in trail procedures. This also implies coordination with the LTM, as it has a network effect beyond the EAP Area.
- (reserved/restricted areas, CDR …);Within their time horizon of work and their multi-sectors overview in their area of interest, EAP takes into account the existing TTA/TTO instructions);
- EAP role has the ability to interact with the control sectors via a communication tool. This tool allows transferring to the sectors the clearances requested, and sharing any kind of information in a bidirectional way, for shared situation awareness between CWPs and INAP Working Position.
- EAP is responsible to act on request from any sector in its given EAP Area when a specific sector or area encounters adverse weather situation (CBs building up, turbulence appearing) the EAP help may be asked to act to facilitate the transition towards a situation where accurate ATFCM measures will come into effect. When En-route holding patterns are activated, the EAP may be asked to assist to coordinate speed reduction with upstream sectors and further to coordinate stack exit levels especially in case of multiple layers.

- The EAP will be able to answer specific and real time requests from users, expressed either by the Flight Crew through RT or through any other communication tool by the FOC Operations.
- Some innovative tasks devoted to EAP should pop up with the application of Dynamic Airspace Configurations, for instance, in the context of activation of Free Route Airspace:
- The EAP will need a tool which gives a probability of strategic conflicts based on the uncertainty (of the trajectory prediction at least). (this is also useful in fixed route environment but deemed mandatory in free route)
- Moreover, as it is more complex to solve conflicts for a sector team in a Free Route environment, the EAP could in some cases, choose to make a strategic deconfliction with a slight change on the trajectory in a smoother way thanks to a trajectory editor at the ATSU level.

- Similarly to the Planning Controller and Tactical Controller tasks, EAP activities will need to cope with:

  - Free Route operations: in case of Short crossings at boundaries of sectors in FRA, EAP should pay a particular attention to these areas, up to circa 30' before they become complex.

  - Conflicts identified (with or without a conflict detection tool) at the boundary of two sectors: this ambiguous situation can become a safety issue if the responsibility for solving the conflict is not clearly allocated early enough. Thanks to its view of the traffic extended at the ATSU level, the EAP will be in the best position to determine the most suitable sector team for resolution of the conflict. A dedicated tool may be used to share information about the conflicts with the most suitable sector team(s).

  - Intricate conflicts which share the same crossing point or interfere with one another in the same area, with sufficient level of anticipation and certainty: as the EAP is not subject to the same time pressure as the sector team, they can have more time to think about a resolution. The EAP will be able to analyse and share relevant information about the conflicts well in advance, also choosing relevant recipients for this information, allowing sector team(s) to better anticipate and potentially coordinate their analysis when several sectors are involved. Anticipated resolution of complex conflicts involving several sectors will also be facilitated, with more time for coordination and fewer last minute actions.

#### 3.5.2.5.2 The Local Traffic Manager (LTM)

Within INAP, he LTM is involved in dDCB processes for all phases. The present section will focus on the short-term planning/execution phases. (S)he ensures consistency between the whole ATFCM measures. The LTM uses traffic load monitoring tools, to compare demand with declared capacity in the Network Operations Plan and to assess sectors workloads and/or complexity compared with predefined thresholds.

The Local Traffic Manager's responsibilities within INAP function refer to the Airspace Management and the dynamic Demand and Capacity Balancing.

The Local Traffic Manager is responsible for:

- Monitoring the demand and the capacity
    - Monitor forecast demand against declared capacity.
    - Assess the impact of different sector configurations on the traffic flows.
    - Assess sectors workloads.

- Providing information about predicted imbalance
    - Provide advance notice of demand that peaks above capacity.
    - Provide advance notice of sector workloads.
    - Provide advance notice of peaks in traffic complexity.
    - Provide messaging if required.
- Designing, assessing and Coordinating actions with others actors to manage imbalances
    - Notify the ATSU Supervisor of any reduction in declared capacity.
    - Advise the ATSU Supervisor on sector opening/closing and staffing to meet the demand
    - Devise and coordinate appropriate action to resolve any imbalances in co-ordination with the ATSU Supervisor.
    - Optimise ATC/ATFM system performance including the instigation and coordination of remedial action with any ATS provider, aircraft operator or aerodrome to ensure maximum system performance
- Monitoring in real time the local consequences of measures applied in adjacent airspace
    - Monitor the impact of departure, en-route and arrival management systems on traffic in the area of interest.
    - Monitor the impact of traffic in neighbouring areas on his area of interest.
- Managing unusual situations
    - Manage demand when impacted by weather or following an incident or unusual occurrence.
    - Provide information on, and solutions for unexpected increases in demand.

The LTM:

- The Local Traffic Manager (LTM) is functionally located between the Flow Manager (sub-regional level) and multi-sector planning actors. (S)he is responsible for a group of sectors (potentially a complete ATSU) and for any airfield located within its area of responsibility.
- The LTM is a major actor of DCB processes both for the Medium- to Short-Term phases and the ATFCM short-term planning/execution phases. In case of imbalance, (s)he is responsible for identifying the adequate measures to be taken, in coordination with the appropriate partners (that could include NM (Network Manager), FM, (Flow Manager) other LTM and AU).
- The LTM provides a bridge in understanding between operational perceptions of complexity, workload & demand and how that translates into ATFCM requirements as deliverable occupancy & workload values.
- In short-term to execution phase, the LTM works closely with Supervisors and Extended ATC Planning. The LTM is also likely to be either a Supervisor, or report to one, and as such will retain local safety accountability. Any ATFCM initiatives will have to be approved by him/her.
- Tasks included in the scope of the LTM (Local traffic Manager):

Day of execution

- Monitor the balance of sector configuration and ensure consistency with the Count Forecast (potentially enriched with flight lists and profiles)
- Identify complexity situation
- Find solutions to solve imbalances between demand and capacity thanks to:

  1: Airspace organization and management
    - Negotiation with military partners to shift or cancel reservation of airspace
    - alternative sector configuration
    - Use of the flexible division of flight level
    - …

  2: ATFCM measures (CDM with AU, FM, other LTMs, NM…)
    - ATFCM scenarios
    - Regulations (CTOT)
    - Increase of the potential regulation rate thanks to a complexity assessment performed through flight lists analysis.
    - .Short term ATFCM (on ground or on airborne flights)
      - FL Capping
      - Rerouting
      - Minimum Departure Interval
      - …

  3: Assessment and improvement of the ATFCM measures:
    - Assess network effects
    - Monitor the impact and the efficiency of the measures
    - Exclude non pertinent A/C from regulation
    - Force A/C to average delay in case of high delay identification
    - Elaborate through a CDM process with the EAP function DCB measures to be applied on airborne a/c , …

#### 3.5.2.5.3 Full INAP Function

The sector planning role plans the air traffic situation within an applicable horizon directly dependent on the quality of Trajectory Prediction and on the available controller support tools. In SESAR 2020 the need to apply DCB measures and re-negotiate the RBT/RMT is considered as an exception, thanks to the use of Trajectory Based Operations. ATM systems should result in a higher incidence of traffic being conformant with the published NOP.

To further enhance ATC safety and optimisation, resolving workload imbalances at the lowest possible level is a key element. The full integration of Network Management and extended ATC planning tasks (INAP function) will allow the development of Network Management techniques to take place at a more granular level, resulting in proactive solution led initiatives which are then coordinated and integrated at an increasingly higher level: current regulations with unnecessary level of constraints for sake of safety (due to high uncertainty), will be replaced by a smarter and more adapted combination of measures, from a wide catalogue, tailored to the operational needs and objectives of the ATSU, with the final aim to best accommodate AUs needs. .

INAP actors will be provided with the capability to identify and resolve local hotspots in a fully integrated way. They will be able to assess potential actions to resolve these hotspots within the context of an evolving traffic picture close to execution, and evaluate the impact of such actions in terms of performance, , both at local level and at Network level, thanks to Network impact Assessment functionality made available via CORSE toolset.

Full INAP capability will provide the INAP Actors with a common view for situation analysis and decision support towards optimised solution and its implementation. The solution will be selected from a palette of options, including DAC, traffic flow management measures and, where appropriate, trajectory measures - encompassing decomplexification and accommodating ATC needs for synchronization/sequencing. The use of predefined resolution scenarios ensures integrated action, and reduces the need for subsequent coordination between INAP actors.

Together with those tools capabilities, automated interfaces and related procedures between Local NMf and ATC Planning improve the ATM resource management efficiency and improve the complexity resolution effectiveness. The interactions and respective responsibilities between all the actors involved will be clearly defined and organized.

In a general way, the synchronization process between NMf and ATC planning relies on common situation awareness and on collaborative approach for rules and decision that ensure synchronized actions and reduces the need for time-consuming coordination between actors.

Coordination will be reduced to minimum thanks to the availability of appropriate information and harmonised procedures for decision making. The sharing of a common vision between actors, which is essential for network-performance-based decision making, is achieved by availability of consistent workload information to all the involved actors through SWIM. The common vision does not come in contradiction with the basic CDM principles, but on the contrary it will enable the automation and simplification of CDM processes. In SESAR 2020 target concept, any intervention on the trajectory should be by exception and this intervention has to be performed in organized manner, where CDM relies on commonly agreed procedures and accepted predefined resolution scenarios rather than current negotiations.

The actor responsible for the implementation of the measure is the Tactical Controller and the coordination is with Planning Controller, Extended ATC Planner, MSP, Local Traffic Manager, etc…, according to the local procedures and working methods.

#### 3.5.2.5.4 EATMA Model of INAP

| | |
|---|---|
| Use case | EAP Hotspot Management in Full Autonomy |
| Use case | EAP Resolution of Downstream Hotspot with LTM coordination |
| Use case | EAP Resolution of Local Hotspot with LTM coordination |

#### 3.5.2.5.4.1 EAP Hotspot Management in Full Autonomy

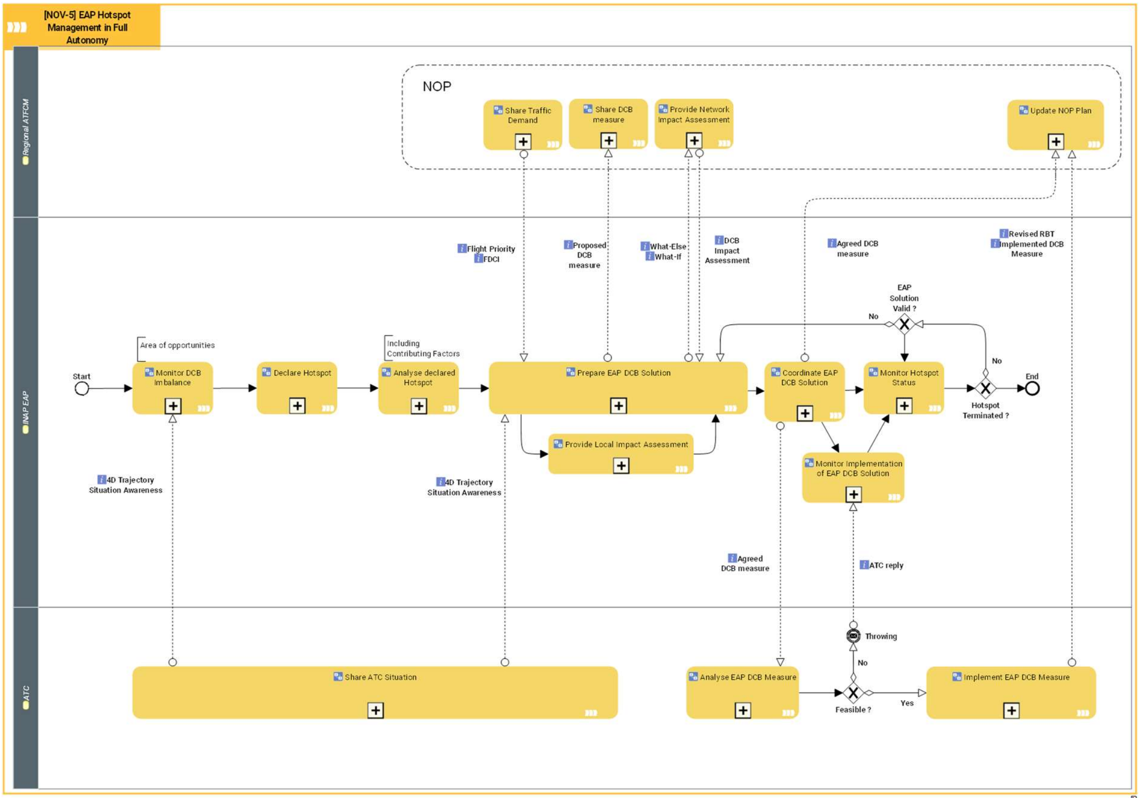



**Figure 46: EATMA Model – EAP Hotspot Management in Full Autonomy**

| Activity | Description |
|---|---|
| Analyse declared Hotspot | EAP has a short leadtime to perform a quick analysis of the hotspot and the factors responsible for the excess of complexity, identifying specific traffic flows and/ or individual flights. |
| Analyse EAP DCB Measure | After the Proposed EAP DCB Measure has been successfully coordinated, it is sent to ATC for implementation. On reception, ATC Planning role analyses the request and its feasibility, in regards to the operational context in their Area of Responsibility. |
| Coordinate EAP DCB Solution | Depending on the leadtime before the occurrence of the hotspot, EAP will coordinate the proposed EAP DCB Solution with the relevant |

| | |
|---|---|
| | partners. Due to the short timeframe of EAP horizon, this coordination mostly lies on pre-coordinated options and agreement by default from impacted partners in specific situations. It could involve INAP actors from neighbouring ATSUs, airports, ATCOs… |
| Declare Hotspot | When specific conditions are met, EAP declares hotspot and shares it with partners via the NOP. |
| Implement EAP DCB Measure | After assessing the feasibility and impact of the EAP DCB Solution, ATC Planning and Executive Roles implement the measure(s) in their Area of Responsibility, via timely instructions to Flight Crew(s). |
| Monitor DCB Imbalance | EAP continuously monitors the local situation in their area of responsibility, either in coordination with LTM after initial detection by LTM, or in full autonomy, on a more tactical timeframe closer to ATC, based on finer input parameters, such as complexity elements computed from 4D Trajectories, or ATC situation. |
| Monitor Hotspot Status | Starting with the declaration of the hotspot and all along their analysis until the hotspot is solved, the EAP will continuously monitor the Hotspot Status, in order to refine and/or update their solution. As long as the hotspot is not solved, the EAP will have to design, coordinate and propose solution to ATC for implementation. |
| Monitor Implementation of EAP DCB Solution | After ATC has agreed to implement EAP DCB Solution, EAP remains in charge of the monitoring of the implementation of the measure and its efficiency to actually solve the hotspot. However, the implementation of the solution is not an objective in itself, as it could happen that the hotspot is solved or disappears even before the solution has been implemented. In this case, and if the instruction has not yet been given to Flight Crew, the EAP will cancel the request to implement the solution, to avoid unnecessary constraints. |
| Prepare EAP DCB Solution | After analysis of the nature and cause for the complexity, EAP targets traffic flows and/or individual flights as candidates for DCB measures, to build a solution. EAP DCB solution can be made of one or several measure(s), impacting flows and/or individual flights, mostly airborne or shortly to be airborne, among which:<br>- Time-based measures (delay absorption in the form of Target Times, TTL/TTG, Speed assignment proposal…)<br>- Tactical Reroutings (no modification of Flight Plan), either geographical rerouting, or vertical rerouting. |
| Provide Local Impact Assessment | EAP Working Position will provide a what-if functionality in order to assess the efficiency and the impact of the proposed EAP DCB Solution on:<br>- The efficiency to solve the hotspot locally,<br>- The impact on performance at local level, for their own ATSU.<br>The impact on neighbouring ATSUs, and on the Network more globally, will be provided by the NOP through the Network Impact Assessment. |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the network level. |

| | |
|---|---|
| Share ATC Situation | ATC instantaneous workload could be made continuously visible to supervisor(s) and local INAP (and EAP more specifically), to be used as an input parameter:<br>- for the detection and analysis of the imbalance by INAP,<br>- and during the elaboration of the EAP DCB Solution. This would improve the acceptability of the Solution by ATC and facilitates its implementation. |
| Share DCB measure | After initial local impact assessment, and before implementation whenever possible, EAP shares the proposed EAP DCB Measure with Regional ATFCM via the NOP. |
| Share Traffic Demand | The NM system provides the FBT information to NMf actors |
| Update NOP Plan | Once the EAP DCB Solution has been successfully coordinated, it becomes an Agreed Solution, and EAP sends it to the NOP, to feed and update the NOP Plan, to be shared with partners. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| INAP EAP | Coordinate EAP DCB Solution o--> Update NOP Plan | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| INAP EAP | Coordinate EAP DCB Solution o--> Update NOP Plan | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| ATC | Throwing o--> Monitor Implementation of EAP DCB Solution | INAP EAP | ATC reply | |
| ATC | Share ATC Situation o--> Prepare EAP DCB Solution | INAP EAP | 4D Trajectory Situation Awareness | |
| Regional ATFCM | Share Traffic Demand o--> Prepare EAP DCB Solution | INAP EAP | Flight Priority | |
| Regional ATFCM | Share Traffic Demand o--> Prepare EAP DCB Solution | INAP EAP | FDCI | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| INAP EAP | Coordinate EAP DCB Solution o--> Analyse EAP DCB Measure | ATC | Agreed DCB measure | ATFMMeasure |
| INAP EAP | Coordinate EAP DCB Solution o--> Analyse EAP DCB Measure | ATC | Agreed DCB measure | ATFMMeasure |
| INAP EAP | Prepare EAP DCB Solution o--> Share DCB measure | Regional ATFCM | Proposed DCB measure | |
| INAP EAP | Prepare EAP DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| INAP EAP | Prepare EAP DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |
| ATC | Implement EAP DCB Measure o--> Update NOP Plan | Regional ATFCM | Revised RBT | |
| ATC | Implement EAP DCB Measure o--> Update NOP Plan | Regional ATFCM | Implemented DCB Measure | |
| ATC | Share ATC Situation o--> Monitor DCB Imbalance | INAP EAP | 4D Trajectory Situation Awareness | |
| Regional ATFCM | Provide Network Impact Assessment o--> Prepare EAP DCB Solution | INAP EAP | DCB Impact Assessment | |

#### 3.5.2.5.4.2 EAP Resolution of Downstream Hotspot with LTM coordination

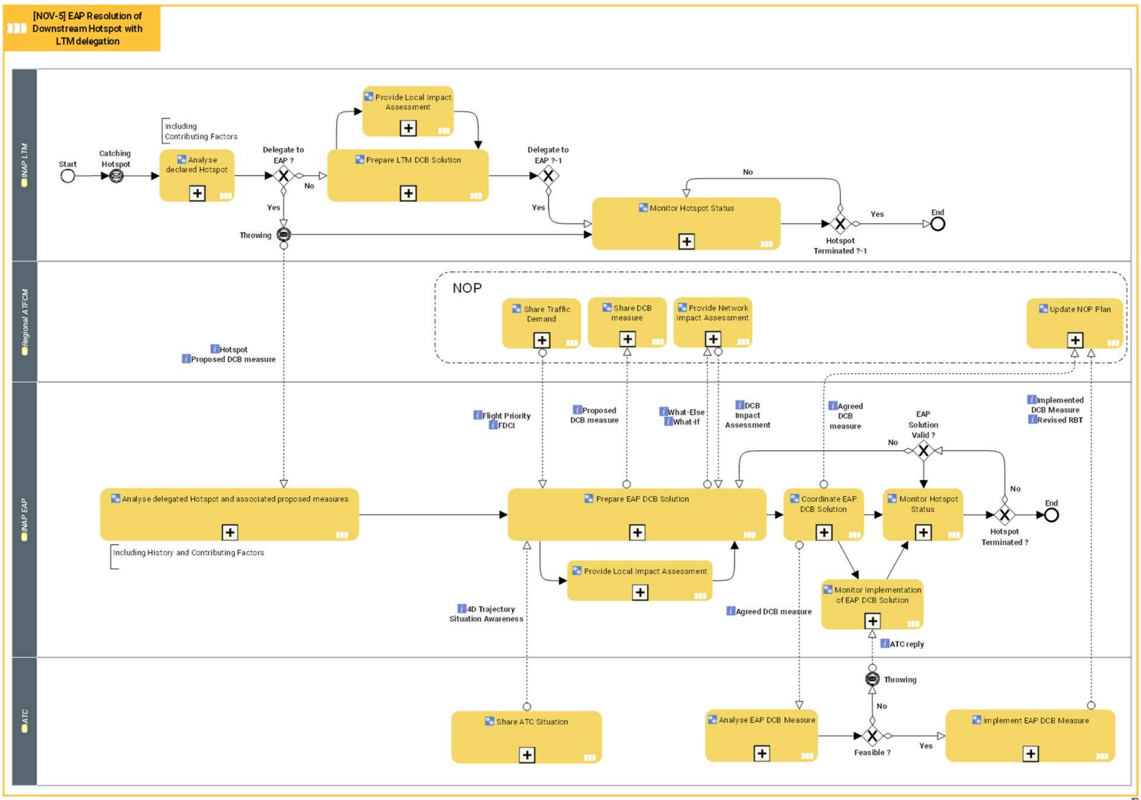



**Figure 47: EATMA Model – EAP Resolution of Downstream Hotspot**

| Activity | Description |
|---|---|
| Analyse declared Hotspot | LTM analyses the declared hotspot in details: assessment of the nature and duration of the hotspot, contributing factors (internal to the hotspot, but also the operational context) and potential impact.<br>Depending on the outcome of this analysis, LTM will either decide to prepare a LTM DCB solution, or to coordinate with EAP for elaboration of an EAP DCB Solution. |
| Analyse declared Hotspot and associated analysis and/or envisaged measures | Coordination with LTM to share their initial analysis and if relevant, potential measures envisaged by LTM, provides EAP with a basis for their own analysis. EAP specific timeframe and granularity will allow finer analysis, based on more predictable data and a shared ATC situation awareness. |

| | |
|---|---|
| Analyse EAP DCB Measure | After the Proposed EAP DCB Measure has been successfully coordinated, it is sent to ATC for implementation. On reception, ATC Planning role analyses the request and its feasibility, in regards to the operational context in their Area of Responsibility. |
| Coordinate EAP DCB Solution | Depending on the lead-time before the occurrence of the hotspot, EAP will coordinate the proposed EAP DCB Solution with the relevant partners. Due to the short timeframe of EAP horizon, this coordination mostly lies on pre-coordinated options and agreement by default from impacted partners in specific situations. It shall involve the implementing ATCOs, and it could involve INAP actors from neighbouring ATSUs, airports, … |
| Implement EAP DCB Measure | After assessing the feasibility and impact of the EAP DCB Solution, ATC Planning and Executive Roles implement the measure(s) in their Area of Responsibility, via timely instructions to Flight Crew(s). |
| Monitor Hotspot Status | Starting with the declaration of the hotspot and all along their analysis until the hotspot is solved, the INAP actor will continuously monitor the Hotspot Status, in order to refine and/or update their solution. As long as the hotspot is not solved, the INAP actor will have to design, coordinate and propose solution for implementation. |
| Monitor Implementation of EAP DCB Solution | After ATC has agreed to implement EAP DCB Solution, EAP remains in charge of the monitoring of the implementation of the measure and its efficiency to actually solve the hotspot. However, the implementation of the solution is not an objective in itself, as it could happen that the hotspot is solved or disappears even before the solution has been implemented. In this case, and if the instruction has not yet been given to Flight Crew, the EAP will cancel the request to implement the solution, to avoid unnecessary constraints. |
| Prepare EAP DCB Solution | After analysis of the nature and cause for the complexity, EAP targets traffic flows and/or individual flights as candidates for DCB measures, to build a solution. EAP DCB solution can be made of one or several measure(s), impacting flows and/or individual flights, mostly airborne or shortly to be airborne, among which:<br>- Time-based measures (delay absorption in the form of Target Times, TTL/TTG, Speed assignment proposal…)<br>- Tactical Reroutings (no modification of Flight Plan), either geographical rerouting, or vertical rerouting.<br><br>Based on the following inputs (non-exhaustive list):<br>- Traffic Demand from the NOP, including additional elements such as AUs Business Needs,<br>- ATC situation in their ATSU (workload/ situation awareness, 4D Trajectories through revised RBTs …),<br>- Initial LTM analysis and proposal,<br>EAP will design a set of STAMs aiming at:<br>- Reducing complexity imbalances<br>- Smoothing traffic sequences |

| | |
|---|---|
| | - Optimizing use of resources and AUs flight profiles… |
| Prepare LTM DCB Solution | When LTM identifies the need to solve the hotspot with a LTM DCB solution, he starts designing a set of DCB measure(s) aiming at:<br>- improving Capacity (change in airspace/ sector configuration,…)<br>- acting on Demand to remove excessive workload, for a smoother traffic distribution<br>Measures on Demand could be time-based (such as regulations) or geographical reroutings, impacting traffic flows most of the time, and individual flights if relevant. |
| Provide Local Impact Assessment | During the elaboration of a DCB solution, INAP working Position offers 'what-if' functionalities to allow LTM and/or EAP to assess the efficiency/ impact of candidate measures:<br>- the efficiency to solve the declared hotspot (i.e. impact on the contributing factors identified as the cause for the imbalance)<br>- the impact on performance at the local level (side effects that could either improve or worsen the situation elsewhere in the ATSU). The impact on neighbouring ATSUs, and on the Network more globally, will be provided by the NOP through the Network Impact Assessment.<br>LTM/EAP will refine their solution until the local impact assessment is satisfactory for them (in coordination with Supervisor). |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the network level. |
| Share ATC Situation | ATC instantaneous workload could be made continuously visible to supervisor(s) and local INAP (and EAP more specifically), to be used as an input parameter:<br>- for the detection and analysis of the imbalance by INAP,<br>- and during the elaboration of the EAP DCB Solution. This would improve the acceptability of the Solution by ATC and facilitates its implementation. |
| Share Draft DCB measure | After initial local impact assessment and before implementation whenever possible, EAP shares the proposed/draft EAP DCB Measure with Regional ATFCM via the NOP, for partners' visibility and feedback, according to CDM process. |
| Share Traffic Demand | The NM system provides the FBT information to NMf actors |
| Update NOP Plan | Once the EAP DCB Solution has been successfully coordinated, it becomes an Agreed Solution, and EAP sends it to the NOP, to feed and update the NOP Plan, to be shared with partners. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| INAP EAP | Coordinate EAP DCB Solution o--> Update NOP Plan | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| INAP EAP | Coordinate EAP DCB Solution o--> Update NOP Plan | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| ATC | Throwing o--> Monitor Implementation of EAP DCB Solution | INAP EAP | ATC reply | |
| INAP LTM | Throwing o--> Analyse delegated Hotspot and associated proposed measures | INAP EAP | Proposed DCB measure | |
| INAP LTM | Throwing o--> Analyse delegated Hotspot and associated proposed measures | INAP EAP | Hotspot | |
| ATC | Share ATC Situation o--> Prepare EAP DCB Solution | INAP EAP | 4D Trajectory Situation Awareness | |
| Regional ATFCM | Share Traffic Demand o--> Prepare EAP DCB Solution | INAP EAP | Flight Priority | |
| Regional ATFCM | Share Traffic Demand o--> Prepare EAP DCB Solution | INAP EAP | FDCI | |
| INAP EAP | Coordinate EAP DCB Solution o--> Analyse EAP DCB Measure | ATC | Agreed DCB measure | ATFMMeasure |
| INAP EAP | Coordinate EAP DCB Solution o--> Analyse EAP DCB Measure | ATC | Agreed DCB measure | ATFMMeasure |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| INAP EAP | Prepare EAP DCB Solution o--> Share DCB measure | Regional ATFCM | Proposed DCB measure | |
| INAP EAP | Prepare EAP DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| INAP EAP | Prepare EAP DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |
| ATC | Implement EAP DCB Measure o--> Update NOP Plan | Regional ATFCM | Revised RBT | |
| ATC | Implement EAP DCB Measure o--> Update NOP Plan | Regional ATFCM | Implemented DCB Measure | |
| Regional ATFCM | Provide Network Impact Assessment o--> Prepare EAP DCB Solution | INAP EAP | DCB Impact Assessment | |

##### 3.5.2.5.4.3 EAP Resolution of Local Hotspot with LTM coordination

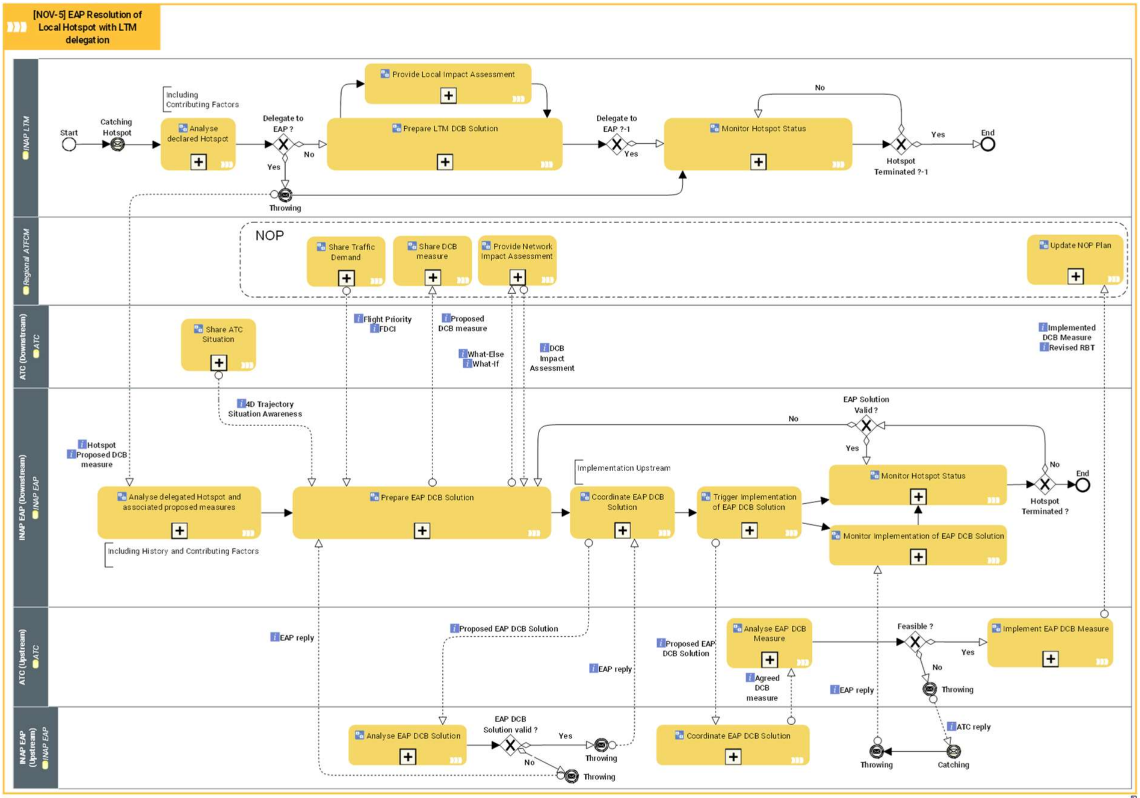



Figure 48: EATMA Model - EAP Resolution of Local Hotspot

| Activity | Description |
|---|---|
| Analyse declared Hotspot | LTM analyses the declared hotspot in details: assessment of the nature and duration of the hotspot, contributing factors (internal to the hotspot, but also the operational context) and potential impact. Depending on the outcome of this analysis, LTM will either decide to prepare a LTM DCB solution, or to coordinate with EAP for elaboration of an EAP DCB Solution. |
| Analyse declared Hotspot and associated analysis and/or proposed measures | Coordination with LTM to share their initial analysis and if relevant, potential measures envisaged by LTM, provides EAP with a basis for their own analysis. EAP specific timeframe and granularity will allow finer analysis, based on more predictable data and a shared ATC situation awareness. |
| Analyse EAP DCB Measure | After the Proposed EAP DCB Measure has been successfully coordinated, it is sent to ATC for implementation. On reception, ATC Planning role analyses the request and its feasibility, in regards to the operational context in their Area of Responsibility. |




Founding Members

| | |
|---|---|
| Analyse EAP DCB Solution | Upstream INAP (implementing ATSU) receives the request for coordination to agree on the solution prepared by downstream ATSU, to be implemented by upstream ATSU, in order to solve hotspot declared in downstream ATSU. Upstream INAP assesses the validity of the solution in relation to their own constraints and objectives. |
| Coordinate EAP DCB Solution | Depending on the lead-time before the occurrence of the hotspot, EAP will coordinate the proposed EAP DCB Solution with the relevant partners. Due to the short timeframe of EAP horizon, this coordination mostly lies on pre-coordinated options and agreement by default from impacted partners in specific situations. It shall involve the implementing ATCOs, and it could involve INAP actors from neighbouring ATSUs, airports, …<br>In case the DCB solution needs to be implemented by an upstream ATSU, the coordination shall involve this ATSU before any other partner, to ensure acceptability and feasibility. |
| Implement EAP DCB Measure | After assessing the feasibility and impact of the EAP DCB Solution, ATC Planning and Executive Roles implement the measure(s) in their Area of Responsibility, via timely instructions to Flight Crew(s). |
| Monitor Hotspot Status | Starting with the declaration of the hotspot and all along their analysis until the hotspot is solved, the INAP actor will continuously monitor the Hotspot Status, in order to refine and/or update their solution. As long as the hotspot is not solved, the INAP actor will have to design, coordinate and propose solution for implementation. |
| Monitor Implementation of EAP DCB Solution | After ATC has agreed to implement EAP DCB Solution, EAP remains in charge of the monitoring of the implementation of the measure and its efficiency to actually solve the hotspot. However, the implementation of the solution is not an objective in itself, as it could happen that the hotspot is solved or disappears even before the solution has been implemented. In this case, and if the instruction has not yet been given to Flight Crew, the EAP will cancel the request to implement the solution, to avoid unnecessary constraints. |
| Prepare EAP DCB Solution | After analysis of the nature and cause for the complexity, EAP targets traffic flows and/or individual flights as candidates for DCB measures, to build a solution. EAP DCB solution can be made of one or several measure(s), impacting flows and/or individual flights, mostly airborne or shortly to be airborne, among which:<br>- Time-based measures (delay absorption in the form of Target Times, TTL/TTG, Speed assignment proposal…)<br>- Tactical Reroutings (no modification of Flight Plan), either geographical rerouting, or vertical rerouting.<br><br>Based on the following inputs (non-exhaustive list): |

| | |
|---|---|
| | - Traffic Demand from the NOP, including additional elements such as AUs Business Needs,<br>- ATC situation in their ATSU (workload/ situation awareness, 4D Trajectories through revised RBTs …),<br>- Initial LTM analysis and proposal,<br>EAP will design a set of STAMs aiming at:<br>- Reducing complexity imbalances<br>- Smoothing traffic sequences<br>- Optimizing use of resources and AUs flight profiles… |
| Prepare LTM DCB Solution | When LTM identifies the need to solve the hotspot with a LTM DCB solution , he starts designing a set of DCB measure(s) aiming at:<br>- improving Capacity (change in airspace/ sector configuration,...)<br>- acting on Demand to remove excessive workload, for a smoother traffic distribution<br>Measures on Demand could be time-based (such as regulations) or geographical reroutings, impacting traffic flows most of the time, and individual flights if relevant. |
| Provide Local Impact Assessment | During the elaboration of a DCB solution, INAP working Position offers 'what-if' functionalities to allow LTM and/or EAP to assess the efficiency/ impact of candidate measures:<br>- the efficiency to solve the declared hotspot (i.e. impact on the contributing factors identified as the cause for the imbalance)<br>- the impact on performance at the local level (side effects that could either improve or worsen the situation elsewhere in the ATSU).<br>The impact on neighbouring ATSUs, and on the Network more globally, will be provided by the NOP through the Network Impact Assessment.<br>LTM/EAP will refine their solution until the local impact assessment is satisfactory for them (in coordination with Supervisor). |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the network level. |
| Share ATC Situation | ATC instantaneous workload could be made continuously visible to supervisor(s) and local INAP (and EAP more specifically), to be used as an input parameter:<br>- for the detection and analysis of the imbalance by INAP,<br>- and during the elaboration of the EAP DCB Solution. This would improve the acceptability of the Solution by ATC and facilitates its implementation. |
| Share Draft DCB measure | After initial local impact assessment and before implementation whenever possible, EAP shares the proposed/draft EAP DCB Measure with Regional ATFCM via the NOP, for partners' visibility and feedback, according to CDM process. |
| Share Traffic Demand | The NM system provides the FBT information to NMf actors |
| Trigger Implementation of EAP DCB Solution | INAP/EAP sends the DCB measures to ATC for implementation |

| | |
|---|---|
| Update NOP Plan | Once the EAP DCB Solution has been successfully coordinated, it becomes an Agreed Solution, and EAP sends it to the NOP, to feed and update the NOP Plan, to be shared with partners. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| INAP EAP (Upstream) | Throwing o--> Prepare EAP DCB Solution | INAP EAP (Downstream) | EAP reply | |
| INAP EAP (Downstream) | Coordinate EAP DCB Solution o--> Analyse EAP DCB Solution | INAP EAP (Upstream) | Proposed EAP DCB Solution | |
| INAP EAP (Upstream) | Throwing o--> Coordinate EAP DCB Solution | INAP EAP (Downstream) | EAP reply | |
| INAP EAP (Upstream) | Throwing o--> Monitor Implementation of EAP DCB Solution | INAP EAP (Downstream) | EAP reply | |
| INAP LTM | Throwing o--> Analyse delegated Hotspot and associated proposed measures | INAP EAP (Downstream) | Proposed DCB measure | |
| INAP LTM | Throwing o--> Analyse delegated Hotspot and associated proposed measures | INAP EAP (Downstream) | Hotspot | |
| INAP EAP (Downstream) | Trigger Implementation of EAP DCB Solution o--> Coordinate EAP DCB Solution | INAP EAP (Upstream) | Proposed EAP DCB Solution | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| ATC (Upstream) | Throwing o--> Catching | INAP EAP (Upstream) | ATC reply | |
| ATC (Downstream) | Share ATC Situation o--> Prepare EAP DCB Solution | INAP EAP (Downstream) | 4D Trajectory Situation Awareness | |
| Regional ATFCM | Share Traffic Demand o--> Prepare EAP DCB Solution | INAP EAP (Downstream) | Flight Priority | |
| Regional ATFCM | Share Traffic Demand o--> Prepare EAP DCB Solution | INAP EAP (Downstream) | FDCI | |
| INAP EAP (Upstream) | Coordinate EAP DCB Solution o--> Analyse EAP DCB Measure | ATC (Upstream) | Agreed DCB measure | ATFMMeasure |
| INAP EAP (Upstream) | Coordinate EAP DCB Solution o--> Analyse EAP DCB Measure | ATC (Upstream) | Agreed DCB measure | ATFMMeasure |
| INAP EAP (Downstream) | Prepare EAP DCB Solution o--> Share DCB measure | Regional ATFCM | Proposed DCB measure | |
| INAP EAP (Downstream) | Prepare EAP DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| INAP EAP (Downstream) | Prepare EAP DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |
| ATC (Upstream) | Implement EAP DCB Measure o--> Update NOP Plan | Regional ATFCM | Revised RBT | |
| ATC (Upstream) | Implement EAP DCB Measure o--> Update NOP Plan | Regional ATFCM | Implemented DCB Measure | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Provide Network Impact Assessment o--> Prepare EAP DCB Solution | INAP EAP (Downstream) | DCB Impact Assessment | |

### 3.5.2.6 CORSE Catalogue

CORSE stands for Complexity Resolution SErvice. It is a local/ subregional automated functionality to support INAP actors (LTM, EAP and/or Planning Controller(s)) in the resolution of local complexity situations, identified as Hotspots and OptiSpots, thanks to the integration of various tools within a single interface.

#### 3.5.2.6.1 How CORSE fits into the full picture

After detection of hotspot and/ or optispot based on local complexity assessment, INAP actors are supported by CORSE toolset for the elaboration of measures to manage complexity whilst achieving specific Performance objectives.

The INAP process associated with CORSE attempt to re-balance the air traffic situations within their particular look-ahead time horizon. System supported facilities (e.g. traffic complexity assessment tool) provide an indication of the predicted workload/complexity levels (cf. **Error! Reference source not found.**) and associated workload/complexity characteristics. The list of factors contributing to the complexity is also made available. The decision concerning which type of workload-balancing measures should be applied will then be made by the appropriate actor ((Extended) ATC Planner or Local Traffic Manager) and executed in line with appropriate procedures, specific to the operational situation at that time (timeframe, stakeholders involved, nature of the problem and the objectives…)

CORSE toolbox will encompass a hybrid set of functions (mixing current ATFCM functions and innovative Extended ATC Planning functions), adapted to the local needs (no "one-size-fits all" tool, but a selection of those of the functions that are considered relevant at the level of the ATSU). This set of functions will provide complexity resolution support, not only for the EAP or the Planning Controller, but also for the LTM, using common toolset but with a different level of action, associated with different levels of granularity.

Sharing the same toolset is required to ensure the targeted integration between the ATFCM and the ATC worlds, where LTM, EAP or PC will work on different timeframes, making decisions to solve complexity on different levels of granularity, based on information sources with different levels of uncertainty, but with a common vision and coordinated strategy, in a seamless process.

Allowing different levels of action and efficiency all along the INAP Timeframe, CORSE can provide support for resolution for each of the following actors[6]. Below are depicted the main tasks related to CORSE process for each actor / role[7]:

- The LTM:
    - Takes into account low granularity information with a relatively high uncertainty (linked to viewing demand in terms of probabilistic)
        - Macro Analysis through CORSE : analysis and support to decision with timely resolution proposals, tailored to the nature and scale of the problem and its associated uncertainty
        - Takes actions whenever capacity / complexity issues exceed the uncertainty values
    - Coordinates with EAP to improve efficiency of the INAP measures and avoid the risk to takes action too early (when uncertainty is too high for instance) which finally turn out to be unnecessarily penalizing

- LTM/ EAP task-sharing in the frame of CORSE:
    - LTM macro-analysis is the first basis shared at local ATFCM level, on which local DCB strategy will be progressively built, under the authority of the Supervisor, leading to collaborative decision making:
    - Either the LTM (in close coordination with Supervisor and/ or EAP) decides to initiate resolutionon the basis of their macro-analysis, because nature and scale of the imbalance justify it, and CORSE l provides support for initial resolution. EAP can then try to refine these measures if and when the timeframe, granularity and certainty make it relevant for him to do so,
    - Either the LTM (in close coordination with Supervisor and/ or EAP) decides to postpone action and EAP will take the responsibility for deeper analysis and resolution, witha better view of the situation thanks to more reliable / accurate data.

**In both cases, CORSE support for resolution will provide LTM with the relevant level of information to make the most appropriate decision.**

---

[6] LTM, EAP and PC are INAP actors, but depending on local implementations and working methods, they will not necessarily be deployed as such. The EAP and LTM roles could very well be handled by the same person, for example.

[7] See §**Error! Reference source not found.** for complete information on roles and activities of each a ctor.

Even if strict categorization of the problems to be addressed by either LTM or EAP is desirable (adaptability to the various natures of imbalances requires full complementarity and flexibility of the roles between LTM and EAP), it is anticipated that the LTM would address more “structural” or plannable issues, leaving the ‘ad-hoc’, smaller scale or unplannable occurrences to be solved by EAP.

- The EAP:
  - Builds on LTM analysis and initiated actions with a finer analysis of specific issue(s), involving mostly aircraft already airborne, with reduced uncertainty. This micro-analysis allows a finerlevel of granularity in the use of information and resolution action.
  - EAP actions are triggered after LTM macro-analysis, along the strategy agreed locally (following CDM principles) and CORSE will provide support for resolution, building on preliminary analysis and action performed by LTM, in a seamless coordination. Following the LTM decisions, EAP will either:
    - finetune measures initiated by LTM (this could very well consist in improvement of the measures),
    - or deal with unexpected/ ad-hoc imbalances which arise shortly before the problem needs to be handled by ATC.

  The fine level of granularity and short-term timeframe (really close to occurrence of the imbalance) which characterize EAP analysis and actions, require significant automated system support.

- The PC (could also be a MSP):
  - The could use CORSE to anticipate the resolution of complexity situations in its AoR, with extended situation awareness on the strategy which has already been initiated with upstream sectors, and the potential impact of his/ her actions on downstream sectors.

Coordination will be reduced to minimum thanks to the availability of appropriate information and harmonised procedures for decision making. The sharing of a common vision between actors, which is essential for network-performance-based decision making, is achieved by availability of consistent workload information to all the involved actors through SWIM. The common vision does not come in contradiction with the basic CDM principles, but on the contrary it will enable the automation and simplification of CDM processes. In SESAR 2020 target concept, any intervention on the trajectory should be by exception and this intervention has to be performed in extremely organized manner, where CDM relies on commonly agreed procedures and accepted predefined resolution scenarios rather than classic negotiations.

**The actor responsible for the implementation of the measure is the Tactical Controller** and the coordination will be made with Planning Controller, Extended ATC Planner, MSP, Local Traffic Manager, etc., according to the local procedures and working methods.

The added value of CORSE lies in the following aspects:

- to avoid the human actor having to compare and interpret a disparate set of information coming from different sources, with various levels of enrichment and references, potentially displayed on two screens or more,
- To facilitate the elaboration of a consistent strategy at ATSU level, compliant with local and/ or regional network objectives
- To ease collaborative decision making thanks to the combination of predefined and pre-agreed strategies, with ad-hoc measures that clearly contribute to the targeted result,
- To facilitate the dissemination of the strategy to the relevant actors for implementation and contribution of all towards a common objective (or at least no counter-productive actions being taken for lack of awareness).

#### 3.5.2.6.2 CORSE Basic principles

Based on various inputs (e.g. complexity/ performance indicators, tools analysis, Trajectory Predictions,..), CORSE can also take into account objectives given by the user (LTM/EAP/PC), which can be linked to safety (no overload or excessive complexity)and/or flow optimization, and propose a set of solutions based on a pre-defined and agreed catalogue of measures.

Within CORSE service, "what-if" and a "what-else" function are included to allow a full analysis of the proposed solutions:

- What-if to evaluate the efficiency of the solution selected by the INAP actors,
- What-else to confront the solutions with their environment, e.g.: constraints, network status and performance.

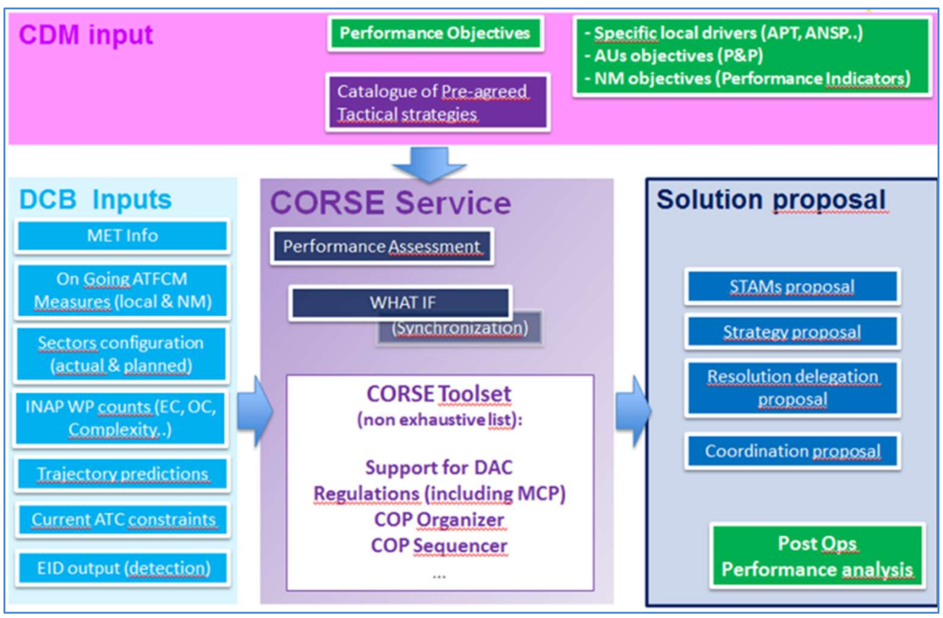



**Figure 49: initial CORSE principle (CDM)**

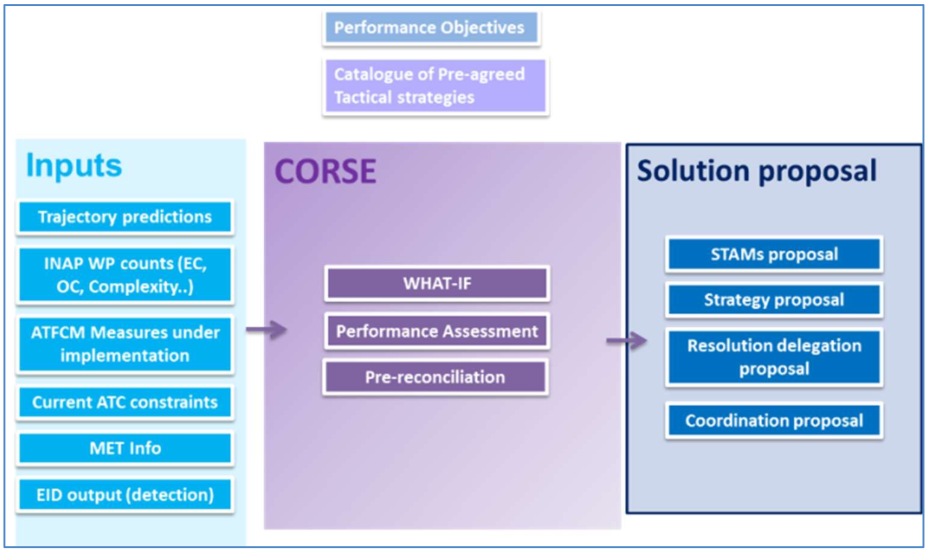



**Figure 50: initial CORSE principle**

CORSE catalogue includes the following measures, which might be triggered according to the operational needs, in isolation or in combination with other measures, some of them belonging to the standard toolset, such as regulations, if ever required:

- First objective is to maximize the available capacity to best accommodate the proposed resolution through Airspace Management and Dynamic Airspace configuration
- If this first level of action is not sufficient to reduce complexity to an acceptable level, mechanisms will be triggered to smooth the traffic demand[8] in the En-Route and Arrival, thanks to a variety of tools, tailored to local needs:
    - Very short Term ATFCM Measures will be designed by tools like COP Organizer, COP-Sequencer for En Route, encompassing proposals for adjustement in all 4 dimensions (vertical, lateral, and longitudinal plans), aiming at minimizing the impact on flight efficiency,
    - Integration with AU and APT methodologies will be ensured through CORSE: UDPP, AIMA
    - Other measures in lateral plan could also be envisaged, such as lateral offsets

8 The demand measures will consist in RBT revisions requests, as FL capping, horizontal rerouting, Target Time allocation, or a combination of all.

The balancing methods used within the ATSU, are applicable to several ATC sectors along with their executive control teams (executive and planning controllers). They are aimed first at utilising all of the available ATC capacity and then at adjusting the air traffic. They include:

- Capacity measures, to be first considered, among which:
  - flexible re-deployment of human resources,
  - dynamic sectorisation based on predefined sector configurations,
- Demand measures, coming as a complementary option if capacity measures described above are not sufficient. These include:
  - redistribution of individual RBTs within the multi-sector (ATSU),
  - re-direction of air traffic flows to ensure that high levels of efficiency are sustained, and
  - adjustments to RBT parameters (target times and/or levels)

Integrated workflow and new tools will be designated for the iNWP (integrated Network Working Position) to support the LTM in this process. In addition to the current functionalities to support the hotspot and STAM management, and the DCB/CDM process, it will count additional major improvements to:

- support the management of many local DCB solutions
- support a what-if and the Network Performance assessment
- support the Dynamic Airspace Configuration and interface with military AUs or authorities
- support the accommodation of AU preferences and priorities (UDPP)
- support the DCB plan monitoring and revision

In essence, the ATM actions in the SBT elaboration and RBT revision phases deal with similar problems, the main differences lie in their scope in time and methods of action related to accuracy of prediction, and extent of the CDM process (notably timeframe and number of actors involved).

The Controlling Sector will still inherit all the tasks from earlier planning layers that are still to be implemented and is therefore involved in complexity, queue management application of dynamic constraints like CTO/CTA, monitoring and facilitating TTO/TTA application, in addition to their own task, prevention of losses of separation.

#### 3.5.2.6.3 CORSE Main Workflow

The workflow presents the nominal flow for use of CORSE within INAP in the situation when EAP[9] is in charge of the hotspot resolution. However, the LTM can decide to ensure early and full resolution of the hotspot, in which case they will perform all tasks described.

During ATM Execution phase, a continuous monitoring of air traffic situations will be performed. If an ‘’event’’ is detected, a specific ATM management ‘’process’’ will be evoked. An ‘’actor’’ responsible for

[9] As described in 3.5.2.5.1, EAP **role** can be ensured by any of the following **actors** ; LTM, EAP or PC. This is valid for the whole section **Error! Reference source not found.**

this process will make a ''decision'', which will be communicated to the process that will trigger an action changing an environment (airspace, trajectory constraints), as required.

.

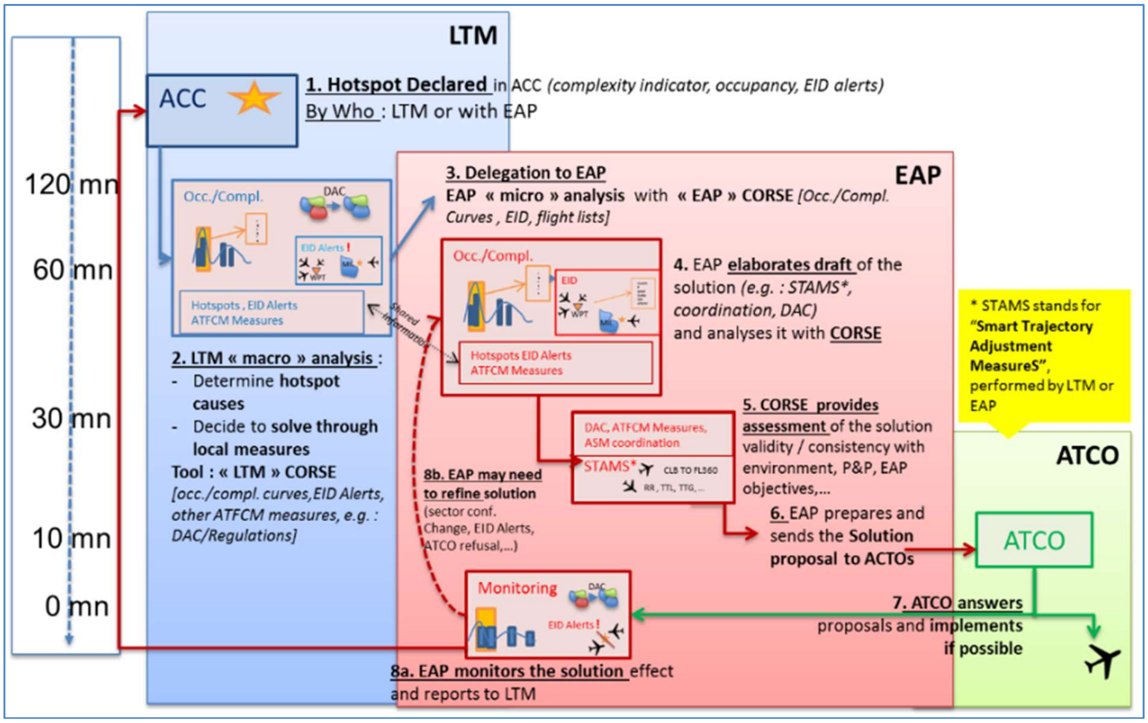



Figure 51: initial CORSE main workflow

### 3.5.2.6.4 Capacity Measures

The full process as regards Dynamic Airspace Configuration (DAC) is defined in PJ08 Solution 08.01 OSED and makes use of following components: ATS Route Network/DCTs, Free Route Airspaces volumes , airspace volumes linked to significant flows, major events or infrastructure, Airspace reservation/restrictions (ARES) … The objective of the DAC process is to identify an optimised configuration for a defined airspace based on the forecast workload/complexity level and ATCO availability in respect of defined performance targets to be achieved or examined (e.g. airspace configuration aiming to improve flight efficiency or capacity).

The concept presented hereafter pertains to how DAC is enabled via the incorporation of complexity into the DCB process to provide automated support regarding the adjustment/refinement of capacity in the short-term planning/execution time framework.

Before proceeding with the specific PJ09 concept, it seems relevant to explain the relationship between DCB and Airspace Configuration Management. To this end, some descriptions have been extracted from previous SESAR activities[10]:

- **Elementary Sector (ES)** is a section of modularized airspace within which a Tactical Air Traffic Controller can perform his controlling function, defined as a result of sector design process. It is composed of two types of airspace components: a sector building block (SBB) is the basic constituent of an elementary sector and sharable airspace modules (SAM) which delineate unstructured demand or low complexity areas that can be re-combined within the sector configuration process
- **Airspace Configuration Management)**: The management of airspace configuration is integrated with Demand and Capacity Balancing activities and aims to define, in an inclusive, synchronised and flexible way, an optimised airspace configuration that is relevant for local, sub-regional and regional level activity to meet users' requirements in line with relevant performance metrics.

The primary objective of Airspace configuration Management is to optimise the use of available airspace, in response to the users demands, by dynamic time-sharing and, at times, by the segregation of airspace among various airspace users on the basis of short-term needs.

It aims at defining and refining, in a synchronised and a flexible way, the most optimum airspace configuration at local, sub-regional and regional levels in a given airspace volume and within a particular timeframe, to meet users requirements while ensuring the best performance of the European Network and avoiding as much as possible any disruption. Airspace Management in conjunction with AFUA is an enabler to improve civil-military co-operation and to increase capacity for the benefit of all users.

PJ09 aims to achieve a fully integration of DAC into DCB to optimally adapt the capacity to the demand and minimise demand adjustments. Integrated airspace solutions are obtained through an iterative optimisation and CDM processes involving local, sub-regional and regional levels. ATM resource (including airspace and ground resources) management efficiency will be improved through a seamless integration of DAC into the advanced DCB and ATC planning process. The process will require the development of a new timeline to adjust the capacity with a better anticipation based on new operating method, role and responsibility. [*DCB-0210*]

The first assumption regarding DAC as addressed in PJ09, is that there is an initial airspace sectorisation (based on a set of elementary sectors) that supports the capacity requirements. This sectorisation has been defined and implemented through the DAC process described in PJ08.01. The responsibility of the DCB process is to refine / adjust this capacity using the available complexity information. The full integration of ASM/DCB/ATS processes within the Dynamic Airspace Configuration concept contributes to the Network performance through closer interaction between ATM operating phases, with consolidated and harmonised solutions integrated in the Planning and Execution phases at local, sub-regional and regional levels. Whilst the ATM operating phases remain intact, the processes of

[10] PJ08.01 OSED, SWP07.02 DOD and SWP04.02 DOD

which they are comprised are no longer restricted to particular times, but rather are driven by data (e.g. demand forecast) uncertainty/confidence parameters. (D106 – TCONOPS S2020)

Within the PJ09 context, DAC is integrated and the process to select and apply the airspace options that meet the needs of the ATM community (decision-making criteria to support DCB and ASM actions) takes place in the short-term / execution phase, and is about providing the most adapted environment for the complexity resolution strategy to be implemented (once the capacity aspect has been ensured by LTM).

Sectors configurations are arranged according an initial set of decision criteria (among which confidence indices, capacity load and stability, granularity versus uncertainties, or local parameters – staffing, capacity level calculation or stability parameters). The assessment and optimisation of the criteria, results on an airspace configuration that is negotiated with the ATM Actors based on automated airspace allocation (ARES) tools to validate the new Airspace plan (required Civil and Military actors will negotiate through the DCB Collaborative Decision Making Process -CDM). The final configuration is made available to the LTM / EAP and to the Control room supervisor.

As the time of operation arrives, the system automatically and periodically reviews the proposed sectorisation using complexity. To do so, the system estimates the complexity values over the proposed sectors as described in section 3.5.2.2.1. If the complexity levels reach Level 3 (orange), then the system produces a Hotspot alert which is displayed to the LTM.

At this moment, the LTM analyses the situation and considers the application of Hotspot solution measures. If the time framework allows for the implementation of a refined sectorisation (XX minutes before occurrence of the Hotspot), then the LTM is provided with the option of implementing a refinement to the sectorisation.

It must be pointed out, that the implementation of DAC refinement will be one of the different options available to the LTM and EAP, to solve the complexity issues. The resulting configuration should provide the most efficient environment for the implementation of the locally-defined strategy and further hotspot solutions based on STAM.

- At LTM level: The refined sectorisation will modify the current airspace plan to reduce the number of hotspots due to complexity. The decision criteria that used consider the available ATCO roster, the time required to implement the new sectorisation, and the complexity levels. Using these criteria, the optimisation algorithm will aim to distribute evenly the complexity, to ensure that all sectors have a manageable level of complexity.

  The LTM will be presented with the available options, and they will select one. This selection will be sent to the Supervisor for review and approval.

  Optimization will be reached through the LTM analysis and detection of under-used available capacity (suggestion to reduce the number of split sectors…)
- At EAP level: The sectorisation defined and refined on a continuous basis will also need to provide the best possible support for the strategy locally defined and agreed within INAP. EAP will have the possibility to further refine the configuration whenever (s)he considers that a

different combination would offer better result to accommodate the objectives (AUs Margins of Manoeuvre, NM or local DCB objectives) when solving hotspots and/ or optispots.

Once the EAP has performed their micro analysis on the basis of the analysis and sector configuration prepared by LTM, (s)he might decide that a change in sector configuration would be needed to best support the local strategy – allocating a bigger part of the resource to a flow/ set of flights, identified as critical to meet the objectives linked to complexity and/ or optimization aspects.

#### 3.5.2.6.5 Demand Measures

Once the capacity has been fully optimized to best accommodate the predicted complexity in the ATSU, INAP actors (LTM and/ or EAP) will be provided with the assessment of the remaining complexity situation. Following this assessment, and if further action is required – be it to solve a hotspot or if there is an opportunity for optimization in the frame of an Optispot, the LTM and/ or the EAP will take the decision to trigger demand measures from the CORSE Catalogue.

Of course the objective of this new operating method is to get rid, or at least to minimize the need to apply regulations which are unnecessarily penalizing and affect a large number of lights, creating adverse side effects such as active avoidance, and subsequent volatility and unpredictability in the traffic prediction.
CORSE Toolset offers a wider variety of measures to solve complexity imbalances: some of which are presented below, as an example. The list of tools available and integrated in CORSE will be specific to each ATSU, in accordance with local needs and resources.

##### 3.5.2.6.5.1 A finer type of STAMs: from Short Term ATFCM Measures to Very short Term ATFCM Measures

The new type of STAMs described in this section comes as a complementary set of options on top of those already described in SESAR 1, which might have been implemented in the frame of more anticipated analysis within DCB. Compared to already existing Short Term ATFCM Measures, the Very short-Term ATFCM Measures, are associated with a finer level of granularity and timeframe closer to the overload, and rely on a high level of certainty of the prediction, of both complexity and trajectories.

Very Short Term ATFCM Measures aim at saving and simplifying tasks/time for INAP in order to fine-tune local and very-short notice imbalance.

- INAP can select a flight for a Very Short Term ATFCM measure without being required to manually capture and notify a hotspot/optispot. However in such a case, the NM system identifies automatically the hotspot characteristics corresponding to the Very Short Term ATFCM measures proposed by INAP. This hotspot is automatically notified to the actors and is stored in the NOP for post-ops analysis and DCB activity traceability.
- INAP can directly, when selecting a flight for a Very Short Term ATFCM Measure, send it directly for implementation if no electronic coordination is needed (otherwise phone is recommended for a limited and simple coordination).

Very Short Term ATFCM measures will be designed with support of a variety of automated tools, specifically adapted to the local operational needs of the ATSU. The following sub-sections describe a non-exhaustive set of tools, which could be integrated within a CORSE Catalogue.

This section focuses on demand measures available for the LTM/EAP in the new operating method. Therefore, standard STAMS, understood as "Short Term ATFCM Measures", will not be addressed as this type of measure was already available in the previous operating method and so presented in the SESAR 1 related OSED.

###### 3.5.2.6.5.2 Very Short Term ATFCM Measures proposed by COP SEQUENCER and COP ORGANIZER

COP Sequencer and COP Organizer are two similar tools, which both aim at bridging the current "Gap in action", between the current catalogue of measures (CASA regulations and current STAMs), and the ATC tactical sequencing/ separation provision in case of a hotspot, as shown in Fig below.

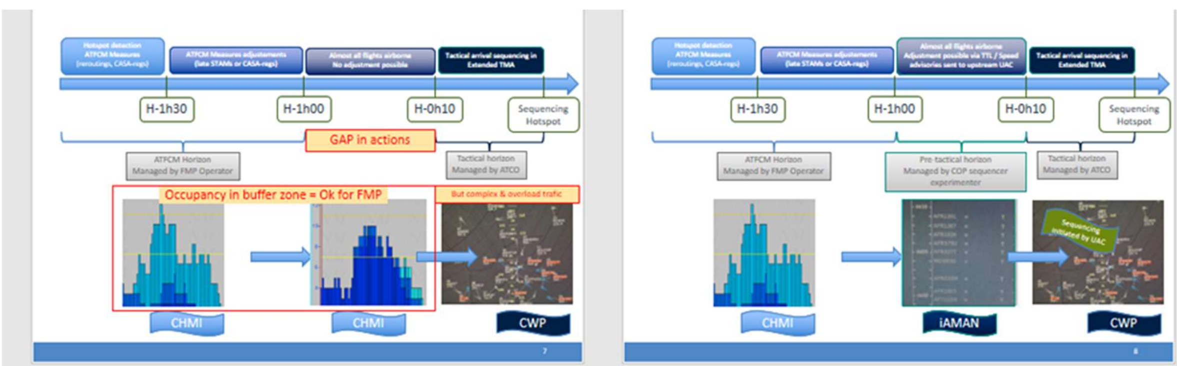



**Figure 52 : Very Short Term ATFCM Measures principle**

In the current situation, ATCOs in charge of the terminal sequencing area sector (for COP Sequencer) or the sector where the bottleneck waypoint is located (for COP Organizer) are the only ones to get a full view of the situation, but with limited anticipation, leaving ATCOs with very short time and space for decision and resolution. This leads to late and penalizing actions on traffic in order to keep complexity at acceptable levels.

COP Sequencer and COP Organizer services embedded within CORSE will:

- Decrease complexity
- Decrease ATC workload
- Decrease unnecessary/ under-efficient ATFCM regulations (and subsequent delays)

- Increase confidence of actors (FMP, Supervisors, ATCO) towards ATM system
- Facilitate More efficient flight profiles
- Integrate airspace user flight profiles

COP sequencer service aims at smoothing traffic at the entry towards extended terminal sequencing area: it provides advisories (speed advisories, TTL) to initiate arrival sequencing while the aircraft are still in upstream en route sectors

COP Organizer service provides advisories (FL, TTL, speed advisories) to smooth traffic flying towards a waypoint in En Route with a bottleneck configuration, causing increased complexity, within an ATSU or across ATSUs/ ANSPs.

Both tools offer increased anticipation and better situation awareness to upstream ATSUs, hence the opportunity for them to contribute, or at least not compromise, the optimization proposal. COP Organizer and COP sequencer contribute to increased predictability, minimizing the need for last-minute actions from the 'receiving' sector, which has a positive effect on keeping safety at its highest level.

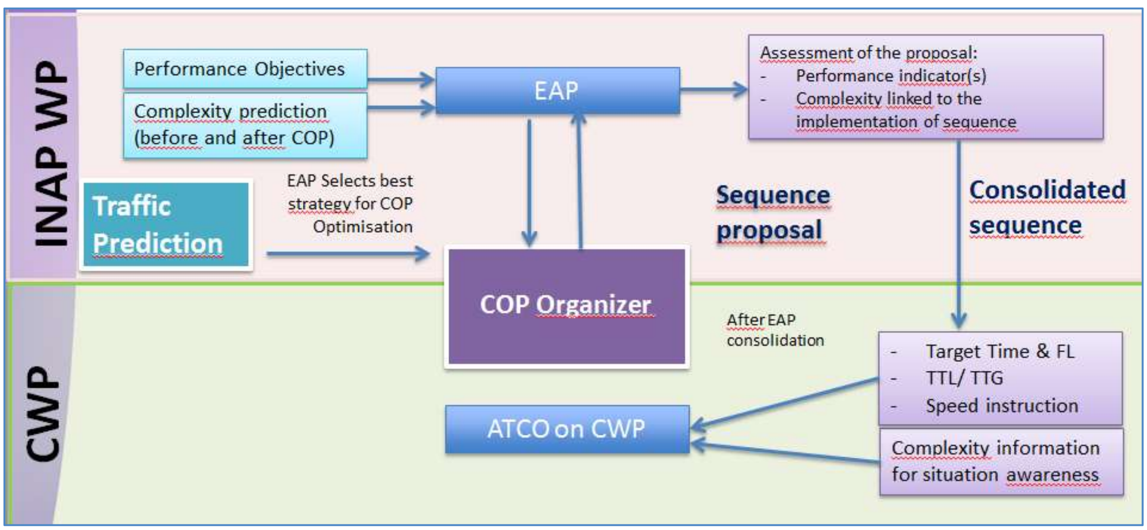



**Figure 53: COP Organizer functional description**

Regardless of the activation of a CASA-regulation, on detection of a hotspot on specific locations where COP Sequencer (for entry into extended-terminal sequencing area) and COP Organizer (for any En Route waypoint with a bottleneck configuration) services are available:

- 40-60 minutes before the hotspot, COP sequencer and COP organizer will provide advisories (FL, Time To Lose and/ or speed advisories) to the EAP,
- EAP will analyse and refine the proposal,
- EAP will then share the measure with CWPs for implementation.
- On CWPs, the COP sequencer/ Organizer advisories will be displayed on the same HMI as the other INAP advisories (e.g. requests for STAMs, XMAN, etc…).

### 3.5.2.7 Target Time Management

To manage the hotspot resolution, INAP or NM can constrain the Time of Entry of flights into the hotspot or the time on a specific waypoint (i.e.the COP, not necessarily being a coordination point between two sectors) with TTO (Target Time Over the congested E/R point) and TTA (Target Time of Arrival at congested Airport) in order to smooth the traffic.

Because Target Times (TTO/TTA) are managed in two different ways depending on whether they have been prepared during the SBT elaboration and refinement or during an RBT revision process,it is proposed to introduce the following distinction:

- TTO/TTA (Target Time Over/Target Time at the Arrival) for measures initiated in the SBT elaboration phase
- tTTO/tTTA (tactical Target Time Over/tactical Target Time at the Arrival) for measures initiated in the RBT revision phase

- TTO/TTA prepared in the Elaboration and refinement of the SBT
  - In the planning phase, TTO/TTA proposed by INAP or NM are disseminated to the NMF actors and mainly to the benefit of AUs that can re-plan in real time to adapt to a changing environment in order to maximise their flight cost efficiency and meet their business goal. Based on the last iteration of the Target Times (TTOT, TSAT, EET …), the FOC updates the SBT and will contain Target Times (TTO/TTA). In this case there is no management of TTO/TTA as such by Flight Crew or ATC, as it is the management of the RBT (built on the basis of the SBT with TTO/TTA) that implicitely ensures the adherence to the TO/TTA.TTA/TTO is not distributed to ATC and Flight Crew as such, but only embedded in the RBT. The main objectives of the ATC and Flight Crew are to facilitate the RBT execution without any change. It is based on the reasonnable effort principle.
  - NM detects TTO/TTA deviation, calculates the impact on Hotspot Resolution and informed NMF actors about Hotspot resolution deviations. It supports the INAP activity re-assessing the progress of the hotspot resolution status. This may lead to an RBT revision process or additional DCB Measures. INAP does not monitor the individual TTO/TTA flight deviation.

- tTTO/tTTA prepared in the RBT Revision
  In the execution phase, tTTO/tTTA proposed by INAP are disseminated to NMf and ATC actors. If agreed by implementing ATC, this leads to a RBT revision process incorporating the tTTO/tTTA in the RBT. At the ATC level the tTTO/tTTA are converted into speed instructions and ATC sends a Speed instruction clearance to the Flight Crew. Flight Crew has to comply with ATC clearances. ATC monitors the conformance of the speed instruction. The Target achievement is therefore mandatory and the level of adherence is high. NM detects tTTO/tTTA deviation based on Target Window and feedback from informed NMf actors. It supports the INAP activity re-assessing the

hotspot resolution status with updated progress of the flight. This may lead to an additional RBT revision process or additional DCB Measures.

#### 3.5.2.7.1 TTO and TTA prepared in the Elaboration of the SBT

##### 3.5.2.7.1.1 Preparation and Dissemination of TTO/TTA constraints in the pre-departure phase

In order to manage a hotspot resolution, INAP, APT or NM proposes Target-Time constraints. TTOs/TTAs are elaborated in the frame of the SBT and the information is disseminated to the NMf and AU actors. The AUs can re-plan the SBT in order to avoid the penalties avoiding the hotspot or they can re-file the EET.

The FOC/AU checks the route and verifies that the provided EET is still achievable.

- if the approved route is acceptable but it is no longer possible to comply with the EET provided in the SBT, the FOC/AU sends a CHG message to simply update this EET or to update its SBT.
- If FOC/AU wishes to update its CTOT but still keep its TTO/TTA, it modifies its EET over the concerned point of the SBT route or modifies its complete 4D profile by sending a CHG message to IFPS.
- If FOC/AU wants to depart on time (so earlier than the attributed CTOT) with a CTOT but still wants to maintain its TTO/TTA, it simply needs to update its EET or its 4D profile. NMf will issue a SRM with new CTOT + original TTO/TTA.
- If FOC/AU wants to depart later than the attributed CTOT, it needs to send a DLA message like in current operations. The FOC will also receive a later TTO/TTA for the flight.

Once an agreement is reached,

- The complete SBT is transmitted to NMf, AU and ATSU.
- The Target-Time information (CTOT/TTO/TTA) is transmitted to NMf and AU.

At this point, ATC and Flight Crew are not explicitly informed about the TTO/TTA providing an incomplete situational awareness. But TTO/TTA are implicitly part of the trajectory (4D targets and their target window are included in the Supporting Data of the RBT).

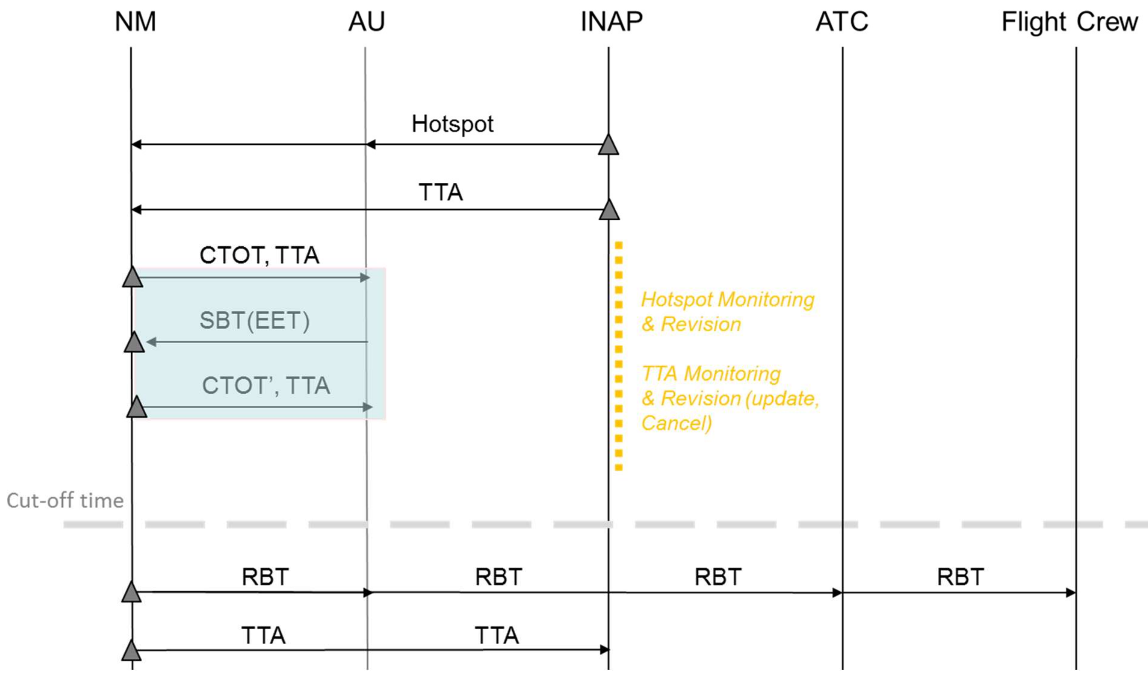



**Figure 54: TTO/TTA in SBT elaboration**

#### 3.5.2.7.1.2 Management of DCB constraints in the execution phase

When flights are in execution phase, the objective for partners is to facilitate the RBTs, which represent the best trade-off for all. All along the flight progress, the revision process will allow to amend the RBT so as to keep it as close as possible to the flown trajectory.

DCB Constraint revision is the process of renegotiating the constraint between the NMf, ATC and Flight Crew. It can occur when a deviation has been detected and under some conditions the constraint must be adjusted, when a constraint is no longer needed, it is not achievable, and/or what is achievable does not contribute towards hotspot resolution. The constraint revision would be a continuous process over time, and should satisfy the following requirements:

1. The decision to revise the constraint should respect CDM principles as far as practicable and relevant, whether along pre-agreed scenarios, or tactical CDM if time and situation permits.

2. The constraint monitoring system shows information messages/alerts to humans in case it is needed (e.g. a flight is not compliant with the constraint), can suggest revisions or at least transmit to pilots-ATCO when a constraint is no longer valid.

3. The owner of the constraint should revise it and the system through which the constraint has been created must allow to monitor, collect data, revise it and communicate the change to the relevant partners.

### TTO/TTA Constraint adherence:

Whereas the adherence of the CTOT is mandatory within the limits of the Target Window [-5 min, +10 min], the TTO/TTA adherence management in the execution phase is not explicitly mandatory. On the other side, TTO/TTAs are implicitly part of the RBT, the execution of which is to be facilitated by ATC and Flight Crew. It is based on the reasonable effort principle for which ATC and Flight Crew, apart from separation purposes, comply with RBT execution. In particular, ATC will consider the impact of any trajectory modification in regards to the RBT achievement.

### TTO/TTA adherence Monitoring by ATC and Flight Crew:

TTO/TTA is not visualized and not monitored by ATC and Flight Crew..

### Hotspot Monitoring by NMf:

For the hotspot monitoring purpose, a continuous process takes place to reassess the status of the TTO/TTA. It is based on the Target Deviation Indicator (TDI) measuring the difference between the Target-Time at the TT_fix point and the Achievable Target-Time at the TT_fix point. NM determines the ATT (ETO/ETA).

The calculation of the Target-Time deviation is:

- TDI = TT – ATT

In addition, a Target Window [-x min, +min] is associated with a Target Time. This Target Window (TW) corresponds to the margin of manoeuvre for the flight to achieve the Target Time without negatively impacting the hotspot resolution. The Target Window may depend on the status of the flight (e.g. +- 10 min after TOBT, +- 5 min after TSAT, +- 3 min after ATOT…). TW is only valid for hotspot or constraint locations.

To be noted that TW is only used for Hotspot Monitoring by NMf and not by ATC or Flight Crew.

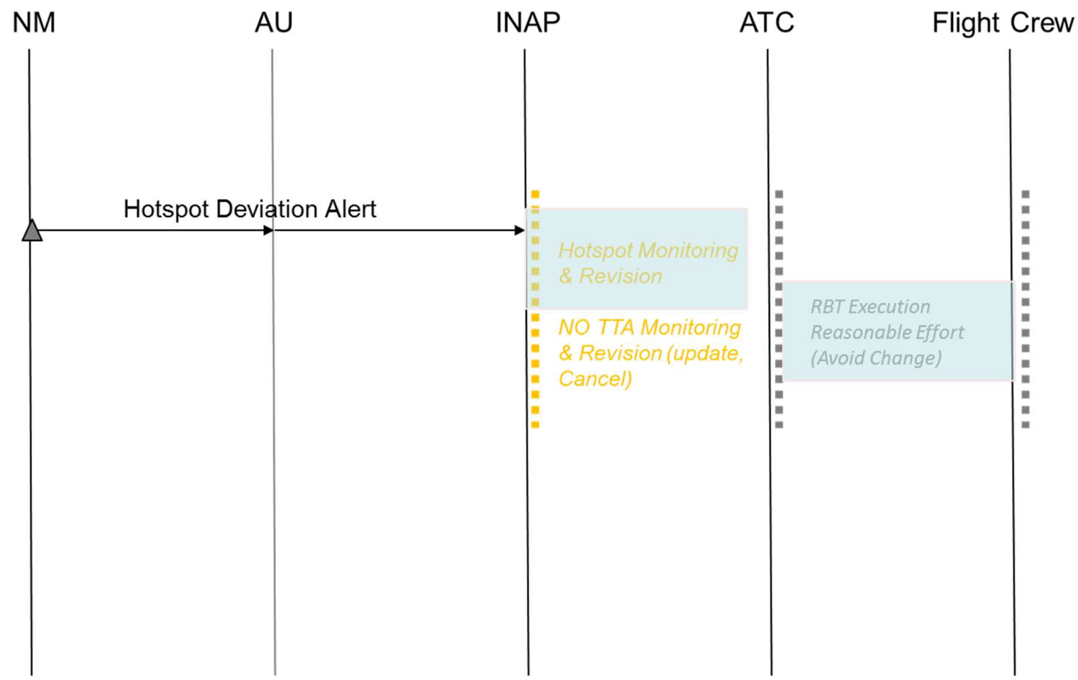



Figure 55: TDI from NMf

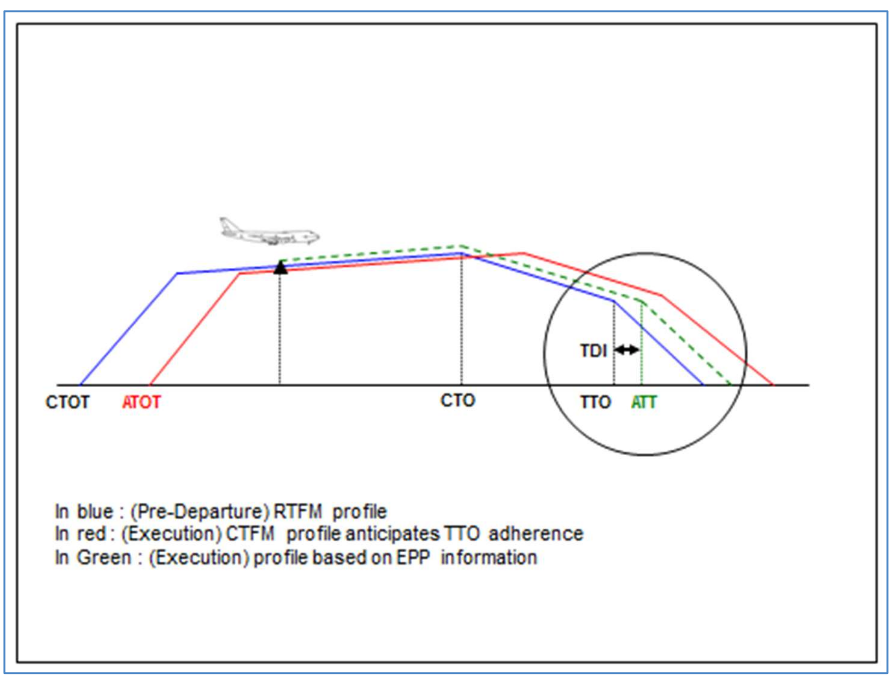



Figure 56: Target Time Deviation

This hotspot resolution deviation is calculated taken into account

- The DCB Dynamic Target Window, i.e. [-min, +min], applied to each Target-Time.
- The Target Deviation Indicator (TDI), i.e. the difference between the Target-Time and the ATT (Achievement Target Time)

In case a deviation outside the Target Window is detected it triggers a warning to INAP that the set of DCB solutions are no longer efficient to resolve the hotspot. INAP analyses the situation to apply a DCB Re-Assessment Process.

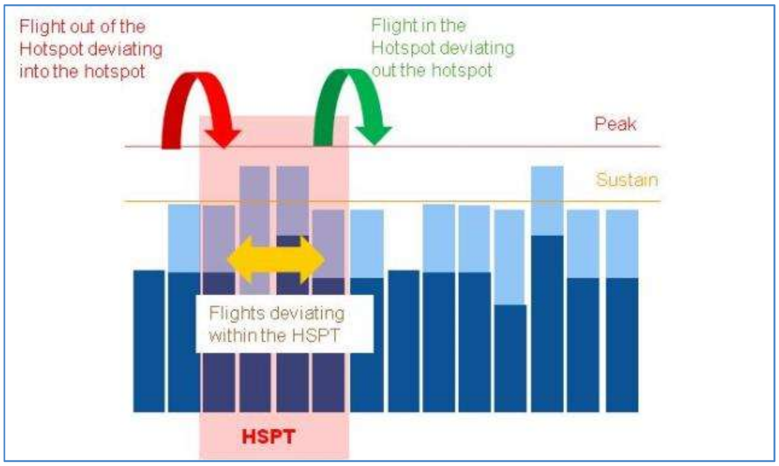



**Figure 57: Monitoring of the Hotspot Resolution**

##### 3.5.2.7.1.3 DCB plan Recovery & TTO/TTA constraint revision

The DCB Re-Assessment Process is activated by the local DCB whenever

- A deviation of the hotspot resolution is detected by the system indicating that the hotspot is no more resolved
- A deviation of the hotspot resolution indicates that the hotspot is cleared
- A deviation has no effect on resolution of the hotspot. It may be the case that the sector at the time of the hotspot remains 'hot' and therefore the hotspot should remain as a protection mechanism and so that the situation is monitored.

With respect to changing conditions, the decision making-criteria triggers an INAP intervention to resolve the residual imbalance. This may lead to an RBT revision process or DCB measures in the planning phases.

#### 3.5.2.7.2 tTTO and tTTA prepared in the RBT Revision process

##### 3.5.2.7.2.1 Preparation and Dissemination of tTTO/tTTA in the execution phase

In order to manage a hotspot resolution, INAP proposes tTTO/tTTA to ATC for implementation. At the appropriate time, and whenever possible, ATC implement the INAP requests by issuing to the Flight Crew the necessary instructions related to the tTTO/tTTA.

The ATC tTTO/tTTA clearance sent to the Flight Crew is in the form of a speed instruction representing a linear absorption of delay to target a point of rendez-vous (tTTO/tTTA).

TTOs/TTAs are elaborated in the frame of the RBT revision process and the information is disseminated to the NMf and AU actors.

The distribution of tTTO/tTTA constraints is based on:

- B2B Services/Messaging from INAP to NMf, AU and ATC to communicate the tTTO/tTTA
- ATC clearance sent to the Flight Crew to communicate the corresponding speed instruction (tTTO/tTTA)

At this point, all actors are informed about the tTTO/tTTA providing a complete situational awareness.

###### 3.5.2.7.2.2 Management of tTTO/tTTA in the execution phase

TTTO/TTTA CONSTRAINT ADHERENCE:

Due to the mandatory aspect of the ATC clearance the tTTO/tTTA adherence management in the execution phase is mandatory. The tTTO/tTTA adherence is within the limits of the Target Window [-1, +1]. The Flight Crew complies with the clearance and execute the trajectory vis a vis the speed instructions.

TTTO/TTTA ADHERENCE MONITORING BY ATC AND FLIGHT CREW:

The tTTO/tTTA information is displayed on the ATC position. In addition, the translation of these tTTO/tTTA in the form of speed changes (mach number) is also displayed. The ATC monitors the proper execution of the speed instruction.

HOTSPOT MONITORING BY NMF:

A continuous process takes place to re-evaluate the achievement of the tTTO/tTTA. It is based on the Target Deviation Indicator (TDI) measuring the difference between the Target-Time at the TT_fix point and the Achievable Target-Time at the TT_fix point.

NM determines the ATT (ETO/ETA).

The calculation of the Target-Time deviation is:

- TDI = TT – ATT

This hotspot resolution deviation is calculated taken into account

- The DCB Dynamic Target Window, i.e. [-min, +min], applied to each Target-Time.
- The Target Deviation Indicator (TDI), i.e. the difference between the Target-Time and the ATT (Achievable Target Time)

In case a deviation outside the Target Window is detected it triggers a warning to INAP that the set of DCB solutions are no longer efficient to resolve the hotspot. INAP analyses the situation to apply a DCB Re-Assessment Process.

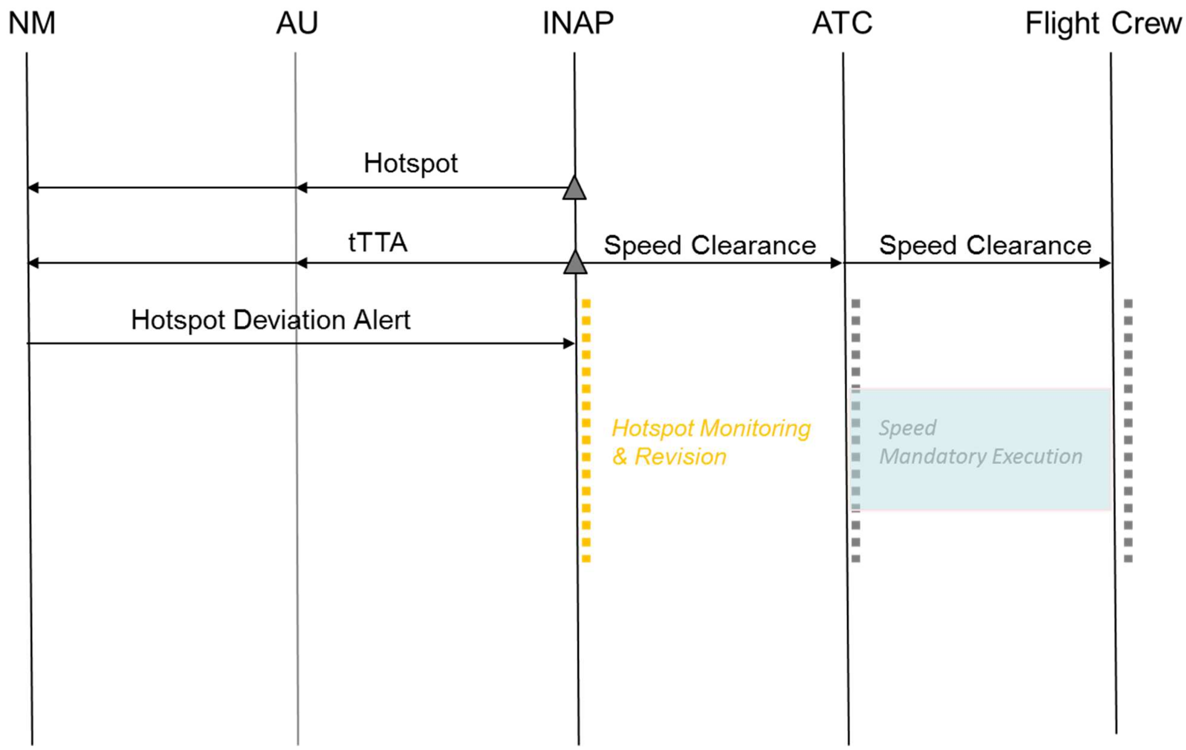



**Figure 58: Hotspot and Speed measure**

DCB PLAN RECOVERY & CONSTRAINT REVISION:

The DCB Re-Assessment Process is activated by the local DCB whenever

- A deviation of the hotspot resolution is detected by the system indicating that the hotspot is no more resolved
- A deviation of the hotspot resolution indicates that the hotspot is cleared
- A deviation has not effect on resolution of the hotspot. It may be the case that the sector at the time of the hotspot remains 'hot' and therefore the hotspot should remain as a protection mechanism and so that the situation is monitored.

With respect to changing conditions, the decision making-criteria triggers an INAP intervention to resolve the residual imbalance. This may lead to a RBT revision process.

### 3.5.2.7.3 From CTOT to TTO/TTA

Target-Time Management has introduced TTA, TTO, tTTA, tTTO. The CTOT is calculated backward (only in case or TTA/TTO) and still managed as a departure contraint [-5,+10]. The question is whether the

CTOT is still relevant or whether it should be adapted or removed, depending of the safety severity and precision of the problem to manage ?

Different type of problems have been introduced : Regulation, Hotspot, Optispot. The CTOT is the mechanism to guarantee the Quality of Service resolving a problem (Regulation, Hotspot). The CTOT is mandatory and appropriate for safety issues. The question is whether it is suitable for the optimisation (optispot) ?

It should be replaced either by TSAT/departure time (CDM Airport/no CDM) or by a new TOBT ?

- Option 1 : Multi-APOC negotiation : The TTA for the arrival sequence (Optispot) is negotiated with the departure Airport. Then, the departure Airport manages the corresponding TSAT (CDM Airport) or the requested departure time (no CDM Airport). This option cannot be envisaged in wave1 because multi-APOC mechanims is not addressed.
- Option 2 : AU changing the flight plan : The TTA for the arrival sequence (Optispot) is negotiated with the AU. The AU refile the flight plan with the corresponding TOBT. This option cannot be envisaged because AUs do not want to refile the flight plan because TOBT is own by the AU for his own problem, the correct standard is TSAT, TTOT or CTOT. The AU should refile the flight plan only in case of new optimum trajectory decided to respect the TTA (new speed). The checking by AU that the TTA is manageable vs the CTOT (or TSAT) will be facilitated by the eFPL, but is supposed to be done today. On top of that, the necessary precision to solve optispot cannot be guaranteed only by AU, but only by departure airport management and all the ATC en route, so the only involvement of AU is not a solution to optispot at arrival airport.
- Option 3: AU requests departure time at not constrained ADEP to accommodate its optimum trajectory according to TTA.

As a result, in wave1 concept, there is no alternative to replace the CTOT

In addition, the Optispot is dedicated to optimise a capacity without any safety issue. An efficient optimisation requires a very high precision with probably an order of [-2, +2] magnitude. This precision can be obtained for airborne flights but not for flights in the pre-departure phase with a [-5, +10] CTOT precision. This implies that to handle optimisation problems, only airborne flights should be managed or that the departure time tolerance (CTOT, TSAT) should be reduced.

To face this new challenge, it should imply that the CTOT tolerance should be adaptive/dynamic to accommodate new needs (Optispot) but also to reflect the departure airport capabilities according to whether the airport is constrained or not. But for now in the context of wave1, it implies to consider Optispot Management only with airborne flights.

In conclusion,

- The CTOT remains the only vehicle to guarantee a controlled departure time according to the TTA. However it cannot guarantee that the TTA will be respected, whatever the precision at departure.
- The CTOT/departure time tolerance cannot provide the required high precision for an Optispot management, specially in arrival airport, and therefore Optispot should only be managed with airborne flights, so with a limited time horizon except for long haul-flights.

### 3.5.2.7.4 EATMA Mode of the Target-Time Management

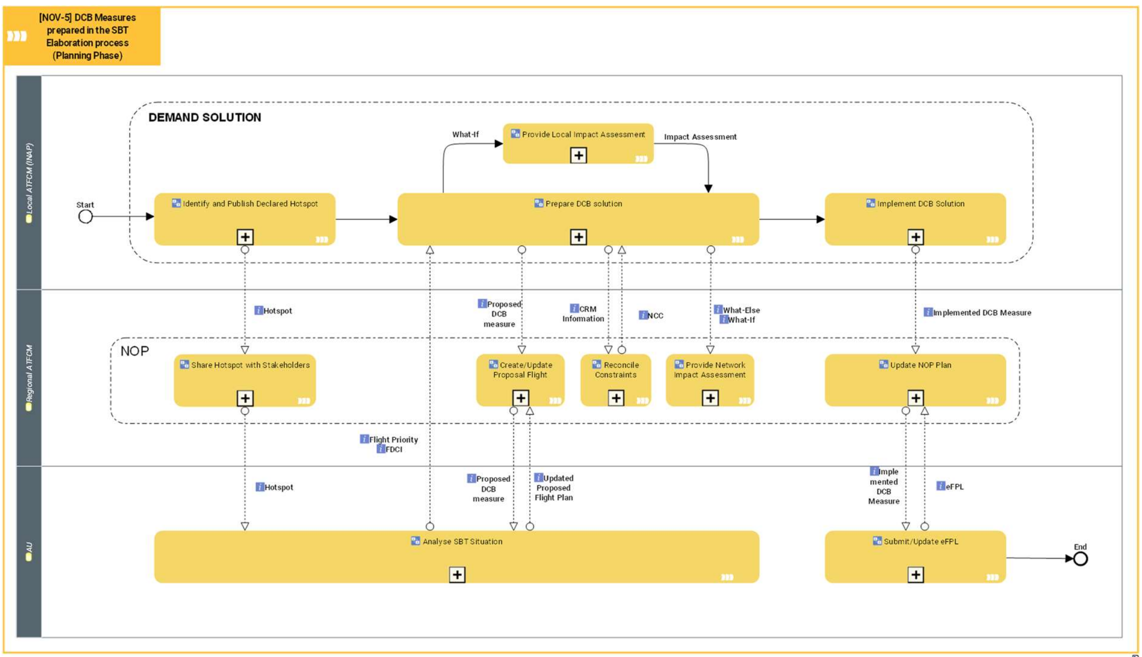



Figure 59: EATMA Model - DCB Measures prepared in the SBT Elaboration process (Planning Phase)

| | |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |

| | |
|---|---|
| | |
| | |
| | |
| | |

| Activity | Description |
|---|---|
| Analyse SBT Situation | The AU function analyse DCB events (imbalance, hotspot, DCB Measures) impacting the the SBT. |
| Create/Update Proposal Flight | AU is informed about TTO/TTA elaborated in the SBT elaboration frame. The AUs can re-plan the SBT in order to avoid the penalties avoiding the hotspot or they can re-fill the EET. |
| Identify and Publish Declared Hotspot | Identify DCB imbalances that need to be monitored and/or resolved by creating and publishing a corresponding hotspot. |
| Implement DCB Solution | Local actor implements the agreed DCB solution. |
| Prepare DCB solution | The NMf local actors prepare DCB measures to resolve the hotspot. |
| Provide Local Impact Assessment | This function provides the impact assessment (what-if) at the local level. |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the network level. |
| Reconcile Constraints | This function collects the planned DCB constraints from local NMF actors and provide the Network Consolidated Constraints (NCC) aiming at reconciling the interfering local constraints. |
| Share Hotspot with Stakeholders | The local hotspots are collected by the Collaborative NOP and accessible by NMf actors |
| Submit/Update eFPL | The AU generates an eFPL or updates an eFPL with changes to the previous one. The AU submits the eFPL to the NMF for operational acceptability. |
| Update NOP Plan | The dDCB/DCB solutions descriptions and their intended use are updated and published in the NOP. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Implement DCB Solution o--> Update NOP Plan | Regional ATFCM | Implemented DCB Measure | |
| AU | Analyse SBT Situation o--> Prepare DCB solution | Local ATFCM (INAP) | Flight Priority | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| AU | Analyse SBT Situation o--> Prepare DCB solution | Local ATFCM (INAP) | FDCI | |
| Regional ATFCM | Update NOP Plan o--> Submit/Update eFPL | AU | Implemented DCB Measure | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Create/Update Proposal Flight | Regional ATFCM | Proposed DCB measure | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Reconcile Constraints | Regional ATFCM | CRM Information | |
| AU | Submit/Update eFPL o--> Update NOP Plan | Regional ATFCM | eFPL | |
| Regional ATFCM | Reconcile Constraints o--> Prepare DCB solution | Local ATFCM (INAP) | NCC | |
| Regional ATFCM | Create/Update Proposal Flight o--> Analyse SBT Situation | AU | Proposed DCB measure | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |
| AU | Analyse SBT Situation o--> Create/Update Proposal Flight | Regional ATFCM | Updated Proposed Flight Plan | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Share Hotspot with Stakeholders o--> Analyse SBT Situation | AU | Hotspot | |
| Local ATFCM (INAP) | Identify and Publish Declared Hotspot o--> Share Hotspot with Stakeholders | Regional ATFCM | Hotspot | |

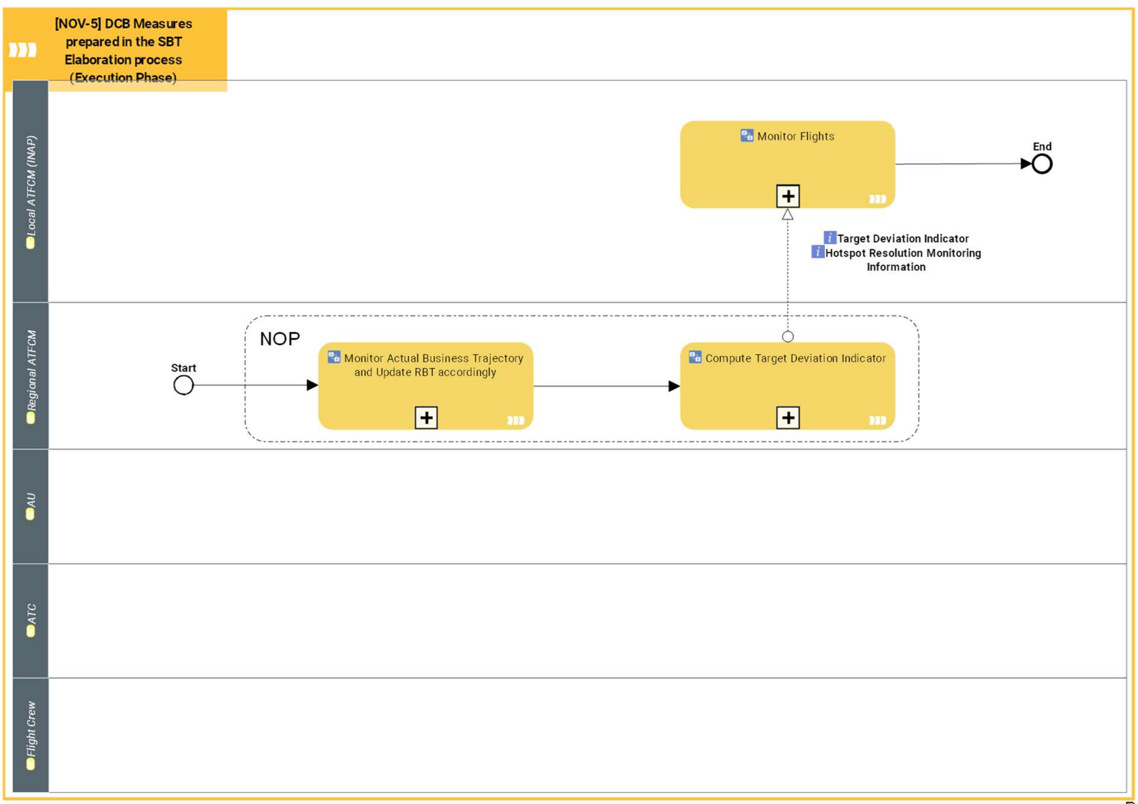



Figure 60: EATMA Model - DCB Measures prepared in the SBT Elaboration process (Execution Phase)

| Activity | Description |
|---|---|
| Compute Target Deviation Indicator | The NM function computes the Target Time deviation (TDI : Target Time Deviation Indicator) and disseminates this information to the concerned NMf actors. |
| Monitor Actual Business Trajectory and Update RBT accordingly | NM function updates the Collaborative NOP with the the updated RBT. |
| Monitor Flights | INAP monitors the tTTO/tTTA adherence. |

| | | | | |
|---|---|---|---|---|
| | | | | |
| | | | | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Compute Target Deviation Indicator o--> Monitor Flights | Local ATFCM (INAP) | Target Deviation Indicator | |
| Regional ATFCM | Compute Target Deviation Indicator o--> Monitor Flights | Local ATFCM (INAP) | Hotspot Resolution Monitoring Information | |

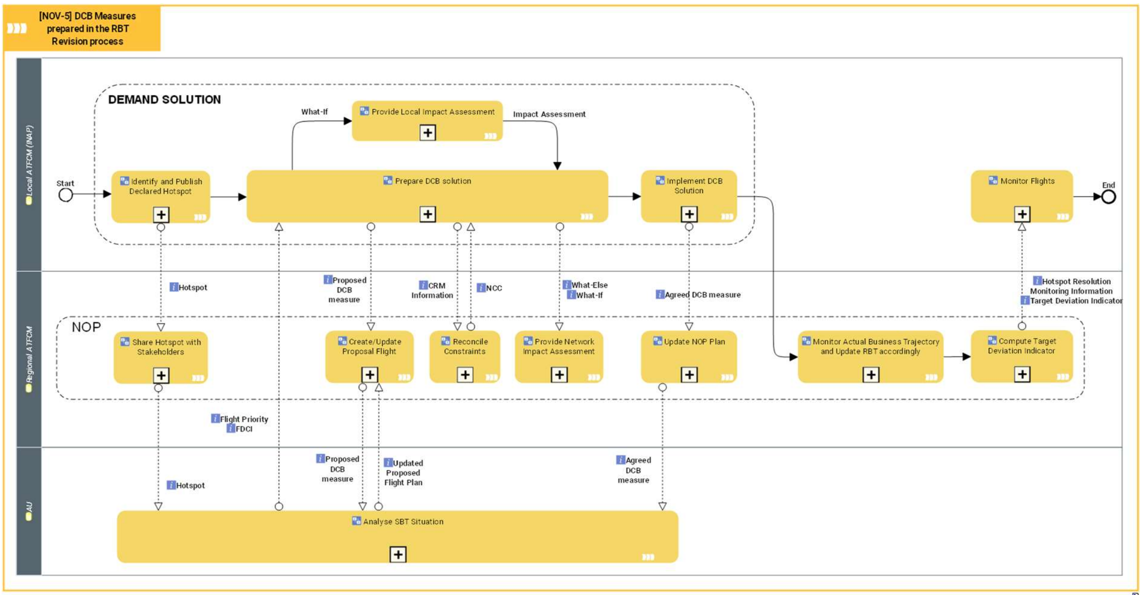



**Figure 61: EATMA Model - DCB Measures prepared in the RBT Revision process**

| Activity | Description |
|---|---|
| Analyse SBT Situation | The AU function analyse DCB events (imbalance, hotspot, DCB Measures) impacting the the RBT. |
| Compute Target Deviation Indicator | The NM function computes the Target Time deviation (TDI : Target Time Deviation Indicator) and disseminates this information to the concerned NMf actors. |
| Create/Update Proposal Flight | This function manage the creation and update of DCB Measures |
| Identify and Publish Declared Hotspot | INAP function identifies and published an hotspot |
| Implement ATC Clearance | The Pilot Crew functions implements the ATC Clearance given by ATC |
| Implement DCB measure | The ATC functions implements the ATC Clearance derived from a DCB measure for RBT. |
| Implement DCB Solution | The ATC functions implements the ATC Clearance derived from a DCB measure for RBT. |

| | |
|---|---|
| Monitor Actual Business Trajectory and Update RBT accordingly | NM function updates the Collaborative NOP with the the updated RBT. |
| Monitor Flights | INAP monitors the tTTO/tTTA adherence. |
| Prepare DCB solution | The NMf local actors prepare DCB measures to resolve the hotspot. |
| Provide Local Impact Assessment | This function provides the impact assessment (what-if) at the local level. |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the network level. |
| Reconcile Constraints | The local hotspots are collected by the Collaborative NOP and accessible by NMf actors |
| Share Hotspot with Stakeholders | The local hotspots are collected by the Collaborative NOP and accessible by NMf actors |
| Update NOP Plan | The DCB/DCB solutions descriptions and their intended use are updated and published in the NOP. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Implement DCB Solution o--> Update NOP Plan | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update NOP Plan | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| AU | Analyse SBT Situation o--> Prepare DCB solution | Local ATFCM (INAP) | Flight Priority | |
| AU | Analyse SBT Situation o--> Prepare DCB solution | Local ATFCM (INAP) | FDCI | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Create/Update Proposal Flight | Regional ATFCM | Proposed DCB measure | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Reconcile Constraints | Regional ATFCM | CRM Information | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Reconcile Constraints o--> Prepare DCB solution | Local ATFCM (INAP) | NCC | |
| Regional ATFCM | Create/Update Proposal Flight o--> Analyse SBT Situation | AU | Proposed DCB measure | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |
| AU | Analyse SBT Situation o--> Create/Update Proposal Flight | Regional ATFCM | Updated Proposed Flight Plan | |
| Regional ATFCM | Share Hotspot with Stakeholders o--> Analyse SBT Situation | AU | Hotspot | |
| Local ATFCM (INAP) | Identify and Publish Declared Hotspot o--> Share Hotspot with Stakeholders | Regional ATFCM | Hotspot | |
| Regional ATFCM | Compute Target Deviation Indicator o--> Monitor Flights | Local ATFCM (INAP) | Target Deviation Indicator | |
| Regional ATFCM | Compute Target Deviation Indicator o--> Monitor Flights | Local ATFCM (INAP) | Hotspot Resolution Monitoring Information | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Update NOP Plan o--> Analyse SBT Situation | AU | Agreed DCB measure | ATFMMeasure |
| Regional ATFCM | Update NOP Plan o--> Analyse SBT Situation | AU | Agreed DCB measure | ATFMMeasure |

#### 3.5.2.8 Synchronization

With the full INAP concept, a variety of local functions (EnRoute and Approach ATC, DCB, APT, AU) are now able to propose for the same flight and at the same time several corrective short-term measures with overlaying horizons which can be affected by concurrent strategies. For this reason, the interaction between DCB and the other En Route and Approach ATC and APT activities needs to be properly managed in order to avoid interfering concurrent actions.

Synchronization process encompasses the management of simultaneous concurrent corrective short-term measures strategies resulting in compatible modifications, on SBT and RBT. Synchronization refers to the idea that competitive measures can co-exist without interfering with the respective DCB/ATC/APT/AU plans.

The process takes place when several ATM functions propose a corrective measure for the same flight(s):

- Intra DCB measures related to density, complexity, traffic organization
- DCB & Arrival management process (e.g. Extended-AMAN)
- DCB & Airport (TSAT, UDPP)

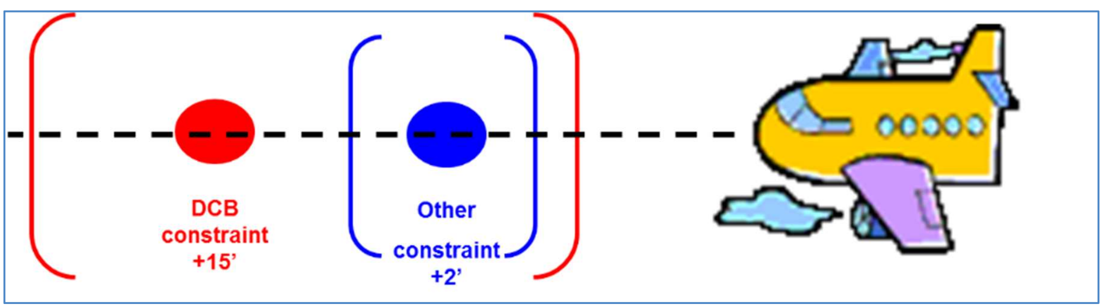



**Figure 62 Synchronization Process**

It is important to keep in mind the main difference with the Constraint Reconciliation process which takes place when the corrective measures are NOT compatible, as shown on figure Y.

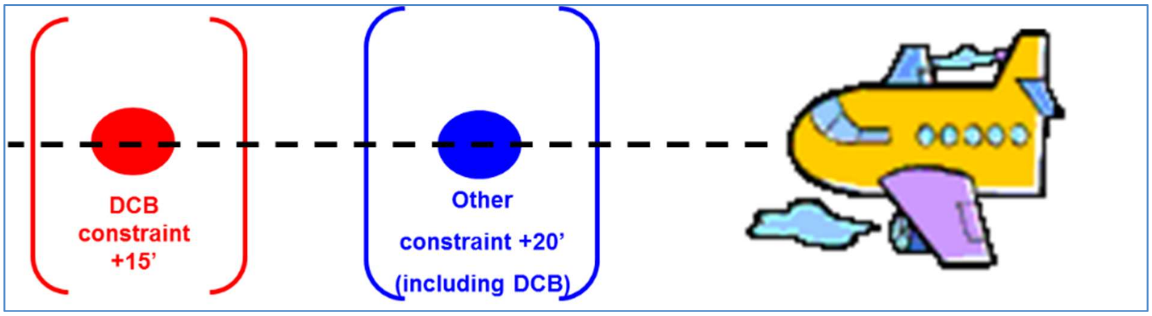



Figure 63 Reconciliation Process

### Example of Synchronization

In the DCB process, flights crossing a declared hotspot – or optispot - (illustrated as the orange rectangle in figure below) will receive a (tactical) Target Time (entry in the hotspot/optispot) associated to a static Target Window (e.g. +/- 4 minutes), illustrated in red brackets in the figure below. That Target Window represents the room of margin available for the flights to achieve the Target Time without negatively impacting the hotspot/optispot resolution.

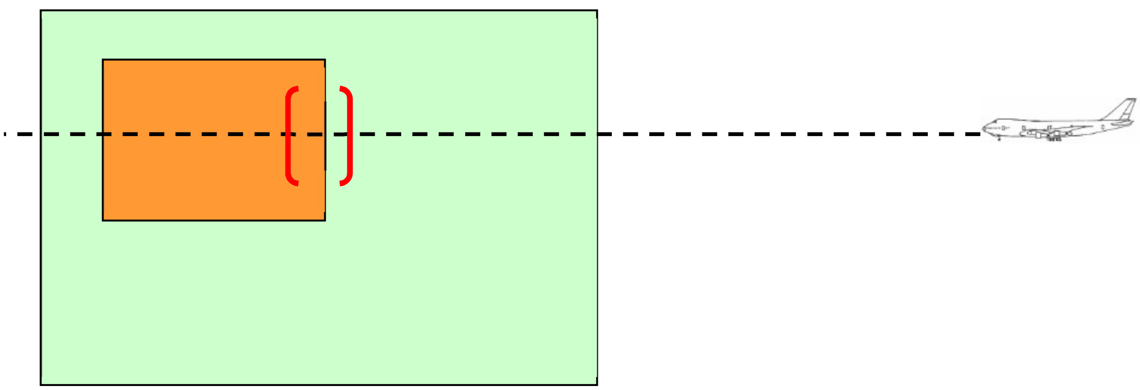


**Figure 64: DCB Target Window for Hotspot / Optispot Resolution (1)**

In this particular example, the synchronization consists in allowing the ATC, APT or LTM/ EAP to propose corrective actions on flights already subject to tTTO and crossing a declared hotspot/optispot in the limit of the DCB Target Window declared until the hotspot/optispot area is crossed.

In such a case, the concurrent constraint does not interfere with the DCB constraint.

In order to understand the principle, the following example is explained and illustrated. A flight (callsign FL123) has been given a DCB constraint of 15' delay to solve a detected hotspot (or optispot)

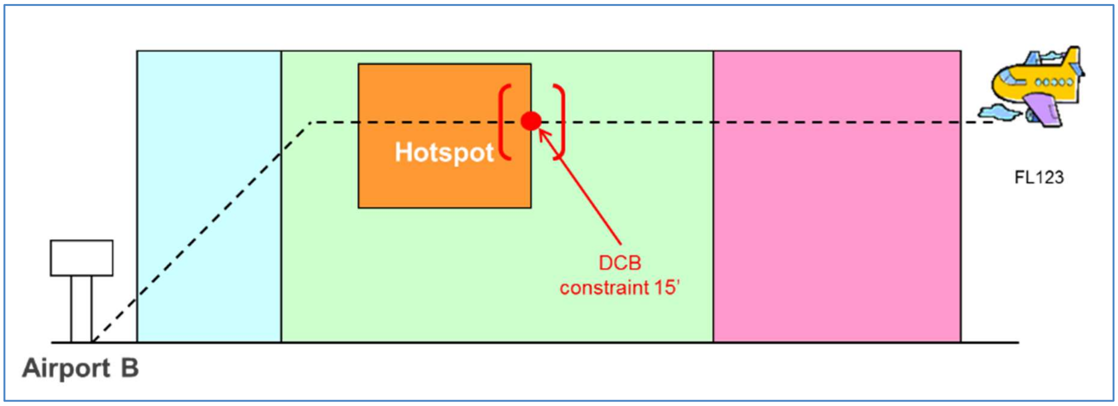



Figure 65: DCB Target Window for Hotspot / Optispot Resolution (2)

Arrival Airport (Airport B) expects a bunch at flight arrival planned time and needs FL123 to arrive with 3' of delay to reach a better sequencing (through tool Extended AMAN for example). Local DCB actors (INAP) are informed of the need and check the compatibility of the measures in regards with expressed plans and constraints. In case measures are compatible, the synchronisation process is successful and all actors are informed. Based on the MPC rule, dthe DCB constraint is applied translated for various actors and needs into TTG/TTL and/or tTTO/tTTA and a speed constraint for flight crew.

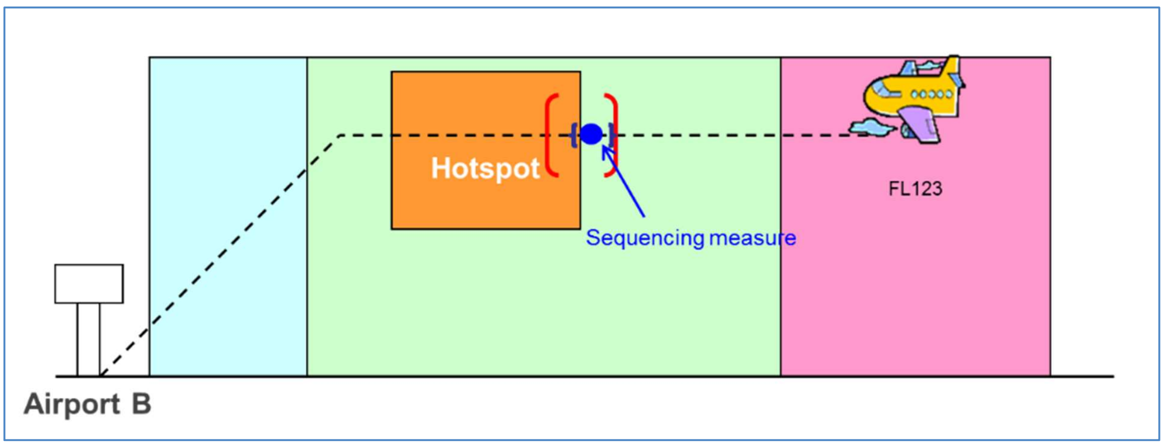



Figure 66: DCB Target Window for Hotspot / Optispot Resolution (3)

## Synchronization Key Enablers

To be implemented efficiently, the synchronization process needs the following key enablers:

- Solid information/data exchange mechanism between all partners INAP/ATC/APT/ AU/NM. The synchronization process can work only if DCB and ATFCM measures are shared to all actors involved in due time and with accurate information.
- Highly automated process to ease the workload (detection, notification alerts). The synchronization process shall be automated at least for:

  - Analysis of a new ATFCM measure: when a new ATFCM measure is proposed by local actors, check if other measures are active on the same flight at the same time horizon and compute if the delays are compatible
  - Notify if a synchronization case is detected and provide:
    - Information about the synchronization process in progress to INAP position (between which measures)
    - which information is displayed to CWP as synchronization final and definitive result
    - and which resulting measure will be applied and sent to Flight Crew.
  - Alert if a synchronization is not possible and a need for reconciliation process is confirmed

- Identified limits for compatibility by means of margin of manoeuvres (e.g. DCB Target Window). To work properly, ATFCM measures need to be provided with homogenized target window computation.
- Clear process & procedures (e.g. interaction with AUs, safety issues). Synchronisation outputs shall be understood by all involved actors: how the measures are compared, how the resulting measure is provided and so on.

### Operating Method

The AMAN (Arrival Manager) horizon will be extended into En-Route sectors for a single TMA, enabling queuing times to be absorbed further upstream. With further extension of AMAN horizons, En-Route sectors are affected by concurrent arrival management strategies due to the overlapping AMAN horizons of several independent TMAs, and at the same time need to consider the impact on non-arrival traffic within the sector as well as DCB constraints/activities. It is proposed to synchronise the DCB and Extended AMAN constraints where appropriate, in order to minimise the residual interferences. Residual interferences will be managed differently depending if:

- The Flight is in the planning phase: DCB and Extended-AMAN constraints will be reconciled afterward according to NM priority rules
- The Flight is in the execution phase: DCB and Extended-AMAN constraints will be arbitrated and managed by the INAP actor.

In both cases, providing all stakeholders, and especially AUs (including flight deck when airborne), with timely and relevant information about Extended AMAN activity is key to ensure predictability and stability of the plan.

Extended AMAN enables optimization of arrival traffic management in the en-route phase. Once an aircraft enters the eligibility Horizon[11] , extended AMAN starts to prepare the sequence planning based on the latest Network Manager System data. With such a horizon, Extended AMAN will capture both ground and airborne flights, when required.

In the Eligibility Horizon, Extended AMAN will not request actions on the aircraft from upstream ATSUs, and it will use updated information from the Network Management system (e.g. ETFMS) to refresh the previewed sequence.

Once the aircraft enters the Active Advisory Horizon (AAH), and depending on the delay sharing strategy selected for Extended AMAN operations, the Extended AMAN may send time constraint for concerned flights in the form of CTA/CTO or time to lose (TTL) in upstream ATSUs.

Extended AMAN planning activity within the Active Advisory Horizon, even if of low magnitude, may result in creating unexpected peaks of traffic in upstream ATSUs that will facilitate the arrival management of the concerned airports. The multiplication of such bunch of traffic could create demand/capacity imbalances resulting into declared hotspot.

Therefore, it is necessary that Extended AMAN activity can be identified and presented to local-DCB actors in order to allow them to correctly monitor the traffic situation within their area of responsibility and to detect if Extended AMAN proposals disturb the current operations.

The Extended AMAN activity can be quantified and presented to the local-DCB actor in terms of:

- Number of Extended AMAN proposal per unit of time and or per aircraft
- Occupancy and or Entry load variation due to Extended AMAN

The quantification of the Extended AMAN level of activity has to be determined well in advance in order for FMPs and local-DCBs to plan the expected workload requested to them by the Extended AMAN.

Two different levels of analysis are considered:

- a macro level, with a go/ no go, based on the previous criteria (Number of Extended AMAN proposal per unit of time and or per aircraft and occupancy and or Entry load variation due to Extended AMAN)
- a micro level (EAP), where the EAP would decide on which advisories should be transmitted to which sectors (flight by flight basis), even If the macro analysis has stated for a ‘go’. This would avoid bunching on CWPs, with too many requests that cannot be satisfied (the best effort principle would induce very little implementation ratio in this case)

## ATFCM Measures eligible to Synchronisation Process

The array below shows which measures can be subject to synchronisation, based mainly on their time horizon and purpose (in green: measures to be considered for synchronisation, in yellow: measures to be considered for synchronisation providing establishment of specific rules):

| MEASURE | CASA | STAM | COP-ORG | SEQ/AIMA/ COP-SEQ | Extended AMAN |
|---|---|---|---|---|---|
| CASA | | | | | |
| STAM | | | | | |
| COP-ORG | | | | | |
| SEQ/AIMA/COP-SEQ | | | | | |

**Table 15 ATFCM Measures eligible to Synchronisation Process**

| | |
|---|---|
| Use case | INAP Resolution of Optispot with En-Route (Cop-Organizer or Seq) and Extended AMAN |

### 3.5.2.8.1 EATMA Model of the Synchronization Process

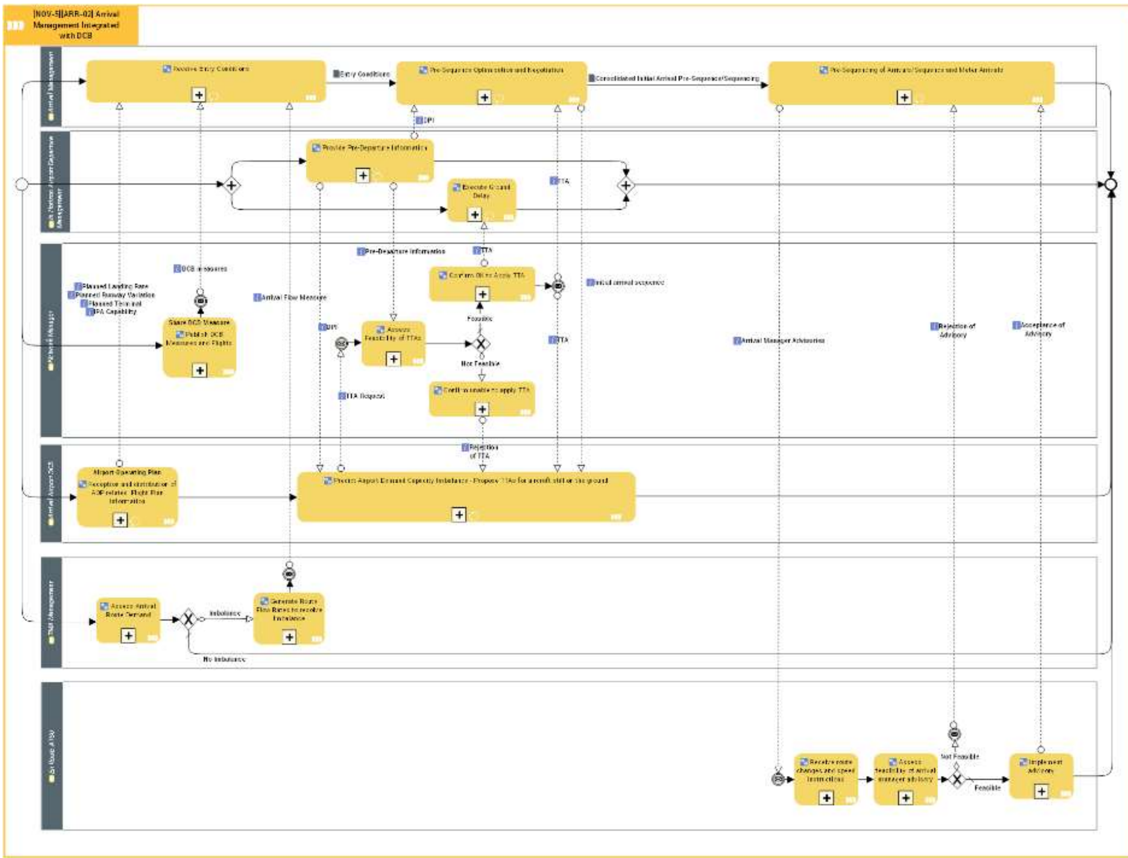


**Figure 67: EATMA Model – Arrival Management Integrated with DCB**

Diagram Id: 9B709E385B286C31

| Activity | Description |
|---|---|
| Assess Arrival Route Demand | The TMA Manager assesses the arrival route demand to determine if there is an imbalance |
| Assess feasibility of arrival manager advisory | The En Route ATSU assesses the feasibility of the arrival manager advisory and sends the feasibility status (accept / reject) to the Arrival Manager. |

| | |
|---|---|
| Assess Feasibility of TTAs | The Network Manager receives proposed TTAs from the Airport DCB and assesses their feasibility within the wider context of the network. |
| Confirm OK to Apply TTA | The Network Manager confirms that the TTAs (proposed or updated) can be applied and forwards on the TTAs to the In Horizon Airport Departure Manager and Destination Arrival Manager and shares TTA information via the NOP. |
| Confirm unable to apply TTA | The Network Manager confirms UNABLE that the TTAs can be applied and sends an UNABLE confirmation to the Arrival Airport DCB. |
| Execute Ground Delay | The In Horizon Airport Departure Manager receives the TTAs and facilitates the TTAs in the departure sequence. |
| Generate Route Flow Rates to resolve imbalance | The TMA Manager calculates the route flow rates for the available arrival routes and sends this to the Destination Arrival Manager |
| Implement advisory | Provide Aircraft with TTL or Target time at IMP/MP |
| Pre-Sequence Optimisation and Negotiation | The destination Sequence Manager receives updates for active flights within the Long Range Eligibility Horizon / Extended Eligibility Horizon. The Sequence Manager generates a consolidated initial arrival pre-sequence that absorbs some predicted arrival delay at the destination airport and smooth''s the inbound arrival flows within the extended TMA.<br>The Sequence Manager takes into consideration pre-departure information from in horizon departures and can also receive NM approved Target Times of Arrivals of pre-departure aircraft within the extended eligibility horizon; facilitating their times within the initial arrival sequence. The Sequence manager also adheres to the Arrival Flow Measures received from the Extended-TMA Manager. |
| Pre-Sequencing of Arrivals/Sequence and Meter Arrivals | The Sequence Manager issues the arrival sequence and advisories that aim to absorb predicted arrival delay and smooth the presentation of traffic inbound to the destination airport. To achieve the sequence times, the Arrival Manager can issue advisories to the upstream En Route ATSU(s) e.g; Speed change instructions, Time to Lose / Gain, CTAs within an aircraft ETA min/max window (for aircraft with 4D capability) |
| Predict Airport Demand Capacity Imbalance - Propose TTAs for aircraft still on the ground | The Airport DCB receives the initial arrival sequence from Arrival Management and the Pre-Departure Information from the In Horizon Airport Departure Management and predicts an imbalance and proposes Target Times of Arrival to the Network Manager to alleviate the imbalance. The proposed TTA are consistent with Airport Demand Capacity and the Initial Arrival Sequence. |
| Provide Pre-Departure Information | The In Horizon Airport Departure Manager provides aircraft Pre-Departure Information to; the Arrival Manager, Network Manager and Arrival Airport DCB. |



| | |
|---|---|
| Publish DCB Measures and Flights | NOP shares the DCB measures and impacted flights with stakeholders. |
| Receive Entry Conditions | The destination sequence manager receives the initial sequencing conditions including; Delay Absorption Strategy (from the Collaborative Platform), Arrival Flow Measures (from the Extended-TMA Manager), Airport Operating Plan preference information (from destination airport) prior to aircraft entering the Long Range Eligibility Horizon / Extended Eligibility Horizon. |
| Receive route changes and speed instructions | The En Route ATSU receives the Arrival Manager Advisories detailing the route changes and speed instructions / aircraft to be pre-sequenced (on best effort basis). |
| Reception and distribution of AOP related Flight Plan information | This activity involves handling all data exchanges between the Airport Operations Centre and Network Management. This consists of the AOC sending airports slot, TSAT,TTOT, SID, STAR and taxi time information and receiving Extended and Reference Flight Plan information. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Network Manager | Throwing o--> Receive Entry Conditions | Arrival Management | DCB measures | ATFCMMeasure |
| Network Manager | Throwing o--> Receive Entry Conditions | Arrival Management | DCB measures | ATFCMMeasure |
| TMA Management | Throwing o--> Receive Entry Conditions | Arrival Management | Arrival Flow Measure | |
| Arrival Airport DCB | Airport Operating Plan o--> Receive Entry Conditions | Arrival Management | Planned Landing Rate | RunwayLandingRate |
| Arrival Airport DCB | Airport Operating Plan o--> Receive Entry Conditions | Arrival Management | Planned Runway Variation | |
| Arrival Airport DCB | Airport Operating Plan o--> Receive Entry Conditions | Arrival Management | Planned Terminal | Terminal |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Arrival Airport DCB | Airport Operating Plan o--> Receive Entry Conditions | Arrival Management | IPA Capability | |
| Arrival Airport DCB | Predict Airport Demand Capacity Imbalance - Propose TTAs for aircraft still on the ground o--> Catching | Network Manager | TTA Request | |
| Network Manager | Throwing o--> Predict Airport Demand Capacity Imbalance - Propose TTAs for aircraft still on the ground | Arrival Airport DCB | TTA | TargetTimeOfArrival |
| Network Manager | Confirm OK to Apply TTA o--> Execute Ground Delay | In Horizon Airport Departure Management | TTA | TargetTimeOfArrival |
| Network Manager | Confirm unable to apply TTA o--> Predict Airport Demand Capacity Imbalance - Propose TTAs for aircraft still on the ground | Arrival Airport DCB | Rejection of TTA | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Arrival Management | Pre-Sequence Optimisation and Negotiation o--> Predict Airport Demand Capacity Imbalance - Propose TTAs for aircraft still on the ground | Arrival Airport DCB | Initial arrival sequence | InitialLandingSequence |
| In Horizon Airport Departure Management | Provide Pre-Departure Information o--> Pre-Sequence Optimisation and Negotiation | Arrival Management | DPI | DPI |
| In Horizon Airport Departure Management | Provide Pre-Departure Information o--> Predict Airport Demand Capacity Imbalance - Propose TTAs for aircraft still on the ground | Arrival Airport DCB | DPI | DPI |
| En Route ATSU | Throwing o--> Pre-Sequencing of Arrivals/Sequence and Meter Arrivals | Arrival Management | Rejection of Advisory | |
| En Route ATSU | Implement advisory o--> Pre-Sequencing of Arrivals/Sequence and Meter Arrivals | Arrival Management | Acceptance of Advisory | ArrivalManagementAdvisory |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Arrival Management | Pre-Sequencing of Arrivals/Sequence and Meter Arrivals o--> Catching | En Route ATSU | Arrival Manager Advisories | ArrivalManagementAdvisory |
| Network Manager | Throwing o--> Pre-Sequence Optimisation and Negotiation | Arrival Management | TTA | TargetTimeOfArrival |
| In Horizon Airport Departure Management | Provide Pre-Departure Information o--> Assess Feasibility of TTAs | Network Manager | Pre-Departure Information | |

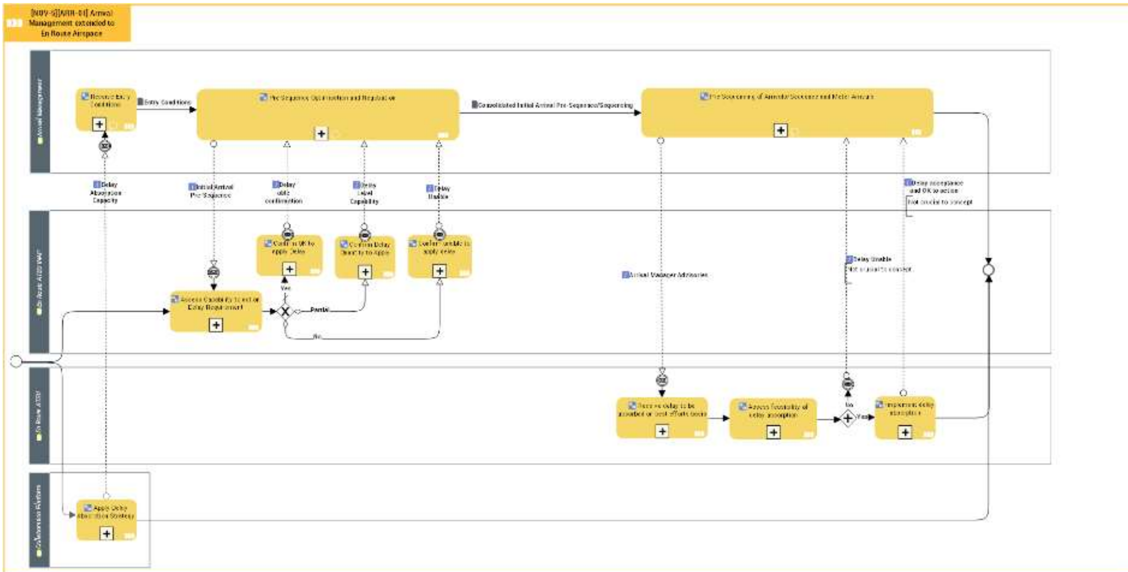


**Figure 68 : EATMA Model : Arrival Management extended to En-Route Airspace**

Diagram Id: B07BB6305B2743E2

| Activity | Description |
|---|---|
| Assess Capability to act on Delay Requirement | The INAP assesses the capability to act on the delay requirement and provides a pre-agreed Delay Absorption Capacity pattern to the Arrival Manager. |
| Assess feasibility of delay absorption | The En Route ATSU assesses the feasibility of the delay absorption request in the advisories and sends the feasibility status (accept / reject) to the Arrival Manager |
| Confirm Delay Quantity to Apply | The INAP confirms to the Arrival Manager that the delay absorption in the Initial Arrival Sequence is partially acceptable and confirms the delay quantity to apply |
| Confirm OK to apply Delay | The INAP confirms to the Arrival Manager that the delay absorption in the Initial Arrival Sequence is acceptable |
| Confirm unable to apply delay | The INAP confirms to the Arrival Manager that the delay absorption in the Initial Arrival Sequence is not acceptable and rejects the Initial Arrival Sequence |
| Implement delay absorption | The ATSU implements feasible Arrival Manager advisories to absorb predicted holding delay and synchronise inbound traffic |
| Receive delay to be absorbed on best efforts basis | The En Route ATSU receives the Arrival Manager Advisories detailing the delay to be absorbed / traffic synchronised (on best effort basis) |
| Apply Delay Absorption Strategy | The Collaboration Platform pre-determines the delay absorption strategy taking into account the limited capability of the En route |

| | |
|---|---|
| | sectors to act on delay requirements. Multiple priorities could be considered e.g. network impact, airport priorities, flows, airline strategies. |
| Pre-Sequence Optimisation and Negotiation | The destination Sequence Manager receives updates for active flights within the Long Range Eligibility Horizon / Extended Eligibility Horizon. The Sequence Manager generates a consolidated initial arrival pre-sequence that absorbs some predicted arrival delay at the destination airport and smooth''s the inbound arrival flows within the extended TMA.<br>The Sequence Manager takes into consideration pre-departure information from in horizon departures and can also receive NM approved Target Times of Arrivals of pre-departure aircraft within the extended eligibility horizon; facilitating their times within the initial arrival sequence. The Sequence manager also adheres to the Arrival Flow Measures received from the Extended-TMA Manager. |
| Pre-Sequencing of Arrivals/Sequence and Meter Arrivals | The Sequence Manager issues the arrival sequence and advisories that aim to absorb predicted arrival delay and smooth the presentation of traffic inbound to the destination airport. To achieve the sequence times, the Arrival Manager can issue advisories to the upstream En Route ATSU(s) e.g; Speed change instructions, Time to Lose / Gain, CTAs within an aircraft ETA min/max window (for aircraft with 4D capability) |
| Receive Entry Conditions | The destination sequence manager receives the initial sequencing conditions including; Delay Absorption Strategy (from the Collaborative Platform), Arrival Flow Measures (from the Extended-TMA Manager), Airport Operating Plan preference information (from destination airport) prior to aircraft entering the Long Range Eligibility Horizon / Extended Eligibility Horizon. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Arrival Management | Pre-Sequence Optimisation and Negotiation o--> Catching | En Route ATSU INAP | Initial Arrival Pre-Sequence | |
| Arrival Management | Pre-Sequencing of Arrivals/Sequence and Meter Arrivals o--> Catching | En Route ATSU | Arrival Manager Advisories | ArrivalManagementAdvisory |



| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| En Route ATSU INAP | Throwing o--> Pre-Sequence Optimisation and Negotiation | Arrival Management | Delay able confirmation | FlightConfirmationMessage |
| En Route ATSU INAP | Throwing o--> Pre-Sequence Optimisation and Negotiation | Arrival Management | Delay Level Capability | DelayApportionment |
| Collaboration Platform | Apply Delay Absorption Strategy o--> Catching | Arrival Management | Delay Absorption Capacity | DelayApportionment |
| En Route ATSU | Throwing o--> Pre-Sequencing of Arrivals/Sequence and Meter Arrivals | Arrival Management | Delay Unable | |
| En Route ATSU INAP | Throwing o--> Pre-Sequence Optimisation and Negotiation | Arrival Management | Delay Unable | |
| En Route ATSU | Implement delay absorption o--> Pre-Sequencing of Arrivals/Sequence and Meter Arrivals | Arrival Management | Delay acceptance and OK to action | DelayMessage |

#### 3.5.2.9 Collaborative Framework

The Collaborative Framework supports:

- the Network Management function in which the local actors (INAP, Airports, AUs) will have significant roles and responsibilities to manage DCB solutions in the short-term planning/execution phases for daily nominal operations. NM plays also an important role, supporting CDM and consolidating local perspectives to share them via the NOP.

- the NM key role in Long- and Medium- term planning, as well as in the critical event and crisis management

The collaborative framework is part of the overall Collaborative NOP and it focuses on collaborative Decision-making mechanisms in support of DCB activities.

#### 3.5.2.9.1 The Collaborative Framework Process

It aims at describing the variety of options supporting the Collaborative Decision-Making DCB process between the regional (NM) and/or the sub-regional/local DCB (INAP) and/or the Airport (APOC) and/or AU (FOC) to manage a common agreement on the best accommodation of DCB solutions both for safety issues and areas of opportunities for optimization. The benefits of managing DCB solutions in a cooperative way are to reach a common agreement amongst stakeholders which will then incite them to execute the DCB plan.

The objective is to facilitate cooperation between NM, AU, APT and INAP and support the Collaborative Decision-making mechanisms providing transparency and feedback on the impact of DCB activities on their operations. To be noted that it must be considered as areas deserving validation and more detailed description in the OSED.

is the Collaborative Framework process is articulated around some major features:

- The provision of network consolidated imbalance figures
- The provision of Hotspot and Optispot information
- The provision of what-if capabilities to simulate alternate SBT/RBT based on Performance Indicators
- The provision of what-else capabilities to propose alternate SBT/RBT based on Performance Indicators
- The provision of the Network Consolidated Constraint (NCC) generated by the Multiple Contraint Reconciliation.
- The management of Hotspot
- The management of DCB Measures

  - Consolidated Imbalances figures

At any time in the D-1 to 20 min timeframe, the consolidated imbalance figures are available to all actors to perform a network impact assessment evaluation. The Imbalance Confidence Index associated to the consolidated imbalance figures supports the actors to trigger the decision at the best moment according to the level of certainty of the prediction. Imbalances are consolidated at network level, but are not necessarily all generated at network level.

  - Hotspot information

As soon as a Hotspot is notified, the information is available to all actors allowing them to anticipate potential SBT/RBT penalties and minimise the SBT/RBT impact. Additional information like the Hotspot criticality can support the decision-making of stakeholders.

  - What-if capabilities

At any time in the D-1 to 20 min timeframe, the what-if capabilities are available to all actors. The what-if simulates the alternate SBT/RBT providing values concerning the targeted Performance Indicators (imbalances figures, reactionary delay …). It allows comparing the local and networking performance impact comparing different status of the DCB activities.

- What-else capabilities

At any time in the D-1 to 20 min timeframe, the what-else capabilities are available to all actors. The what-else proposes alternate SBT/RBT optimising targeted Performance Indicators (imbalances figures, reactionary delay …).

- Multiple Target-Time Constraint Information

At any time in the D-1 to 20 min timeframe, when local actors propose a Target-Time Measure (Flight Proposal), the NM system in a continuous re-assessment notifies to the concerned actors the Target-Time situation regards to the Most Penalizing Constraint or Priority Rules impacting the request.

- Hotspot Management

At any time in the D-1 to 20 min timeframe, NM and INAP actors can create, modify, cancel and delegate a hotspot (to elaborate and revise DCB Measures). The hotspot is notified with some attributes (reference location, status, start/end time, criticality…).

- Measure Management

At any time in the D-1 to 20 min timeframe, NM and INAP actors can elaborate and revise DCB Measures. The DCB Measure is managed according to different status (draft, proposed, for coordination, coordinated, for implementation implemented, abandoned). The DCB measure is prepared in the frame of the SBT elaboration or RBT revision.

The DCB Collaborative mechanism identifies several generic modus operandi and workflow depending of:

- Location of the Spot
  - En Route or Arrival
- ATM phases
  - DCB solutions can be prepared mainly either in the SBT Elaboration process or in the RBT revision process
- Mode of Collaboration

The nature of the problem to be managed (Spot Category) implies different actors, roles and responsibilities. Several modes of collaboration and delegation are defined :

- Full Autonomy: it concerns the full responsibility and authority to manage a Spot identification, resolution design and implementation. CDM is still applicable to take collaborative decision with others actors (coordination mechanism)

- Full Delegation: It concerns the full transfer of responsibility and authority of the Spot resolution from INAP to an other actor. The delegated actor in charge is accountable for the outcome and implements the DCB solution. The full delegation can concerns :

  - Hotspot delegation : The delegated actor has the full choice to decide DCB solutions to be applied
  - Hotspot resolution delegation and proposed flights candidates for DCB Measures : the delegated actor shall only apply DCB solutions on flight candidates proposed by INAP
  - Hotspot resolution delegation and on-going related DCB Measures : the delegated actor shall manage on-going DCB solutions initiated by INAP

- Limited Delegation: It concerns the limited transfer of responsibility and authority, during a determined timeframe, of the Spot resolution from INAP to a delegated actor. At the end of the delegation, the delegated actor proposes a solution to INAP. INAP is accountable for the outcome and implementation of the DCB solution.
  - Hotspot resolution delegation : The delegated actor has the full choice to decide DCB solutions to be applied
  - Hotspot resolution delegation and proposed flights candidates for DCB Measures : the delegated actor shall only apply DCB solutions on flight candidates proposed by INAP
  - Hotspot resolution delegation and proposed related DCB Measures : the delegated actor shall manage on-going DCB solutions initiated by INAP

INAP can initiate a delegation mode, can update the delegation mode and can cancel the delegation if necessary for a take-over. The delegation period is specified with a time-out in the case of a limited delegation. INAP can delegate a hotspot and specify the candidate flights for DCB measures. Also, INAP can delegate a hotspot and on-going DCB measures.

INAP can specify a required performance objective (e.g. max delay) to be achieved in the delegation 'contract'.

The delegation mechanism requires a long anticipation to put all this in place which implies to manage SBT only in ~ [6 hrs – 2 hrs] timeframe.

In the figure below are described the different modes of collaboration depending the category of problems (CrisisSpot, CriticalSpot, Hotspot, OptiSpot) and actors (NM, INAP, APT, AU).

| | DCB Actors (NM) | DCB Actors (INAP) | Others Actors (APT, AU, …) |
|---|---|---|---|
| CrisisSpot | Full Autonomy | • Full Delegation<br>• Limited Delegation | |
| CriticalSpot | Full Autonomy | • Full Delegation<br>• Limited Delegation | • Limited Delegation |
| HotSpot | | • Full Autonomy | • Full Delegation<br>• Limited Delegation |
| OptiSpot | | • Full Autonomy | • Full Autonomy<br>• Full Delegation |

**Table 16: Actors, Roles and Responsibilities versus Spot Category**

The mode of delegation (e.g. between INAP and Airport) is depending on different parameters, e.g time-Horizon (anticipation), imbalance severity and duration, ….

Hereafter is illustrated the possibility of making delegations according to different contexts

- Time-horizon (3hours+, 1h30, 40 min)
- Imbalance severity (high, medium)
- Duration of the imbalance (short, large, very large)

Colored boxes (green, orange, red) represent the possibility (ok, ok with conditions, nok) to initiate a delegation.

| Time Horizon | Hotspot/Optispot | | Delegation mode | |
|---|---|---|---|---|
| | Severity | Duration | Limited | Full |

| | | | | |
|---|---|---|---|---|
| High (3H+) | High | Long | OK with conditions<br>• if enough flights still on the ground for airport to act | OK with conditions<br>• if enough anticipation for Airport (6H+) and room to accommodate shifted demand |
| | | Short | OK | OK with conditions<br>• Delay < 10 min for delayed flight<br>• If no risk to impact en-route operations<br>• Imbalance Confidence Index influence the decision |
| | medium | Long | Situation is highlighted to APT but no decision taken: Only monitoring because the hotspot has a too long duration | |

Table 17 : Conditions of delegation in a 3h + time horizon

| Time Horizon | Hotspot/Optispot | | Delegation mode | |
|---|---|---|---|---|
| | Severity | Duration | Limited | Full |
| 1h30 | High | Long | NOK due to safety issues (not enough anticipation, global regulation needed) | NOK due to safety issues (not enough anticipation, global regulation needed) |
| | | Short | OK with conditions<br>• small/medium airports | OK with conditions<br>• for small airports only (specific flows)<br>• INAP identified flights to be delayed (and Airport attributes the delay)<br>• Imbalance Confidence Index influences the decision |
| | medium | Very Long | Situation is highlighted to APT but no decision taken: Only monitoring because the hotspot has a too long duration | |

Table 18 : Conditions of delegation in a 1h30 time horizon

| Time Horizon | Hotspot/Optispot | | Delegation mode | |
|---|---|---|---|---|
| | Severity | Duration | Limited | Full |

| | | | | |
|---|---|---|---|---|
| **40 min** | **High** | **Long** | NOK due to safety issues (not enough anticipation, global regulation needed) | NOK due to safety issues (not enough anticipation, global regulation needed) |
| | | **Short** | OK with conditions<br>• for departures only | OK with conditions<br>• for departures only |
| | **medium** | **Very Long** | Situation is highlighted to APT but no decision taken: Only monitoring because the hotspot has a too long duration | |

**Table 19 : Conditions of delegation in a 40 min time horizon**

To reflect the variety of collaborative processes (Location of Spot, ATM phases, mode of collaboration), several different generic models have been identified. They define the roles, responsibilities, rules and procedures concerning the initiation, delegation, coordination, implementation and monitoring to guide the DCB activities under the Network performance targets. At each step the workflow defines the principles for stakeholders to consider the Network impact including interferences and inconsistencies, and to achieve targets established in the Network Performance Framework.

Note: Only the categories HotSpot and OptiSpot are described in this OSED version

| | | Hotspot | | | OptiSpot | | |
|---|---|---|---|---|---|---|---|
| | | NM | INAP | Others (APT, AU) | NM | INAP | Others (APT, AU, …) |
| Arrival<br><br>Spot | SBT<br><br>Phase | | *Model1* Full Autonomy | *Model2* Limited Delegation<br><br>*Model3* Full Delegation | | *Model7* Full Autonomy | *Model8* Full Autonomy<br><br>*Model9* Full Delegation |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | RBT phase | | *Model4* Full Autonomy | *Model13* Limited Delegation<br>*Model14* Full Delegation | | | *Model10* Full Autonomy |
| E/R Spot | SBT phase | | *Model5* Full Autonomy | | | *Model11* Full Autonomy | |
| | RBT phase | | *Model6* Full Autonomy | | | *Model12* Full Autonomy | |

**Table 20: Identified Models for the Collaborative Framework**

###### 3.5.2.9.1.1 Model 1: The description of the DCB Collaborative Workflow for Hotspot Arrival Management using TTA prepared in the SBT Elaboration process – INAP Full Autonomy

The objective is to manage a flow STAM Measure (TTA) to resolve hotspot at the arrival airport. The DCB measures are prepared in the SBT Elaboration process in the 3hrs-2hrs timeframe.

INAP is responsible for proposing a solution ensuring the relevant smoothing to resolve the hotspot. INAP generates the smoothed DCB sequence solution based on TTA measures. This solution accommodates the priority expressed by the AU. Then, the proposed solution is coordinated with the AU actor. At the end of the coordination period, INAP implements the DCB sequence solution. In the execution phase, INAP monitor the DCB plan deviation and revise if necessary the plan.

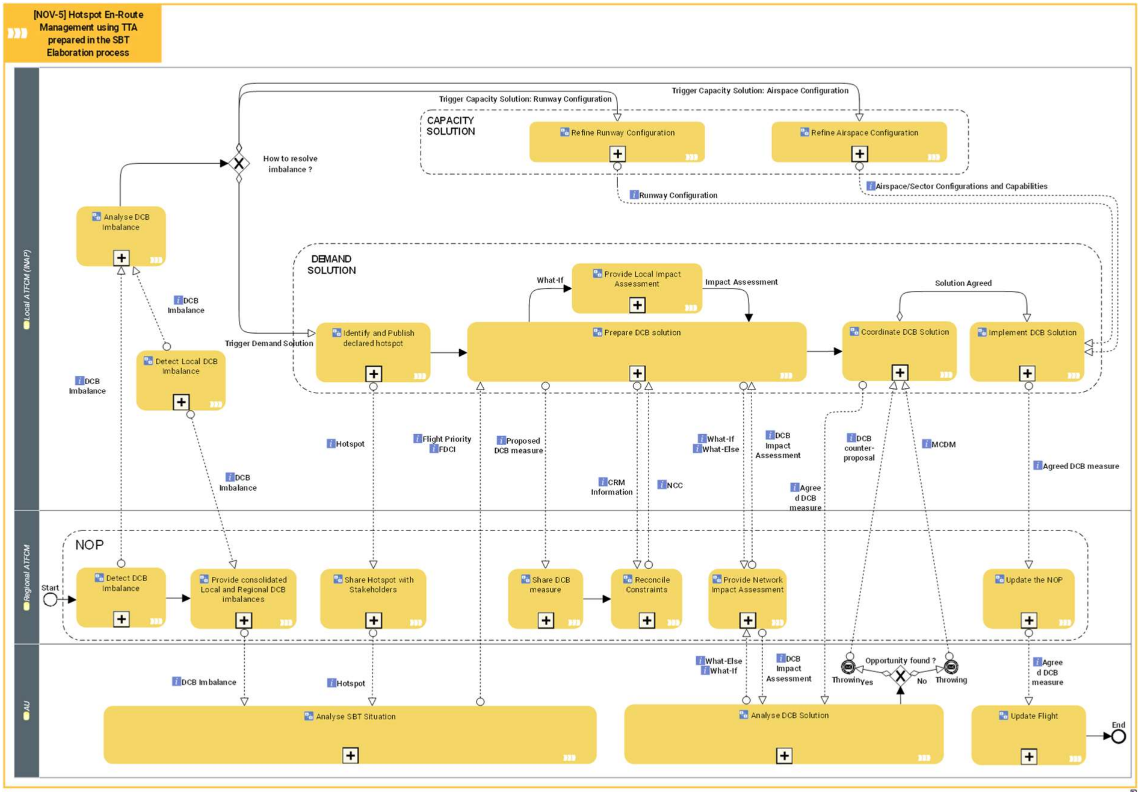



**Figure 69: EATMA Model – Model-1 & Model-7: Hotspot Arrival Management using TTA prepared in the SBT Elaboration process Full Autonomy**

| Activity | Description |
|---|---|
| Analyse DCB Imbalance | The Local Traffic Manager and/or the Flow Manager analyse the demand versus the given resources and capabilities in his area, in order to foresee the resulting problems. |
| Analyse DCB Solution | INAP analyses the DCB solution proposed by the delegated actors (APOC) |
| Analyse SBT Situation | The AU function analyse DCB events (imbalance, hotspot, DCB Measures) impacting the SBT. |
| Coordinate DCB Solution | INAP coordinate the DCB solution with concerned actors. |
| Detect DCB Imbalance | NM identifies the balance between demand and capacity in real time by analysing entry and occupancy counts and associated workload values, and comparing them respectively with situational traffic capacity values and occupancy traffic monitoring values. |
| Detect Local DCB Imbalance | INAP function analyses the local imbalance figures (complexity, ….). |

| | |
|---|---|
| Identify and Publish declared hotspot | Once capacity has been maximized and the imbalance still remains, INAP triggers the elaboration of a solution acting on Demand. The first step is to identify the volume (time and 3D volume) of the imbalance, and publishing the hotspot to make it visible to all stakeholders |
| Implement DCB Solution | INAP implements the DCB solution. |
| Prepare DCB solution | The NMf local actors prepares DCB measures to resolve the hotspot. |
| Provide consolidated Local and Regional DCB imbalances | This function collects the local imbalance figures and provide a network imbalance consolidated view. |
| Provide Local Impact Assessment | This function provides the impact assessment (what-if) at the local level. |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the network level. |
| Reconcile Constraints | This function collects the planned DCB constraints from local NMf actors and provides the Network Consolidated Constraints (NCC) aiming at reconciling the interfering local constraints. |
| Refine Airspace Configuration | According to the imblance figures, INAP refines the Airspace Configuration |
| Refine Runway Configuration | According to the imblance figures, the NMf local actors refines the Runway Configuration |
| Share Hotspot with Stakeholders | The local hotspots are collected by the Collaborative NOP and accessible by NMf actors |
| Update Flight | The SBT is updated to reflect the DCB measures. |
| Update the NOP | The DCB/DCB solutions descriptions and their intended use are updated and published in the NOP. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Prepare DCB solution o--> Reconcile Constraints | Regional ATFCM | CRM Information | |
| Regional ATFCM | Reconcile Constraints o--> Prepare DCB solution | Local ATFCM (INAP) | NCC | |
| AU | Throwing o--> Coordinate DCB Solution | Local ATFCM (INAP) | DCB counter-proposal | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| AU | Throwing o--> Coordinate DCB Solution | Local ATFCM (INAP) | MCDM | |
| AU | Analyse DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| AU | Analyse DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |
| Regional ATFCM | Provide consolidated Local and Regional DCB imbalances o--> Analyse SBT Situation | AU | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Provide consolidated Local and Regional DCB imbalances | Regional ATFCM | DCB Imbalance | Imbalance |
| Regional ATFCM | Provide Network Impact Assessment o--> Analyse DCB Solution | AU | DCB Impact Assessment | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Identify and Publish declared hotspot o--> Share Hotspot with Stakeholders | Regional ATFCM | Hotspot | |
| Regional ATFCM | Provide Network Impact Assessment o--> Prepare DCB solution | Local ATFCM (INAP) | DCB Impact Assessment | |
| Local ATFCM (INAP) | Coordinate DCB Solution o--> Analyse DCB Solution | AU | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Coordinate DCB Solution o--> Analyse DCB Solution | AU | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update the NOP | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update the NOP | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Prepare DCB solution o--> Share DCB measure | Regional ATFCM | Proposed DCB measure | |
| Regional ATFCM | Update the NOP o--> Update Flight | AU | Agreed DCB measure | ATFMMeasure |
| Regional ATFCM | Update the NOP o--> Update Flight | AU | Agreed DCB measure | ATFMMeasure |
| Regional ATFCM | Share Hotspot with Stakeholders o--> Analyse SBT Situation | AU | Hotspot | |
| Regional ATFCM | Detect DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| AU | Analyse SBT Situation o--> Prepare DCB solution | Local ATFCM (INAP) | Flight Priority | |
| AU | Analyse SBT Situation o--> Prepare DCB solution | Local ATFCM (INAP) | FDCI | |
| Local ATFCM (INAP) | Refine Runway Configuration o--> Implement DCB Solution | Local ATFCM (INAP) | Runway Configuration | ActiveRunwayConfiguration |
| Local ATFCM (INAP) | Refine Airspace Configuration o--> Implement DCB Solution | Local ATFCM (INAP) | Airspace/Sector Configurations and Capabilities | |

###### 3.5.2.9.1.2 Model 2: The description of the DCB Collaborative Workflow for Hotspot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Limited Delegation

The objective is to manage a flow STAM Measure (TTA) to resolve hotspot at the arrival airport. The DCB measures are prepared in the SBT Elaboration process in the 3hrs-2hrs timeframe.

INAP is responsible to detect the hotspot and delegates to the APOC (APT and AUs) the elaboration of the DCB solution according to their business rules (UDPP, AIMA, ….). At the end of the delegation duration, INAP analyses and eventually fine-tune the proposed APOC solution, then implements the DCB sequence solution. In the execution phase, INAP monitors the DCB plan deviation and revises if necessary the plan.

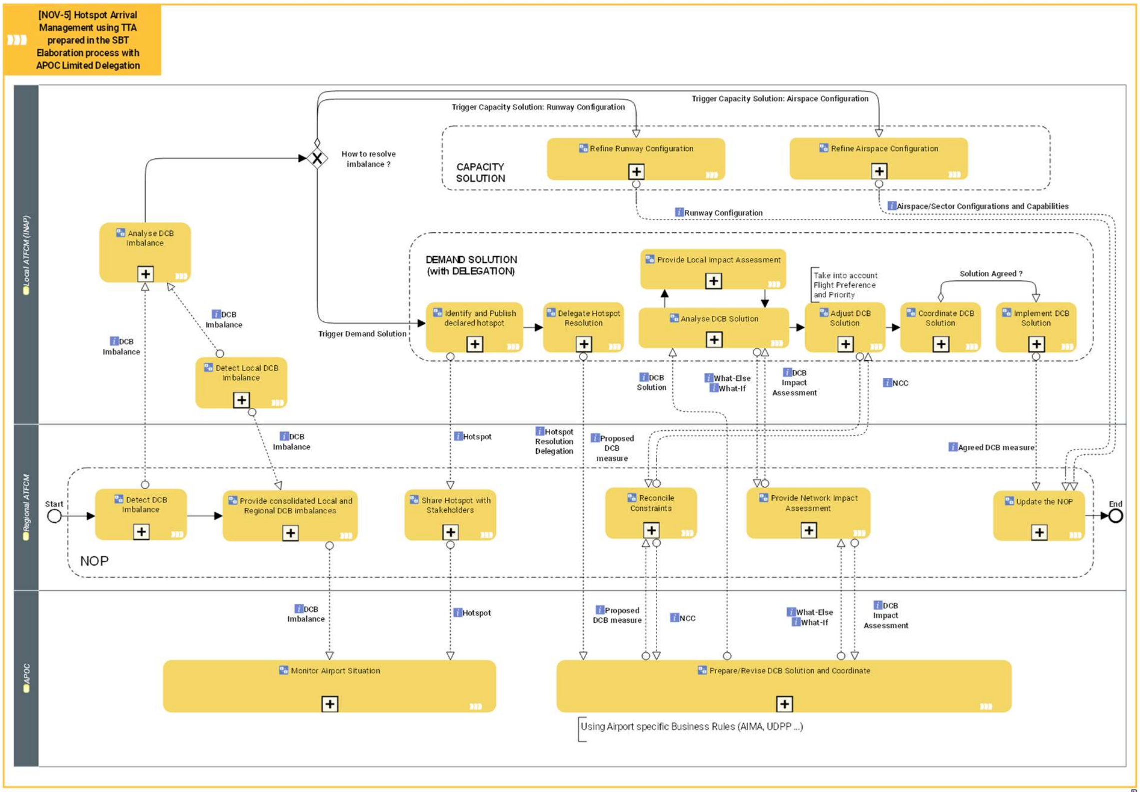



**Figure 70: EATMA model – Model 2 : Hotspot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Limited Delegation**

| Activity | Description |
|---|---|
| Adjust DCB Solution | INAP adjusts the proposed delegated solution if necessary. |
| Analyse DCB Imbalance | The Local Traffic Manager and/or the Flow Manager analyse the demand versus the given resources and capabilities in his area, in order to foresee the resulting problems. |
| Analyse DCB Solution | INAP analyses the DCB solution proposed by the delegated actors (APOC) |
| Coordinate DCB Solution | INAP coordinate the DCB solution with concerned actors. |
| Delegate Hotspot Resolution | INAP delegate the resolution of the hotspot to an other actors |
| Detect DCB Imbalance | NM identifies the balance between demand and capacity in real time by analysing entry and occupancy counts and associated workload |

| | |
|---|---|
| | values, and comparing them respectively with situational traffic capacity values and occupancy traffic monitoring values. |
| Detect Local DCB Imbalance | INAP function analyses the local imbalance figures (complexity, ….). |
| Identify and Publish declared hotspot | Once capacity has been maximized and the imbalance still remains, INAP triggers the elaboration of a solution acting on Demand. The first step is to identify the volume (time and 3D volume) of the imbalance, and publishing the hotspot to make it visible to all stakeholders |
| Implement DCB Solution | The ATC functions implements the ATC Clearance derived from a DCB measure for RBT. |
| Monitor Airport Situation | The APOC functions monitor the imbalance situation at the airport |
| Prepare/Revise DCB Solution and Implement | The NMf local actors prepare, revise and implement DCB measures to resolve the hotspot. |
| Provide consolidated Local and Regional DCB imbalances | This function collects the local imbalance figures and provide a network imbalance consolidated view. |
| Provide Local Impact Assessment | This function provides the impact assessment (what-if) at the local level. |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the network level. |
| Reconcile Constraints | This function collects the planned DCB constraints from local NMf actors and provides the Network Consolidated Constraints (NCC) aiming at reconciling the interfering local constraints. |
| Refine Airspace Configuration | According to the imbalance figures, INAP refines the Airspace Configuration |
| Refine Runway Configuration | According to the imblance figures, the NMf local actors refine the Runway Configuration |
| Share Hotspot with Stakeholders | The local hotspots are collected by the Collaborative NOP and accessible by NMf actors |
| Update the NOP | The DCB/DCB solutions descriptions and their intended use are updated and published in the NOP. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Refine Runway Configuration o--> Update the NOP | Regional ATFCM | Runway Configuration | ActiveRunwayConfiguration |
| Regional ATFCM | Detect DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Refine Airspace Configuration o--> Update the NOP | Regional ATFCM | Airspace/Sector Configurations and Capabilities | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Identify and Publish declared hotspot o--> Share Hotspot with Stakeholders | Regional ATFCM | Hotspot | |
| Local ATFCM (INAP) | Delegate Hotspot Resolution o--> Prepare/Revise DCB Solution and Coordinate | APOC | Hotspot Resolution Delegation | |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update the NOP | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update the NOP | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |
| APOC | Prepare/Revise DCB Solution and Coordinate o--> Reconcile Constraints | Regional ATFCM | Proposed DCB measure | |
| Regional ATFCM | Reconcile Constraints o--> Prepare/Revise DCB Solution and Coordinate | APOC | NCC | |
| Regional ATFCM | Provide consolidated Local and Regional DCB imbalances o--> Monitor Airport Situation | APOC | DCB Imbalance | Imbalance |
| Regional ATFCM | Share Hotspot with Stakeholders o--> Monitor Airport Situation | APOC | Hotspot | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Provide Network Impact Assessment o--> Prepare/Revise DCB Solution and Coordinate | APOC | DCB Impact Assessment | |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Provide consolidated Local and Regional DCB imbalances | Regional ATFCM | DCB Imbalance | Imbalance |
| APOC | Prepare/Revise DCB Solution and Coordinate o--> Analyse DCB Solution | Local ATFCM (INAP) | DCB Solution | |
| APOC | Prepare/Revise DCB Solution and Coordinate o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| APOC | Prepare/Revise DCB Solution and Coordinate o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |
| Regional ATFCM | Provide Network Impact Assessment o--> Analyse DCB Solution | Local ATFCM (INAP) | DCB Impact Assessment | |
| Regional ATFCM | Reconcile Constraints o--> Adjust DCB Solution | Local ATFCM (INAP) | NCC | |
| Local ATFCM (INAP) | Adjust DCB Solution o--> Reconcile Constraints | Regional ATFCM | Proposed DCB measure | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Analyse DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| Local ATFCM (INAP) | Analyse DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |

###### 3.5.2.9.1.3 Model 3: The description of the DCB Collaborative Workflow for Hotspot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Full Delegation

The objective is to manage a flow STAM Measure (TTA) to resolve hotspot at the arrival airport. The DCB measures are prepared in the SBT Elaboration process in the 3hrs-2hrs timeframe.

INAP is responsible to detect the hotspot and delegates entirely to APOC (APT and AUs) the end-to-end elaboration of the DCB solution according to their business rules (UDPP, AIMA,….). APOC implements the DCB sequence solution through NM or FOC. In the execution phase, INAP monitors the DCB plan deviation and revises if necessary the plan.

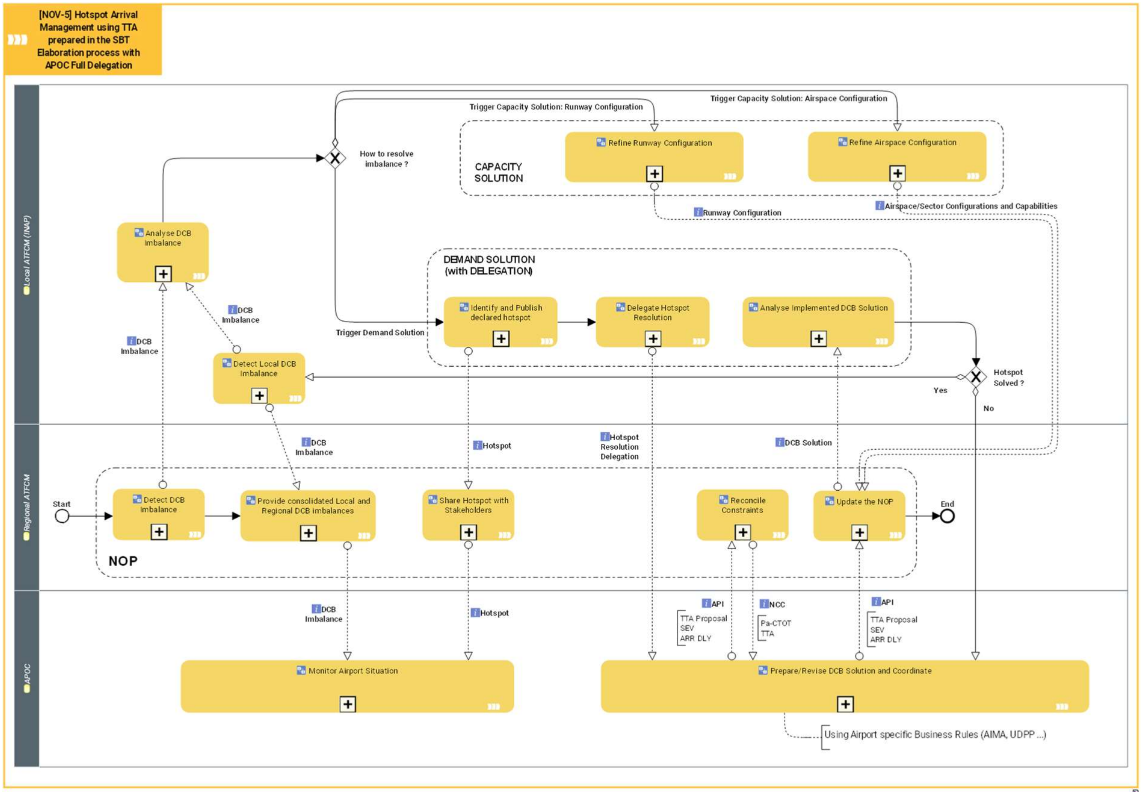



**Figure 71: EATMA Model – Model 3 : Hotspot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Full Delegation**

| Activity | Description |
|---|---|
| Analyse DCB Imbalance | The Local Traffic Manager and/or the Flow Manager analyse the demand versus the given resources and capabilities in his area, in order to foresee the resulting problems. |
| Analyse Implemented DCB Solution | INAP monitors the proper execution of the DCB plan to resolve the hotspot and takes additional measures in case of plan deviation if necessary |
| Delegate Hotspot Resolution | INAP delegates the resolution of the hotspot to another actor |
| Detect DCB Imbalance | NM identifies the balance between demand and capacity in real time by analysing entry and occupancy counts and associated workload values, and comparing them respectively with situational traffic capacity values and occupancy traffic monitoring values. |
| Detect Local DCB Imbalance | INAP function analyses the local imbalance figures (complexity,….). |
| Identify and Publish declared hotspot | Once capacity has been maximized and the imbalance still remains, INAP triggers the elaboration of a solution acting on Demand. The first step is to identify the volume (time and 3D volume) of the imbalance, and publishing the hotspot to make it visible to all stakeholders |
| Monitor Airport Situation | The APOC functions monitor the imbalance situation at the airport |



Founding Members

| | |
|---|---|
| Prepare/Revise DCB Solution and Implement | The NMf local actors prepare, revise and implement DCB measures to resolve the hotspot. |
| Provide consolidated Local and Regional DCB imbalances | This function collects the local imbalance figures and provides a network imbalance consolidated view. |
| Reconcile Constraints | This function collects the planned DCB constraints from local NMf actors and provides the Network Consolidated Constraints (NCC) aiming at reconciling the interfering local constraints. |
| Refine Airspace Configuration | According to the imbalance figures, INAP refines the Airspace Configuration |
| Refine Runway Configuration | According to the imblance figures, the NMf local actors refine the Runway Configuration |
| Share Hotspot with Stakeholders | The local hotspots are collected by the Collaborative NOP and accessible by NMf actors |
| Update the NOP | The DCB/DCB solutions are updated and published in the NOP. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Refine Runway Configuration o--> Update the NOP | Regional ATFCM | Runway Configuration | ActiveRunwayConfiguration |
| Regional ATFCM | Detect DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Refine Airspace Configuration o--> Update the NOP | Regional ATFCM | Airspace/Sector Configurations and Capabilities | |
| Local ATFCM (INAP) | Identify and Publish declared hotspot o--> Share Hotspot with Stakeholders | Regional ATFCM | Hotspot | |
| Local ATFCM (INAP) | Delegate Hotspot Resolution o--> Prepare/Revise DCB Solution and Coordinate | APOC | Hotspot Resolution Delegation | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| APOC | Prepare/Revise DCB Solution and Coordinate o--> Update the NOP | Regional ATFCM | API | |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |
| APOC | Prepare/Revise DCB Solution and Coordinate o--> Reconcile Constraints | Regional ATFCM | API | |
| Regional ATFCM | Reconcile Constraints o--> Prepare/Revise DCB Solution and Coordinate | APOC | NCC | |
| Regional ATFCM | Provide consolidated Local and Regional DCB imbalances o--> Monitor Airport Situation | APOC | DCB Imbalance | Imbalance |
| Regional ATFCM | Share Hotspot with Stakeholders o--> Monitor Airport Situation | APOC | Hotspot | |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Provide consolidated Local and Regional DCB imbalances | Regional ATFCM | DCB Imbalance | Imbalance |
| Regional ATFCM | Update the NOP o--> Analyse Implemented DCB Solution | Local ATFCM (INAP) | DCB Solution | |

#### 3.5.2.9.1.4 Model 4: The description of the DCB Collaborative Workflow for Hotspot Arrival Management using tTTA

**prepared in the RBT Revision process – INAP Full Autonomy**

The objective is to manage a STAM Measure on an airborne flight (tTTA tactical Target Time of Arrival) to resolve hotspot at the arrival airport. The DCB measures are prepared in the RBT Revision process in the 1hr30-30 min timeframe.

INAP is responsible for proposing a solution ensuring the relevant smoothing to resolve the hotspot. INAP generates the smoothed DCB sequence solution based on tTTA measures. This solution accommodates the priority expressed by the AU. Due to the short time horizon, the proposed solution is potentially not negotiated, but only coordinated with the AU actor. Then, INAP implements the DCB sequence solution. In the execution phase, INAP monitors the DCB plan deviation and revises the plan if necessary.

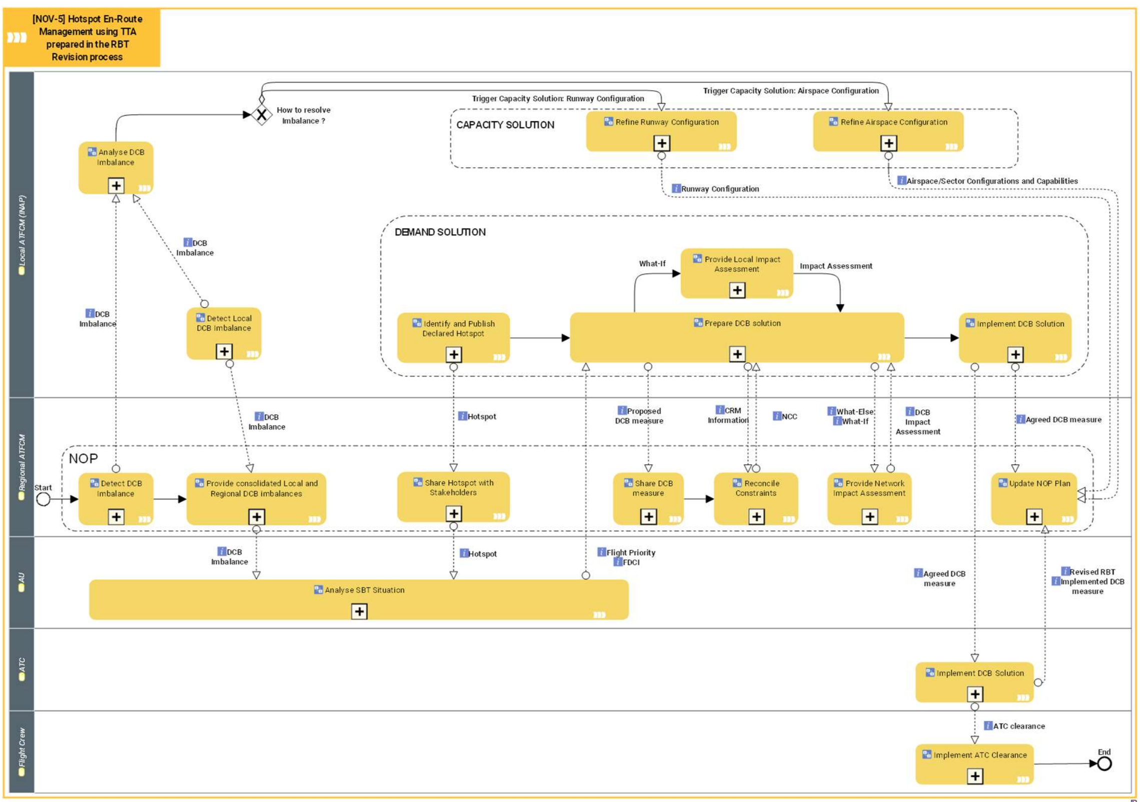



**Figure 72: EATMA Model - Model 4 : Hotspot Arrival Management using tTTA prepared in the RBT Revision process – INAP Full Autonomy**

| Activity | Description |
|---|---|
| Analyse DCB Imbalance | The Local Traffic Manager and/or the Flow Manager analyse the demand versus the given resources and capabilities in his area, in order to foresee the resulting problems. |
| Analyse SBT Situation | The AU function analyses DCB events (imbalance, hotspot, DCB Measures) impacting the SBT. |
| Detect DCB Imbalance | NM identifies the balance between demand and capacity in real time by analysing entry and occupancy counts and associated workload values, and comparing them respectively with situational traffic capacity values and occupancy traffic monitoring values. |
| Detect Local DCB Imbalance | INAP function analyses the local imbalance figures (complexity, ….). |
| Identify and Publish Declared Hotspot | INAP function identifies and publishes a hotspot |
| Implement ATC Clearance | The Pilot Crew functions implement the ATC Clearance given by ATC. |
| Implement DCB Solution | The ATC functions implement the ATC Clearance derived from a DCB measure for RBT. |
| Prepare DCB solution | INAP prepares DCB measures to manage the hotspot |
| Provide consolidated Local and Regional DCB imbalances | This function collects the local imbalance figures and provides a network imbalance consolidated view. |
| Provide Local Impact Assessment | This function provides the impact assessment (what-if) at the local level. |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the network level. |
| Reconcile Constraints | This function collects the planned DCB constraints from local NMf actors and provides the Network Consolidated Constraints (NCC) aiming at reconciling the interfering local constraints. |
| Refine Airspace Configuration | According to the imbalance figures, INAP refines the Airspace Configuration |
| Refine Runway Configuration | According to the imbalance figures, the NMf local actors refine the Runway Configuration |
| Share DCB measure | The local DCB measures are collected by the Collaborative NOP and accessible by NMf actors |
| Share Hotspot with Stakeholders | The local hotspots are collected by the Collaborative NOP and accessible by NMf actors |
| Update NOP Plan | The NOP plan is updated to reflect the Hotspot and DCB measures status. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Prepare DCB solution o--> Reconcile Constraints | Regional ATFCM | CRM Information | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Provide consolidated Local and Regional DCB imbalances | Regional ATFCM | DCB Imbalance | Imbalance |
| Regional ATFCM | Share Hotspot with Stakeholders o--> Analyse SBT Situation | AU | Hotspot | |
| ATC | Implement DCB Solution o--> Implement ATC Clearance | Flight Crew | ATC clearance | |
| AU | Analyse SBT Situation o--> Prepare DCB solution | Local ATFCM (INAP) | Flight Priority | |
| AU | Analyse SBT Situation o--> Prepare DCB solution | Local ATFCM (INAP) | FDCI | |
| Local ATFCM (INAP) | Refine Airspace Configuration o--> Update NOP Plan | Regional ATFCM | Airspace/Sector Configurations and Capabilities | |
| Local ATFCM (INAP) | Refine Runway Configuration o--> Update NOP Plan | Regional ATFCM | Runway Configuration | ActiveRunwayConfiguration |
| Local ATFCM (INAP) | Prepare DCB solution o--> Share DCB measure | Regional ATFCM | Proposed DCB measure | |
| Regional ATFCM | Reconcile Constraints o--> Prepare DCB solution | Local ATFCM (INAP) | NCC | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Identify and Publish Declared Hotspot o--> Share Hotspot with Stakeholders | Regional ATFCM | Hotspot | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |
| Regional ATFCM | Provide Network Impact Assessment o--> Prepare DCB solution | Local ATFCM (INAP) | DCB Impact Assessment | |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update NOP Plan | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update NOP Plan | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Implement DCB Solution o--> Implement DCB Solution | ATC | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Implement DCB Solution o--> Implement DCB Solution | ATC | Agreed DCB measure | ATFMMeasure |
| Regional ATFCM | Detect DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Provide consolidated Local and Regional DCB imbalances o--> Analyse SBT Situation | AU | DCB Imbalance | Imbalance |
| ATC | Implement DCB Solution o--> Update NOP Plan | Regional ATFCM | Revised RBT | |
| ATC | Implement DCB Solution o--> Update NOP Plan | Regional ATFCM | Implemented DCB measure | |

###### 3.5.2.9.1.5 Model 5: The description of the DCB Collaborative Workflow for Hotspot En-Route Management using TTO prepared in the SBT Elaboration process – INAP Full Autonomy

The objective is to manage a STAM Measure (TTO, Level Cap, Rerouting) to resolve hotspot in the En-Route. The DCB measures are prepared in the SBT Elaboration process in the 3hrs-2hrs timeframe.

INAP is responsible for proposing a solution ensuring the relevant smoothing to resolve the hotspot. INAP generates the DCB solution. This solution accommodates the preferences and priorities expressed by the AU. Then, the proposed solution is coordinated with the AU actor. At the end of the coordination period, INAP implements the DCB solution. In the execution phase, INAP monitors the DCB plan deviation and revises if necessary the plan.

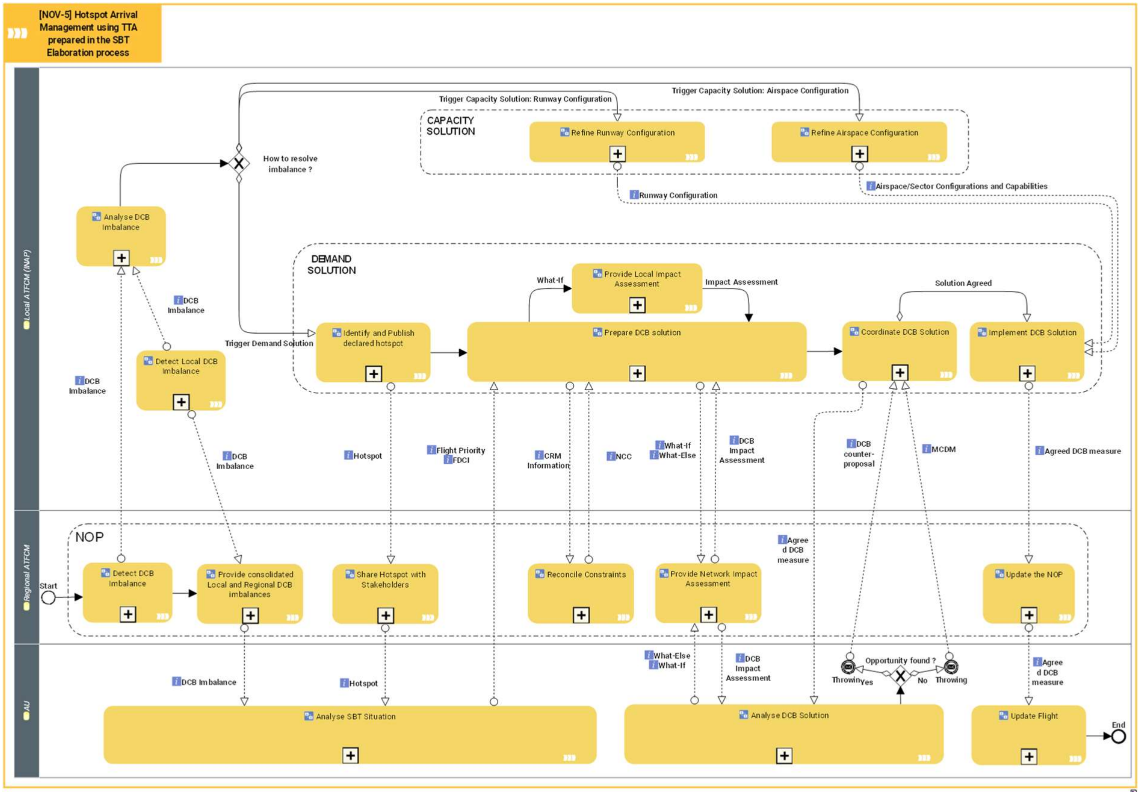



**Figure 73: EATMA Model – Model 5 & Model 11 : Hotspot En-Route Management using TTO prepared in the SBT Elaboration process – INAP Full Autonomy**

| Activity | Description |
|---|---|
| Analyse DCB Imbalance | The Local Traffic Manager and/or the Flow Manager analyse the demand versus the given resources and capabilities in his area, in order to foresee the resulting problems. |
| Analyse DCB Solution | |
| Analyse SBT Situation | The AU function analyses DCB events (imbalance, hotspot, DCB Measures) impacting the SBT. |
| Coordinate DCB Solution | INAP analyses the DCB solution proposed by the delegated actors (APOC) |
| Detect DCB Imbalance | NM identifies the balance between demand and capacity in real time by analysing entry and occupancy counts and associated workload values, and comparing them respectively with situational traffic capacity values and occupancy traffic monitoring values. |
| Detect Local DCB Imbalance | INAP function analyses the local imbalance figures (complexity, ….). |
| Identify and Publish declared hotspot | Once capacity has been maximized and the imbalance still remains, INAP triggers the elaboration of a solution acting on Demand. The first step is to identify the volume (time and 3D volume) of the imbalance, and publishing the hotspot to make it visible to all stakeholders |

| | |
|---|---|
| Implement DCB Solution | The ATC functions implements the ATC Clearance derived from a DCB measure for RBT. |
| Prepare DCB solution | The NMf local actors prepare DCB measures to resolve the hotspot. |
| Provide consolidated Local and Regional DCB imbalances | This function collects the local imbalance figures and provides a network imbalance consolidated view. |
| Provide Local Impact Assessment | This function provides the impact assessment (what-if) at the local level. |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the Network level. |
| Reconcile Constraints | This function collects the planned DCB constraints from local NMf actors and provides the Network Consolidated Constraints (NCC) aiming at reconciling the interfering local constraints. |
| Refine Airspace Configuration | According to the imblance figures, INAP refines the Airspace Configuration |
| Refine Runway Configuration | According to the imblance figures, the NMf local actors refines the Runway Configuration |
| Share DCB measure | The local DCB measures are collected by the Collaborative NOP and accessible by NMf actors |
| Share Hotspot with Stakeholders | The local hotspots are collected by the Collaborative NOP and accessible by NMf actors |
| Update Flight | The AU update the SBT accordingly to the DCB constraints |
| Update the NOP | The DCB/DCB solutions descriptions and their intended use are updated and published in the NOP. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Reconcile Constraints o--> Prepare DCB solution | Local ATFCM (INAP) | NCC | |
| AU | Throwing o--> Coordinate DCB Solution | Local ATFCM (INAP) | DCB counter-proposal | |
| AU | Throwing o--> Coordinate DCB Solution | Local ATFCM (INAP) | MCDM | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| AU | Analyse DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| AU | Analyse DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |
| Regional ATFCM | Provide consolidated Local and Regional DCB imbalances o--> Analyse SBT Situation | AU | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Provide consolidated Local and Regional DCB imbalances | Regional ATFCM | DCB Imbalance | Imbalance |
| Regional ATFCM | Provide Network Impact Assessment o--> Analyse DCB Solution | AU | DCB Impact Assessment | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Identify and Publish declared hotspot o--> Share Hotspot with Stakeholders | Regional ATFCM | Hotspot | |
| Regional ATFCM | Provide Network Impact Assessment o--> Prepare DCB solution | Local ATFCM (INAP) | DCB Impact Assessment | |
| Local ATFCM (INAP) | Coordinate DCB Solution o--> Analyse DCB Solution | AU | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Coordinate DCB Solution o--> Analyse DCB Solution | AU | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update the NOP | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update the NOP | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Prepare DCB solution o--> Reconcile Constraints | Regional ATFCM | CRM Information | |
| Regional ATFCM | Update the NOP o--> Update Flight | AU | Agreed DCB measure | ATFMMeasure |
| Regional ATFCM | Update the NOP o--> Update Flight | AU | Agreed DCB measure | ATFMMeasure |
| Regional ATFCM | Share Hotspot with Stakeholders o--> Analyse SBT Situation | AU | Hotspot | |
| Regional ATFCM | Detect DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| AU | Analyse SBT Situation o--> Prepare DCB solution | Local ATFCM (INAP) | Flight Priority | |
| AU | Analyse SBT Situation o--> Prepare DCB solution | Local ATFCM (INAP) | FDCI | |
| Local ATFCM (INAP) | Refine Runway Configuration o--> Implement DCB Solution | Local ATFCM (INAP) | Runway Configuration | ActiveRunwayConfiguration |
| Local ATFCM (INAP) | Refine Airspace Configuration o--> Implement DCB Solution | Local ATFCM (INAP) | Airspace/Sector Configurations and Capabilities | |

###### 3.5.2.9.1.6 Model 6: The description of the DCB Collaborative Workflow for Hotspot En-Route Management using STAM Measures prepared in the RBT Revision process – INAP Full Autonomy

The objective is to manage a flow STAM Measure on an airborne flight (tTTO, Level Cap, Rerouting) to resolve hotspot in the En-Route. The DCB measures are prepared in the RBT Revision process in the 1hr30-15 min timeframe.

INAP is responsible for proposing a solution ensuring the relevant smoothing to resolve the hotspot. INAP generates the DCB solution. This solution accommodates the preferences and priorities expressed by the AU. Due to the short time horizon the proposed solution is potentially not coordinated with the AU actor. Then, INAP implements the DCB solution. In the execution phase, INAP monitors the DCB plan deviation and revises the plan if necessary.

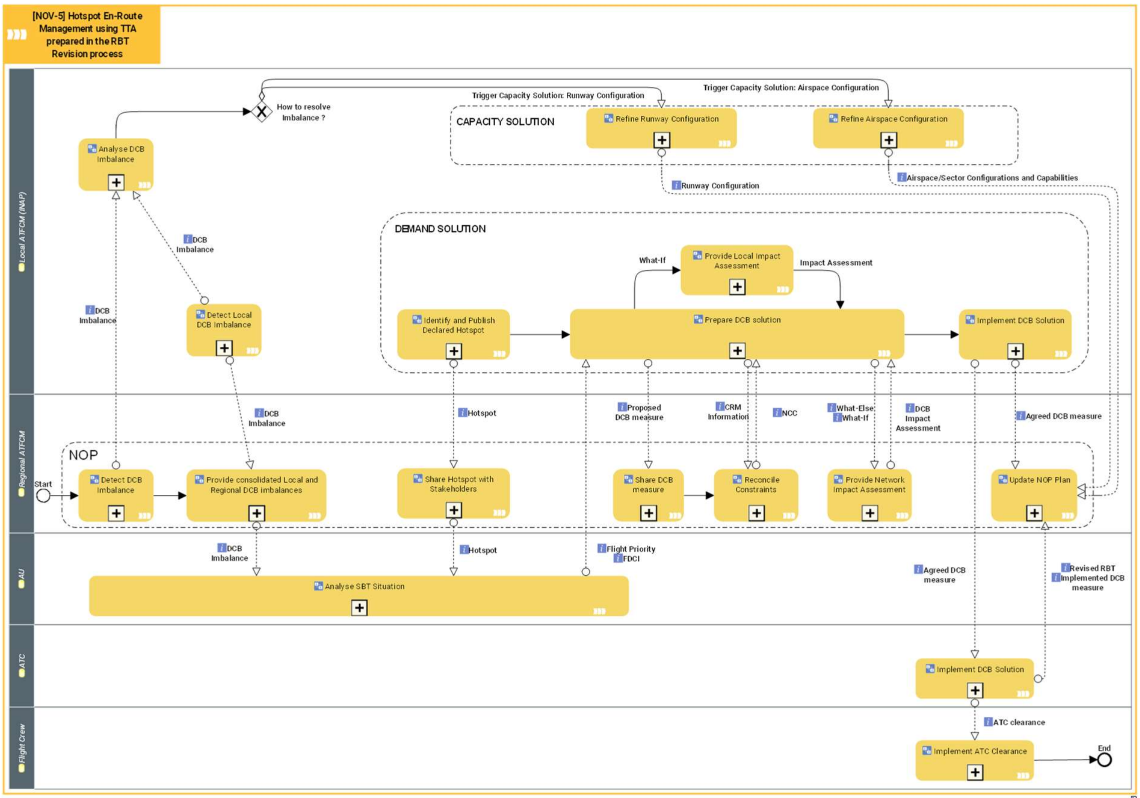



**Figure 74: EATMA Model – Model 6 & Model 12 : Hotspot En-Route Management using tTTO prepared in the RBT Revision process – INAP Full Autonomy**

| Activity | Description |
|---|---|
| Analyse DCB Imbalance | The Local Traffic Manager and/or the Flow Manager analyse the demand versus the given resources and capabilities in his area, in order to foresee the resulting problems. |
| Analyse SBT Situation | The AU function analyse DCB events (imbalance, hotspot, DCB Measures) impacting the the SBT. |
| Detect DCB Imbalance | NM identifies the balance between demand and capacity in real time by analysing entry and occupancy counts and associated workload values, and comparing them respectively with situational traffic capacity values and occupancy traffic monitoring values. |
| Detect Local DCB Imbalance | INAP function analyses the local imbalance figures (complexity, ....). |
| Identify and Publish Declared Hotspot | INAP function identifies and publishes a hotspot |
| Implement ATC Clearance | The Pilot Crew functions implement the ATC Clearance given by ATC. |

| | |
|---|---|
| Implement DCB Solution | The ATC functions implements the ATC Clearance derived from a DCB measure for RBT. |
| Prepare DCB solution | INAP prepare DCB measures to manage the hotspot |
| Provide consolidated Local and Regional DCB imbalances | This function collects the local imbalance figures and provides a network imbalance consolidated view. |
| Provide Local Impact Assessment | This function provides the impact assessment (what-if) at the local level. |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the network level. |
| Reconcile Constraints | This function collects the planned DCB constraints from local NMf actors and provides the Network Consolidated Constraints (NCC) aiming at reconciling the interfering local constraints. |
| Refine Airspace Configuration | According to the imbalance figures, INAP refines the Airspace Configuration |
| Refine Runway Configuration | According to the imbalance figures, the NMf local actors refine the Runway Configuration |
| Share DCB measure | The local DCB measures are collected by the Collaborative NOP and accessible by NMf actors |
| Share Hotspot with Stakeholders | The local hotspots are collected by the Collaborative NOP and accessible by NMf actors |
| Update NOP Plan | The NOP plan is updated to reflect the Hotspot and DCB measures status. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Prepare DCB solution o--> Reconcile Constraints | Regional ATFCM | CRM Information | |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Provide consolidated Local and Regional DCB imbalances | Regional ATFCM | DCB Imbalance | Imbalance |
| Regional ATFCM | Share Hotspot with Stakeholders o--> Analyse SBT Situation | AU | Hotspot | |
| ATC | Implement DCB Solution o--> Implement ATC Clearance | Flight Crew | ATC clearance | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| AU | Analyse SBT Situation o--> Prepare DCB solution | Local ATFCM (INAP) | Flight Priority | |
| AU | Analyse SBT Situation o--> Prepare DCB solution | Local ATFCM (INAP) | FDCI | |
| Local ATFCM (INAP) | Refine Airspace Configuration o--> Update NOP Plan | Regional ATFCM | Airspace/Sector Configurations and Capabilities | |
| Local ATFCM (INAP) | Refine Runway Configuration o--> Update NOP Plan | Regional ATFCM | Runway Configuration | ActiveRunwayConfiguration |
| Local ATFCM (INAP) | Prepare DCB solution o--> Share DCB measure | Regional ATFCM | Proposed DCB measure | |
| Regional ATFCM | Reconcile Constraints o--> Prepare DCB solution | Local ATFCM (INAP) | NCC | |
| Local ATFCM (INAP) | Identify and Publish Declared Hotspot o--> Share Hotspot with Stakeholders | Regional ATFCM | Hotspot | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| Local ATFCM (INAP) | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Provide Network Impact Assessment o--> Prepare DCB solution | Local ATFCM (INAP) | DCB Impact Assessment | |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update NOP Plan | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update NOP Plan | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Implement DCB Solution o--> Implement DCB Solution | ATC | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Implement DCB Solution o--> Implement DCB Solution | ATC | Agreed DCB measure | ATFMMeasure |
| Regional ATFCM | Detect DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |
| Regional ATFCM | Provide consolidated Local and Regional DCB imbalances o--> Analyse SBT Situation | AU | DCB Imbalance | Imbalance |
| ATC | Implement DCB Solution o--> Update NOP Plan | Regional ATFCM | Revised RBT | |
| ATC | Implement DCB Solution o--> Update NOP Plan | Regional ATFCM | Implemented DCB measure | |

###### 3.5.2.9.1.7 Model 7: The description of the DCB Collaborative Workflow for OptiSpot Arrival Management using TTA prepared in the RBT Elaboration process – INAP Full Autonomy

The objective is to manage a flow STAM Measure (TTA) to manage an OptiSpot at the arrival airport. The DCB measures are prepared in the SBT Elaboration process in the 3hrs-2hrs timeframe.

INAP is responsible for proposing a solution ensuring the relevant smoothing to manage the OptiSpot. INAP generates the smoothed DCB sequence solution based on TTA measures. This solution accommodates the Margins of Manoeuvre expressed by the AU. Then, the proposed solution is coordinated with the AU actor. At the end of the coordination period, INAP implements the DCB sequence solution. In the execution phase, INAP monitors the DCB plan deviation and revises if necessary the plan.

The Model 7 for OptiSpot is identical to model 1 for Hotspot

###### 3.5.2.9.1.8 Model 8: The description of the DCB Collaborative Workflow for OptiSpot Arrival Management using TTA prepared in the SBT Elaboration process – APOC Full Autonomy

The objective is to manage a flow STAM Measure (TTA) to manage an OptiSpot at the arrival airport. The APOC takes the initiative to identify and manage an OptiSpot. APOC prepares DCB measures in the SBT Elaboration process in the 3hrs-2hrs timeframe.

APOC proposed the smoothed DCB sequence solution based on TTA measures. This solution accommodates the Margins of Manoeuvre expressed by the AU. Then, the proposed solution is coordinated with the AU actor. At the end of the coordination period, APOC implements the DCB sequence solution through NM or FOC. In the execution phase, INAP monitors the DCB plan deviation and revises if necessary the plan.

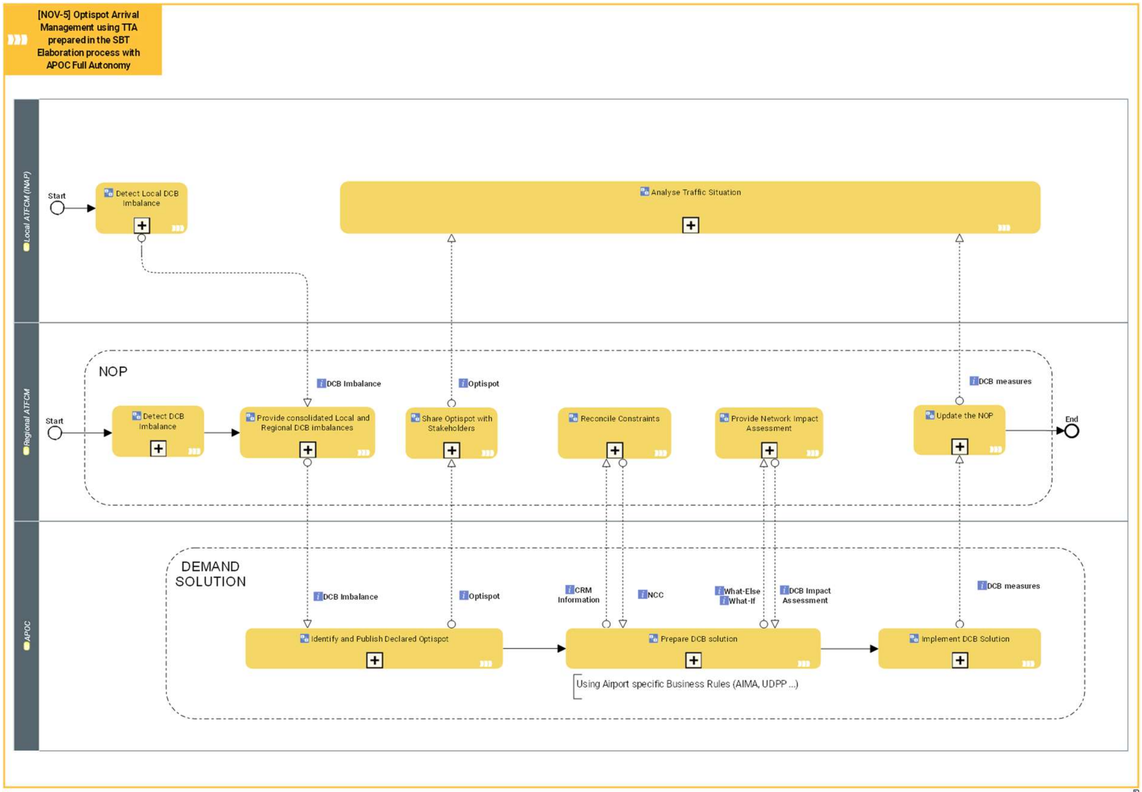



**Figure 75: EATMA Model – Model 8 : OptiSpot Arrival Management using TTA prepared in the SBT Elaboration process – APOC Full Autonomy**

| Activity | Description |
|---|---|
| Analyse Traffic Situation | INAP analyses the situations of the delegated hotspot management |
| Detect DCB Imbalance | NM identifies the balance between demand and capacity in real time by analysing entry and occupancy counts and associated workload values, and comparing them respectively with situational traffic capacity values and occupancy traffic monitoring values. |
| Detect Local DCB Imbalance | INAP function analyses the local imbalance figures (complexity, ….). |
| Identify and Publish declared Optispot | INAP function identifies and publishes an optispot |
| Implement DCB Solution | The ATC functions implements the ATC Clearance derived from a DCB measure for RBT. |
| Prepare DCB solution | INAP prepares DCB measures to manage the hotspot |
| Provide consolidated Local and Regional DCB imbalances | This function collects the local imbalance figures and provides a network imbalance consolidated view. |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the network level. |
| Reconcile Constraints | This function collects the planned DCB constraints from local NMf actors and provides the Network Consolidated Constraints (NCC) aiming at reconciling the interfering local constraints. |

| | |
|---|---|
| Share Optispot with Stakeholders | The local Optispots are collected by the Collaborative NOP and accessible by NMf actors |
| Update the NOP | The DCB/DCB solutions descriptions and their intended use are updated and published in the NOP. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| APOC | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| APOC | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |
| Regional ATFCM | Provide Network Impact Assessment o--> Prepare DCB solution | APOC | DCB Impact Assessment | |
| Regional ATFCM | Update the NOP o--> Analyse Traffic Situation | Local ATFCM (INAP) | DCB measures | ATFMMeasure |
| Regional ATFCM | Update the NOP o--> Analyse Traffic Situation | Local ATFCM (INAP) | DCB measures | ATFMMeasure |
| Regional ATFCM | Share Optispot with Stakeholders o--> Analyse Traffic Situation | Local ATFCM (INAP) | Optispot | |
| APOC | Implement DCB Solution o--> Update the NOP | Regional ATFCM | DCB measures | ATFMMeasure |
| APOC | Implement DCB Solution o--> Update the NOP | Regional ATFCM | DCB measures | ATFMMeasure |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| APOC | Prepare DCB solution o--> Reconcile Constraints | Regional ATFCM | CRM Information | |
| Regional ATFCM | Reconcile Constraints o--> Prepare DCB solution | APOC | NCC | |
| Regional ATFCM | Provide consolidated Local and Regional DCB imbalances o--> Identify and Publish Declared Optispot | APOC | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Provide consolidated Local and Regional DCB imbalances | Regional ATFCM | DCB Imbalance | Imbalance |
| APOC | Identify and Publish Declared Optispot o--> Share Optispot with Stakeholders | Regional ATFCM | Optispot | |

###### 3.5.2.9.1.9 Model 9: The description of the DCB Collaborative Workflow for OptiSpot Arrival Management using TTA prepared in the SBT Elaboration process – APOC Full Delegation

The objective is to manage a flow STAM Measure (TTA) to resolve an OptiSpot at the arrival airport. The DCB measures are prepared in the SBT Elaboration process in the 3hrs-2hrs timeframe.

INAP is responsible to detect the OptiSpot and delegates entirely to APOC (APT and AUs) the end-to-end elaboration of the DCB solution according to their business rules (UDPP, AIMA, ….). APOC implements the DCB sequence solution through NM or FOC . In the execution phase, INAP monitors the DCB plan deviation and revises if necessary the plan.

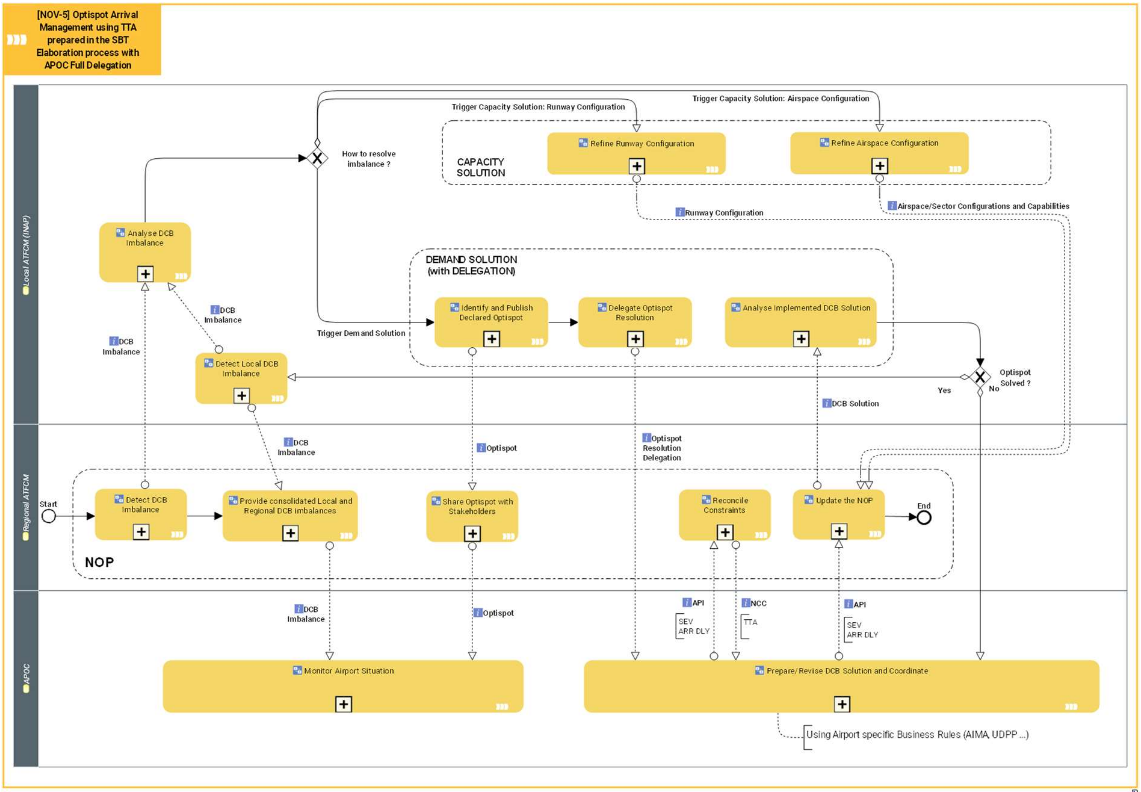



**Figure 76: EATMA Model – Model 9 : OptiSpot Arrival Management using TTA prepared in the SBT Elaboration process – APOC Full Delegation**

| Activity | Description |
|---|---|
| Analyse DCB Imbalance | INAP function analyses the imbalance figures provided by NM (Entry/Occupancy) |
| Analyse Implemented DCB Solution | INAP monitors the proper execution of the DCB plan to resolve the hotspot and takes additional measures in case of plan deviation if necessary |
| Delegate Optispot Resolution | INAP delegate the resolution of the optispot to an other actors |
| Detect DCB Imbalance | NM identifies the balance between demand and capacity in real time by analysing entry and occupancy counts and associated workload values, and comparing them respectively with situational traffic capacity values and occupancy traffic monitoring values. |
| Detect Local DCB Imbalance | INAP function analyses the local imbalance figures (complexity, ….). |
| Identify and Publish declared Optispot | Once capacity has been maximized and the imbalance still remains, INAP triggers the elaboration of a solution acting on Demand. The first |

| | |
|---|---|
| | step is to identify the volume (time and 3D volume) of the imbalance, and publishing the hotspot to make it visible to all stakeholders |
| Monitor Airport Situation | The APOC functions monitor the imbalance situation at the airport |
| Prepare/Revise DCB Solution and Implement | The NMf local actors prepare, revise and implement DCB measures to resolve the hotspot. |
| Provide consolidated Local and Regional DCB imbalances | This function collects the local imbalance figures and provides a network imbalance consolidated view. |
| Reconcile Constraints | This function collects the planned DCB constraints from local NMf actors and provides the Network Consolidated Constraints (NCC) aiming at reconciling the interfering local constraints. |
| Refine Airspace Configuration | According to the imbalance figures, INAP refines the Airspace Configuration |
| Refine Runway Configuration | According to the imbalance figures, the NMf local actors refine the Runway Configuration |
| Share Optispot with Stakeholders | The local optispots are collected by the Collaborative NOP and accessible by NMf actors |
| Update the NOP | The DCB/DCB solutions descriptions and their intended use are updated and published in the NOP. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Refine Runway Configuration o--> Update the NOP | Regional ATFCM | Runway Configuration | ActiveRunwayConfiguration |
| Regional ATFCM | Detect DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Refine Airspace Configuration o--> Update the NOP | Regional ATFCM | Airspace/Sector Configurations and Capabilities | |
| Local ATFCM (INAP) | Delegate Optispot Resolution o--> Prepare/Revise DCB Solution and Coordinate | APOC | Optispot Resolution Delegation | |
| APOC | Prepare/Revise DCB Solution and Coordinate o--> Update the NOP | Regional ATFCM | API | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| APOC | Prepare/Revise DCB Solution and Coordinate o--> Reconcile Constraints | Regional ATFCM | API | |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |
| Regional ATFCM | Reconcile Constraints o--> Prepare/Revise DCB Solution and Coordinate | APOC | NCC | |
| Regional ATFCM | Provide consolidated Local and Regional DCB imbalances o--> Monitor Airport Situation | APOC | DCB Imbalance | Imbalance |
| Regional ATFCM | Share Optispot with Stakeholders o--> Monitor Airport Situation | APOC | Optispot | |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Provide consolidated Local and Regional DCB imbalances | Regional ATFCM | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Identify and Publish Declared Optispot o--> Share Optispot with Stakeholders | Regional ATFCM | Optispot | |
| Regional ATFCM | Update the NOP o--> Analyse Implemented DCB Solution | Local ATFCM (INAP) | DCB Solution | |

#### 3.5.2.9.1.10 Model 10: The description of the DCB Collaborative Workflow for OptiSpot Arrival Management using tTTA prepared in the RBT Revision process – Extended AMAN Full Autonomy

The objective is to manage a flow STAM Measure (tTTA) on an airborne flight to resolve an OptiSpot at the arrival airport. The DCB measures are prepared in the RBT Revision process in the 1hr30-15 min timeframe.

Extended AMAN is responsible for proposing a solution ensuring the relevant smoothing to resolve the OptiSpot. Extended AMAN generates the smoothed sequence solution based on tTTA measures. The solution is proposed to INAP. Then, if possible, INAP implements the sequence solution. In the execution phase, Extended AMAN monitors the plan deviation and revises the plan if necessary.

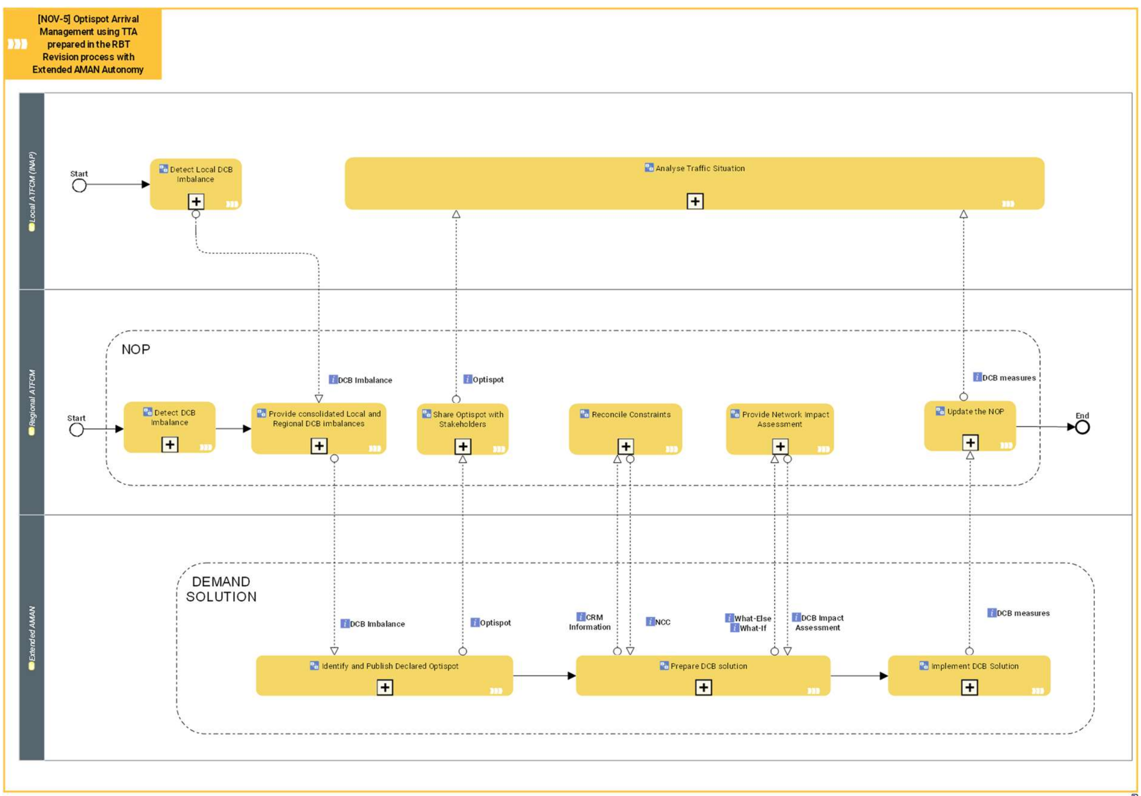



**Figure 77: EATMA Model – Model 10 : OptiSpot Arrival Management using tTTA prepared in the RBT Elaboration process – Extended AMAN Full Autonomy**

| Activity | Description |
|---|---|
| Analyse Traffic Situation | INAP analyses the situations of the delegated hotspot management |
| Detect DCB Imbalance | NM identifies the balance between demand and capacity in real time by analysing entry and occupancy counts and associated workload values, and comparing them respectively with situational traffic capacity values and occupancy traffic monitoring values. |
| Detect Local DCB Imbalance | INAP function analyses the local imbalance figures (complexity, ….). |
| Identify and Publish declared Optispot | Once capacity has been maximized and the imbalance still remains, INAP triggers the elaboration of a solution acting on Demand. The first step is to identify the volume (time and 3D volume) of the imbalance, and publishing the hotspot to make it visible to all stakeholders |
| Implement DCB Solution | The ATC functions implements the ATC Clearance derived from a DCB measure for RBT. |
| Prepare DCB solution | The NMf local actors prepare DCB measures to resolve the hotspot. |
| Provide consolidated Local and Regional DCB imbalances | This function collects the local imbalance figures and provides a network imbalance consolidated view. |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the network level. |
| Reconcile Constraints | This function collects the planned DCB constraints from local NMf actors and provides the Network Consolidated Constraints (NCC) aiming at reconciling the interfering local constraints. |
| Share Optispot with Stakeholders | The local hotspots/Optispots are collected by the Collaborative NOP and accessible by NMf actors |
| Update the NOP | The DCB/DCB solutions descriptions and their intended use are updated and published in the NOP. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Extended AMAN | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| Extended AMAN | Prepare DCB solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Update the NOP o--> Analyse Traffic Situation | Local ATFCM (INAP) | DCB measures | ATFMMeasure |
| Regional ATFCM | Update the NOP o--> Analyse Traffic Situation | Local ATFCM (INAP) | DCB measures | ATFMMeasure |
| Regional ATFCM | Provide Network Impact Assessment o--> Prepare DCB solution | Extended AMAN | DCB Impact Assessment | |
| Regional ATFCM | Share Optispot with Stakeholders o--> Analyse Traffic Situation | Local ATFCM (INAP) | Optispot | |
| Extended AMAN | Implement DCB Solution o--> Update the NOP | Regional ATFCM | DCB measures | ATFMMeasure |
| Extended AMAN | Implement DCB Solution o--> Update the NOP | Regional ATFCM | DCB measures | ATFMMeasure |
| Extended AMAN | Prepare DCB solution o--> Reconcile Constraints | Regional ATFCM | CRM Information | |
| Regional ATFCM | Reconcile Constraints o--> Prepare DCB solution | Extended AMAN | NCC | |
| Regional ATFCM | Provide consolidated Local and Regional DCB imbalances o--> Identify and Publish Declared Optispot | Extended AMAN | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Provide consolidated Local and Regional DCB imbalances | Regional ATFCM | DCB Imbalance | Imbalance |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Extended AMAN | Identify and Publish Declared Optispot o--> Share Optispot with Stakeholders | Regional ATFCM | Optispot | |

###### 3.5.2.9.1.11 Model 11: The description of the DCB Collaborative Workflow for OptiSpot En-Route Management using TTO prepared in the SBT Elaboration process – INAP Full Autonomy

The objective is to manage a flow STAM Measure (TTO, Level Cap, Reroute) to manage an OptiSpot in the En-Route. The DCB measures are prepared in the SBT Elaboration process in the 3hrs-2hrs timeframe.

INAP is responsible for proposing a solution ensuring the relevant smoothing to manage the OptiSpot. INAP generates the DCB solution. This solution accommodates the preferences and priorities expressed by the AU. Then, the proposed solution is coordinated with the AU actor. At the end of the coordination period, INAP implements the DCB solution. In the execution phase, INAP monitors the DCB plan deviation and revises if necessary the plan.

The Model 11 for OptiSpot is identical to model 5 for Hotspot

###### 3.5.2.9.1.12 Model 12: The description of the DCB Collaborative Workflow for OptiSpot En-Route Management using STAM Measures prepared in the RBT Revision process – INAP Full Autonomy

The objective is to manage a flow STAM Measure on an airborne flight (tTTO, Level Cap, Rerouting) to manage an OptiSpot in the En-Route. The DCB measures are prepared in the RBT Revision process in the 1hr30-30 min timeframe.

INAP is responsible for proposing a solution ensuring the relevant smoothing to resolve the OptiSpot. INAP generates the DCB solution. This solution accommodates the preferences and priorities expressed by the AU. Due to the short time horizon the proposed solution is potentially not coordinated with the AU actor. Then, INAP implements the DCB solution. In the execution phase, INAP monitors the DCB plan deviation and revises the plan if necessary.

The Model 12 for OptiSpot is identical to model 6 for Hotspot

#### 3.5.2.9.1.13 Model 13: The description of the DCB Collaborative Workflow for Hotspot Arrival Management using tTTA prepared in the RBT Revision process with APOC Limited Delegation

The objective is to manage a flow STAM Measure (tTTA) to resolve hotspot at the arrival airport. The DCB measures are prepared in the RBT Revision process in the 1hr-30 min timeframe.

INAP is responsible to detect the hotspot and delegates to the APOC (APT and AUs) the elaboration of the DCB solution according to their business rules. At the end of the delegation duration, INAP analyses and eventually fine-tune the proposed APOC solution, then implements the DCB sequence solution. In the execution phase, INAP monitors the DCB plan deviation and revises the plan if necessary..

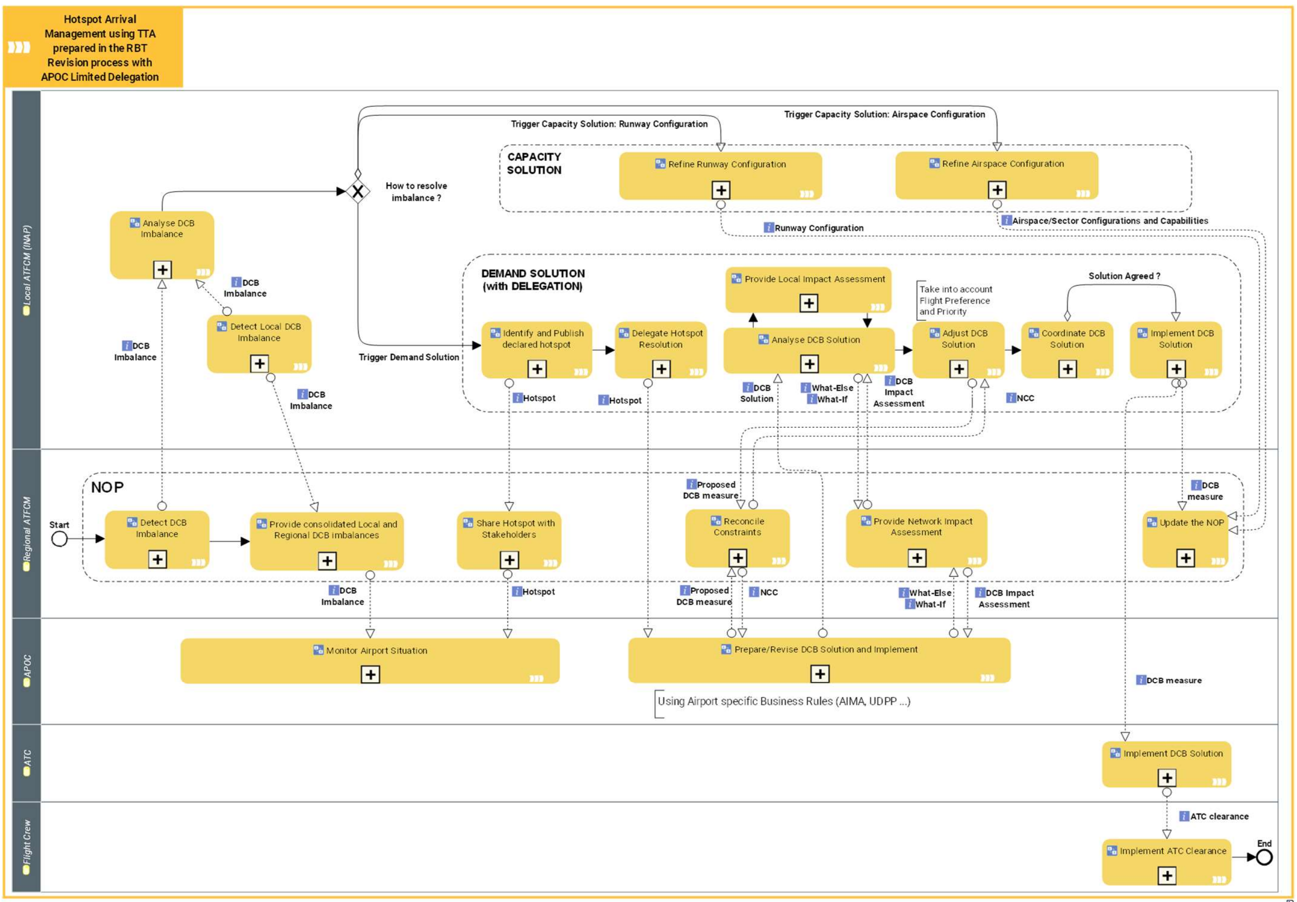


**Figure 78 : EATMA Model – Model 13 : Hotspot Arrival Management using tTTA prepared in the RBT Revision process with APOC Limited Delegation**

| Activity | Description |
|---|---|
| Adjust DCB Solution | INAP adjusts the proposed delegated solution if necessary. |
| Analyse DCB Imbalance | The Local Traffic Manager and/or the Flow Manager analyse the demand versus the given resources and capabilities in his area, in order to foresee the resulting problems. |
| Analyse DCB Solution | INAP analyses the DCB solution proposed by the delegated actors (APOC) |
| Coordinate DCB Solution | INAP coordinates the DCB solution with concerned actors. |
| Delegate Hotspot Resolution | INAP delegates the resolution of the hotspot to another actor |
| Detect DCB Imbalance | NM identifies the balance between demand and capacity in real time by analysing entry and occupancy counts and associated workload values, and comparing them respectively with situational traffic capacity values and occupancy traffic monitoring values. |
| Detect Local DCB Imbalance | INAP function analyses the local imbalance figures (complexity, ….). |
| Identify and Publish declared hotspot | Once capacity has been maximized and the imbalance still remains, INAP triggers the elaboration of a solution acting on Demand. The first step is to identify the volume (time and 3D volume) of the imbalance, and publishing the hotspot to make it visible to all stakeholders |
| Implement ATC Clearance | The Pilot Crew functions implements the ATC Clearance given by ATC |
| Implement DCB Solution | The ATC functions implements the ATC Clearance derived from a DCB measure for RBT. |
| Monitor Airport Situation | The APOC functions monitor the imbalance situation at the airport |
| Prepare/Revise DCB Solution and Implement | The NMf local actors prepare, revise and implement DCB measures to resolve the hotspot. |
| Provide consolidated Local and Regional DCB imbalances | This function collects the local imbalance figures and provides a network imbalance consolidated view. |
| Provide Local Impact Assessment | This function provides the impact assessment (what-if) at the local level. |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the network level. |
| Reconcile Constraints | This function collects the planned DCB constraints from local NMf actors and provides the Network Consolidated Constraints (NCC) aiming at reconciling the interfering local constraints. |
| Refine Airspace Configuration | According to the imbalance figures, INAP refines the Airspace Configuration |

| | |
|---|---|
| Refine Runway Configuration | According to the imbalance figures, the NMf local actors refines the Runway Configuration |
| Share Hotspot with Stakeholders | The local hotspots are collected by the Collaborative NOP and accessible by NMf actors |
| Update the NOP | The DCB/DCB solutions descriptions and their intended use are updated and published in the NOP. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| ATC | Implement DCB Solution o--> Implement ATC Clearance | Flight Crew | ATC clearance | |
| Local ATFCM (INAP) | Hotspot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Full Delegation o--> Analyse DCB Solution | AU | DCB measures | ATFCMMeasure |
| AU | Analyse SBT Situation o--> Adjust DCB Solution | AU | Margins of Manoeuvre | |
| Local ATFCM (INAP) | Refine Runway Configuration o--> Update the NOP | Regional ATFCM | Runway Configuration | ActiveRunwayConfiguration |
| Regional ATFCM | Detect DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Refine Airspace Configuration o--> Update the NOP | Regional ATFCM | Airspace/Sector Configurations and Capabilities | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Detect DCB Imbalance o--> Analyse SBT Situation | AU | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Identify and Publish declared hotspot o--> Share Hotspot with APOC | Regional ATFCM | Hotspot | |
| Regional ATFCM | Share Hotspot with APOC o--> Analyse SBT Situation | AU | Hotspot | |
| Regional ATFCM | Update the NOP o--> Update Flight | AU | | |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update the NOP | Regional ATFCM | | |
| AU | Analyse DCB Solution o--> Hotspot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Full Delegation | Local ATFCM (INAP) | DCB counter-proposal | |
| Local ATFCM (INAP) | Identify and Publish declared hotspot o--> Share Hotspot with Stakeholders | Regional ATFCM | Hotspot | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Delegate Hotspot Resolution o--> Prepare/Revise DCB Solution and Implement | APOC | Hotspot | |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update the NOP | Regional ATFCM | DCB measure | ATFCMMeasure |
| APOC | Prepare/Revise DCB Solution and Implement o--> Reconcile Constraints | Regional ATFCM | Proposed DCB measure | |
| Regional ATFCM | Reconcile Constraints o--> Prepare/Revise DCB Solution and Implement | APOC | NCC | |
| Regional ATFCM | Provide consolidated Local and Regional DCB imbalances o--> Monitor Airport Situation | APOC | DCB Imbalance | Imbalance |
| Regional ATFCM | Share Hotspot with Stakeholders o--> Monitor Airport Situation | APOC | Hotspot | |
| APOC | Prepare/Revise DCB Solution and Implement o--> Analyse Implemented DCB Solution | Local ATFCM (INAP) | DCB Solution | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Provide Network Impact Assessment o--> Prepare/Revise DCB Solution and Implement | APOC | DCB Impact Assessment | |
| Regional ATFCM | Coordinate DCB Solution o--> Analyse DCB Solution | AU | DCB measures | ATFCMMeasure |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Provide consolidated Local and Regional DCB imbalances | Regional ATFCM | DCB Imbalance | Imbalance |
| AU | Analyse DCB Solution o--> Coordinate DCB Solution | Regional ATFCM | DCB counter-proposal | |
| APOC | Prepare/Revise DCB Solution and Implement o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| APOC | Prepare/Revise DCB Solution and Implement o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |
| APOC | Prepare/Revise DCB Solution and Implement o--> Analyse DCB Solution | Local ATFCM (INAP) | DCB Solution | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Provide Network Impact Assessment o--> Analyse DCB Solution | Local ATFCM (INAP) | DCB Impact Assessment | |
| Regional ATFCM | Reconcile Constraints o--> Adjust DCB Solution | Local ATFCM (INAP) | NCC | |
| Local ATFCM (INAP) | Adjust DCB Solution o--> Reconcile Constraints | Regional ATFCM | Proposed DCB measure | |
| Local ATFCM (INAP) | Analyse DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| Local ATFCM (INAP) | Analyse DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |
| Local ATFCM (INAP) | Implement DCB Solution o--> Implement DCB Solution | ATC | DCB measure | ATFCMMeasure |

###### 3.5.2.9.1.14 Model 14: The description of the DCB Collaborative Workflow for Hotspot Arrival Management using tTTA prepared in the RBT Revision process with APOC Full Delegation

The objective is to manage a flow STAM Measure (tTTA) to resolve hotspot at the arrival airport. The DCB measures are prepared in the RBT Revision process in the 1hr-30 min timeframe.

INAP is responsible to detect the hotspot and delegates entirely to APOC (APT and AUs) the end-to-end elaboration of the DCB solution according to their business rules. APOC implements the DCB sequence solution through NM or FOC. In the execution phase, INAP monitors the DCB plan deviation and revises the plan if necessary.

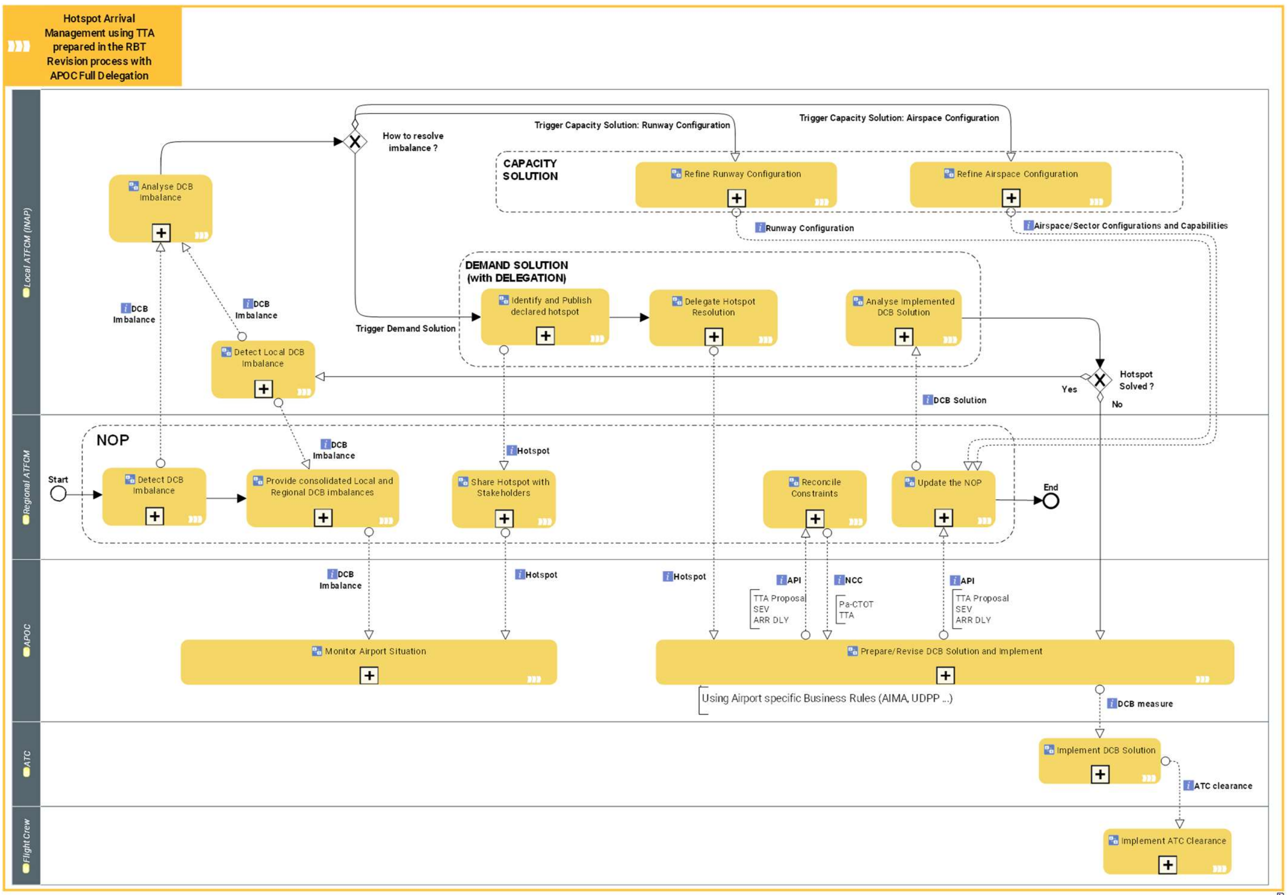



**Figure 79 : EATMA Model – Model 14 : Hotspot Arrival Management using tTTA prepared in the RBT Revision process with APOC Full Delegation**

| Activity | Description |
|---|---|
| Analyse DCB Imbalance | The Local Traffic Manager and/or the Flow Manager analyse the demand versus the given resources and capabilities in his area, in order to foresee the resulting problems. |



| | |
|---|---|
| Analyse Implemented DCB Solution | INAP monitors the proper execution of the DCB plan to resolve the hotspot and take additional measures in case of plan deviation of necessary |
| Delegate Hotspot Resolution | INAP delegate the resolution of the hotspot to an other actors |
| Detect DCB Imbalance | NM identifies the balance between demand and capacity in real time by analysing entry and occupancy counts and associated workload values, and comparing them respectively with situational traffic capacity values and occupancy traffic monitoring values. |
| Detect Local DCB Imbalance | INAP function analyses the local imbalance figures (complexity, ….). |
| Identify and Publish declared hotspot | Once capacity has been maximized and the imbalance still remains, INAP triggers the elaboration of a solution acting on Demand. The first step is to identify the volume (time and 3D volume) of the imbalance, and publishing the hotspot to make it visible to all stakeholders |
| Implement ATC Clearance | The Pilot Crew functions implement the ATC Clearance given by ATC |
| Implement DCB Solution | The ATC functions implement the ATC Clearance derived from a DCB measure for RBT. |
| Monitor Airport Situation | The APOC functions monitor the imbalance situation at the airport |
| Prepare/Revise DCB Solution and Implement | The NMf local actors prepare, revise and implement DCB measures to resolve the hotspot. |
| Provide consolidated Local and Regional DCB imbalances | This function collects the local imbalance figures and provides a network imbalance consolidated view. |
| Reconcile Constraints | This function collects the planned DCB constraints from local NMf actors and provides the Network Consolidated Constraints (NCC) aiming at reconciling the interfering local constraints. |
| Refine Airspace Configuration | According to the imbalance figures, INAP refines the Airspace Configuration |
| Refine Runway Configuration | According to the imbalance figures, the NMf local actors refine the Runway Configuration |
| Share Hotspot with Stakeholders | The local hotspots are collected by the Collaborative NOP and accessible by NMf actors |
| Update the NOP | The DCB/DCB solutions descriptions and their intended use are updated and published in the NOP. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Update the NOP o--> Analyse Implemented DCB Solution | Local ATFCM (INAP) | DCB Solution | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| APOC | Prepare/Revise DCB Solution and Implement o--> Implement DCB Solution | ATC | DCB measure | ATFCMMeasure |
| APOC | Prepare/Revise DCB Solution and Implement o--> Implement DCB Solution | ATC | DCB measure | ATFCMMeasure |
| ATC | Implement DCB Solution o--> Implement ATC Clearance | Flight Crew | ATC clearance | |
| Local ATFCM (INAP) | Hotspot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Full Delegation o--> Analyse DCB Solution | AU | DCB measures | ATFCMMeasure |
| AU | Analyse SBT Situation o--> Adjust DCB Solution | AU | Margins of Manoeuvre | |
| Regional ATFCM | Detect DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Refine Runway Configuration o--> Update the NOP | Regional ATFCM | Runway Configuration | ActiveRunwayConfiguration |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
| --- | --- | --- | --- | --- |
| Local ATFCM (INAP) | Refine Airspace Configuration o--> Update the NOP | Regional ATFCM | Airspace/Sector Configurations and Capabilities | |
| Regional ATFCM | Detect DCB Imbalance o--> Analyse SBT Situation | AU | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Identify and Publish declared hotspot o--> Share Hotspot with APOC | Regional ATFCM | Hotspot | |
| Regional ATFCM | Share Hotspot with APOC o--> Analyse SBT Situation | AU | Hotspot | |
| AU | Analyse DCB Solution o--> Hotspot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Full Delegation | Local ATFCM (INAP) | DCB counter-proposal | |
| Local ATFCM (INAP) | Identify and Publish declared hotspot o--> Share Hotspot with Stakeholders | Regional ATFCM | Hotspot | |
| Local ATFCM (INAP) | Delegate Hotspot Resolution o--> Prepare/Revise DCB Solution and Implement | APOC | Hotspot | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| APOC | Prepare/Revise DCB Solution and Implement o--> Update the NOP | Regional ATFCM | API | |
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Analyse DCB Imbalance | Local ATFCM (INAP) | DCB Imbalance | Imbalance |
| APOC | Prepare/Revise DCB Solution and Implement o--> Reconcile Constraints | Regional ATFCM | API | |
| Regional ATFCM | Reconcile Constraints o--> Prepare/Revise DCB Solution and Implement | APOC | NCC | |
| Regional ATFCM | Provide consolidated Local and Regional DCB imbalances o--> Monitor Airport Situation | APOC | DCB Imbalance | Imbalance |
| Regional ATFCM | Share Hotspot with Stakeholders o--> Monitor Airport Situation | APOC | Hotspot | |
| APOC | Prepare/Revise DCB Solution and Implement o--> Analyse Implemented DCB Solution | Local ATFCM (INAP) | DCB Solution | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Local ATFCM (INAP) | Detect Local DCB Imbalance o--> Provide consolidated Local and Regional DCB imbalances | Regional ATFCM | DCB Imbalance | Imbalance |
| Local ATFCM (INAP) | Coordinate DCB Solution o--> Analyse DCB Solution | AU | DCB measures | ATFCMMeasure |
| AU | Analyse DCB Solution o--> Coordinate DCB Solution | AU | DCB counter-proposal | |

#### 3.5.2.9.2 The Collaborative Framework Service

It aims at supporting the collaborative process in providing the information exchange modalities to represent the orchestrated and repeatable DCB process patterns. The Collaborative Workflow Service shall be supported by the extension of the current M-CDM B2B Services or new SWIM Services.

Compared to SESAR1, it shall support:

- Delegation: it aims at delegating under conditions to other actors/functions the responsibility to resolve hotspots or optispot (areas of optimisation opportunities)
- Complex Coordination: it aims at coordinating with others actors/functions a proposed set of DCB solutions. The actors requested in the coordination can manage a complex dialogue to negotiate counter-proposal or alternative proposals.
- INAP-ATC Implementation: it aims at supporting the INAP-ATC implementation of DCB Measures
- Margins of Manoeuvre & Preference Information Exchange: it aims at distributing integrated information representing the Margins of Manoeuvre and Preference expressed by the different actors.

The Hotspot Management Service shall support the features below:

| Status | Definition |
|---|---|
| **PROPOSED** | Hotspot is captured in a private mode |

| | |
|---|---|
| **INTENT** | Hotspot is notified to the Collaborative NOP |
| **CANCELLED** | Hotspot is cancelled |
| **CLEARED** | Hotspot is resolved |
| **DELEGATED** | Hotspot resolution is delegated |

**Table 21: Hotspot status definition**

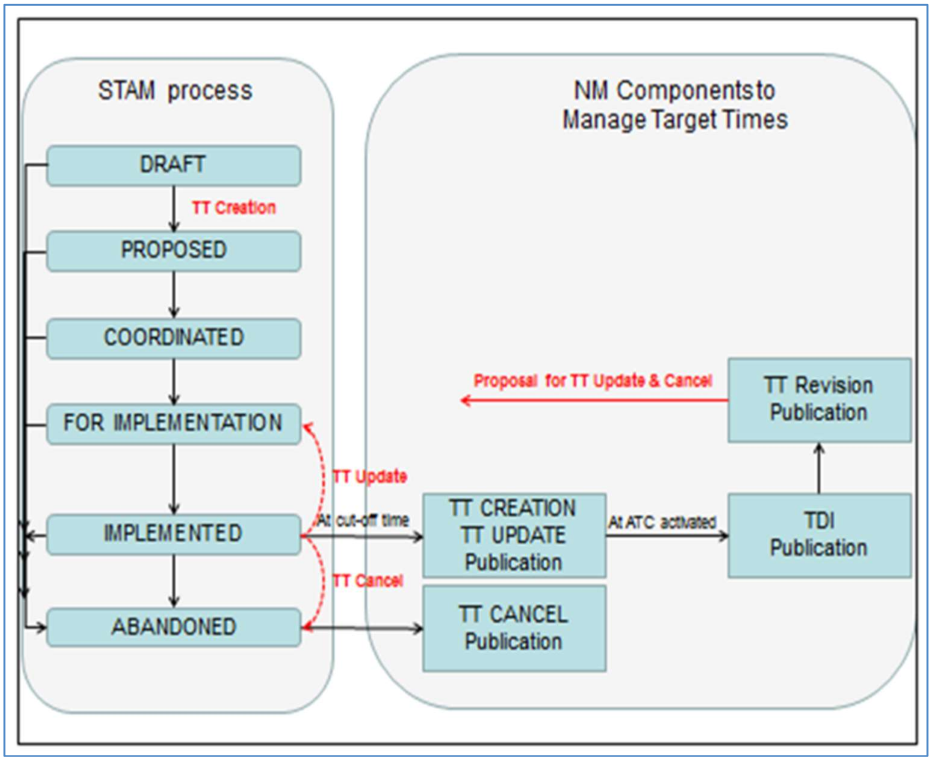



**Figure 80: STAM process and TT management in NM**

The DCB Measure Management Service shall support the features below:

| Status | Definition |
|---|---|
| DRAFT | Measure is prepared in a private mode |
| PROPOSED | Measure is proposed and notified to the Collaborative NOP |
| FOR COORDINATION | Measure is proposed for coordination<br>Simple coordination (accept/reject)<br>Complex coordination (counter-proposal) |
| COORDINATED | Measure is coordinated |
| FOR IMPLEMENTATION | Measure is proposed for implementation<br>Implementation without accept/reject<br>Implementation with accept/reject (INAP-ATC link) |
| IMPLEMENTED | Measure is implemented |
| ABANDONED | Measure is abandoned |
| FINISHED | Measure has been executed and is terminated |

**Table 22: DCB Measures definition**

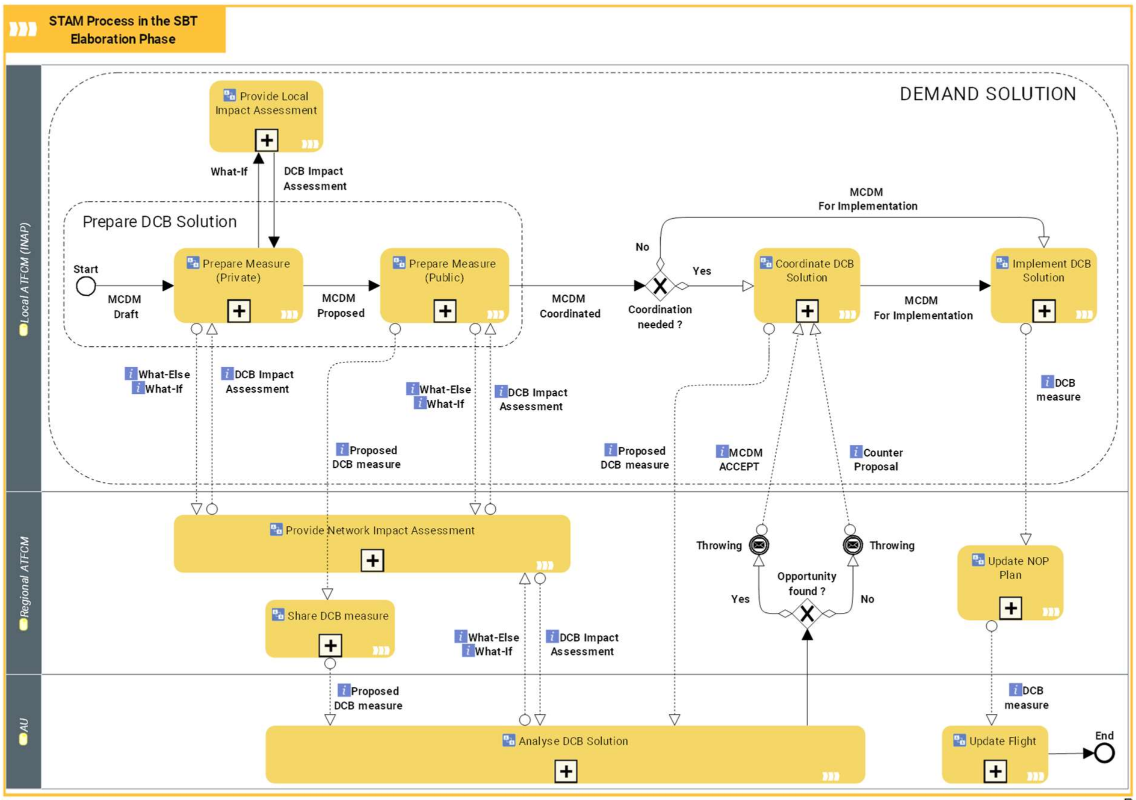



**Figure 81: EATMA Model - STAM process in SBT Elaboration Phase model**

| Activity | Description |
|---|---|
| Analyse DCB Solution | INAP analyses the DCB solution proposed by the delegated actors (APOC) |
| Coordinate DCB Solution | INAP coordinates the DCB solution with concerned actors. |
| Implement DCB Solution | The ATC functions implement DCB measures for SBT |
| Prepare Measure (Private) | INAP prepare privately the DCB measures |
| Prepare Measure (Public) | The DCB measures are published |
| Provide Local Impact Assessment | This function provides the impact assessment (what-if) at the local level. |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the network level. |
| Share DCB measure | This function provides the impact assessment (what-if) at the local level. |
| Update Flight | The Au update the SBT according to the DCB constraints |

| | |
|---|---|
| Update NOP Plan | The DCB/DCB solutions descriptions and their intended use are updated and published in the NOP. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Throwing o--> Coordinate DCB Solution | Local ATFCM (INAP) | MCDM ACCEPT | |
| Regional ATFCM | Throwing o--> Coordinate DCB Solution | Local ATFCM (INAP) | Counter Proposal | |
| Regional ATFCM | Share DCB measure o--> Analyse DCB Solution | AU | Proposed DCB measure | |
| Local ATFCM (INAP) | Prepare Measure (Public) o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| Local ATFCM (INAP) | Prepare Measure (Public) o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |
| Regional ATFCM | Provide Network Impact Assessment o--> Prepare Measure (Public) | Local ATFCM (INAP) | DCB Impact Assessment | |
| AU | Analyse DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| AU | Analyse DCB Solution o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |
| Regional ATFCM | Provide Network Impact Assessment o--> Analyse DCB Solution | AU | DCB Impact Assessment | |
| Local ATFCM (INAP) | Coordinate DCB Solution o--> Analyse DCB Solution | AU | Proposed DCB measure | |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update NOP Plan | Regional ATFCM | DCB measure | ATFCMMeasure |
| Local ATFCM (INAP) | Prepare Measure (Private) o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| Local ATFCM (INAP) | Prepare Measure (Private) o--> Provide Network Impact Assessment | Regional ATFCM | What-Else | |
| Local ATFCM (INAP) | Prepare Measure (Public) o--> Share DCB measure | Regional ATFCM | Proposed DCB measure | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Provide Network Impact Assessment o--> Prepare Measure (Private) | Local ATFCM (INAP) | DCB Impact Assessment | |
| Regional ATFCM | Update NOP Plan o--> Update Flight | AU | DCB measure | ATFCMMeasure |

### 3.5.2.10 Local Constraint Reconciliation and Global Optimization

PJ09 considers two different approaches depending on whether we manage a normal or critical situation. These different contexts imply a clear distribution of responsibilities between roles of INAP and NM, and different local and network DCB mechanisms.

- The Nominal context activates local optimisations without a global optimum. Local INAP actors will play the main role deciding the local solution to apply. In such a context, local methodologies (udpp, aima, cop sequencer, ad-hoc STAM, ….) are used with a Constraint Reconciliation Mechanism in order to manage the local interfering constraints. The resulting DCB solutions optimise the local business needs but are sub-optimum at the global level.
- The Critical context activates the global optimisation. NM actor will play the main role deciding the solutions to be applied at the global level. In such a context, one global methodology (CASA, CRO, Interactive Regulation, …) is used (global optimisation). The resulting DCB solution is an optimized solution at the global level. It supports the NM business needs to recover efficiently a global nominal situation.

Managing with different roles, responsibilities, methodologies these nominal and critical contexts requires a reliable prediction of the network states (nominal, critical), clear splitting role of INAP and NM according to the context, and handover mechansims to shift from local and global decisions/solutions.

**Nominal Context : Local Optimisation and Constraint Reconciliation Architecture**

In the figure hereafter, each local optimisation method (e.g. udpp, aima, cop-sequencer, …) designs a solution (DCB time-based sequence) to minimize the cost function. Then, a Constraint Reconciliation at the global level detects the interfering constraints, applying rules (e.g. Most Important Problem) to resolve the interferences. It delivers solutions optimized locally which might be sub-optimal at the global level.

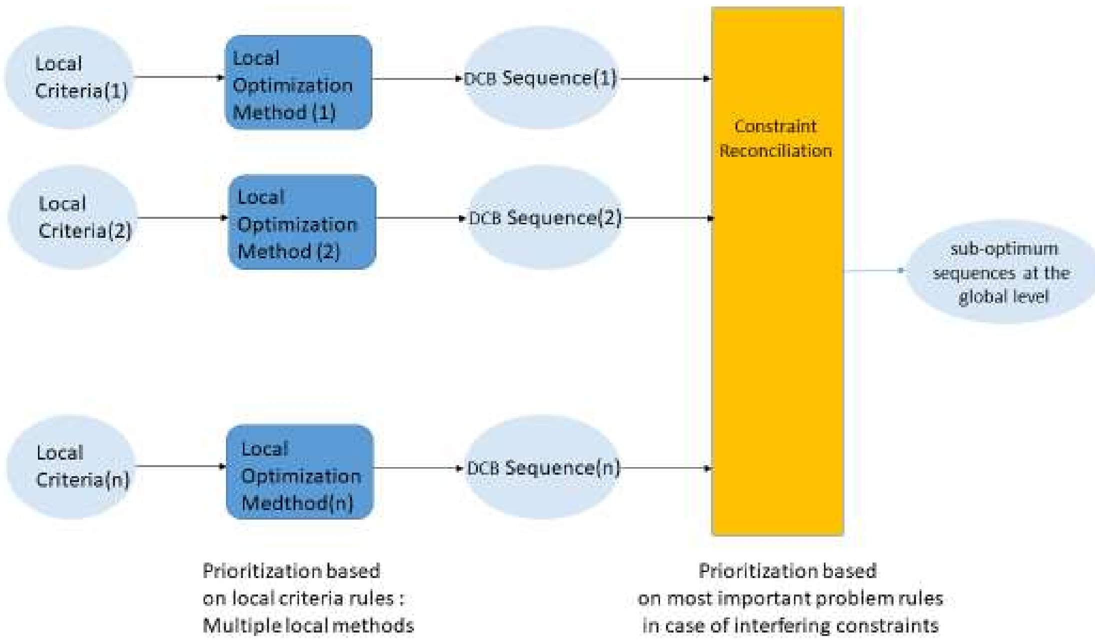



**Figure 82 : Local Optimisation and Global Constraint Reconciliation**

**Critical Context : Global Optimisation**

In the figure hereafter, a global optimisation at the network level implies

- to have a direct access to the local criteria to optimize
- to offer one & unique single method at the global method to resolve problems
- to define multi-criteria cost function

The global optimisation processes the multiple local criterias (cost functions) to propose optimum DCB solutions.

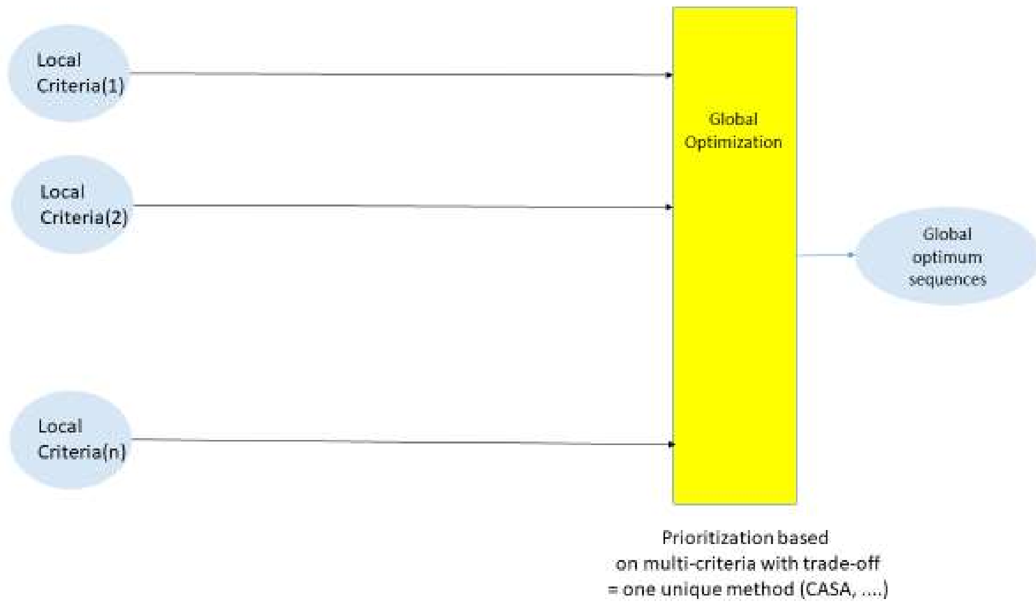



Figure 83 : Global Optimization

#### 3.5.2.10.1 Constraint Reconciliation

In the SESAR 2020 environment, Local-DCB actors (en-route, airport) will be able to apply local rules to build DCB solutions adapted to their needs within their area of responsibility. This significant increase in role and responsibilities and the introduction of the Spot-centric management approach imply:

- A multiplication of sources (i.e. origin) for DCB decisions (en-route, airport, airspace users),
- A mix of DCB measures with time-based and geographical trajectory adjustments.
- DCB plans will be developed to manage safety and/or pure optimisation issues
- to run what-ifs on global network performance and use them to propose potential alternative

Within such distributed decision-making environment, a flight can be captured in different spots (i.e. hotspot for safety, optispot for optimisation) and affected by different local constraints generating possible interfering constraints.

At network level, a mechanism shall ensure the management of these interfering constraints. The Constraint Reconciliation service shall:

- Ensure the collection of the locally planned DCB Target-Time solutions to determine the global consistency and to detect which flight trajectories will be affected by multiple constraints interferences.
- Provide a Network Consolidated Constraint (NCC) to the local-DCB actors which allow them to be informed about the Network situation by a network consolidated target-time reply based on their target-time proposal request.
- Offering the re-assessment based on other existing constraints that would make the candidate constraint unnecessary/ not efficient

The Network Consolidated Constraint (NCC) determines the eligible constraint based on two main principles:

- The categorization of identified DCB "Spot"
- The introduction of priority rules to manage conflicting DCB measures depending on the nature of the related DCB "Spot" (i.e. hotspot, optispot)

The categorization of DCB spots introduces the notion of the Most Important Problem (MIP) that prioritizes the level of criticality. Four main categories of DCB spots have been identified and are listed, starting from the most important, in the table below.

| Spot Category | Most Important Problem (MIP) |
|---|---|
| **CrisisSpot** | 1 |
| **CriticalSpot** | 2 |
| **HotSpot** | 3 |
| **OptiSpot** | 4 |

**Table 23: List of DCB spot categories**

A DCB Target-Time measure associated to a Spot Category inherits the MIP attribute. It implies that a planned DCB measure for a most important DCB spot will always take priority over a DCB measure for a less important DCB spot.

Rules and principles have to be defined in order to manage conflicting measures:

- Between different DCB spot category (extra-category priority)
- Within a same DCB spot category (intra-category priority)

#### 3.5.2.10.1.1 Category of Problems

Crisisspot : It represents a crisis situation in which NM imposes the solutions (contingency plans) to recover to a nominal situation, shares the impact and predicted network states with other stakeholders. A crisis situation represents a non nominal and unplanned event.

On safety side, CrisisSpots present the high-level risk on network operations. Crisis are managed using contingency plans, usually paper based. For an ACC, the cases covered a) range from loss of power supply, b) security threat and c) closure of the ACC. Those plans are developed by each ACC and transmitted to the Network Manager each year.

In case of crisis, there is a need to have a support tool to drive the execution of the recovery plan, to manage the coordination between the ACC/FMPs, AUs, Airport and the Network Manager.

Crisis events have to be managed at network level:

- Network Manager has a clear role in leading and facilitating the execution of the recovery plan, by better sharing the information on crisis impact over the network, using network states to develop an optimised recovery plan;
- As recovery plans are developed locally, at ACC level, it is proposed for the Network Manager to review and consolidate the local contingency plans to identify those which are not up-to-date or obsolete and not useful.

Criticalspot : It represents a critical situation in which NM can propose solutions (based on a dedicated catalogue of measures and predefined scenarios) to recover to a nominal situation, share the impact and predicted network states with other stakeholders. A critical situation represents a non nominal and planned event. Critical spots have the second level by order of priority (i.e. less than crisis, higher than hotspots), and the main rule to be applied for arbitration between flights captured by two or more critical spots is the Most Penalizing Constraint (MPC) principle. Inspecific cases, Predefined scenarios and coordinated action plans between local actors could be applied instead of the MPC rule, when operationally relevant and efficient.

As difference with crisis management where Network Manager recovery plan has to be applied (i.e. mandatory), there is a need to define a clear role for NM related to:

- Share critical spots alongside information such as tendency & variability
- Provide impact assessment
- Identify who could provide help and support within the neighbouring areas
- Provide guidance & solutions to ACC/FMPs, Airports, AUs

Hotspot : It represents a traffic situation (safety non critical) in which ANSP (INAP) are responsible to define solutions. A hotspot situation represents a nominal, safety non critical and planned event.

Optispot : It represents a traffic situation to be optimized, in which ANSP (INAP) define solutions. An Optispot situation represents a nominal, safe and planned event. The arbitration mechanism to be applied when multiple OptiSpots are concerned :

- The Best-Effort principle in case of an OptiSpot measure in a DCB hotspot
- The First Come First Served principle to arbitrate between multiple OptiSpots measures

#### 3.5.2.10.1.2 Extra-category DCB spot priority

The Extra-category Spot priority rules have to be defined between each category.

| List of extra DCB-Spot priority and rules | CrisisSpot | CriticalSpot | HotSpot | OptiSpot |
|---|---|---|---|---|
| **CrisisSpot** | Recovery Plan | *MIP* | *MIP* | *MIP* |
| **CriticalSpot** | *MIP* | • MPC for Time based<br>• Constraint Optimisation for Rerouting | *MIP* | *MIP* |
| **HotSpot** | *MIP* | *MIP* | • MPC for Time based<br>• Constraint Optimisation for Rerouting | **BestEffort** |
| **OptiSpot** | *MIP* | *MIP* | **BestEffort** | First Come First Served principle |

**Table 24: List of extra-category DCB spot priority**

**Mip (Most Important Problem) :** The MIP priority rule considers for example the Hotspot measures as a higher priority than the OptiSpot measures and overwrite slots allocated to the Optispot. Because the Constraint Reconciliation Service is continuously recalculating the situation, this first slot available for a problem can be reallocated to a most important problem according to the table "List of DCB spot category".

**BestEffort :** The BestEffort priority rule considers the Hotspot measures as a higher priority than the OptiSpot measures but uses the mechanism of no-slot-before to look for the first slot available for the OptiSpot measures. Because the Constraint Reconciliation Service is continuously recalculating the situation, this first slot available for the OptiSpot measure can be:

- Overruled by Hotspot measures
- Pushed further than the requested target-time or earliest available slot provided.
- Improved in the limit of the requested target-time

For a given flight affected by several DCB measures , the above mentioned prioritisation and optimisation process according to the category of DCB spot will be continuously recalculated until the freeze time, that will normally coincide with Slot Issue Time 1 (**SIT1**) i.e. 2h before EOBT. After that time, there will be mechanism of revision, in similar lines than today's one, that can be activated or not , to improve the allocated delay. Additionally the current manually overriding processes to cope with late critical problems will remain valid and will overrule the nominal automatic process

##### 3.5.2.10.1.3 Intra-category DCB spot priority

The Priority rules for target-time measures associated to the same Spot category are defined.

| DCB spot category | Intra-Category Rules |
|---|---|
| **CrisisSpot** | *Not yet defined.* |
| **CriticalSpot** | MPC (Most Penalizing Constraint) |
| **HotSpot** | MPC (Most Penalizing Constraint) |
| **OptiSpot** | *First Come First Served* |

**Table 25: Priority Rules**

**Most Penalizing Constraint (MPC) :** The MPC is a target-time measure that applies the most penalizing delay among all target-time measures along the trajectory. The MPC rule imposes this most penalizing delay to the whole trajectory. In the case where the Constraint Reconciliation Service for the same SBT collects several Target-Time proposals associated to HotSpot, the NCC reply to the requesters is equal to the MPC.

**First Come First Served :** FCFS basically means that a flight which is planned to enter the problem (regulated) location earlier has priority over flights intended to use it later.

##### 3.5.2.10.1.4 Constraint Reconciliation Operating Method

In the figure below is illustrated the Constraint Reconciliation mechanism.

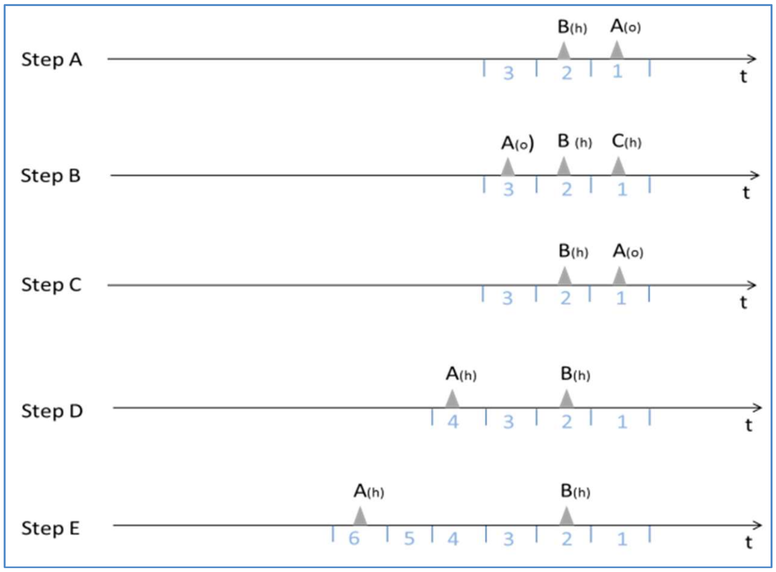



**Figure 84: Constraint Reconciliation Mechanism**

To be noted : in the figure above, the notation (o) corresponds to a slot issued for an Optispot and (h) corresponds to a slot issued for a Hotspot.

**Step A:** The actor INAP-1 declares an Optispot and sends a Target-Time proposal request to the Constraint Reconciliation to assign slot1 for flight-A. The requesting slot time (slot1) is available and the Constraint Reconciliation replies to INAP-1 with the NCC value time (slot1). The flight A(o) is assigned to slot1. The flight B is assigned to the slot2.

**Step B:** The actor INAP-2 declares a Hotspot and sends a Target-Time proposal request to the Constraint Reconciliation Service to assign slot1 for flight-C. The requested slot time (slot 1) is not available but the flight-C measure (HotSpot) is considered more important than the flight-A measure (OptiSpot). The Constraint Reconciliation Service assign the flight-C to the requested slot1 and find for flight-A an earliest available slot pushing further than the requested target-time. The flight-A(o) is assigned to slot3. The slot2 was not possible because occupied by a more important measure (flight-B/Hotspot).

**Step C:** The actor INAP-2 abandons the measure for the flight-C. The Constraint Reconciliation Service reassesses the situation and improves the flight-A slot in the limit of the requested target-time. Flight-A is again assigned to the slot1.

**Step D:** The actor INAP-3 declares a Hotspot and sends a Target-Time proposal request to the Constraint Reconciliation to assign slot4 for flight-A. The Constraint Reconciliation overrules the flight-

A/slot1 with the flight-A/slot4 because the INAP3/Hotspot is more important than the INAP-1/OptiSpot.

| Actor | DCB Spot | Flight | Proposal Request |
|---|---|---|---|
| INAP-3 | HotSpot | Flight-A | Slot4 |
| INAP-1 | OptiSpot | Flight-A | Slot1 |

**Table 26: Constraint Reconciliation Example (1)**

**Step E:** The actor INAP-4 declares a Hotspot and sends a Target-Time proposal request to the Constraint Reconciliation to assign slot6 for flight-A. The Constraint Reconciliation considers that there are two requested proposal (from INAP-3 and INAP4) eligible because associated to a Hotspot issue. It apply the Most Penalizing Constraint rule (MPC) and assign the slot-6 for flight-A

| Actor | DCB Spot | Flight | Proposal Request |
|---|---|---|---|
| INAP-4 | HotSpot | Flight-A | Slot6 |
| INAP-3 | HotSpot | Flight-A | Slot4 |
| INAP-1 | OptiSpot | Flight-A | Slot1 |

**Table 27: Constraint Reconciliation Example (2)**

##### 3.5.2.10.1.5 EATMA Model of the Constraint Reconciliation

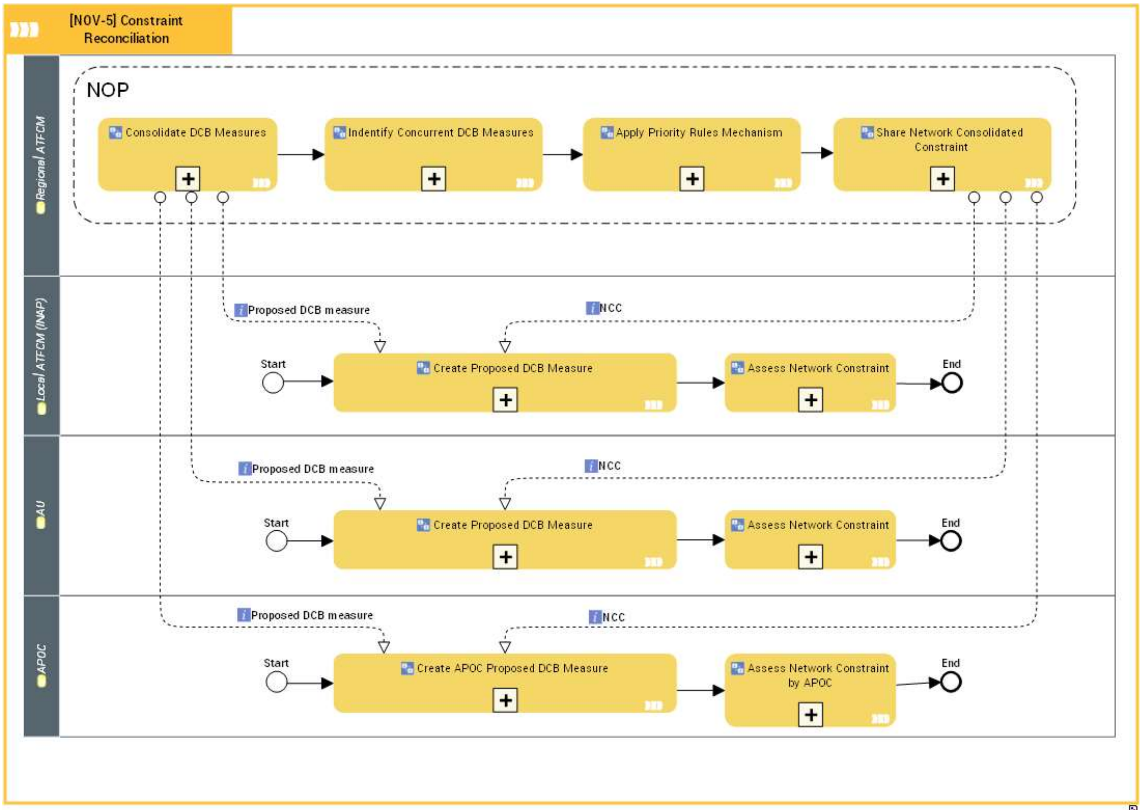



**Figure 85: EATMA Model – Constraint Reconciliation**

| Activity | Description |
|---|---|
| Apply Priority Rules Mechanism | Thus function determines the eligible constraint according to the 'Most Important Problem' rules. It generates the NCC (Network Consolidated Constraint) |
| Assess Network Constraint | The local NMF actors perform a Network Impact to assess the NCC proposed by the Collaborative NOP. |
| Assess Network Constraint by APOC | The local NMF actors perform a Network Impact to assess the NCC proposed by the Collaborative NOP. |
| Consolidate DCB Measures | This function collects all the proposed DCB constraints from local NMf actors. |
| Create APOC Proposed DCB Measure | Local actors propose DCB constraints |
| Create Proposed DCB Measure | Local actors propose DCB constraints |
| Indentify Concurrent DCB Measures | This function determine concurrent and interfering DCB constraints proposed by local NMf actors. |



| | |
|---|---|
| Share Network Consolidated Constraint | The proposed DCB constraints are collected by the Collaborative NOP and accessible by NMf actors |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Consolidate DCB Measures o--> Create Proposed DCB Measure | Local ATFCM (INAP) | Proposed DCB measure | |
| Regional ATFCM | Share Network Consolidated Constraint o--> Create Proposed DCB Measure | AU | NCC | |
| Regional ATFCM | Consolidate DCB Measures o--> Create Proposed DCB Measure | AU | Proposed DCB measure | |
| Regional ATFCM | Consolidate DCB Measures o--> Create APOC Proposed DCB Measure | APOC | Proposed DCB measure | |
| Regional ATFCM | Share Network Consolidated Constraint o--> Create Proposed DCB Measure | Local ATFCM (INAP) | NCC | |
| Regional ATFCM | Share Network Consolidated Constraint o--> Create APOC Proposed DCB Measure | APOC | NCC | |

#### 3.5.2.10.2 Constraint Optimisation

Constraint Reconciliation Optimisation (CRO) in the context of a network flow problem refers to the provision of an optimal solution to observe different constraints and to minimize a multitude of system costs. In a simplest case, the problem contains one flight concerned by multiple constraints along its planned route profile. In any more complex case, the problem contains a number of flights from which a relevant share is concerned by multiple constraints. They have to be reconciled, either based on rules or based on cost coefficients as part of an optimisation modelling approach. Such an approach shall extend the reconciliation by assigning costs to flights in a most efficient manner while observing those constraints. It is essential to select the type of costs according to specific stakeholder perspectives. In a first attempt to cover the Network Manager`s point of view, delay costs are focussed. Therefore, all imbalances have to be resolved by allocating delay and slots. Flights which have to be delayed are selected in a way that primary *and* reactionary (secondary) delay is minimized.

#### 3.5.2.10.2.1 System Architecture

CRO processes flights and regulations and returns a set of restricted flights with calculated take-off times and slot entries.

The optimisation function (CRO) will be called in each iteration and will have the following interface:

- **Inputs:** flights, regulations, regulation entries, **auto linked regulations**
- **Outputs:** ATM-delay, allocated slots, Most Penalizing Regulation

#### 3.5.2.10.2.2 CRO Principles

i. CRO receives the current flights, regulations and slot entries.
ii. CRO computes an optimal solution according to the defined target function. Optimal delay, slots and MPR are allocated.
iii. When the slot issue time is reached, departure slots are issued. However, exceptions exist when flights are not issued, even though slot issue time is reached.
iv. Filed flight plans, regulations, sector configurations etc. are known since the beginning (in the prediction horizon). Traffic departures can be randomly disturbed while additional regulations could be triggered throughout the iterations. No changes in traffic/capacities occur during the optimisation.
v. Secondary imbalances and bunching due to regulated flights will not be prevented in the optimisation. These imbalances could be detected in the next iteration and thereafter be resolved by optimisation.
vi. Reactionary delay is computed, ATFCM delay and slot allocations are updated accordingly.

#### 3.5.2.10.2.3 CRO Description

CRO performs a DCB optimisation. The optimal flight restrictions are found by solving a Linear Binary Integer Problem. Primary and reactionary delay types are part of the cost function to find an optimal trade-off. When a sector is overloaded, CRO can reduce the demand in the specific sector time window. Hotspots and imbalances will be resolved so that primary and secondary delays are minimized. However, a strict avoidance of regulated hotspots may lead to “secondary” imbalances or hotspots.

Those imbalances, which arise from the optimal solution, could be detected by RNEST to be provided to CRO for reconciliation within the next iteration.

The CRO workflow is shown in figure below:

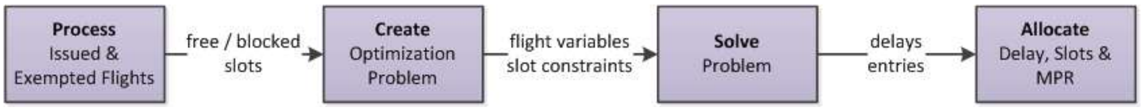



**Figure 86 : CRO workflow**

The following chapters describe each of the referred parts of CRO.

#### 3.5.2.10.2.4 Process Issued and Exempted Flights

CRO receives flights, regulations and entries. Flights are handled depending on their status and slot issue state. Slots of issued flights are permanently allocated and are not available to slot allocation anymore.

i. Flights with issued slots are checked and if necessary, slot allocations are corrected.

ii. Flights with exempted status are delayed with zero delay and receive the closest available slot if they enter a regulation in the regulation period.

iii. Remaining flights are validated regarding entries, slots and delay.

#### 3.5.2.10.2.5 Create the Optimisation Problem

Before starting the optimisation, the different departure time options of the flights have to be mapped to the regulations and the slots, respectively. For all flights and all possible departures (for every possible entry-sequence), entry sequences are created. Each flight-option is mapped to one preliminary slot for each regulation which is entered. The slots are selected so that the timeover is within the same overlap interval. CRO does not allocate slots for flights when the entry time is outside a regulation time window. When the CTO of a departure-option is after the last regulation slot, the flight is allocated to that regulation ending time. Because the number of flight and slot entry permutations is so high, entry sequences are added iteratively in the solving process of Column Generation.

**Mapping of ATM delay to regulation time-slots**

Regulations are partitioned in slots which all have capacity of one. The interval between slot times is equal to the regulation window over rate. When all slots are observed, it is **guaranteed** that capacities are observed for all possible entry-count intervals. However, to allow flexibility of slot allocation, a window width tolerance of 5 minutes around slot time is given in the current network. In CRO, all flights are allocated in the same overlap interval as the slot.

i. Slot window: slot time ± half window width

ii. Slot interval: regulation timewindow / flow rate

iii. overlap interval: overlapping integration windows shifted by the sliding step. E.g. 20 minute integration windows shifted by 10 minutes lead to overlap intervals of 10 minutes.

When the flow rate is low, the window width could be lower than the slot interval (see figure below). In this case, time periods exist in which no flight can enter a slot in the window width interval. This is indicated as “no man’s land”. Accordingly, a flight which has an ETO in a *no man’s land* time period will be delayed so that the flight receives a slot where CTO is allocated within a slot window.

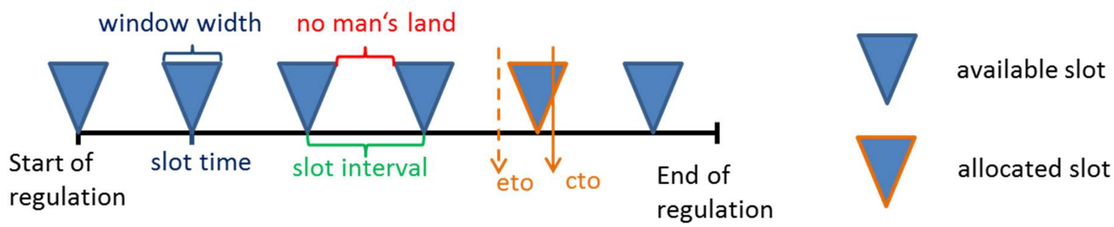



**Figure 87 : Low rate: CTO outside slot windows (“no man’s land”)**

When all slots between ETO and regulation end time are occupied, entries are set to the regulation end (see figure below). Therefore a slot without capacity limitations is created as the last regulation slot. If too many flights are set to this slot, traffic bunching occurs.

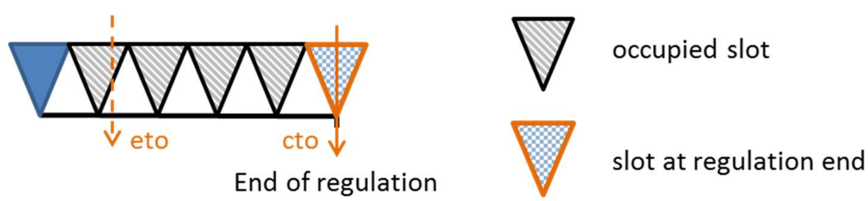



**Figure 88 : Medium rate and occupied slots: CTO at regulation end**

When the flow rate is high, slot windows are larger than slot intervals, so that they overlap (see figure below). In each case one of the overlapping slots has to be selected.

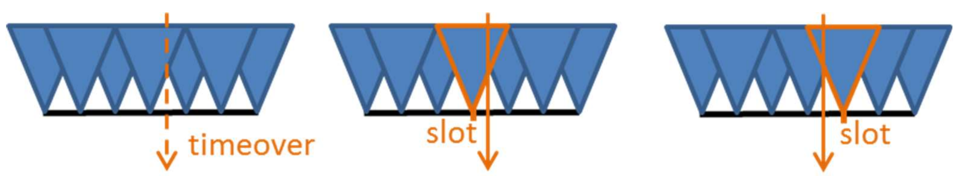



**Figure 89 : high rate, left) CTO in two slot windows, center) earlier slot selected, right) later slot selected**

For each flight which has a timeover inside the regulation period, a slot has to be allocated. For each departure option, proper slot entry sequences are generated.

**Linked Regulations**

If more than one flight is planned to enter a set of regulations, these regulations are linked.

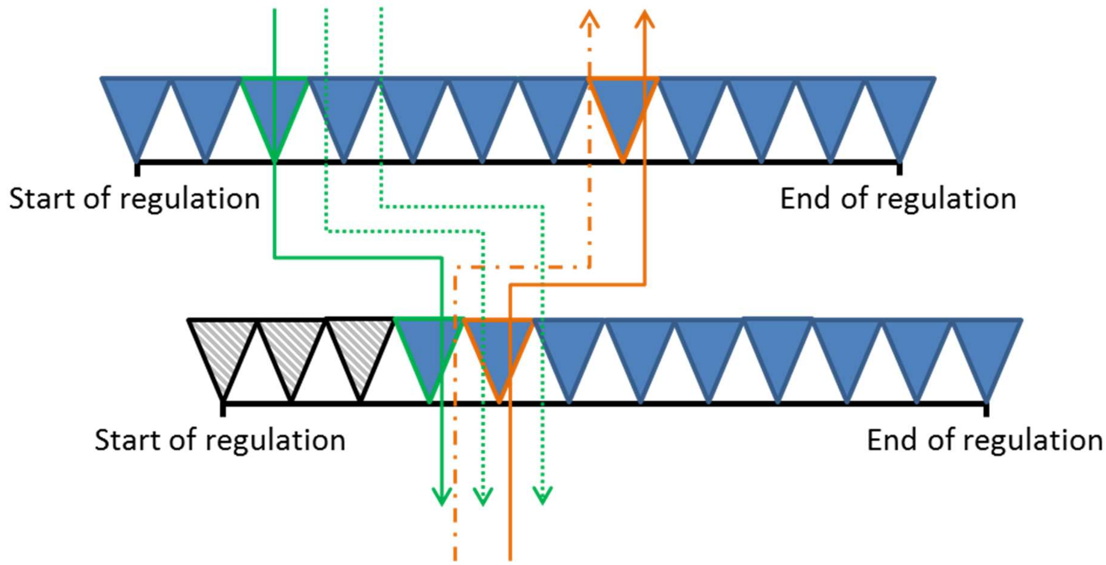



**Figure 90 : Two flights in two regulations competing for the same slot**

The linked constraints are reconciled by the optimisation, so that every slot has at most one entry.

**Optimisation problem**

The optimisation problem consists of binary decision variables with primary and secondary delay costs. Each flight has a departure constraint for all possible delays and slot entry sequences. Each slot is constrained by a capacity value of one for all possibly entering flights.

i. **Flight-related costs:** Defined for primary and secondary delay. A sensitive cost-coefficient is defined to conduct trade-off analysis.

ii. **Departure conditions:** For each flight, one probable departure slot option has to be seletcted.

iii. **Slot constraints:** The entry sequences for each flight are mapped to the slots. Each slot has a capacity constraint of one entry, so that overloads are prevented.

The optimisation problem is a Binary Integer Problem (BIP) with linear constraints. The solution performance for Integer Problems is mainly driven by the amount of data to be processed; by the number of decision variables and constraints but also by the complexity of the target (cost) function.

#### 3.5.2.10.2.6 Allocation of Delays, Slots and Most Penalizing Regulations

The optimal solution which is returned by CRO includes the delay and slot entries for each flight. The Most Penalizing Regulation (MPR) is computed in a post-processing. The regulation inducing the highest allocation delta of ETO and CTO is declared as MPR. The MPR can be selected according to this delta in a first regulation or according to the number of slots from which the flight is denied to enter in another regulation as depicted in figure below.

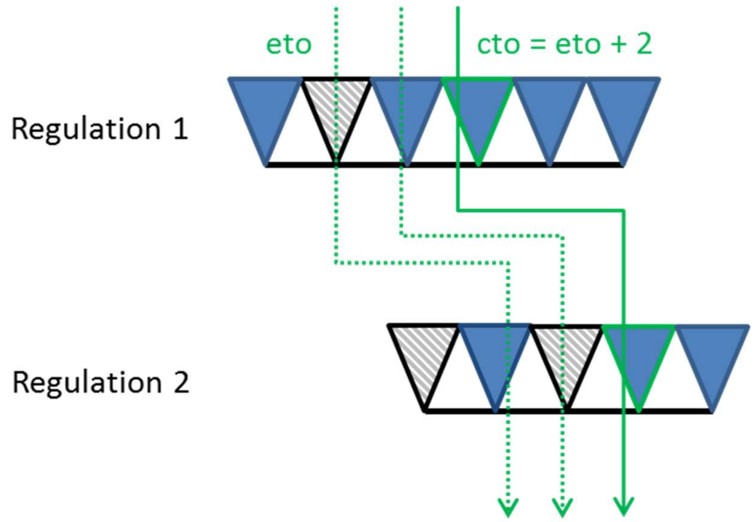



**Figure 91 : MPR cases. Regulation 1 causes a flight to be delayed and the consecutive target slot of regulation 2 is occupied. The flight is delayed by two slots. The MPR can be set as to be originated from regulation 2.**

After delays, slots and MPR are set and validated, CRO returns the control flow to the system to start the next iteration.

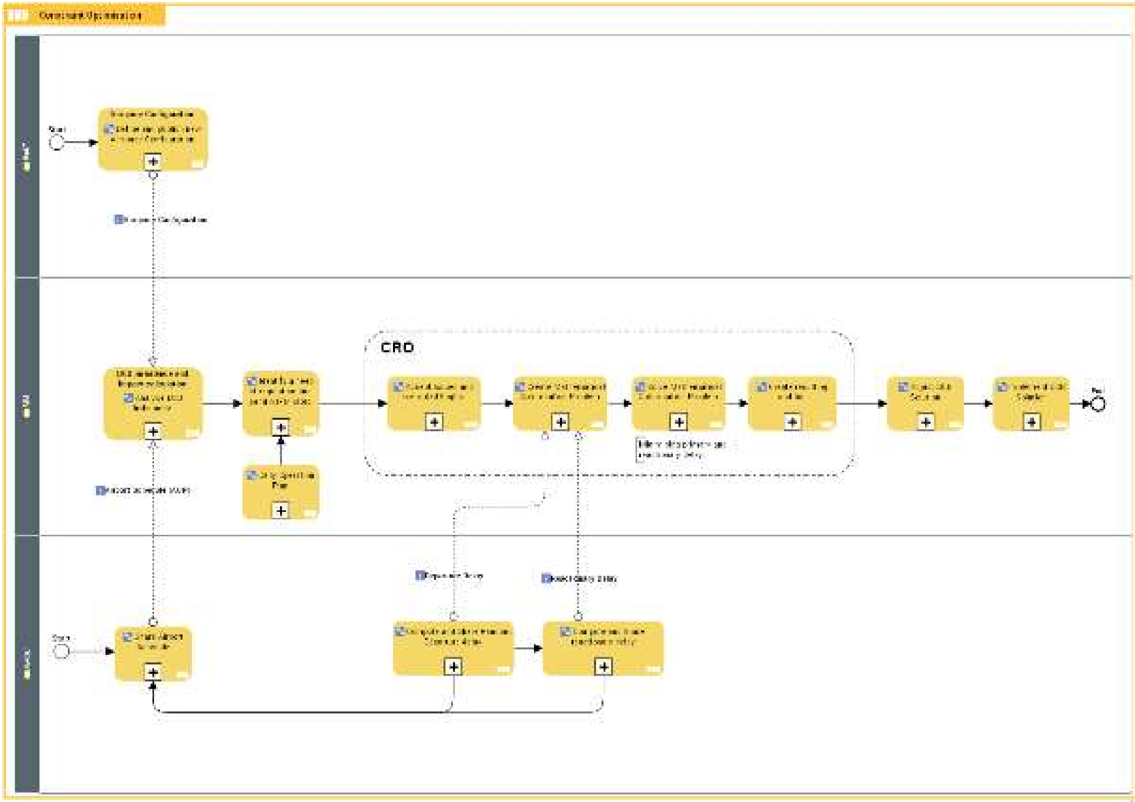



**Figure 92 : Constraint Optimisation**

| Activity | Description |
|---|---|
| Accept Issued and Exempted Flights | Issued and exempted flights are taken as is, not changed. |
| Adjust DCB Solution | The DCB solution is adjusted if necessary. |
| Analyse DCB Imbalance | The Local Traffic Manager and/or the Flow Manager analyse the demand versus the given resources and capabilities in his area, in order to foresee the resulting problems. |
| Compute and Share Random Departure delay | Random delay values are generated to represent stochastic delay of operations. Flight plans are updated accordingly (EOBT, entry times). |
| Compute and Share reactionary delay | Reactionary delay results from primary delay, when there is a flight connection with a buffer time smaller than primary delay. Flight plans are updated accordingly. |
| Create Mathematical Optimisation Problem | All flights, which are not issued or exempted, participate in optimisation. Flight variables are created and mapped to slots |

| | |
|---|---|
| | according to timeover and sliding ten tolerance rule. Slot constraints make sure that at each slot serves max one flight. |
| Create resulting slot list | The solution from the optimisation problem is translated into RNEST flights which receive ATM delay and slots according to solution. |
| Daily Operation Plan | It provides the capacity figures. |
| Define and publish new Airspace Configuration | Airspace configuration for the day is taken from the daily plan. |
| Identify a need of regulation and send ATFCM slots | When demand for air traffic services is expected to exceed the available capacity of airports or airspace within the ECAC area, the Network Manager issues slot times for being able to balance demand with capacity. |
| Implement DCB Solution | Local actor implements the agreed DCB solution. |
| Share Airport Schedule | Flight plans are gathered from ALLFT+ and passed to RNEST. |
| Solve Mathematical Optimisation Problem | Optimisation problem is solved to find solution which has one active variable per flight, fulfilling slot constraints and minimizing cost (minimizing primary and reactionary delay). |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| APOC | Share Airport Schedule o--> DCB imbalance and impact calculation | NM | Airport Schedule (AOP) | |
| INAP | Airspace Configuration o--> DCB imbalance and impact calculation | NM | Airspace Configuration | AIRM_Change_Request |
| APOC | Compute and Share Random Departure delay o--> Create Mathematical Optimisation Problem | NM | Departure Delay | |
| APOC | Compute and Share reactionary delay o--> Create Mathematical Optimisation Problem | NM | Reactionary Delay | |

#### 3.5.2.11 Collaborative NOP

The Collaborative NOP supports additional capabilities:

##### 3.5.2.11.1 AU absolute priority indicator

To accommodate the AU business needs, DCB solutions shall take into account AU flight priorities. In order to manage AU priority, En-Route INAP actors needs a harmonised and unified priority information to decide over which flights to apply STAM measures choosing between flights of different AUs. The issue is complex because the flight priority can be determined by different heterogeous prioritisation methodologies (i.e. UDPP, AIMA, ….) at remote departure/arrival airports and then propagated in the En-Route network.

In order to guarantee an unambigous priority information, the concept of an absolute priority value has emerged to be distributed to DCB actors. The assumption is that the absolute priority would allow easy comparison and use by DCB actors, ensuring that all AU's policy and priorities are equally taken into account.

PJ07 made a study to investigate this issue and findings have demonstrated that there is no unambiguous way to determine the absolute priority among the flights from the local relative priorities in the context in which they were generated by AUs and/or airports prioritisation systems. The reason is that the prioritisations made by the AUs and airports typically take into account internal information about the costs and business needs that often is not visible to the DCB and that is not fully represented by the prioritisation information. Therefore, the relative priority values cannot be compared between them, even when they belong to the same AU (in general, priorities cannot be used out of the context in which they were generated).

It is worthy to mention that in current UDPP features the concept of 'priority list' is not representing well anymore the way of operating and expressing the AUs needs. And when used, the priority list is something calculated and expressed by the AUs after looking at the actual situation of their flights (all their fligths, under congestion or not), assessing the impact and options to recude costs, and deciding the new sequence desired. The prioritisation list is generated by the AUs as a way to communicate not the actual priorities undersood as which flights are more important to the AU, but to manipulate the UDPP mechanism and achieve the new sequence desired for such specific congestion situation.

Other prioritisation systems, such as AIMA, will take into account similar internal business logics in which complex cost structures and prioritisations relative to the actual situation will be present.

Therefore, contextualised prioritisations will not be useful out of their context, and consequently cannot be used unambiguously by DCB in other congestion scenarios. It means that PJ07 cannot propose a solution that could allow INAP to manage AU priority in wave1.

#### 3.5.2.11.2 AU Flight Delay Criticality Indicator

The FLIGHT DELAY CRITICALITY INDICATOR [FDCI] is a parameter provided by the Airspace User to indicate that it is critical that the flight progresses and arrives on time. Hence, the flight should preferably not be assigned any or much delay and it should even be tried to decrease an allocated delay if accepted and possible.

A flight should not be critical in the pre-tactical or early tactical planning phase. However, a flight can be an important flight from the beginning for several reasons like high revenue flight for airline or few occurrences scheduled in the week… Important flights are prompted to become critical flights along the day as disruptions of the planning, in the network or within the airline, come up. Nonetheless, any flight can potentially become critical.

Several variants of this concept are nowadays in use at local level (ANSP) and in a way at network level through the helpdesk.

An important advantage of providing the [FDCI] to the NOP is the transparency of the process and awareness for all network actors. This is an important element in this concept. Additionally the use of this indicator can be centrally monitored, traced and reported and a simple set of agreed rules can be enforced to avoid its abuse.

NMOC, local FMP and AOP can act to solve or improve the situation of a critical flight.  See UC below.

Reasons to use FDCI are for example to avoid a curfew, to not miss an important connection, crew hours, to avoid incurring unnecessary high costs to the AU (airline reputation, VIP flight or high passenger economical compensation)

The FDCI consists of three attributes:

- A first attribute reflecting the criticality, which will be shown in the flight list as an additional column.

- A second indicator containing the reason

- and a third one being the time tolerance (maximum acceptable delay) that will be used by NMOC/FMP as a help to resolve the problem.

Sharing the FDCI has the following advantages:

- NMOC, FMP and AOP can help the critical flights. They can reduce the delay of a critical flight or avoid providing a delay during the cherry picking selection to create a DCB measure.
- Full transparency of information at network level
- Less workload for FMP (compared to phone calls FMP/AO used sometimes today)
- Limited additional workload for NMOC Flow helpdesk (as number of FDCI is restricted)
- The use and a potential abuse of this indicator can and will be traced and reported based on FDCI post-analysis data.

Rules to prevent excessive use of FDCI

- Maximum number of FDCI request per AU per period of time (Today, Last 7 days, Last month)
- Maximum number is weighted considering the number of flights that the airline has in ECAC area

And/Or

- Maximum number could be weighted by the proportion of airline traffic affected by regulations.

Several ways to input the FDCI are envisaged:

- The AU can input via NOP/CHMI and NM eHelpdesk
- The FMP can also set the FDCI via NOP/CHMI if the request is received by mail or phone.

In the future, the AU could set the FDCI using the eFPL (FIXM).

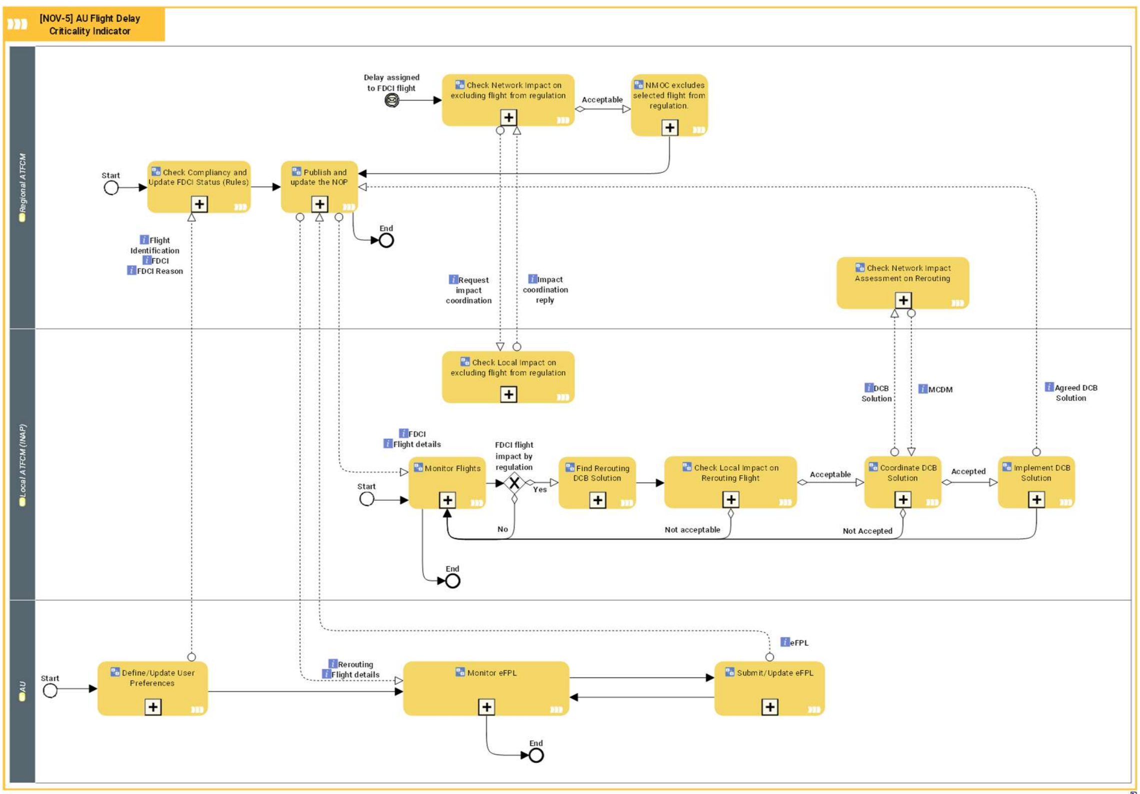



**Figure 93: AU Flight Delay Criticality Indicator**

| | |
|---|---|
| | |
| | |
| | |

| | |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

| Activity | Description |
|---|---|
| Check Compliancy and Update FDCI Status (Rules) | NM systems check FDCI compliancy against defined rules. |
| Check Local Impact on excluding flight from regulation | FMP performs a local impact assessment on excluding the flight from regulation. |
| Check Local Impact on Rerouting Flight | FMP checks local impact of rerouting the flight. |
| Check Network Impact Assessment on Rerouting | NMOC performs a Network impact assessment on rerouting the flight. |
| Check Network Impact on excluding flight from regulation | NMOC performs a Network impact assessment on excluding the flight from regulation. |
| Coordinate DCB Solution | FMP coordinates the DCB solution with concerned actors. |
| Define/Update User Preferences | AU defines or updates the flight preferences to help NMF on the decision making when selecting a flight for STAM. In this use case the preference is expressed as:<br>Flight not to delay : it is a binary information indicating that for the AU this flight is more sensitive to the delays |
| DEL4 | AU prepares extended flight plan including Flight Simple Preference to be submitted to Regional ATFCM for integration in the Network Demand. |
| Find Rerouting DCB Solution | FMP looks for rerouting options for FDCI flight. |
| Implement DCB Solution | Local actor implements the agreed DCB solution. |
| Monitor eFPL | AU monitors the flights and assesses the need to find alternative trajectory due to the impact introduced by DCB measures or apply the DCB measures to the trajectory. |

| | |
|---|---|
| Monitor Flights | FMP Monitor flights and associated FDCI in sector. |
| NMOC excludes selected flight from regulation. | NMOC excludes selected flight from regulation. |
| Publish and update the NOP | DCB solutions are listed and their descriptions are published in the NOP. |
| Submit/Update eFPL | The AU generates an eFPL or updates an eFPL with changes to the previous one. The AU submits the eFPL to the NMF for operational acceptability. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Check Network Impact on excluding flight from regulation o--> Check Local Impact on excluding flight from regulation | Local ATFCM (INAP) | Request impact coordination | |
| Local ATFCM (INAP) | Check Local Impact on excluding flight from regulation o--> Check Network Impact on excluding flight from regulation | Regional ATFCM | Impact coordination reply | |
| AU | Define/Update User Preferences o--> Check Compliancy and Update FDCI Status (Rules) | Regional ATFCM | Flight Identification | Flight |
| AU | Define/Update User Preferences o--> Check Compliancy and Update FDCI Status (Rules) | Regional ATFCM | FDCI Reason | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| AU | Define/Update User Preferences o--> Check Compliancy and Update FDCI Status (Rules) | Regional ATFCM | FDCI | |
| Regional ATFCM | Publish and update the NOP o--> Monitor eFPL | AU | Flight details | |
| Regional ATFCM | Publish and update the NOP o--> Monitor eFPL | AU | Rerouting | ATFMMeasure |
| Regional ATFCM | Publish and update the NOP o--> Monitor Flights | Local ATFCM (INAP) | Flight details | |
| Regional ATFCM | Publish and update the NOP o--> Monitor Flights | Local ATFCM (INAP) | FDCI | |
| Local ATFCM (INAP) | Implement DCB Solution o--> Publish and update the NOP | Regional ATFCM | Agreed DCB Solution | |
| Local ATFCM (INAP) | Coordinate DCB Solution o--> Check Network Impact Assessment on Rerouting | Regional ATFCM | DCB Solution | |
| Regional ATFCM | Check Network Impact Assessment on Rerouting o--> Coordinate DCB Solution | Local ATFCM (INAP) | MCDM | |
| AU | Submit/Update eFPL o--> Publish and update the NOP | Regional ATFCM | eFPL | |

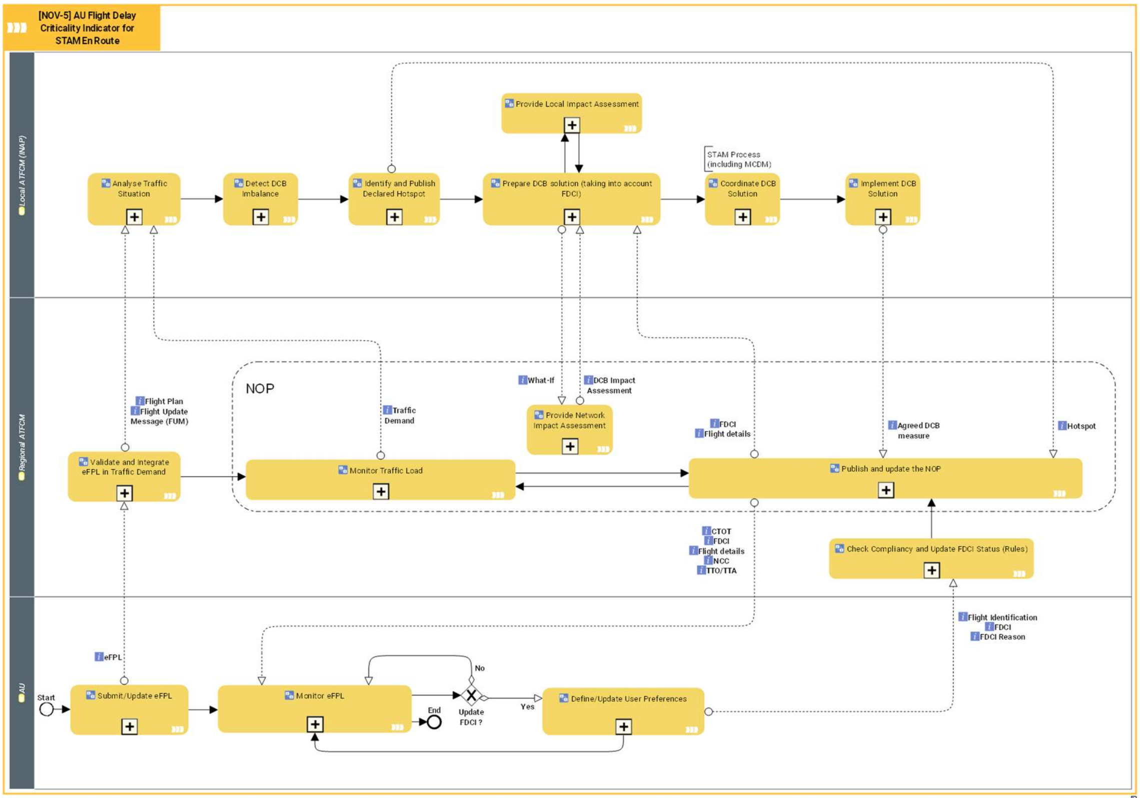



Figure 94: EATMA Model - AU Flight Delay Criticality Indicator for STAM En Route

| Activity | Description |
|---|---|
| Analyse Traffic Situation | The Flow Manager (INAP) analyse the demand versus the given resources and capabilities in his area, in order to foresee the resulting problems. |
| Check Compliancy and Update FDCI Status (Rules) | NM systems check FDCI compliancy against defined rules. |
| Coordinate DCB Solution | FMP coordinates the DCB solution with concerned actors. |
| Define/Update User Preferences | AU defines or updates the flight preferences to help NMF on the decision making when selecting a flight for STAM. In this use case the preference is expressed as:<br>Flight not to delay : it is a binary information indicating that for the AU this flight is more sensitive to the delays |
| Detect DCB Imbalance | The Local Traffic Manager and/or the Flow Manager monitor the balance between demand and capacity in real time by analysing entry and occupancy counts and associated workload values, and comparing |

| | |
|---|---|
| | them respectively with situational traffic capacity values and occupancy traffic monitoring values. |
| Identify and Publish Declared Hotspot | Identify DCB imbalances that need to be monitored and/or resolved by creating and publishing a corresponding hotspot. |
| Implement DCB Solution | Local actor implements the agreed DCB solution. |
| Monitor eFPL | AU monitors the flights and assesses the need to find alternative trajectory due to the impact introduced by DCB measures or apply the DCB measures to the trajectory. |
| Monitor Traffic Load | NMOC monitors the overall network traffic load. |
| Prepare DCB solution (taking into account FDCI) | The NMf local actors prepares DCB measures to resolve the hotspot taking into account FDCI flights (trying to avoid cherry picking them). |
| Provide Local Impact Assessment | This function provides the impact assessment (what-if) at the local level. |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the network level. |
| Publish and update the NOP | DCB solutions are listed and their descriptions are published in the NOP. |
| Submit/Update eFPL | The AU generates an eFPL or updates an eFPL with changes to the previous one. The AU submits the eFPL to the NMF for operational acceptability. |
| Validate and Integrate eFPL in Traffic Demand | Validate the submitted eFPL against the Airspace Constraints and integrate the eFPL in traffic demand. If the submitted eFPL violates Static Airspace Constraints, set the Planning Status indicating that the eFPL is not operationally acceptable, including the violated Static Airspace Constraints. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| AU | Define/Update User Preferences o--> Check Compliancy and Update FDCI Status (Rules) | Regional ATFCM | Flight Identification | Flight |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| AU | Define/Update User Preferences o--> Check Compliancy and Update FDCI Status (Rules) | Regional ATFCM | FDCI Reason | |
| AU | Define/Update User Preferences o--> Check Compliancy and Update FDCI Status (Rules) | Regional ATFCM | FDCI | |
| Local ATFCM (INAP) | Identify and Publish Declared Hotspot o--> Publish and update the NOP | Regional ATFCM | Hotspot | |
| Local ATFCM (INAP) | Implement DCB Solution o--> Publish and update the NOP | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Implement DCB Solution o--> Publish and update the NOP | Regional ATFCM | Agreed DCB measure | ATFMMeasure |
| Local ATFCM (INAP) | Prepare DCB solution (taking into account FDCI) o--> Provide Network Impact Assessment | Regional ATFCM | What-If | |
| Regional ATFCM | Provide Network Impact Assessment o--> Prepare DCB solution (taking into account FDCI) | Local ATFCM (INAP) | DCB Impact Assessment | |
| Regional ATFCM | Publish and update the NOP o--> Prepare DCB solution (taking into account FDCI) | Local ATFCM (INAP) | Flight details | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Publish and update the NOP o--> Prepare DCB solution (taking into account FDCI) | Local ATFCM (INAP) | FDCI | |
| Regional ATFCM | Monitor Traffic Load o--> Analyse Traffic Situation | Local ATFCM (INAP) | Traffic Demand | Demand |
| Regional ATFCM | Validate and Integrate eFPL in Traffic Demand o--> Analyse Traffic Situation | Local ATFCM (INAP) | Flight Plan | FlightPlan |
| Regional ATFCM | Validate and Integrate eFPL in Traffic Demand o--> Analyse Traffic Situation | Local ATFCM (INAP) | Flight Update Message (FUM) | FUM |
| Regional ATFCM | Publish and update the NOP o--> Monitor eFPL | AU | Flight details | |
| Regional ATFCM | Publish and update the NOP o--> Monitor eFPL | AU | TTO/TTA | |
| Regional ATFCM | Publish and update the NOP o--> Monitor eFPL | AU | CTOT | CalculatedTakeOffTime |
| Regional ATFCM | Publish and update the NOP o--> Monitor eFPL | AU | NCC | |
| Regional ATFCM | Publish and update the NOP o--> Monitor eFPL | AU | FDCI | |
| AU | Submit/Update eFPL o--> Validate and Integrate eFPL in Traffic Demand | Regional ATFCM | eFPL | |

#### 3.5.2.11.3 Impact Severity Indicator

The airport will send to the NOP, as part of Arrival Plan Information and its updates, the Impact severity indicator for a flight. This indicator indicates the impact that the associated SBT will have on the airport planning when a deviation from the scheduled in-block time may occur.

The role of the collaborative NOP in this respect is to share it with NOP stakeholders , in particular with the integrated local DCB working position (and in a later phase with local AMAN) in order to improve situation awareness and support decision making.

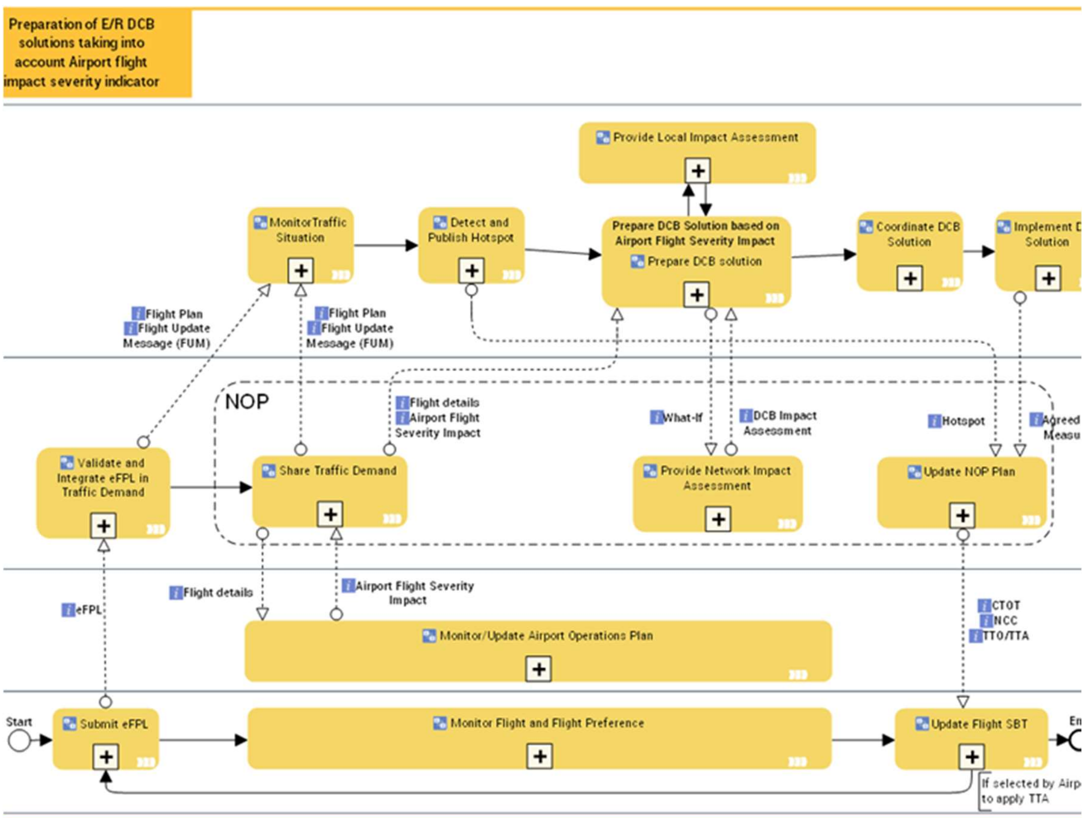



**Figure 95: Preparation of E/R DCB solutions taking into account Airport Flight impact severity indicator**

| Activity | Description |
|---|---|
| Coordinate DCB Solution | The Flow Manager (INAP) coordinate the DCB solution with concerned actors. |

| | |
|---|---|
| Detect and Publish Hotspot | Identify DCB imbalances that need to be monitored and/or resolved by creating and publishing a corresponding hotspot. |
| Implement DCB Solution | Local actor implements the agreed DCB solution. |
| Monitor Flight and Flight Preference | Monitoring of flight changes and adjusts preferences if needed. |
| Monitor/Update Airport Operations Plan | APOC monitors flight updates and eventually updates the AOP (including Airport Flight Severity Indicators) |
| Monitor Traffic Situation | The Flow Manager (INAP) analyse the demand versus the given resources and capabilities in his area, in order to foresee the resulting problems. |
| Prepare DCB solution | The NMf local actors prepare DCB measures to resolve the hotspot. |
| Provide Local Impact Assessment | This function provides the impact assessment (what-if) at the local level. |
| Provide Network Impact Assessment | This function provides the impact assessment (what-if) at the network level. |
| Share Traffic Demand | The NM systems provides the consolidated traffic demand through the NOP |
| Submit eFPL | AU sends an extended flight plan to be integrated in the consolidated traffic demand and replacing its corresponding predicted flight (if exists) |
| Update Flight SBT | The AU updates the SBT |
| Update NOP Plan | The DCB/DCB solutions descriptions and their intended use are updated and published in the NOP. |
| Validate and Integrate eFPL in Traffic Demand | The NM systems receives, validate and eventually integrates the new or updated eFPL into the traffic demand. |

#### 3.5.2.11.4 Network What-if processing local imbalance methodologies

The what-if aims at simulating the impact of a trajectory in regards with a specific predicted imbalance methodology (Occupancy Count, Complexity…)[12]. The what-if can be processed on different scales from a local to a regional view.

[12] The function of the Imbalance Repository and its integration in the collaborative NOP and what-if services remains to be elaborated.



Each local imbalance methodology provides the local imbalance figures to a centralized imbalance repository in order to allow this component to build the consolidated network imbalance view (Imbalance Repository). Any NMf actor can send a request to the imbalance repository in order to perform a Network What-if and to get the consolidated network imbalance figures related to a SBT/RBT.

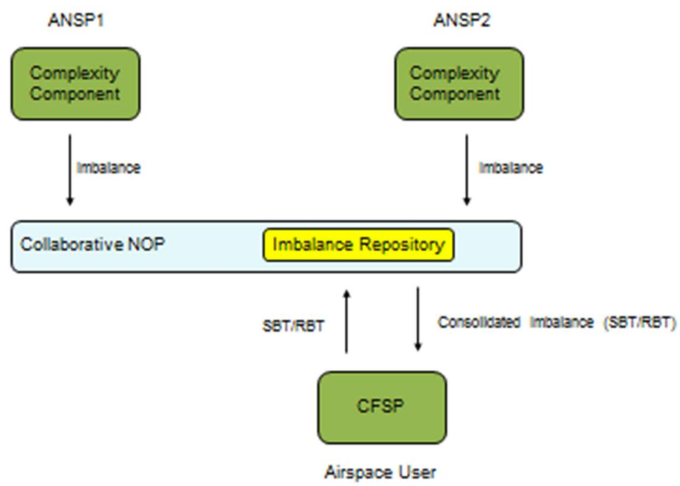



**Figure 96: NMf actor sending request to imbalance repository**

In addition, the evolution of the status of the DCB measures needs to be reflected in the system to provide consolidated overviews of the demand and feed the different "what-if" tools used at the local and network levels.

For this purpose it is established that:

- for each status of the DCB measure process a specific SBT is created in the systems:
  - SBT_ini: initial SBT coming from historical data or filed trajectory
  - SBT_coord: SBT caught in a hotspot and with a proposed RR/FLC proposal = coordination in progress
  - SBT_impl: DCB constraint has been implemented
- each INAP monitors the traffic in his sectors through 2 views:
  - View 1 takes into account SBT_ini and on-going DCB Measures with status for coordination/coordinated/for_implementation/implemented: it will support a local what-if
    - SBT_ini for flights not affected by DCB constraint
    - SBT_impl for flights that have implemented a coordinated DCB constraint

- SBT_coord for flights affected by DCB constraint and in the coordination process
- View 2 takes into account SBT_ini and on-going DCB Measures with status for_implementation/implemented: it will support a global what-if
  - SBT_ini for flights not affected by DCB constraints
  - SBT_impl for flights that have implemented a coordinated DCB constraint

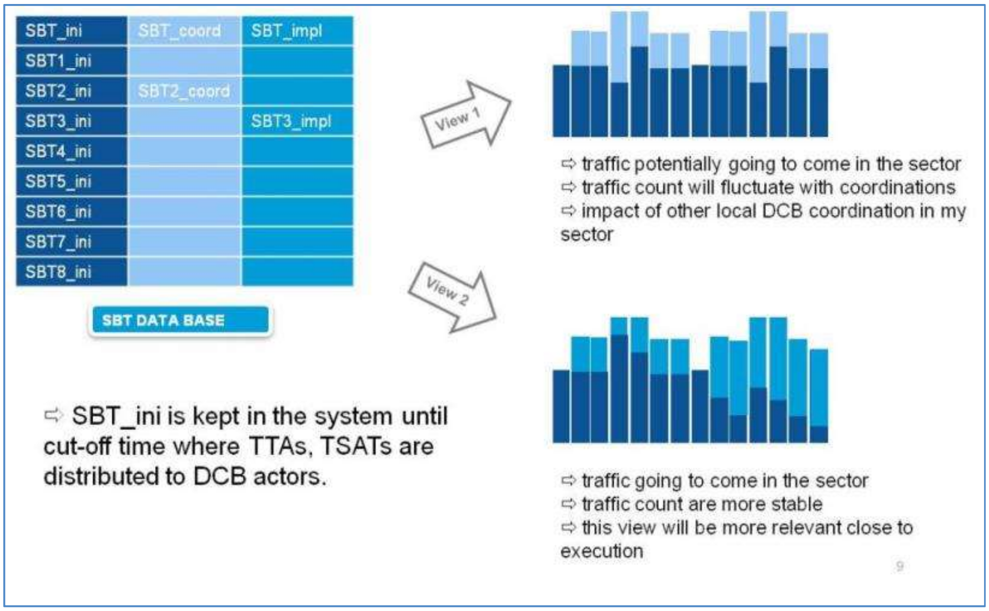



**Figure 97: View of What-If processing result**

#### 3.5.2.11.5 Network what-if capabilities for AU planning

This section addresses the what-if and what-else capabilities provided by NOP specifically for AU and CFSPs to support the integration of Flow Management and Flight planning services. See Flow Management and Flight Planning integration.

### 3.5.2.12 AOP-NOP Integration

The AOP-NOP Integration is a comprehensive integration of airports and network. This section contains the description of the evolving content of the Network Operations Plan (NOP) with regards to integration with Airport Planning Plan (AOP).

SESAR 1 provided a first step towards AOP-NOP integration DCB-103 –A (and corresponding AO-0801-A at airport side). The SESAR achievements focus on arrival and departure planning information during the planning phase, concretely up to 24 hours before EOBT.

AOP exchanged departure (extended DPI) and arrival planning information (API) per flight departing or arriving at the airport. NOP exchanged ELDT (estimated landed time) as well as other flight relevant information related to their status, details and profiles in the NOP.

API and extended DPI provided by AOP included information such as runway, de-icing, terminal, turn around and time estimates and actual values at specific milestones of the flight: such as schedule, filed, … landing, taxing, in-block.

AOP-NOP increases predictability in both airport and network thanks to more accurate trajectories i.e. more reliable traffic demand, and much early exchange of data than current DPI

- Predictability gain was significant in a horizon of as from 9h ahead.
- The AOP-NOP exchange undoubtedly supports the multi-airport integration by increasing predictability up to the next 4/5 legs.

Building upon the work performed on SESAR 1, briefly described above, SESAR2020 with the corresponding OIs DCB-103 –B (and associated AO-0801-B at airport side) will bring improvement in the following areas:

1. Provision of arrival and departure information in support of network predicted demand

The AOP builds upon its scheduled demand enhanced by predictions based on historical data and simulation capabilities, and can provide to regional network in a rolling manner a traffic demand prediction up the next 6 days. The provision is supported, as in SESAR1, by the exchange of DPI and API messages in a very dynamic and event driven mode.

AOP enhances the network predicted traffic demand in NOP (adding, deleting, confirming and tuning network predicted flights) by means of arrival or departure planning message (API or e-DPI).

A network predicted flight is confirmed in NOP upon reception of an arrival or departure planning message (API or e-DPI). If AOP sends an API or e-DPI and there is not predicted flight in NOP, NOP will create a (new) predicted flight using the provided AOP estimates and a route from the NOP data demand repository. Predicted flights that are not confirmed by an active AOP will be deleted (or suspended). The departure and arrival time estimates provided in the API or e-DPI messages are used to tune the profile of the network predicted flights.

The extension to the medium term planning phase is a step forward in improving network predictability beyond was achieved in SESAR 1.

The integration of the AOP-NOP data in the Probabilistic Traffic Demand will be subject of SESAR 2020 wave 2.

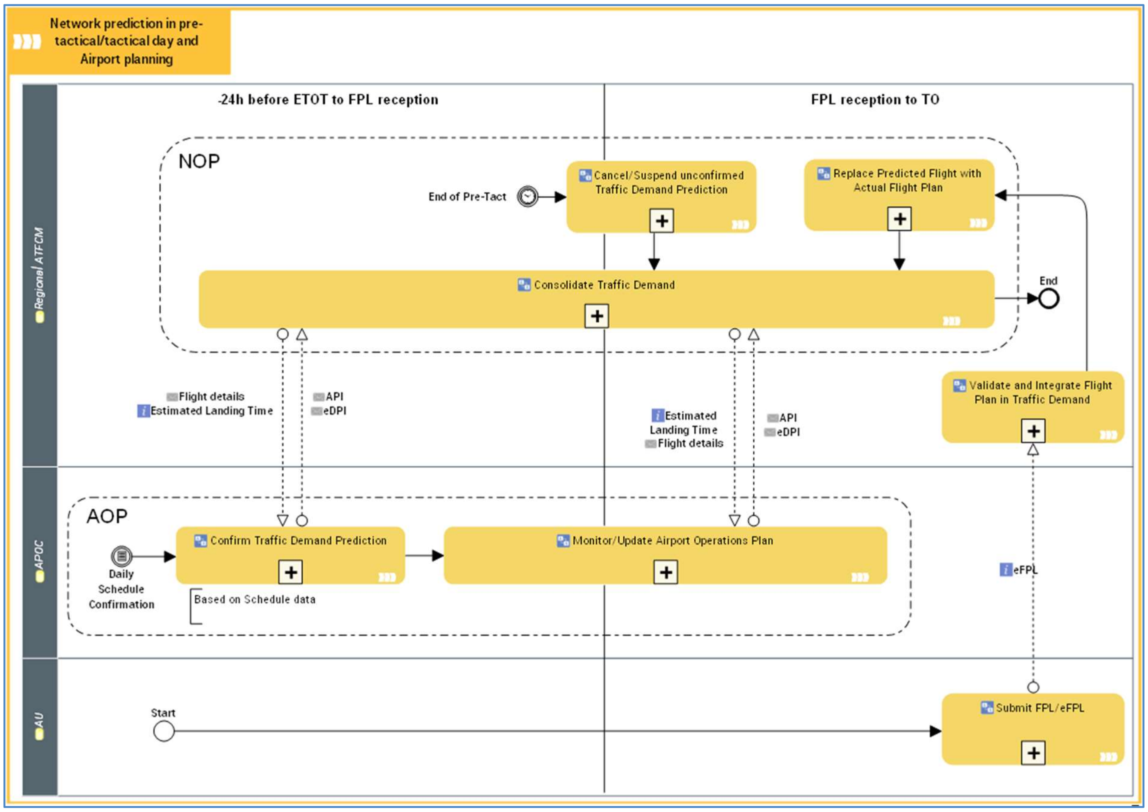



Figure 98: EATMA Model - Provision of arrival and departure information to in support of network predicted demand

| Activity | Description |
|---|---|
| Cancel/Suspend unconfirmed Traffic Demand Prediction | At the end of the Pre-Tactial period, unconfirmed flights (either by AOP or by AU) are removed from the demand. |
| Confirm Traffic Demand Prediction | Send daily schedule confirmation from AOP to confirm predicted flights in NOP |
| Consolidate Traffic Demand | Consolidate traffic demand with most updated flight confirmation (PFD >> Daily Schedule >> eFPL) |
| Monitor/Update Airport Operations Plan | Update traffic demand with latest airport schedule information through API/DPI in the NOP |
| Replace Predicted Flight with Actual Flight Plan | When a flight plan is received, it replaces the corresponding predicted flight. |

| | |
|---|---|
| Submit eFPL | AU sends an extended flight plan to be integrated in the consolidated traffic demand and replacing its corresponding predicted flight (if exists) |
| Validate and Integrate eFPL in Traffic Demand | Validate an extended flight plan received from the AU and integrate in the traffic demand. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| APOC | Confirm Traffic Demand Prediction o--> Consolidate Traffic Demand | Regional ATFCM | API | |
| APOC | Confirm Traffic Demand Prediction o--> Consolidate Traffic Demand | Regional ATFCM | eDPI | |
| AU | Submit/Update eFPL o--> Validate and Integrate eFPL in Traffic Demand | Regional ATFCM | eFPL | |
| Regional ATFCM | Consolidate Traffic Demand o--> Monitor/Update Airport Operations Plan | APOC | Estimated Landing Time | EstimatedLandingTime |
| Regional ATFCM | Consolidate Traffic Demand o--> Monitor/Update Airport Operations Plan | APOC | Flight details | |
| Regional ATFCM | Consolidate Traffic Demand o--> Confirm Traffic Demand Prediction | APOC | Estimated Landing Time | EstimatedLandingTime |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Consolidate Traffic Demand o--> Confirm Traffic Demand Prediction | APOC | Flight details | |
| APOC | Monitor/Update Airport Operations Plan o--> Consolidate Traffic Demand | Regional ATFCM | API | |
| APOC | Monitor/Update Airport Operations Plan o--> Consolidate Traffic Demand | Regional ATFCM | eDPI | |

2. Target times of arrival (TTA) and RBT revision process

The process of TTA assignment by APOC by delegation from INAP/LTM will be revisited and enhanced from SESAR1. The major areas of improvements are the revision process and the direct inclusion of AU preferences/priorities in selection of flights for TTA assignment.

The revision process becomes more dynamic and will be optimised to pro-actively identify opportunities -better CTOT- in the network in case the initial requested TTA could not be achieved.

The AU simple preferences/ priorities are provided by the AU per flight and can be dynamically updated. AOP can receive them from collaborative NOP and will use them together with the airport business rules in the TTA s flight selection process.

In this case of delegation from INAP/LTM to APOC, that we are considering, once a hotspot or imbalance is detected by INAP/LTM and or APOC, the resolution by target time assignment is delegated to APOC (AOP). The role of INAP/LTM is in this case to trigger the start of implementation of the measure and then revise after implementation. Firstly INAP/LTM will request regional NM the creation of the TTA place-holder that will subsequently be populated with the individual TTAs. AOP will consequently decide, following its own business rules and the flight AU simple preference indicator, the flights to be TTA-ed and will issue TTA request messages to NOP for each selected flight.

NOP will allocate a consolidated network constraint CTOT in return of a requested TTA. In doing so, NOP logic tries to respect as much as possible the requested TTA, considering the existing constraints in the network and its priority.

There is an automated built-in revision/ optimisation process in NOP logic, similar to the exiting today for CASA regulations, to improve or better match the requested TTA by AOP.

Additionally there is the revision process that can be triggered at any time by the APOC or AOP to revise the tTTA for one or several flights to adapt to the dynamic and evolving conditions in the planning phase.

3. Impact Severity indicator

The severity will be used by the airport stakeholders to make decisions about an SBT considering the impact that a non-punctual arrival, based initially on SBT and later on the RBT, will have on the airport planning and on AUs business needs.

In other words, the severity indicator will inform all airport stakeholders about the impact that the associated SBT will have on the airport planning when a deviation from the scheduled in-block time may occur. The impact assessment will be mainly based upon business needs of the destination airport and the AUs.

The severity indicator will address a set of different cases based upon arrival punctuality and potential knock-on effect on departure punctuality, like earlier than schedule, on schedule, delayed , delayed and Knock-on effect.

The severity indicator will be sent to the NOP as part of the arrival planning information (API). The role of the collaborative NOP in this respect is to share it with NOP stakeholders , in particular with the integrated local DCB working position ( and in a later phase with local AMAN) in order to improve situation awareness and support decision making.

#### 3.5.2.13 Flow Management and Flight Planning integration

The FF-ICE planning service is a new service defined at ICAO level and planned to be implemented in 2020 onwards. SESAR 2020 in particular PJ07.01 and PJ09.03 in the context of Collaborative NOP and DCB, contributes to capture the detailed requirements of the most prominent topics, and to assess and validate their impact on both regional network operations and AU flight planning process.

FF-ICE implies much more integration between flight planning and flow management information flows than in current operations. It support trajectory negotiation processes with airspace users and DCB users in the pre-departure phase.

PJ09S03 is providing enhanced DCB information for a flight to support to FF-ICE phase 1.

For the details, see PJ07.01 OSED (ref **Error! Reference source not found.**) and corresponding use case into it ("Use case AU Flight Planning via FF-ICE Planning Services Enhanced with DCB Constraints and Enriched DCB Information in ATFM regulations context").

With the early provision of FPL, the AU will benefit from planning their operations in a more predictable network, resulting in a win-to-win approach.

AU will be able to pro-actively avoid DCB constraints affecting his SBT and make use of opportunities as they appear in the evolving network supporting more optimum trajectories.

In wave 1, the horizon of the PFP will extend from the current modus operandi up to the start of the day of opertations in the best case, -6h or -10h before EOBT are nominal figures that could be used for illustration. The AU reaction to the notification of DCB constraints affecting his SBT will depend on several parameters as the lead time to EOBT, the stability of the network and the expected gain regarding its trajectory cost if an alternative trajectory was chosen.

NOP will provide what-if and what-else capabilities easy to integrate in their FPL systems (B2B services) to help the AU to find alternative trajectories in the case of an avoidance of a DCB constraint or an opportunity. These services will provide enriched DCB information compared to today classical CTOT and much earlier, i.e. soon as the PFP is submitted to NOP. The enriched DCB information will include the classical regulations activated along the trajectory, the STAM measures and TTO/TTA. Optionally entry and occupancy overloads and hotspots crossed, and finally a congestion indicator that will integrate in a simple and consolidated manner the SBT status according to DCB situation.

In particular, in the context of STAM, the AU will also be further integrated in the process by using the above mentioned what-if capabilities to determine alternatives to the proposal provided to him by LTM/INAP. Hence, when an AU is notified through the M-CDM that his flight has been selected in a cherry-pick process in STAM, the AU can find a network /DCB compliant alternative route (AU counter proposal) that better suits his needs and book it into the NOP. Following this the AU will be expected to re-submit, within an agreed time period, his updated RBT matching the proposal resulting in replacing the latter by his updated/revised RBT.

Two major points need to be analysed and validated in the context of the FF-ICE , the potential increase of network variability due to the more pro-active role of flight planning in DCB and the Impact on AU operators workload (under PJ07.01).



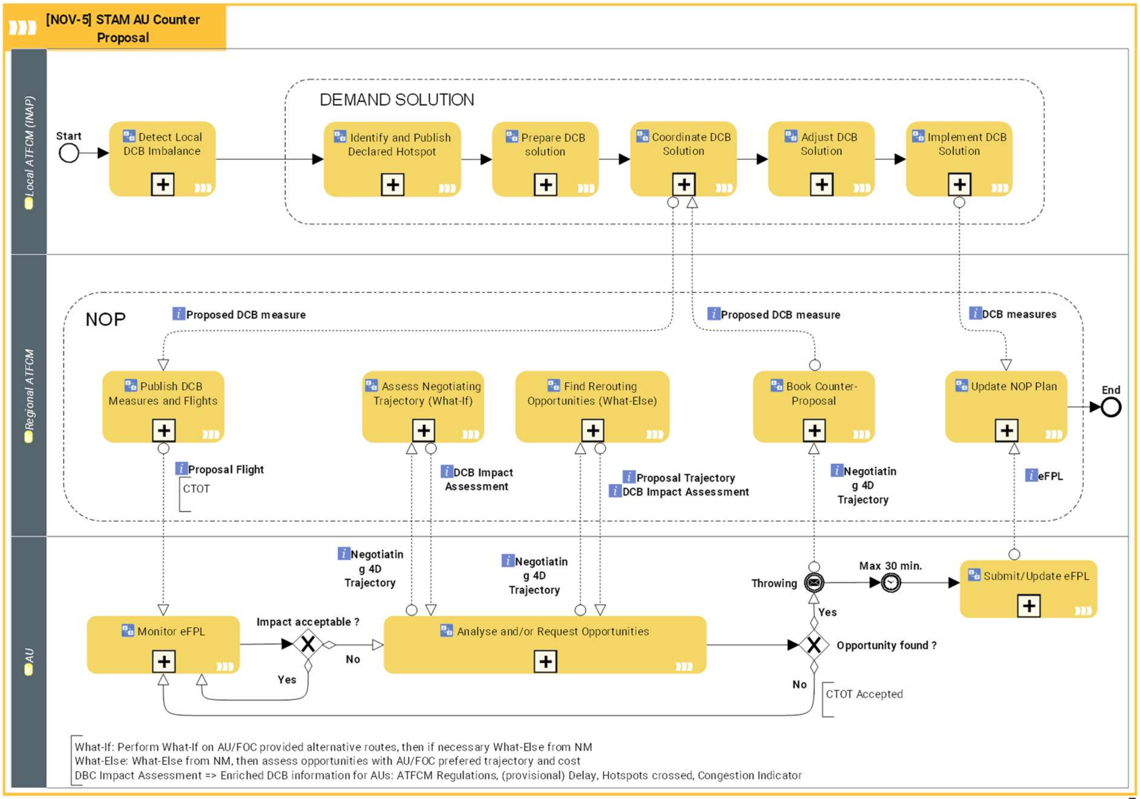



**Figure 99: EATMA Model - Flight Management Planning Integration**

| Activity | Description |
|---|---|
| Adjust DCB Solution | The DCB solution is adjusted according with AU counter-proposal. |
| Analyse and/or Request Opportunities | AU, when declaring the DCB impact on their flight as not acceptable tries to find a solution through assessing their alternative trajectories or requesting Regional ATFCM for other opportunities. |
| Assess Trajectory (What-If) | Regional ATFCM provides a DCB impact assessment on the AU provided trial trajectory. |
| Book Counter-Proposal | When AU deems the opportunity acceptable, he reserves this opportunity in the network tactical system (to be confirmed in the next 30 minutes) |
| Coordinate DCB Solution | INAP coordinate the DCB solution with concerned actors. |
| Detect Local DCB Imbalance | INAP function analyses the local imbalance figures (complexity, ….). |
| Find Rerouting Opportunities (What-Else) | Regional ATFCM provides rerouting alternatives to AU submitted negotiating tracjectory with corresponding DCB Impact Assessments. |
| Identify and Publish Declared Hotspot | Once capacity has been maximized and the imbalance still remains, INAP triggers the elaboration of a solution acting on Demand. The first |

| | |
|---|---|
| | step is to identify the volume (time and 3D volume) of the imbalance, and publishing the hotspot to make it visible to all stakeholders |
| Implement DCB Solution | INAP implements the agreed DCB solution. |
| Monitor Flights | AU monitors its flights and evaluates acceptability of DCB impacts. |
| Prepare DCB solution | The NMf local actors prepare DCB measures to resolve the hotspot. |
| Publish DCB Measures and Flights | NOP shares the DCB measures and impacted flights with stakeholders. |
| Submit eFPL | Submit updated extended flight plan to confirm rerouting. |
| Update NOP Plan | The DCB/DCB solutions descriptions and their intended use are updated and published in the NOP. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Assess Negotiating Trajectory (What-If) o--> Analyse and/or Request Opportunities | AU | DCB Impact Assessment | |
| AU | Throwing o--> Book Counter-Proposal | Regional ATFCM | Negotiating 4D Trajectory | Trajectory |
| AU | Analyse and/or Request Opportunities o--> Find Rerouting Opportunities (What-Else) | Regional ATFCM | Negotiating 4D Trajectory | Trajectory |
| AU | Submit/Update eFPL o--> Update NOP Plan | Regional ATFCM | eFPL | |
| Regional ATFCM | Find Rerouting Opportunities (What-Else) o--> Analyse and/or Request Opportunities | AU | DCB Impact Assessment | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Find Rerouting Opportunities (What-Else) o--> Analyse and/or Request Opportunities | AU | Proposal Trajectory | Trajectory |
| Regional ATFCM | Book Counter-Proposal o--> Coordinate DCB Solution | Local ATFCM (INAP) | Proposed DCB measure | |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update NOP Plan | Regional ATFCM | DCB measures | ATFMMeasure |
| Local ATFCM (INAP) | Implement DCB Solution o--> Update NOP Plan | Regional ATFCM | DCB measures | ATFMMeasure |
| Local ATFCM (INAP) | Coordinate DCB Solution o--> Publish DCB Measures and Flights | Regional ATFCM | Proposed DCB measure | |
| Regional ATFCM | Publish DCB Measures and Flights o--> Monitor eFPL | AU | Proposal Flight | |
| AU | Analyse and/or Request Opportunities o--> Assess Negotiating Trajectory (What-If) | Regional ATFCM | Negotiating 4D Trajectory | Trajectory |

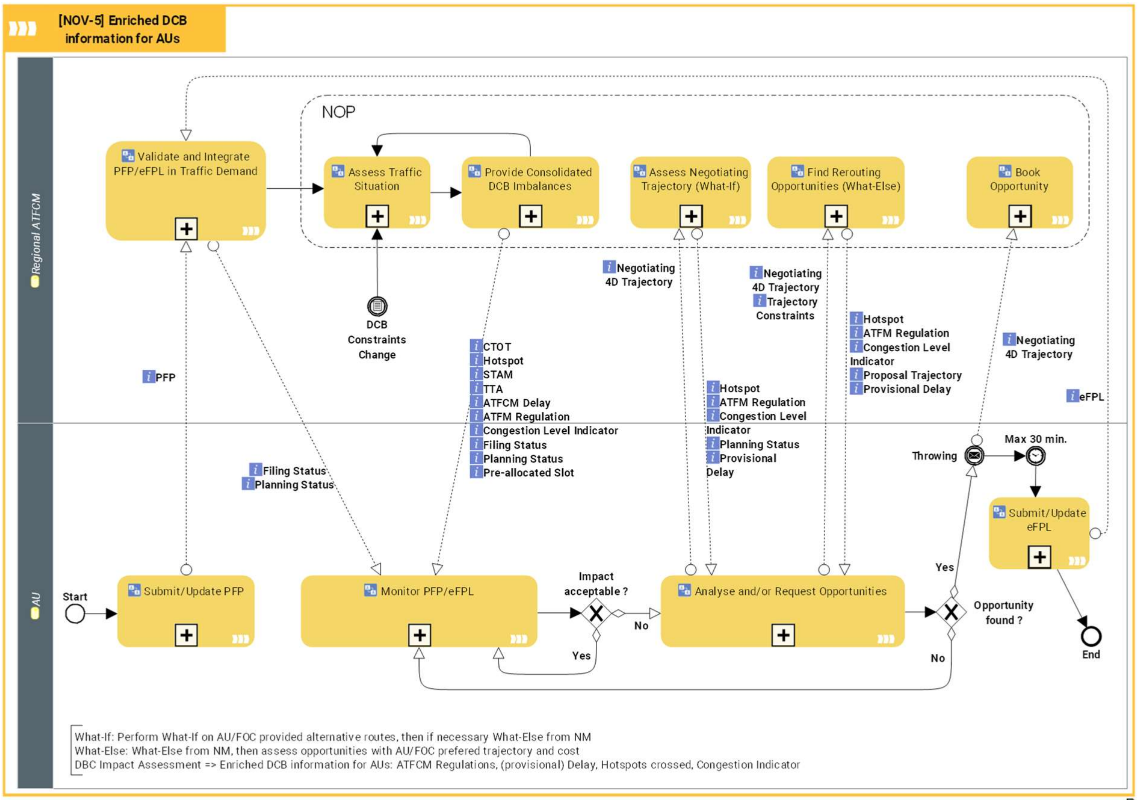



**Figure 100 : EATMA Model – Enriched DCB Information**

| Activity | Description |
|---|---|
| Analyse and/or Request Opportunities | AU, when delcaring the DCB impact on their flight not acceptable tries to find a solution through assessing their alternative trajectories or requesting Regional ATFCM for other opportunities. |
| Assess Trajectory (What-If) | Regional ATFCM provides a DCB impact assessment on the AU provided trial trajectory. |
| Book Opportunity | Select rerouting opportunity is beeing reserved by the AU for maximum 30 minutes (needing to be confirmed by an updated eFPL to be send by the AU). |
| Find Rerouting Opportunities (What-Else) | Regional ATFCM provides rerouting alternatives to AU submitted negotiating tracjectory with corresponding DCB Impact Assessments. |
| Monitor PFP | AU monitors the impact in terms of DCB (measure, hotspot) on his PFP |
| Provide Consolidated DCB Imbalances | Updated traffic situation is compared to available capacity to provide an updated DCB view. |

| | |
|---|---|
| Re-assess traffic situation | Traffic demand is recomputed when a new flight is added to the demand or a regulation is created or changed. |
| Submit eFPL | AU send amended extended flight plan to confirm rerouting. |
| Submit PFP | AU sends PFP to Regional ATFCM for integration on the overall Traffic Demand. |
| Validate and Integrate eFPL in Traffic Demand | PFP are beeing validated and integrated in the network traffic demand. |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| AU | Submit/Update PFP o--> Validate and Integrate PFP/eFPL in Traffic Demand | Regional ATFCM | PFP | |
| AU | Analyse and/or Request Opportunities o--> Find Rerouting Opportunities (What-Else) | Regional ATFCM | Negotiating 4D Trajectory | Trajectory |
| AU | Analyse and/or Request Opportunities o--> Find Rerouting Opportunities (What-Else) | Regional ATFCM | Trajectory Constraints | |
| Regional ATFCM | Provide Consolidated DCB Imbalances o--> Monitor PFP/eFPL | AU | TTA | TargetTimeOfArrival |
| Regional ATFCM | Provide Consolidated DCB Imbalances o--> Monitor PFP/eFPL | AU | Pre-allocated Slot | |
| Regional ATFCM | Provide Consolidated DCB Imbalances o--> Monitor PFP/eFPL | AU | Planning Status | |
| Regional ATFCM | Provide Consolidated DCB Imbalances o--> Monitor PFP/eFPL | AU | STAM | ATFMMeasureDynamic |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Provide Consolidated DCB Imbalances o--> Monitor PFP/eFPL | AU | Hotspot | |
| Regional ATFCM | Provide Consolidated DCB Imbalances o--> Monitor PFP/eFPL | AU | ATFCM Delay | ATFMDelay |
| Regional ATFCM | Provide Consolidated DCB Imbalances o--> Monitor PFP/eFPL | AU | Filing Status | |
| Regional ATFCM | Provide Consolidated DCB Imbalances o--> Monitor PFP/eFPL | AU | CTOT | CalculatedTakeOffTime |
| Regional ATFCM | Provide Consolidated DCB Imbalances o--> Monitor PFP/eFPL | AU | Congestion Level Indicator | |
| Regional ATFCM | Provide Consolidated DCB Imbalances o--> Monitor PFP/eFPL | AU | ATFM Regulation | ATFMRegulation |
| AU | Analyse and/or Request Opportunities o--> Assess Negotiating Trajectory (What-If) | Regional ATFCM | Negotiating 4D Trajectory | Trajectory |
| Regional ATFCM | Find Rerouting Opportunities (What-Else) o--> Analyse and/or Request Opportunities | AU | Proposal Trajectory | Trajectory |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Find Rerouting Opportunities (What-Else) o--> Analyse and/or Request Opportunities | AU | Hotspot | |
| Regional ATFCM | Find Rerouting Opportunities (What-Else) o--> Analyse and/or Request Opportunities | AU | Provisional Delay | ATFMDelay |
| Regional ATFCM | Find Rerouting Opportunities (What-Else) o--> Analyse and/or Request Opportunities | AU | Congestion Level Indicator | |
| Regional ATFCM | Find Rerouting Opportunities (What-Else) o--> Analyse and/or Request Opportunities | AU | ATFM Regulation | ATFMRegulation |
| AU | Throwing o--> Book Opportunity | Regional ATFCM | Negotiating 4D Trajectory | Trajectory |
| AU | Submit/Update eFPL o--> Validate and Integrate PFP/eFPL in Traffic Demand | Regional ATFCM | eFPL | |
| Regional ATFCM | Assess Negotiating Trajectory (What-If) o--> Analyse and/or Request Opportunities | AU | Planning Status | |
| Regional ATFCM | Assess Negotiating Trajectory (What-If) o--> Analyse and/or Request Opportunities | AU | Hotspot | |

| Issuer | Info Exchange | Addressee | Info Element | Info Entity |
|---|---|---|---|---|
| Regional ATFCM | Assess Negotiating Trajectory (What-If) o--> Analyse and/or Request Opportunities | AU | Provisional Delay | ATFMDelay |
| Regional ATFCM | Assess Negotiating Trajectory (What-If) o--> Analyse and/or Request Opportunities | AU | Congestion Level Indicator | |
| Regional ATFCM | Assess Negotiating Trajectory (What-If) o--> Analyse and/or Request Opportunities | AU | ATFM Regulation | ATFMRegulation |
| Regional ATFCM | Validate and Integrate PFP/eFPL in Traffic Demand o--> Monitor PFP/eFPL | AU | Planning Status | |
| Regional ATFCM | Validate and Integrate PFP/eFPL in Traffic Demand o--> Monitor PFP/eFPL | AU | Filing Status | |

### 3.5.3 Use Cases

| UC# | UC Category | UC Title/Description |
|---|---|---|
| UC-01 | Demand Prediction | Demand Forecast in planning: all flights are before EOBT, so anything that is up to around 14H00 UTC of day -1 (ultra-long haul flights are about 14-16 hours in the air before arriving with the 1$^{st}$ |

| | | |
|---|---|---|
| | | wave after curfew; so they enter IFPZ max 4 hours before landing at major airports between 5 and 6 UTC approx) |
| UC-02 | Demand Prediction | Demand Forecast in FMP horizon: all flights between 6 and 2 hours before reference time – mix of planning and execution flights – at his point in time the FBTs will have been matched by SBT and RBT for 90 percent of the flights. |
| UC-03 | Demand Prediction | Demand Forecast in LTM/EAP horizon: all flights between 3 hours and 20 minutes before reference time – mostly execution flights – at EOBT-2H all flights are expected to to have an RBT or SBT. |
| UC-04 | Complexity | Hotspot identification describes how a local operator identifies a hotspot, and communicates with the network manager and other local operators to identify an optimum solution. |
| UC-05 | Complexity | Distribution of complexity using dynamic sectorisation describes how a local operators assesses and distributes complexity over a specific airspace to ensure that all estimation areas have a Level 2 or lower complexity level. |
| UC-06 | Complexity | CFSP performing a what-if to elaborate RBT |
| UC-07 | Complexity | INAP performing a what-if to propose DCB solution (RBT) |
| UC-08 | Complexity | NM performing a what-if to evaluate DCB solution (timeframe 1h-30 min) |
| UC-09 | Network Performance | APOC/AIMA performing multiple criteria what-if to elaborate SBT/RBT |
| UC-10 | Network Performance | INAP performing multiple criteria what-if to propose DCB solution |
| UC-11 | Network Performance | Network Resilience |
| UC-12 | INAP process | LTM/EAP Task sharing: EAP to manage DCB solutions (LTM/EAP timeframe) |
| UC-13 | INAP process | LTM/EAP Task sharing: LTM initiates measures, EAP for monitoring and fine-tuning DCB solutions (LTM/EAP timeframe) |
| UC-14 | INAP process | EAP end-to-end DCB management: from detection to implementation (EAP timeframe) |
| UC-15 | Catalogue Measure | Resolution of E/R complexity using STAMs based on Cop-Organizer |

| | | |
|---|---|---|
| UC-16 | Catalogue Measure | Resolution of E/R complexity using STAMs based on Cop-Sequencer |
| UC-17 | Target Time Management | DCB Measures prepared in the SBT Elaboration |
| UC-18 | Target Time Management | DCB Measures prepared in the RBT Revision |
| UC-19 | Target Time Management | Target Time deviation monitoring and revision |
| UC-20 | Synchronisation | E/R (UDPP - Hotspot) + Extended AMAN (Optispot) |
| UC-21 | Synchronisation | E/R (Cop-Organizer or Seq) + Extended AMAN to be applied by one En-Route ATSU |
| UC-22 | Synchronisation | Extended AMAN + Extended AMAN to be applied by one En-Route ATSU |
| UC-24 | Collaborative NOP | Preparation of E/R DCB solutions taking into account Airport flight impact severity indicator |
| UC-31 | Hotspot Management | Hotspot Management |
| UC-32 | Hotspot Management | Optispot Management |
| UC-33 | Collaborative Framework | Hotspot Arrival Management using TTA prepared in the SBT Elaboration process |
| UC-34 | Collaborative Framework | Hotspot Arrival Management using TTA prepared in the SBT Elaboration process using APOC Limited Delegation |
| UC-35 | Collaborative Framework | Hotspot Arrival Management using TTA prepared in the SBT Elaboration process using APOC Full Delegation |
| UC-36 | Collaborative Framework | Hotspot Arrival Management using tTTA prepared in the RBT Revision process |
| UC-37 | Collaborative Framework | Hotspot En-Route Management using TTO prepared in the SBT Elaboration process |

| | | |
|---|---|---|
| UC-38 | Collaborative Framework | Hotspot En-Route Management using tTTO prepared in the RBT Revision process |
| UC-39 | Collaborative Framework | Optispot Arrival Management using TTA prepared in the SBT Elaboration process with Extended AMAN Autonomy |
| UC-40 | Collaborative Framework | Optispot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Full Autonomy |
| UC-41 | Collaborative Framework | Optispot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Full Delegation |
| UC-42 | Constraint Reconciliation | Dep (CASA/Hotspot) + Arr (AIMA/OptiSpot) |
| UC-43 | Constraint Reconciliation | Dep (UDPP/Hotspot) + Arr (UDPP/Hotspot) |
| UC-44 | Constraint Reconciliation | Dep (UDPP/Hotspot) + Arr (AIMA/Optispot) |
| UC-45 | Constraint Reconciliation | Dep (CASA/Hotspot) + E/R (Cherry-picking TTO/Hotspot) |
| UC-46 | Constraint Reconciliation | E/R (Cherry-picking TTO/SBT - Hotspot) + Arr (UDPP - Hotspot) |
| UC-47 | Constraint Reconciliation | E/R (Cherry-picking TTO/SBT - Hotspot) + Extended AMAN (Optispot) |
| UC-53 | Constraint Optimisation | Preparation of a DCB Solution based on the Optimization of Primary and Reactionary Delay |
| UC-54 | AU Flight Delay Criticality Indicator | AU Flight Delay Criticality Indicator |
| UC-55 | AU Flight Delay Criticality Indicator | AU Flight Delay Criticality Indicator for STAM En Route |
| UC-56 | FF-ICE | STAM AU Counter Proposal |
| UC-57 | AOP-NOP Integration | Network prediction in short-term planning/execution phases and Airport planning |
| UC-59 | DAC and Collaborative DCB | DAC and Collaborative DCB |
| UC-60 | FF-ICE | Enriched DCB information for AUs |

**Table 28 List of Use-Cases**

### 3.5.3.1 Demand Prediction

Although the use cases below are complete in terms of interactions and processes, they are not yet complete in terms of roles, responsibilities and information exchanges.

The role of NMOC, APOC, EAP, etc., are not yet fully elaborated. Further more use cases are not yet defined to describe the interactions between NMf and INAP, or with the AOP for that matter, in the Traffic Demand Forecast. How the systems integrate to achieve a homogeneous and complete view of the Predicted Traffic Demand has not been described in full detail.

#### UC-01 – Demand Forecast in Planning

We use the term 'Traffic Density Threshold' instead of 'Capacity' or 'Occupancy'. In fact the modelling of 'capacity' requires a thorough study since the current single value 'Capacity at Entry' and dual value 'Occupancy at Traffic Volume on Airspaces' is too limited for proper DCB purposes.

We use the term 'Traffic Density Situation' instead of 'Count' or 'Demand'. This is to allow to represent Traffic Density in terms of other factors than A/C movements or presence, and to allow other expressions of reference than the current static geometrical based definitions of volumes, areas, or singularities.

The basic use case is based on the assumption that there can be only one forecast model that contains a single probability for each flight.

We could however opt for a richer implementation that allows to have multiple models provided by different suppliers – or that a single model contains multiple probabilities each provided by a different supplier.

Certainly in an early phase it is useful to allow different models to co-exist and to find the context in which one model or another model produces more accurate results.

The use case will indicate the extensions to allow multiple models to be used.

<u>**NOTE:**</u> All steps in the use case with a light blue background only apply to the multi-model approach.

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| | | **Flight Intention:** A statement of flight intent based on airport schedules, historical data, and other sources of information. Minimal consist of ARCID; ATYPE; ADEP; ADES;EOBT | | | Definition | |
| | | **Forecast Business Trajectory:** A trajectory prediction that results from the Flight Intention processing representing the most likely profile given the available data (past, present, and forecast). Contains all the data elements as for SBT/RBT models | | | Definition | |
| | | **Context Filter:** The collection of parameters / conditions / factors to select or calculate representative forecast trajectories | | | Definition | |
| | | **Probabilistic Traffic Density Situations:** The Traffic Density Situations are calculated using a statistical distribution of likelihood that the flight will be in a specific time slice of the reference location. | | | Definition | |
| | Pre-Condition | All flights have an FBT. Some long haul flights may already have an SBT. The second condition is not mandatory, the first one is. | | | Context | |
| | Pre-Condition | Weather info has been processed | | | Context | |
| | Pre-Condition | All special events leading to an increase in demand have been processed | | AXIS info, Olympics, Tournaments, other | Context | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Pre-Condition | All predictable circumstances leading to Traffic Density Threshold reduction have been processed (NOTAM; AUP; ...) | | Runway maintenance, Airspace Reservations, Industrial action | | |
| | Timeframe | The use case starts not later than 2H before EOBT of the earliest flight of the day=D – this means the flight entering the extended IFPZ at or after 00H00 with the greatest EET | | In practice this translates to 14H00 UTC for long haul flights with EET up to or exceeding 16H and landing at an AD within the ECAC zone from 04H00 UTC or after curfew if any. | Context | |
| | Timeframe | The use case ends when the demand is balanced by capacity maximisation, use of spare capacity, or planned measure and no later than 16H00 of D-1. | | Given the above definitions, some flights will already have taken off. | Context | |
| | ForecastTime Frame | **Reference Time Window [RTW]:** The time period of interest | | | Definition | |
| | ForecastLead Time | **Reference Lead Time [RLT]:** the difference between the Reference Time Window and the time of the event, decision, or action | | | Definition | |
| 1.0 | Initiate | The FMPs Request the Flight Intentions to be processed based on the **Context Filter**. | NMOC | FBT are calculated | Action | RLT=RTW-20H |



| | | | | | | |
|---|---|---|---|---|---|---|
| 1.1 | Select | If there are multiple sources of Flight Intentions that are distinguished by a different model – the system presents the list of available models that are compatible with the context filter for the user to select from. | FMP or NMOC | | | |
| 2.0 | Context Filtering | All the **Context Filter** elements are listed providing indicators on impact | System | Flights impacted by element, impact estimates | Information | |
| 2.1 | Analyse | The NMOC checks that the FBT correspond to the **Context Filter**. | NMOC | Context compliance indicator | Information | |
| 2.5 | Condition Processing | If the context filters are incomplete or do not result in a credible FBT, the use case continues at 1.0 and updates the **Context Filter**. | NMOC | | Next 2.0 | |
| 3.0 | Traffic Forecast | Using the **FBT**, the system calculates the **Probabilistic Traffic Density Situations** | System | Traffic Density Situations are calculated and given an Imbalance Confidence Index | Information | |
| 3.1 | Compare | If the user wants, a second Traffic Forecast can be computed selecting another model re-iterating the use case step 1.1.<br>Only one Traffic Density Situation forecast per model is allowed. | FMP | Traffic Density Situations are stored for comparison Traffic Density Situations from another model | Information | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4.0 | Traffic Density Threshold Forecast | Using a historical Traffic Density Threshold combined with a declared Traffic Density Threshold, a Traffic Density Threshold forecast is modelled | System | Traffic Density Threshold brackets are calculated and given an Imbalance Confidence Index | Informatio n | |
| 4.1 | Select | If there are multiple sources of Traffic Density Threshold that are distinguished by a different model – the system presents the list of available models that are compatible with the context. | FMP or NMOC | | | |
| 5.0 | Analyse | Imbalances are detected between Traffic Forecast and Traffic Density Threshold Forecast and ranked according to severity and probability | System | | Action | RLT=RT W-19H30 |
| 5.1 | Compare | If the user wants, a second imbalance result can be computed selecting another model re-iterating the use case step 4.0.<br>Only one imbalance forecast per model is allowed. | FMP | Traffic Density Situations are stored for comparison Traffic Density Situations from another model | Informatio n | |
| 5.2 | Select | Based on evaluation of the imbalance results, the FMP selects the one matching his expectations. | FMP | Reference for forecast is selected | Informatio n | |
| 6 | Solution Forecast | Significant Imbalances are identified and the impact analysed and measures or | NMOC FMP | What-if analysis | Informatio n | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | scenarios are proposed to resolve them | | | | |
| 6.1 | Assist by FMP | Where the NMOC cannot find a predefined solution, the FMP may be contacted to assist | FMP | Delegation of solution definition | Action | |
| 7 | Analyse | The selected measures and scenarios are applied | System | Rerouting and Delay decisions are added to the Context Filter | Informatio n | |
| 7.1 | Forecast Business Trajectory | The FBTs are recalculated given the enhanced Context Filter and now present the most likely trajectory that the flight will take in function of the structural information available at this time | System | | | |
| 8.0 | Condition Processing | If the selected measures and scenarios are applied and do not lead to an acceptable traffic situation the use case continues at 5.0 | NMOC | Iterate as many times as needed | Action | |
| 9.0 | Decision | The Traffic Situation is Acceptable | FMP | ATFCM Situation Display | Informatio n | Before DNP[13] – 2H |
| 9.1 | Decision | The FBTs are transferred to TACT to allow Tactical Demand Prediction | System | Forecast Trajectories | Informatio n | Before DNP – 2H |
| 10 | Completed | The use case ends | | | | |
| | Post-Condition | The FBT contains the most probable trajectory | | | Context | |

[13] DNP: Dynamic Network Plan

https://www.eurocontrol.int/sites/default/files/events/presentation/20160127_dynamic_network_plan_peregrine.pdf

| | | | | | | |
|---|---|---|---|---|---|---|
| | Post-condition | The System contains all the measures to be applied to achieve a balanced network | | | Context | |

#### 3.5.3.1.1 UC-02 – Demand Forecast in Mixed Planning-Execution RLT [06H00-02H00[

Note: **Reference Lead Time [RLT]:** the difference between the Reference Time Window and the time of the event, decision, or action

Note: **[06H00-02H00[**: this is the period in which the FMP is actively monitoring the traffic situation to detect potential mismatches between demand and capacity. A major proportion of flights will still be on the ground.

Note: **Forecast Business Trajectory [FBT]**: With regards to the RLT, it should be noted that whithin the Demand Forecast the flights that do not have an STB or RBT will fall quite rapidly. This means that the PreQI (Prediction Quality Indicator) will become significantly higher as we approach the end of the RLT.

Note: **Actor NM within NMf**: The role of the NM and the NMf within this use case still needs to be elaborated.

Note: **Actor APOC within AOP**: The role of the APOC and the AOP within this use case still needs to be elaborated.

Where necessary the use case can be further split to address specific interactions and steps that differ between the responsibilities of the FMP and those of the LTM.

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| | | **Planned Flight Data [PFD]:** A statement of a flight intent which is based on the FBT but which may be updated due to TACTICAL events | | | Definition | |
| | | **Forecast Business Trajectory:** A trajectory prediction that results from the Flight Intention processing representing the most likely profile given the available data (past, present, and forecast). Contains all the data elements as for SBT/RBT models | | | Definition | |
| | | **Context Filter:** The collection of parameters / conditions / factors to select or calculate representative forecast trajectories | | | Definition | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **Probabilistic Traffic Density Situations:** The Traffic Density Situations are calculated using a statistical distribution of likelihood that the flight will be in a specific time slice of the reference location. | | | Definition | |
| | Pre-Condition | All flights have a PFD or an SBT. SBTs are filed flights or pre-filed in FF-ICE planning service context. | | | Context | |
| | Pre-Condition | Weather info has been processed (weather updates could be quite significant) | | | Context | |
| | Pre-Condition | All actual (ad-hoc) circumstances leading to capacity reduction have been processed (NOTAM; AUP; Sector Configuration; …) | | ATC Rostering, True capacity, … | Context | |
| | Timeframe | The use case starts not earlier than 6H before the Reference Time Window. Some long haul flights may already have an SBT | | | Context | |
| | Timeframe | The use case ends when the demand is balanced by capacity maximisation, use of spare capacity, or planned measure and no later than 03H00 RLT. | | Given the above definitions, some flights will already have taken off. | Context | |
| | ForecastTime Frame | **Reference Time Window [RTW]:** The time period of interest – usually not wider than 2 hours | | | Definition | |
| | ForecastLead Time | **Reference Lead Time [RLT]:** the difference between the | | | Definition | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Reference Time Window and the time of the event, decision, or action<br>Must be in the range [06H00;02H00[ | | | | |
| | Context | The use case continues from UC-01.<br>This use case cannot be executed if UC-01 was unsuccessful | | | Trigger | |
| 1.0 | Initiate | The FMPs Request the FMP Monitor to give the load and occupancy status for the reference location at a reference time and window (can be specified as well as a Query Period) | FMP | Traffic Density Situations are compared to declared capacity and occupancy threshold | Action | RLT=RTW-06H00 |
| 2.0 | Reprocess | The system reprocesses the FBTs with the latest information.<br>The system processes the SBT and RBT of the flights for which a flight plan has been filed and for which sequence or departure info is provided. | System | | | |
| 2.2 | Flight Filtering | FBTs which do not have a corresponding SBT at RTW-LRT are marked as 'Not confirmed'. | System | | | |
| 2.4 | Analyse | The proportion of 'Not confirmed' flights is reported to the FMP in instant value and trend. | FMP | KPI – Flight Occurrence – Imbalance Confidence index for predictability = Confirmed Flights / Total FBT | Information | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2.6 | Flight Filtering | SBT or RBT for which we do not have an FBT at RTW-LRT are marked as 'Unplanned' | System | | | |
| 2.8 | Analyse | The proportion of 'Unplanned' flights is reported to the FMP in instant value and trend. | FMP | KPI – Flight Predictability – Imbalance Confidence index for unpredictability = (Total FBT Flights + Unplanned Flights) / Total FBT Flights | Information | |
| 2.9 | Decision | In case the KPIs for Flight Occurrence or Flight Predictability are exceeding a predefined threshold, the situation monitoring is qualified as unreliable and the use case ends. | FMP | Information: Suspicious state is reported. This triggers a use case not in the realm of DCB | Action | |
| 3.0 | Probability Adjustment | The probability that the flight will be in the count/flight list is recomputed based on the flight status information.<br>The flight status can be a result of processing the API for the previous leg, the DPI for the current leg, and additional information like weather, ATFCM Measures, etc.<br>Any message to affect the progress or status of the flight is relevant, not limited to API or DPI. | System | The probabilistic parameters are saved with the flight data. Each flight has a probability indicator | Information | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3.5 | Measure Updates | Ineffective Measures that were defined in UC-01 which are of no use are cancelled.<br>Ad hoc measures created to deal with capacity reduction as a result of tactical events (weather, equipment, …) will be fed to the system.<br>The flight status is recomputed accordingly. | System | Ineffective Measures and impacted number of flights are recorded for post OPS KPIs (short-term Measure Effectiveness) | | |
| 4.0 | Traffic Forecast | Using the **FBT**, SBT and RBT the system calculates the **Probabilistic Traffic Density Situations** using the probability adjustments.<br>A Prediction Quality Indicator is provided for the Traffic Density Situation derived from Unplanned and Not Confirmed flights aggregated with the context information from use case 1 pertaining to the planned situation updated with the actual situation. | System | Traffic Density Situations are calculated and given an Imbalance Confidence Index | Informatio n | |
| 4.0 | Capacity Forecast | Using the Traffic Density Forecast from UC-01 combined with updates, a new DCB forecast is modelled.<br>Any airspace configuration update includes an update of Traffic Density Thresholds (capacity/occupancy) | System | Traffic Density threshold brackets are calculated and given a Imbalance Confidence Index | Informatio n | |
| 5.0 | Analyse | Imbalances are detected between Traffic Situation Forecast and Traffic Density Forecast and ranked according to severity and probability | System | | Action | RLT=RT W-06H00 to RTW-03H00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | Solution Forecast | Significant Imbalances are identified[14] and the impact analysed and measures or scenarios are proposed to resolve them based on probabilistic information and Prediction Quality Indicator related to context.<br>Solutions in similar or identical context are given high PQI..<br>(Note: there are two indicators, one indicating the match between the traffic situations and one indicating the expected effectiveness of the solutions) | FMP | What-if analysis | Informatio n | |
| 6.5 | Iterate | What-if analysis is performed to compare the effect of the forecast solutions. We continue to iterate to step 6 until the Solution Forecast is acceptable. | | | | |
| 7 | Analyse, Apply and Execute DCB Measures | The use case continues with the DCB use cases for applying the right measure/scenario at the right time for the right purpose. These use cases are available elsewhere and can be STAM, Mandatory Cherry Picking, Regulations, Reroutings, etc. | | | | |
| 7.1 | Business Trajectory Forecast | The FBTs are recalculated given the enhanced Context Filter and now present the | System | FBTs are complete and up-to-date | | |

[14] The interface between this use case and the imbalance repository is to be elaborated in a future version of this OSED.

| | | | | | | |
|---|---|---|---|---|---|---|
| | | most likely trajectory that the flight will take in function of the structural information available at this time | | | | |
| | Post-Condition | The FBT contains the most probable trajectory | | | Context | |
| | Post-Condition | The Forecast Traffic Density Situation and the Forecast Density Threshold are the ones deemed to have the highest credibility | | | Context | |
| | Post-Condition | The Forecast Solution contains the measures determined to be the most likely to solve the imbalances detected | | | | |
| | Post-condition | The System contains all the measures to be applied to achieve a balanced network | | | Context | |

#### 3.5.3.1.2 UC-03 – Demand Forecast in Execution RLT [02H00-00H10[

Note: **Reference Lead Time [RLT]:** the difference between the Reference Time Window and the time of the event, decision, or action

Note: **[02H00-00H10[**: this is the period in which the LTM, EAP and ATC are actively monitoring the traffic situation to detect potential mismatches between demand and capacity. Flights still on the ground are too close to take-off for ground based rerouting measures. Flights closer than 00H40 are considered too close to take-off for ground based delay measures. At this time the probability that the flight will cross the sector (that is the reference location) for which it is forecasted is close to 1.

It is assumed that all flights have been filed at the start of the RTW. All flights have either been confirmed by a flight plan or have been marked as 'not-confirmed'. Any flight being modified within this period is considered to be a Late Updater and may experience negative consequences in terms of Delay attribution. Having said that, updates to avoid delays are of course considered as positive, unless they cause an overload in another sector.

Any flights that are filed after the RTW or for which airborne flight plans are created are considered as Unanticipated Traffic (Intruder). Unanticipated Traffic categorised as Late Filers will be accepted but are moved to the end of the queue for Delay attribution.

In terms of prediction of demand (the Traffic Density Situation), historical data will be used to adjust the filed demand with the unanticipated demand.

Flights later than 00H10 RLT are considered to be purely in ATC and cannot be enhanced by ATFCM measures.

As the RLT diminishes, the probabilistic effect will be reduced and we revert to none-probabilistic predictions as in today's mainstream ATM operations.

Where necessary the use case can be further split to address specific interactions and steps that differ between the responsibilities of the EAP and those of the ATC.

The FBT shall be used to model the prediction of flights in what-if or proposal mode. The FBT will continue to exist as the baseline for comparison between the latest predicted flight intention and the filed flight intention.

Note: **Actor NM within NMf**: The role of the NM and the NMf within this use case still needs to be elaborated.

Note: **Actor APOC within AOP**: The role of the APOC and the AOP within this use case still needs to be elaborated.



| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| | | **Planned Flight Data [PFD]:** A statement of a flight intent which is based on the FBT but which may be updated due to TACTICAL events | | | Definition | |
| | | **Forecast Business Trajectory:** A trajectory prediction that results from the Flight Intention processing representing the most likely profile given the available data (past, present, and forecast). Contains all the data elements as for SBT/RBT models | | | Definition | |
| | | **Context Filter:** The collection of parameters / conditions / factors to select or calculate representative forecast trajectories | | | Definition | |
| | | **Probabilistic Traffic Density Situations:** The Traffic Density Situations are calculated using a statistical distribution of likelihood that the flight will be in a specific time slice of the reference location. | | | Definition | |
| | Pre-Condition | All flights have an SBT. | | | Context | |
| | Pre-Condition | Weather info has been processed (weather updates could be quite significant) | | | Context | |
| | Pre-Condition | All actual (ad-hoc) circumstances leading to capacity reduction have been processed (NOTAM; AUP; Sector Configuration; …) | | ATC Rostering, True capacity, … | Context | |
| | Timeframe | The use case starts not earlier than 2H before the Reference Time Window. | | | Context | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Timeframe | The use case ends no later than 00H10 RLT. | | Given the above definitions, some flights will already have terminated before the end of the RTW. | Context | |
| | ForecastTime Frame | **<u>Reference Time Window [RTW]:</u>** The time period of interest – usually not wider than 2 hours | | | Definition | |
| | ForecastLead Time | **<u>Reference Lead Time [RLT]:</u>** the difference between the Reference Time Window and the time of the event, decision, or action<br>Must be in the range [02H00;00H10[ | | | Definition | |
| | Context | The use case continues from UC-02.<br>This use case can be executed if UC-02 was unsuccessful but then it reverts to current operational processes and procedures which are not repeated in this document | | | Trigger | |
| 1.0 | Initiate | The FMPs Request the FMP Monitor to give the load and occupancy status for the reference location at a reference time and window (can be specified as well as a Query Period) | FMP | Traffic Density Situations are compared to declared capacity and occupancy – Traffic Density Threshold | Action | RLT=RTW-06H00 |



| | | | | | | |
|---|---|---|---|---|---|---|
| 2.0 | Reprocess | The system reprocesses the FBTs with the latest information.<br>The system processes the SBT and RBT of the flights for which a flight plan has been filed and for which sequence or departure info is provided. | System | | | |
| 2.2 | Flight Filtering | 'Not confirmed' flights are made invisible (not listed, not counted). | System | | | |
| 2.3 | Demand Adjustment | Unanticipated Demand is added to the Forecast Traffic Density Situation based on Archive data to adjust for Unanticipated Traffic. | System | KPI – Unanticipated Traffic Buffer [UTB] | | |
| 2.4 | Analyse | The proportion of 'Unanticipated Traffic' is reported to the EAP/LTM in instant value and trend.<br><br>If there are no Unanticipated Flights, PreQI = 100% | EAP/LTM | KPI – UTB Occurrence – Imbalance Confidence Index for predictability = (Total Flights - Unanticipated Flights) / Total Flights | Information | |
| 2.6 | Flight Filtering | SBT or RBT for which we do not have an FBT at RTW-LRT are marked as 'Unplanned Traffic' | System | | | |
| 2.8 | Analyse | The proportion of 'Unplanned' flights is reported to the EAP in instant value and trend.<br><br>If there are no Unplanned flights, PreQI = 100% | EAP/LTM | KPI – Flight Predictability – Imbalance Confidence Index for unpredictability = (Total Flights - Unplanned | Information | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Flights) / Total Flights | | |
| 2.9 | Decision | In case the KPIs for Unanticipated or Unplanned Traffic CI are below a predefined threshold, the situation monitoring is qualified as unreliable and the use case ends. | EAP/LTM | Information: Suspicious state is reported. This triggers a use case not in the realm of DCB | Action | |
| 3.0 | Probability Adjustment | The probability that the flight will be in the count/flight list is recomputed based on the flight status information.<br>The flight status can be a result of processing the API for the previous leg, the DPI for the current leg, and additional information like weather, ATFCM Measures, etc.<br>Any message to affect the progress or status of the flight is relevant, not limited to API or DPI. | System | The probabilistic parameters are saved with the flight data. Each flight has a probability indicator | Information | |
| 3.5 | Measure Updates | Ineffective Measures that were defined in UC-01 or UC-02 which are of no use are cancelled.<br>Ad hoc measures created to deal with capacity reduction as a result of tactical events (weather, equipment, …) will be fed to the system.<br>The flight status is recomputed accordingly.<br>STAM Measures to deal with short terms ATFCM situations are introduced. | System | Ineffective Measures and impacted number of flights are recorded for post OPS KPIs (short-term Measure Effectiveness) | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4.0 | Traffic Forecast | Using the SBT and RBT the system calculates the **<u>Actual Traffic Density Situations</u>** using the probability adjustments.<br>A Prediction Quality Indicator is provided for the Traffic Density Situation derived from Unplanned and Unanticipated Traffic flights.<br>The Actual Traffic Density Situation is mapped against the Forecast Traffic Density Situation. | System | Traffic Density Situations are calculated and given a Imbalance Confidence Index | Informatio n | |
| 4.0 | Capacity Forecast | The Actual Traffic Density Thresholds are recorded based on the Actual Traffic Situation and mapped against the Forecast Traffic Density Thresholds. | System | Traffic Density Threshold brackets are calculated and given an Imbalance Confidence Index | Informatio n | |
| 5.0 | Analyse | Imbalances are detected between Actual Traffic Situation and Actual Traffic Density and ranked according to severity and probability. | System | | Action | RLT=RT W-02H00 to RTW-00H10 |
| 6 | Solution Forecast | Significant Imbalances are identified and the impact analysed and STAM Measures or Scenarios (potentially airborne) are proposed to resolve them based on probabilistic information and Imbalance Confidence Index related to context.<br>Solutions in similar or identical context are given high confidence indicators.<br>It is assumed that there is no time to iterate between solutions. | EAP/LT M | STAM Analysis | Informatio n | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7 | Analyse, Apply and Execute STAM Measures | The use case continues with the DCB use cases for applying the right measure/scenario at the right time for the right purpose. These use cases are available elsewhere and can be STAM, etc. The use case continues by execution of existing DCB Use Cases – the use case ends when the flights have left the reference location. | EAP/LTM | | Action | |
| | Post-condition | The System has executed all the measures and achieves a balanced network | | | Context | |

### 3.5.3.2 Predicted Workload

#### 3.5.3.2.1 UC-04: Hotspot identification describes how a local operator identifies a hotspot, and communicates with the network manager and other local operators to identify an optimum solution.

| OPTION A: Assess complexity Manually | | | | | |
|---|---|---|---|---|---|
| N° | Action | Description | Actor | Information | Type |
| 1 | Context | The operator chooses to assess complexity over a specific volume, time-frame and traffic. | | | |
| 2 | Context | No Free Route environment | | | Assumption |

| | | | | | Context |
|---|---|---|---|---|---|
| 3 | Present area | Presents a geographical area and allows selection of **basic sectors**, **sectors**, or **sectorisation** | LTM Local Tool | | |
| 4 | Sectorisation / CWP | Aggrupation of Sectors | LTM Local Tool | Sector | Information |
| 5 | Basic Sector (DAC unit) | | LTM Local Tool | Sector | Information |
| 6 | Sector | Aggrupation of **Basic Sectors** | LTM Local Tool | Sector | Information |
| 7 | Select Time Interval | | LTM | Scope | |
| 8 | Select Volume | | LTM | Scope | |
| 9 | Present a/c list | Presents a list of a/c associated to a specific geographical area and time interval | LTM Local Tool | | |
| OPTION A.1 | Select Traffic | Selection of a traffic flow between two points associated to a **time interval** | LTM | Scope | |
| OPTION A.2 | Select flight(s) | Selection of one or several flights associated to a **time interval** | LTM | Scope | |
| 10 | Select Segment | Operator selects a period of time over which the complexity will be calculated (e.g. complexity calculated in segments of 10 minutes) | LTM | | |
| 11 | Load Historical Data | | Complexity/Workload assessment tool | WISH | |
| 12 | Load FPL | Load FPL associated to a specific **scope** | ITEC+LTM Local Tool | FPL | |
| 13 | Load EFD | Load EFD associated to a specific **scope** | LTM Local Tool | FPL | |
| 14 | Integrate FPL & EFD | Data fusion to obtain the most likely **FPL** | LTM Local Tool | FPL | |

| | | | | | |
|---|---|---|---|---|---|
| 15 | Enhanced FPL | Using historical data and existing FPL data, the system creates the most probable FPL. | | WISH FPL | |
| 16 | Estimate Trajectory | Using the most likely **FPL to** create a detailed **trajectory** | LTM Local Tool | Trajectory | |
| 17 | Determine Control Events | *Note: information obtained from the MTCD* | Complexity/Workload assessment tool | Control event | |
| 18 | Integrate over segment | | Complexity/Workload assessment tool | | |
| 19 | Assign Cognitive W/L | | Complexity/Workload assessment tool | | |
| 20 | Provide complexity estimation | | Complexity/Workload assessment tool | Complexity | |
| 21 | Display of the results to the LTM | | LTM Local Tool | | Information |
| | System Monitors and displays alerts | | | | |
| N° | Action | Description | Actor | Information | Type |
| 22 | | ATFCM performs hotspot monitoring assessing the evolution (positive or negative) of a hotspot during execution. Deviations from the plan (i.e. flight deviations, changing conditions or deviation from | | | Context |

| | | | | | |
|---|---|---|---|---|---|
| | | planned constraints) can be used to assess the Hotspot evolutions. | | | |
| 23 | Check for flight deviations or changing conditions | Check for flight deviations or changing conditions on:<br>• demand forecast<br>• workload forecast<br>• Complexity<br>• Flight plan deviations<br>That may lead to a new imbalance situation | LTM<br>Flight Crew<br>ATC | Deviations that may request a new hotspot or an update of an existing one | Action |
| 24 | Monitor using Complexity estimations | System estimates complexity value for a given airspace volume. If it is above acceptable levels then a hotspot is declared. | LTM Local Tool | Complexity Estimation calculated using complexity algorithms | Action |
| 25 | | Hotspot severity<br>• Green Zone: below the sustain threshold<br>• Yellow Zone: above the sustain value for less than 20 minutes<br>• Orange Zone: above the sustain threshold for more than 20 min<br>• Red Zone: above the peak threshold | | | Information |
| LTM Analyses Hotspot | | | | | |
| N° | Action | Description | Actor | Information | Type |

| | | | | | |
|---|---|---|---|---|---|
| 26 | Consult available information | The LTM consults demand data: flight list with some attributes such as<br>• accurate flight status<br>• aircraft attitude<br>• hotspot entry/exit time<br>• specific mark on flights with previous penalisations in other FMPs<br>• specific mark on flights concerned by on-going other hotspots<br>• specific mark on flights concerned by on-going other hotspots associated to a proposed/coordinated/released STAM<br>in order to gain a more detailed understanding of the anticipated demand and to consider what mitigation measures might be available to which flight, which flights are to be preferably excluded and which flights are to be addressed first concerning any mitigation measures. | LTM | Flight list | |
| 27 | Select flights for consideration of measure | The LTM selects individual flights and changes manually their profile in order to simulate and analyse the impact on Occupancy Counts and Entry Counts. The FMP is also able to select individual flights to exclude from the potential STAM or regulation. | LTM | Flight List | |
| 28 | | The LTM identifies flights creating complexity from the list proposed by the system. | LTM | Flight List with complexity | |
| 29 | Assess the impact | The LTM evaluates the impact of a regulation or STAM (or a | LTM | | |

| | | | | | |
|---|---|---|---|---|---|
| | | combination of both) in terms of performance indicators such as minutes and delay. | | | |
| 30 | Assess possible solutions | The LTM selects the most likely solution(s) for detected imbalance.<br>• For cherry-picking STAM solution, the LTM HMI proposes a menu with possible STAM actions:<br>    • Time-based: The FMP need to check the MPR rules as defined in section 3.2.1.3 (cannot overrule flight-under-constraint **S/** flight-under-constraint **R)**<br>    • Flight level capping<br>    • Rerouting<br>• For flow STAM solution, the LTM HMI proposes to group STAM and to display a menu with possible STAM actions. | LTM | Proposed STAM list | |
| 31 | Update STAM status | The STAM status turns to DRAFT | SYSTEM | | |

LTM Declares Hotspot

| N° | Action | Description | Actor | Information | Type |
|---|---|---|---|---|---|
| 32 | Declare Hotspot | FMP reviews candidate hotspots OCMV (Occupancy Counts Monitoring Values) criteria, complexity estimations and forecast workload criteria to identify hotspot | LTM | Peak Occupancy Count<br>Sustain Occupancy Count<br>Overload Duration<br>Duration of counting | Action |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Complexity Estimation Workload Forecast Hotspot definition | |
| Notify Hotspot | | | | | |
| | Action | Description | Actor | Information | Type |
| 33 | Notify Hotspot | LTM notifies NM (via B2B/CollaborativeNOP) of hotspot.<br>This data is displayed to the Network Manager for notice and the Local Traffic Manager affected for review. When Hotspot issues are confirmed, detailed analysis begins. | LTM NM | Hotspot notification | Action |

#### 3.5.3.2.2 UC-05: Distribution of complexity using dynamic sectorisation describes how a local operator assesses and distributes complexity over a specific airspace to ensure that all estimation areas have a Level 2 or lower complexity level.

| | | | | | |
|---|---|---|---|---|---|
| OPTION B: Assess complexity Automatically | | | | | |
| | Action | Description | Actor | Information | Type |
| 1 | New data received **(trigger)** | This process starts with the provision of new data to the system. The interval of providing new data depends on the incorporation of new flight plans. | | Data. | Source. |

| | | | | | |
|---|---|---|---|---|---|
| 2 | Integration of the flight plan. | When a new flight plan is received at the system, it will be integrated both in geographical position and in time interval. | | | Allocation. |
| 3 | Translation of the flight plan to controller's events. | The input needed by the "Complexity/Workload assessment tool" is a sequence of controller's events, so once we have the last updated flight plan, it is necessary to translate these flight plans into controller's events. | Complexity/Workload assessment tool | | |
| 4 | Assign Cognitive W/L. | | Complexity/Workload assessment tool | | |
| 5 | Provide complexity estimation. | According to the flight plans introduced in the system, the "Complexity/Workload assessment tool" will provide an estimation of complexity. The system will provide a value of complexity per each elemental volume (TBD), per flight, and per group of flights. | Complexity/Workload assessment tool | Complexity | |
| 6 | Compare traffic complexity with thresholds. | When an estimation of complexity is provided, this value will be compared with thresholds (TBD) in order to detect if the situation is acceptable or not: non-critical situation vs. critical situation. | | | |
| 7 | Identify a non-critical | If the evaluated complexity is detected as being **inside** the **thresholds**, the related | | | |

| | | | | | |
|---|---|---|---|---|---|
| | complexity situation. | complexity situation will be marked as **non-critical** (acceptable situation). | | | |
| 8 | Display monitored complexity | When the complexity situation is evaluated and classified as **non-critical**, it is provided for display.<br><br>Thus, the complexity manager can request **details**, **mark** a situation **as critical** if not performed by the system, or **change** some of the complexity management **settings** and configuration. From that display, the complexity manager can decide if the evaluated complexity has in fact a critical level even if has not been detected by the system. | INAP | | |
| 7b | Identify a critical complexity situation. | If the evaluated complexity is detected as being **outside** the **thresholds**, the related complexity situation will be marked as **critical** (non-acceptable situation). In this case, the system will alert to the complexity manager. | | | |
| 8b | Display complexity problem. | When the complexity situation is evaluated and classified as **critical**, it is provided for display.<br><br>Thus, the complexity manager can request **details** on the displayed complexity, request **solutions** | INAP. | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | calculations or **change** some of the complexity managements **settings** and configuration. | | | | |
| System Monitors and displays alerts | | | | | | |
| LTM Analyses Hotspot | | | | | | |
| LTM Declares Hotspot | | | | | | |
| Notify Hotspot | | | | | | |

### 3.5.3.2.3 UC-06: CFSP performing a what-if to elaborate RBT

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) collects the local and generates the consolidated network imbalances | INAP, APT, NM AU | Local Imbalances (+ severity + Imbalance Confidence Index) | Action | 6 hrs-20 min before entry time |
| 2 | Analysis | INAP analyses the imbalance severity and Imbalance Confidence Index and decides to trigger an action if there is an identified imbalance to manage | INAP | Imbalances (+ severity + Imbalance Confidence Index) | Context | 6 hrs-20 min before entry time |
| 3 | Decision | INAP publishes the hotspot to the Collaborative NOP | INAP | Hotspot | Action | 6 hrs-20 min before entry time |
| 4 | Analysis | AU analyses the consolidated network imbalance severity and Imbalance Confidence Index | AU | Hotspot | Context | 6 hrs-20 min before entry time |
| 5 | Decision | AU anticipates the potential imbalances and | AU | Hotspot | Action | 6 hrs-20 min |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | decides to update the SBT to alleviate the imbalance using a what-if/what-else tool | | | | before entry time |
| 5 | Decision | AU requests for a SBT/RBT a Network what-if to assess the imbalance impact at the Network Level (green, orange, red) | INAP | What-if | Action | 6 hrs-20 min before entry time |
| 6 | Decision | NM provides the consolidated network imbalances for the complete trajectory of the SBT/RBT | NM | Consolidated Network Imbalance figures | Action | 6 hrs-20 min before entry time |
| 7 | Decision | NM provides the CI (Congestion Indicator) indicating the level of congestion for the complete trajectory | NM | CI | Action | 6 hrs-20 min before entry time |
| 8 | Analysis | AU analyses the consolidated network imbalance figure and CI value in order to assess the imbalance reduction | AU | Consolidated Network Imbalance figures, CI | Context | 6 hrs-20 min before entry time |
| 9 | Analysis | AU determines that the proposed DCB measures for the SBT/RBT is relevant because it goes through imbalance-free and hotspot-free areas | AU | Consolidated Network Imbalance figures, CI | Context | 6 hrs-20 min before entry time |
| 10 | Decision | AU update the SBT | AU | SBT | Action | 6 hrs-20 min before entry time |

#### 3.5.3.2.4 UC-07: INAP performing a what-if to propose DCB solution (RBT)

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) collects the local imbalances and generates the consolidated network imbalances | INAP, APT, NM AU | Local Imbalances (+ severity + Imbalance Confidence Index) | Action | 6 hrs-20 min before entry time |
| 2 | Analysis | INAP analyses the imbalance severity and Imbalance Confidence Index and decides to trigger an action if there is an identified imbalance to manage | INAP | Imbalances (+ severity + Imbalance Confidence Index) | Context | 6 hrs-20 min before entry time |
| 3 | Decision | INAP publishes the hotspot to the Collaborative NOP | INAP | Hotspot | Action | 6 hrs-20 min before entry time |
| 4 | Decision | INAP prepares DCB solution and perform a Local what-if to assess the resolution of the Hotspot and the new local imbalance figure (green, orange, red) | INAP | What-if | Action | 6 hrs-20 min before entry time |
| 5 | Decision | INAP requests for a SBT/RBT a Network what-if to assess the imbalance impact at the Network Level (green, orange, red) | INAP | What-if | Action | 6 hrs-20 min before entry time |
| 6 | Decision | NM provides the consolidated network imbalances for the complete trajectory of the SBT/RBT | NM | Consolidated Network Imbalance figures | Action | 6 hrs-20 min before entry time |
| 7 | Decision | NM provides the CI (Congestion Indicator) indicating the level of congestion for the complete trajectory | NM | CI | Action | 6 hrs-20 min before entry time |
| 8 | Analysis | INAP analyses the consolidated network | INAP | Consolidated Network | Context | 6 hrs-20 min |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | imbalance figure and CI value in order to assess the imbalance reduction | | Imbalance figures, CI | | before entry time |
| 9 | Decision | INAP determines that the proposed DCB measures for the SBT/RBT is not relevant because it goes through another INAP AoR congested (orange/red figure) | INAP | Consolidated Network Imbalance figures, CI | Action | 6 hrs-20 min before entry time |

#### 3.5.3.2.5 UC-08: NM performing a what-if to evaluate DCB solution (timeframe 1h – 30 min)

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) collects the local imbalances and generates the consolidated network imbalances | INAP, APT, NM AU | Local Imbalances (+ severity + Imbalance Confidence Index) | Action | 1 hr30 -20 min before entry time |
| 2 | Analysis | NM monitors the state of the network analysing the Consolidated Network Impact and CI information | NM | Consolidated Network Imbalance figures, CI | Context | 1 hr30 - 20 min before entry time |

### 3.5.3.3 Network Performance

#### 3.5.3.3.1 UC-09: APOC/AIMA performing multiple criteria what-if to elaborate SBT/RBT

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides the local imbalances and consolidated network imbalances | INAP, APOC, NM AU | Imbalances (+ severity + Imbalance Confidence Index) | Context | 6 hrs-20 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | Analysis | APOC analyses the imbalance with the associated Imbalance Confidence Index and decides to trigger an action if there is an identified 'rate' imbalance to manage | APOC | Imbalances (+ severity + Imbalance Confidence Index), TMV rate | Action | 6 hrs-20 min before entry time |
| 3 | Analysis | APOC defines an area of opportunities (OptiSpot) to optimise | APOC | OptiSpot | Context | 6 hrs-20 min before entry time |
| 4 | Decision | APOC publishes the OptiSpot to the Collaborative NOP | APOC | OptiSpot | Action | 2hrs – 20 min before entry time |
| 5 | Decision | APOC analyses the OptiSpot characteristics and decides to apply their business rules (AIMA) to prepare a DCB solution. | APOC | OptiSpot, flight list, business rules (AIMA) | Action | 6 hrs-20 min before entry time |
| 6 | Decision | APOC prepares with AUs the DCB solution (TTA proposal) using local what-if | APOC, AU | OptiSpot, flight-list, Local What-if, business rules | Action | 6 hrs-20 min before entry time |
| 7 | Decision | APOC sends to NM the TTA proposal | APOC, AU | TTA | Action | 6 hrs-20 min before entry time |
| 8 | Decision | NM collect the TTA, calculates the NCC and disseminates to the NMf actors the proposed NCC (TTA) | NM | NCC, TTA | Action | 6 hrs-2 hrs before entry time |
| 9 | Decision | APOC performs a Network what-if to verify the impact for the different PI | APOC, AU | TTA, Network what-if | Action | 6 hrs-20 min before entry time |
| 10 | Analysis | APOC verifies that the PI for INAP is taken into account. APOC detects that a measure is shifting a flight in a more complex area: APOC updates the measure in | APOC | Network What-if, PI | Context | 6 hrs-20 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | order to alleviate the complexity area | | | | |
| 11 | Analysis | APOC verifies that the PI for NM (ATFCM delay, reactionary delay) is taken into account and the values are not degraded compared to a reference value | APOC | Network What-if, PI | Context | 6 hrs-20 min before entry time |
| 12 | Decision | APOC implements the TTA | APOC | TTA | Action | 6 hrs-20 min before entry time |

#### 3.5.3.3.2 UC-10: INAP performing multiple criteria what-if to propose DCB solution

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) collects the local and generates the consolidated network imbalances | INAP, APT, NM AU | Local Imbalances (+ severity + Imbalance Confidence Index) | Action | 6 hrs-20 min before entry time |
| 2 | Analysis | INAP analyses the imbalance severity and Imbalance Confidence Index and decides to trigger an action if there is an identified imbalance to manage | INAP | Imbalances (+ severity + Imbalance Confidence Index) | Context | 6 hrs-20 min before entry time |
| 3 | Decision | INAP publishes the hotspot to the Collaborative NOP | INAP | Hotspot | Action | 6 hrs-20 min before entry time |
| 4 | Analysis | INAP prepares DCB measures and analyses the related PI impacts from the AU (Margins of Manoeuvre) and NM | INAP | Local What-if, PI | Context | 6 hrs-20 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | (ATFCM delay, reactionary delay) actors | | | | |
| 5 | Decision | INAP defines DCB measures accommodating the local imbalance figures | INAP | Local What-if, PI | Action | 6 hrs-20 min before entry time |
| 6 | Decision | INAP sends to NM the TTA proposal | APOC, AU | TTA | Action | 6 hrs-20 min before entry time |
| 7 | Decision | NM collect the TTA, calculates the NCC and disseminates to the NMf actors the proposed NCC (TTA) | NM | NCC, TTA | Action | 6 hrs-2 hrs before entry time |
| 8 | Decision | INAP requests a Network what-if to assess the different PIs impacted by the DCB measures | INAP | TTA, Network What-if | Action | 6 hrs-20 min before entry time |
| 9 | Analysis | INAP analyses the consolidated network imbalance figure and CI value in order to assess the network imbalance impact of the proposed DCB measures | INAP | Consolidated Network Imbalance figures, CI | Action | 6 hrs-20 min before entry time |
| 10 | Analysis | APOC verifies that the PI for NM (ATFCM delay, reactionary delay) is taken into account and the values are not degraded compared to a reference value | APOC | Network What-if, PI | Context | 6 hrs-20 min before entry time |
| 11 | Decision | APOC implements the TTA | APOC | TTA | Action | 6 hrs-20 min before entry time |

#### 3.5.3.3.3 UC11 : Network Resilience

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| *1* | Analysis | INAP analysis predicted traffic patterns and deduces workloads within traffic volumes | INAP | Predicted traffic counts and demand to deliver input for capacity function | Action | Pre-tactical |
| *2* | Analysis | AOP analysis predicted traffic patterns and deduces workloads within traffic volumes | AOP | Predicted traffic counts and demand to specify AOP | Action | Pre-tactical |
| *3* | Action | Specification and evaluation of pre-tactical network scenarios | NM | Initial NOP based on AOPs, ATC capacity planning and network scenarios | Action | Pre-tactical |
| *4* | Action | Specification of DCB solutions | NM + INAP + Airport | ATFCM measures | Action | |
| *5* | Action | Evaluation of regulation data | NM | Identification of occurrence thresholds of regulation types, determination of network states: *nominal*, *critical* | Action | Tactical, Rolling |
| *6* | Action | Propose potential DCB solutions in case of critical network state | NM | Propose potential DCB solutions according to selected resilience | Action | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | indicators (e.g. time-to-recover) | | |
| *7* | Decision | NM decides for resilient DCB solution | NM | Based on potential impact prediction, resilient DCB solution(s) are initiated to recover the network | Decision | |
| *8* | Implementation | NM implements DCB solution(s) | NM | Based on a best-anticipated resilience path | Action | |
| *9* | Completed | The network is back in nominal state | | | Context | |

### 3.5.3.4 INAP functions

#### 3.5.3.4.1 UC12 : LTM/EAP Task sharing: EAP to manage DCB solutions (LTM/EAP timeframe)

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Analysis | The Collaborative NOP (Imbalance Repository) provides local and consolidated network imbalances | INAP, APOC, NM, AU, Extended-AMAN | Imbalances (+ severity + Imbalance Confidence Index) | Context | 2 hrs before entry time |
| 2 | Analysis | INAP detects and analyses the local imbalance with the associated Imbalance Confidence Index. | INAP | Imbalances (+ severity + imblance confidence index), TMV rate | Action | 2 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | Analysis | INAP identifies a Hotspot based on identified safety TMV 'rates' (i.e. entry or occupancy). | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2 hrs before entry time |
| 4 | Decision | INAP publishes the Hotspot via the NOP to notify all concerned stakeholders. | INAP | Hotspot | Action | 2 hrs before entry time |
| 5 | Analysis | LTM analyses the Hotspot characteristics at flow level to determine the appropriate course of action | LTM | Hotspot, flight list, ATFCM measures, | Action | 2 hrs before entry time |
| 6 | Decision | LTM decides to delegate the resolution to the EAP (under supervisor consent) | LTM, EAP | DCB Measures, hotspot characteristics | Action | 2 hrs before entry time |
| 7 | Analysis | EAP analyse the Hotspot characteristics at a trajectory level using finer and more accurate indicators based on more reliable predictions : complexity, indicators, | EAP | Hotspot, flight list, complexity andoccupancy curves based on FDPS TPs, various indicators | Action | 2 - 1 hr before entry time |
| 8 | Analysis | EAP selects a solution in the CORSE Catalogue and can assess its | EAP | Hotspot, flight list, What if, CORSE | Action | 1 hr before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | efficiency through local What if and local tools | | catalogue, performance indicators | | entry time |
| 9 | Decision | EAP decides to propose to implement the solution and sends to implementing CWP | EAP, ATC | EAP measure implementation proposal, hotspot status | Action | 30 min before entry time |
| 10 | Analysis | ATC analyses the request and verifies its feasibility with FC and the other A/C in his area | ATC | | Action | 30 min before entry time |
| 11 | Decision | ATC decides to implement the solution and sends the clearance to FC | ATC, FC | | Action | 30-15 min before entry time |
| 12a | Decision | FC executes the ATC clearance | FC | | Action | 30-15 min before entry time |
| 12b | Decision | ATC reports to EAP the measure(s) acceptance and implementation. | ATC, EAP | | Action | 30-15 min before entry time |
| 12c | Decision | Updated ATFCM plan is shared locally with relevant CWPs, and shared on the NOP | INAP | EAP solution and hotspot status | Action | |
| 13 | Analysis | The EAP monitors the hotspot resolution | EAP, LTM | Hotspot status, curves and local | Action | 30-15 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | progress and reports to LTM, NOP is updated | | performance indicators | | entry time |
| 14 | Completed | The hotspot is solved and NOP is updated | | | Context | |

#### 3.5.3.4.2 UC13 : LTM/EAP Task sharing: LTM initiates measures, EAP monitoring and fine-tuning DCBsolutions (LTM/EAP timeframe)

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides local and consolidated network imbalances | INAP, APOC, NM, AU, Extended-AMAN | Imbalances (+ severity + imbalance confidence index) | Context | 2 hrs before entry time |
| 2 | Analysis | INAP detects and analyses the local imbalance with the associated imbalance confidence index. | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2 hrs before entry time |
| 3 | Analysis | INAP identifies a Hotspot based on identified safety TMV 'rates' (i.e. entry or occupancy). | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | Decision | INAP publishes the Hotspot via the NOP to notify all concerned stakeholders. | INAP | Hotspot | Action | 2 hrs before entry time |
| 5 | Analysis | LTM analyses the Hotspot characteristics at flow level to determine the appropriate course of action | LTM | Hotspot, flight list, ATFCM measures, | Action | 2 hrs before entry time |
| 6 | Decision | LTM decides to launch resolution process | LTM | Hotspot characteristics | Action | 2 hrs before entry time |
| 7 | Analysis | LTM selects a solution in the CORSE catalogue and assess its efficiency thanks to what if functionalities (local and NM impact assessment) | LTM | CORSE catalogue, LTM candidate DCB Measures, hotspot status, performance indicators (local and NM levels) | Action | 2 hrs before entry time |
| 8 | Decision | LTMdecides that the full implementation of the solution should be allocated to EAP role | LTM | Realistic and updated curves, performance indicators, hotspot status | Action | 2 hrs before entry time |
| 9 | Analysis | The hotspot resolution fine-tuning and solution | EAP, LTM | LTM DCB measures to | Action | 2 - 1 hr before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | monitoring is allocated to the EAP | | be refined, hotspot status | | |
| 10 | Analysis | EAP analyses the LTM proposed solution and assess its validity | EAP, ATC | LTM DCB measures to be refined, hotspot status, local performance indicators, | Action | 30 min before entry time |
| 11 | Analysis | EAP refines the proposed DCB solution and assesses the efficiency of the candidate EAP measures thanks to more accurate and reliable data and tools | EAP, ATC | reliable curves and complexity indicators, local what-if | Action | 30 min before entry time |
| 12 | Decision | EAP decides to propose to implement the refined solution and send to ATC | EAP, ATC | Refined EAP measures, hotspot status | Action | 30 min before entry time |
| 13 | Analysis | ATC analyses the request and verifies its feasibility with FC and the other A/C in his area | ATC | | Action | 30 min before entry time |
| 14 | Decision | ATC decides to implement the | ATC, FC | | Action | 30-15 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | measure(s) and sends the clearance to FC | | | | |
| 15a | Decision | FC executes the ATC clearance | FC | | Action | 30-15 min before entry time |
| 15b | Decision | ATC reports to EAP the measure(s) acceptance and implementation | ATC, EAP | | Action | 30-15 min before entry time |
| 15c | Decision | Updated ATFCM plan is shared locally with relevant CWPs, and shared on the NOP | INAP | EAP solution and hotspot status | Action | |
| 16 | Analysis | The EAP monitors the hotspot resolution progress and reports to LTM. NOP is updated | EAP, LTM | Hotspot status, curves and local performance indicators | Action | 30-15 min before entry time |
| 17 | Completed | The hotspot is solved and NOP updated | | | Context | |

#### 3.5.3.4.3 UC14 : EAP end-to-end DCB management : from detection to implementation (EAP timeframe)

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | After LTM analysis, or when an unplanned event makes it required, EAP takes the full responsibility of end-to-end DCB management in his | LTM | | Action | 1 hr-15 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | area of responsibility for a given period of time, to address a specific situation within the EAP timeframe. LTM in support. | | | | |
| 3 | Analysis | EAP is continuously monitoring the complexity level in his own timeframe, in a complementary mode with LTM | | | context | 2hrs- 15 min before entry time |
| 2 | Analysis | EAP detects and analyses the imbalance with the associated imbalance confidence index | EAP | Imbalances, TMV rate | Action | 2hrs- 15 min before entry time |
| 3 | Analysis | EAP identifies a Hotspot based on identified safety TMV 'rates' (i.e. entry or occupancy). | EAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2hrs- 15 min before entry time |
| 4 | Decision | INAP publishes the Hotspot via the NOP to notify all concerned stakeholders. | INAP | Hotspot | Action | 2hrs- 15 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | entry time |
| 5 | Analysis | EAP analyse the Hotspot characteristics at a trajectory level using finer and more accurate indicators based on more reliable predictions : complexity, indicators | EAP | Hotspot, flight list, complexity, occupancy curves based on FDPs TPs, various indicators | Action | 2hrs- 15 min before entry time |
| 6 | Analysis | EAP selects a solution in the CORSE Catalogue and can assess its efficiency through local What if and local tools | EAP | Hotspot, flight list, What if, CORSE catalogue, performance indicators | Action | 1 hr before entry time |
| 7 | Decision | EAP decides to propose to implement the solution and sends to implementing CWP | EAP, ATC | EAP measure implementation proposal, hotspot status | Action | 30 min before entry time |
| 8 | Analysis | ATC analyses the request and verifies its feasibility with FC and the other A/C in his area | ATC | | Action | 30 min before entry time |
| 9 | Decision | ATC decides to implement the measure(s) and | ATC, FC | | Action | 30-15 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | sends the clearance to FC | | | | entry time |
| 10a | Decision | FC executes the ATC clearance | FC | | Action | 30-15 min before entry time |
| 10b | Decision | ATC reports to EAP the measure acceptance and implementation | ATC, EAP | | Action | 30-15 min before entry time |
| 10c | Decision | Updated ATFCM plan is shared locally with relevant CWPs, and shared on the NOP | INAP | EAP solution and hotspot status | Action | |
| 11 | Analysis | The EAP monitors the hotspot resolution progress and reports to LTM, NOP is updated | EAP, LTM | | Action | 30-15 min before entry time |
| 12 | Completed | The hotspot is solved and NOP is updated | | | Context | |

### 3.5.3.5 CORSE Catalogue

#### 3.5.3.5.1 UC15: Resolution of E/R complexity using STAMs based on Cop-Organizer

Starting conditions:

- INAP has already done the 'standard' DCB analysis and DCB measures, such as e.g. scenarios and/or regulations are already in place wherever needed.
- STAMs in planning have also been implemented when needed and applicable, and DAC has been used to offer the best possible use of available capacity, while keeping ATC workload at an acceptable level.
- Closer to entry time, airborne STAMs (e.g. reroutings or FL caps) might have been needed to mitigate hotspots in En Route.

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Analysis | The Collaborative NOP (Imbalance Repository) provides the local and consolidated network imbalances | INAP, APOC | Imbalances (+ severity + imbalance confidence index) | Context | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 2 | Analysis | INAP detects and analyses the imbalance with the associated imbalance confidence index. | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 3 | Decision | INAP decides to activate COP Organizer service for COPX, because an imbalance has been detected on COPX between HHmm1 and HHmm2. | INAP | Traffic load on COP (flow count or specific TV), pre-agreed scenarios (business rules) | Action | 2hrs-1hr before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | Decision | INAP sets COP Organizer parameters according to coordinated objectives (max throughput, min complexity before COPX…) | INAP | coordinated objectives | Action | 1hr 30min before entry time |
| 5 | Analysis | COP Organizer computes a sequence at COPX based on ETOs at COPX | COP Organizer | ETOs updated with available information (radar tracks, EFDs, clearances…), sequence computed by COP Organizer | Action | 40 min before entry time |
| 6 | Decision | Based on the delta between planned sequence and sequence computed by COP Organizer, INAP defines an area of opportunities to optimise | INAP | TMV rate, performance indicators, local what-if | Action | 40 min before entry time |
| 7 | Decision | INAP publishes the OptiSpot to the Collaborative NOP | INAP | OptiSpot | Action | 40 min before entry time |
| 8 | Analysis | INAP analyzes the OptiSpot | INAP | OptiSpot, flight list, business | Action | 40 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | characteristics and decides to prepare a DCB solution using COP Organizer advisory sequence (mostly based on airborne STAMs), | | rules (coordinated objectives), STAMs | | entry time |
| 9 | Analysis | COP Organizer checks that no flight within its sequence is already subject to DCB constraints. For Flights already constrained, see UC 21. | COP Organizer | Synchronisation, tTTO, COP Organizer computed sequence | Action | 40 min before entry time |
| 10 | Decision | INAP elaborates STAMs proposals accomodating others criterias (ATC workload & complexity, UDPP …) using what-if, based on COP Organizer computed sequence | INAP | OptiSpot, COP Organizer computed sequence, flight-list, What-if, business rules/ coordinated objectives, ATC complexity indicators | Action | 40 min before entry time |
| 11 | Decision | INAP decides to propose to implement the STAMs based on COP Organizer computed sequence and their own analysis | INAP | STAMS | Action | 40 min before entry time |
| 12 | Decision | INAP decides to distribute the | INAP | STAMs | Action | 40min min |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | proposed STAMs to implementing ATC CWPs | | | | before entry time |
| 13 | Analysis | ATC analyses the request and verifies its feasibility with FC and the other A/C in his area | ATC | | Action | 30 min before entry time |
| 14 | Decision | ATC decides to implement the measure(s) and sends the clearance to FC | ATC, FC | | Action | 30-15 min before entry time |
| 15a | Decision | FC executes the ATC clearance | FC | | Action | 30-15 min before entry time |
| 15b | Decision | ATC reports to INAP the measure(s) acceptance and implementation | ATC, INAP | | Action | 30-15 min before entry time |
| 15c | Decision | Updated ATFCM plan is shared locally with relevant CWPs, and shared on the NOP | INAP | STAMs and Optispot status | Action | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 16 | Analysis | The INAP monitors the optispot resolution progress | INAP | | Action | 30-15 min before entry time |
| 17 | Completed | The optispot is solved, NOP is updated | | | Context | |

### 3.5.3.5.2 UC16: Resolution of E/R complexity using STAMs based on Cop-Sequencer

Starting conditions:

- INAP has already done his/ her 'standard' DCB analysis and DCB measures, such as e.g. scenarios and/or regulations are already in place wherever needed.
- STAMs in planning have also been implemented when needed and applicable, and DAC has been used to offer the best possible use of available capacity, while keeping ATC workload at an acceptable level.
- Closer to entry time, airborne STAMs (e.g. reroutings or FL caps) might have been needed to mitigate hotspots in En Route
-
-

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Analysis | The Collaborative NOP (Imbalance Repository) provides the local and consolidated network imbalances | INAP, APOC | Imbalances (+ severity + imbalance confidence index) | Context | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 2 | Analysis | INAP in extended TMA analyses the imbalance with the associated | e-TMA INAP | Imbalances (+ severity + imbalance confidence | Action | from 1hr UNTIL from 1hr UNTIL 20 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | imbalance confidence index. | | index), TMV rate | | min before entry time |
| 3 | Analysis | INAP in extended TMA defines an area of opportunities to optimise the TMA capacity | e-TMA INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 4 | Decision | INAP in extended TMA publishes the OptiSpot to the Collaborative NOP | e-TMA INAP | OptiSpot | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 5 | Decision | INAP in eTMA decides to activate COP Sequencer service to facilitate sequencing in TMA thanks to early absorption of delay in upper En-Route area. | e-TMA INAP | Sequencing through COP (flow count or specific TV), pre-agreed scenarios (business rules) | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 6 | Decision | INAP sets COP Sequencer parameters | e-TMA INAP | coordinated objectives , | Action | 40 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | according to coordinated objectives (x min delay absorption, sequencing) and current operational environment (wind, airport conditions, etc…) | | airport conditions | | entry time |
| 7 | Analysis | INAP analyzes the OptiSpot characteristics and decides to prepare a DCB solution using COP Sequencer advisory sequence (mostly based on airborne STAMs), | INAP | OptiSpot, flight list, business rules (coordinated objectives), STAMs | Action | 40 min before entry time |
| 8 | Analysis | COP Sequencer checks that no flight within its sequence is already subject to DCB constraints.<br><br>In case of an existing DCB constraint, synchronization will be needed. | COP Sequencer | Synchronisation, tTTO, COP Sequencer computed sequence | Action | 40 min before entry time |
| 9 | Decision | INAP elaborates STAMs proposals accomodating others criterias (ATC workload & complexity, UDPP…) using what-if, based | INAP | OptiSpot, COP Sequencer computed sequence, flight-list, What-if, business rules/ | Action | from 1hr UNTIL from 1hr UNTIL 20 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | on COP Sequencer computed sequence | | coordinated objectives, ATC complexity indicators | | entry time |
| 10 | Decision | INAP in eTMA decides to propose to implement the STAMs based on COP Sequencer computed sequence and their own analysis | e-TMA INAP | STAMS | Action | 40 min before entry time |
| 11 | Decision | INAP in eTMA decides to distribute the proposed STAMs request to implementing ATC CWPs | e-TMA INAP | STAMs | Action | 40 min before entry time |
| 12 | Analysis | ATC analyses the request and verifies its feasibility with FC and the other A/C in his area | ATC | | Action | 30 min before entry time |
| 13 | Decision | ATC decides to implement the measure(s) and sends the clearance to FC | ATC, FC | | Action | 30-15 min before entry time |
| 14a | Decision | FC executes the ATC clearance | FC | | Action | 30-15 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | entry time |
| 14b | Decision | ATC reports to INAP in eTMA the measure(s) acceptance and implementation | ATC, e-TMA INAP | | Action | 30-15 min before entry time |
| 14c | Decision | Updated ATFCM plan is shared locally with relevant CWPs, and shared on the NOP | INAP | STAMs and Optispot status | Action | |
| 15 | Analysis | The INAP monitors the Optispot resolution progress | e-TMA INAP | | Action | 30-15 min before entry time |
| 16 | Completed | The Optispot is solved, NOP is updated | | | Context | |

#### 3.5.3.5.3 UC-59 – DAC and Collaborative Framework

| N° | Action | | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | 00 Preparation | A set of possible sector configurations based on human performance, day of operations and workload/complexity assessment is prepared based on the evaluation performed during the strategic planning phase. | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | 01.Detection of demand and capacity imbalance | The LTM monitors the system to detect Demand and Capacity imbalances so that they may be solved. To this end, the LTM continuously monitors the traffic in his/her area of responsibility. The LTM monitors three specific parameters:<br>• entry counts<br>• occupancy counts<br>• Complexity<br><br>Monitoring values are adjusted to each sector to help the LTM detect potential traffic peaks | LTM | | Action | -2h-1h |
| 3 | 02.Network view | Once a potential imbalance situation is detected, the LTM obtains a Network view to be aware of the surrounding space and thus be able to provide better solutions. | LTM<br>NM | | | |
| 4 | 03.Workload and Complexity assessment | The LTM considers the impact of the forecasted traffic peak on the workload and complexity. Workload will be used to assess if the current airspace structure and human resource allocation structure can accommodate the expected traffic peak. Complexity is used to assess the potential for conflicts in the airspace structure. At this stage it is expected that the workload estimations will be more accurate than the complexity ones.<br><br>The analysis of the workload and complexity estimations | LTM<br>Workload Assessment Tool<br>Complexity Assessment tool | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | provide the information required to design an optimum solution. This information is completed with Historical traffic data, which provides previous trends for sector occupancy counts and indicators related to similar days to the day of the forecasted traffic peak. | | | | |
| 5 | | As a result of the analysis, the LTM decides to design a capacity based measure (dynamic airspace configuration).<br><br>The criteria used by the LTM to decide on the design of a capacity measure takes into account:<br>• Workload: avoiding the existence of workload imbalances<br>• Human Resources: availability of the ATCo required for the new airspace structure. Availability includes the required sector license<br>• Complexity: reducing the potential for conflicts in the proposed airspace sectorisation | LTM | | | |
| 6 | 04. Preparation of Capacity measures | The LTM identifies and defines the best possible capacity solution for a capacity/demand imbalance. The solution minimises delays and maximises throughput (always maintaining safety). | LTM | | | |
| 7 | | The LTM requests the system to display the information required to | System | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | design the solution. The information presents: Estimation of predicted Workload<br>• Demand<br>• Military demand<br>• NOP: NM Performance Targets<br>• MET forecasts<br>• Special events<br>• Strategic airspace organisation<br>• Published airspace plan<br>    • Route<br>    • Free route structure<br>    • Sectors<br>    • AFUA<br>    • TMA<br>• Current airspace negotiations<br>• Constraints data | | | | |
| 8 | | Asides from the stated information, the LTM obtains an assessment of the time available to short-notice configuration changes and perform potential negotiations with military authorities. | System | | | |
| 9 | 05 Identify the optimum Sector Configuration | The LTM identifies and designs a solutions that maximises the airspace capacity with the available resources.<br><br>To this end, the LTM balances the predicted workload whilst minimising the complexity of the airspace. He / She does it through the use of a **what-if** tool that provides him/her with a prioritised list of sector | LTM System | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | configurations for the airspace volume. | | | | |
| 10 | 06 Negotiate with all involved actors the implementation of the new sectorisation | Once the LTM decides on a specific sectorisation, he / she negotiates with the involved actors the implementation of the new sectorisation (this includes the interaction with the ARES system) | LTM<br>ARES<br>Other LTMs | | | |
| 11 | 07 Definition of the airspace configuration | Once the negotiation is completed, the LTM produces the airspace configuration. Before considering it as completed, he / she performs a last check where the following criteria is assessed using the system **what-if** capability:<br>• Conformance to Decision criteria<br>• Balance of predicted workload<br>• Complexity levels<br>• Consistency with local performance targets<br>If the criteria is not met, the flow returns back to DAC-02.<br><br>After the assessment of the validity and efficiency of the proposed sectorisation, the LTM choses it as the best possible solution. | LTM<br>System | | | |
| 12 | 08 Airspace publication | The LTM publishes the proposed sectorisation to the NOP to implement it. | LTM<br>NM | | | |
| 13 | 09.Measure implementation | At the expected time the Supervisor reviews and decides to implement the proposed sectorisation. Once the Supervisor approves the implementation of the sectorisation, both the ATC system and the NM are | Supervisor<br>NM<br>ATC system<br>ATCo | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | notified automatically of the impending action. | | | | |

### 3.5.3.6 Target Time Management

#### 3.5.3.6.1 UC-17: DCB Measures prepared in the SBT Elaboration

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Analysis | INAP analyses an imbalance | INAP | Imbalance | Context | 3 hrs before entry-time |
| 2 | Decision | INAP notifies a Hotspot | INAP | Hotspot | Action | 3 hrs before entry-time |
| 3 | Analysis | INAP analyses the flight-list associated to the Hotspot | INAP | Flight-List | Context | 3 hrs before entry-time |
| 4 | Decision | INAP elaborates the solution to resolve the Hotspot based on TTO measures | INAP | List of TTO | Action | 3 hrs before entry-time |
| 5 | Decision | INAP sends the TTO proposal to the NM system | INAP | TTO proposal | Action | 3 hrs before entry-time |
| 6 | Analysis | NM calculates the NCC (Network Consolidated Constraint) to determine the TTO value | NM | NCC, TTO | Context | 3 hrs before entry-time |
| 7 | Decision | NM disseminates the TTO information to the NMf actors | NM | TTO | Action | 3 hrs before entry-time |
| 8 | Analysis | AU analyses the proposed TTO and may decide to re-plan the SBT to alleviate the TTO | AU | SBT | Context | 3 hrs before entry-time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9 | Decision | The FOC updates the SBT to reflect the TTO | AU | SBT (+TTO) | Action | 2 hrs before entry-time |
| 10 | Decision | At the cut-off time, the complete SBT is transmitted to the NMf, AU, ATC and FC actors | NM | SBT | Action | 2 hrs before entry-time |
| 11 | Decision | At the cut-off time, the complete TTO is transmitted to the NMf actors | NM | SBT | Action | 2 hrs before entry-time |
| 12 | Decision | FC execute the RBT based on the best effort principle | FC | RBT execution | Action | 1 hr before entry-time |
| 13 | Decision | ATC manage the flight and facilitate the RBT adherence based on the best effort principle | ATC | RBT adherence management | Action | 1 hr before entry-time |
| 14 | Analysis | To resolve a conflict, ATC considers the impact of a trajectory modification regards to the RBT adherence achievement | ATC | RBT adherence management | Context | 1 hr before entry-time |
| 15 | Decision | ATC sends a clearance to the FC | ATC | ATC Clearance | Action | 1 hr before entry-time |
| 16 | Decision | FC executes the ATC Clearance | FC | ATC Clearance | Action | 1 hr before entry-time |
| 17 | Decision | The RBT is updated | NM | RBT | Action | 1 hr before entry-time |
| 18 | Analysis | The TDI (Trajectory Detection Indicator) is calculated to provide information on Hotspot Resolution Deviation | NM | Hotspot Resolution Deviation | Context | 1 hr before entry-time |
| 19 | Decision | The Hotspot Resolution Alert is disseminated to the NMf actors | NM | Hotspot Resolution Alert | Action | 1 hr before entry-time |
| 20 | Analysis | INAP monitors the hotspot resolution progress and deviations | INAP | Hotspot Resolution Alert, | Context | All the time |

#### 3.5.3.6.2 UC-18: DCB Measures prepared in the RBT Revision

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Analysis | INAP analyses an imbalance | INAP | Imbalance | Context | 1 hrs before entry-time |
| 2 | Decision | INAP send a notification of a Hotspot | INAP | Hotspot | Action | 1 hrs before entry-time |
| 3 | Analysis | INAP analyses the flight-list associated to the Hotspot | INAP | Flight-List | Context | 1 hrs before entry-time |
| 4 | Decision | INAP elaborates the solution to resolve the Hotspot based on tTTO measures | INAP | List of tTTO | Action | 1 hrs before entry-time |
| 5 | Decision | INAP sends the tTTO to the ATC in the form of a speed instruction or TTL/TTG. | INAP | Speed instruction TTL/TTG | Action | 1 hrs before entry-time |
| 6 | Decision | tTTO information is sent to the NM system | INAP | tTTO | Action | 1 hrs before entry-time |
| 7 | Decision | tTTO information is sent to the NMf and AU actors | NM | tTTO | Action | 1 hrs before entry-time |
| 8 | Decision | ATC sends the ATC Clearance to the FC | ATC | ATC clearance | Action | 1 hrs before entry-time |
| 9 | Decision | FC executes the ATC Clearance | FC | ATC clearance | Action | 1 hrs before entry-time |
| 10 | Decision | The RBT is revised and disseminated | NM | RBT | Action | 1 hr before entry-time |
| 11 | Analysis | The tTTO information is displayed on the ATC position | ATC | tTTO | Context | 1 hrs before entry-time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 12 | Analysis | The ATC monitors the proper execution of the ATC Clearance | ATC | tTTO | Context | 1 hrs before entry-time |
| 13 | Analysis | The TDI (Trajectory Detection Indicator) is calculated to provide information on Hotspot Resolution Deviation | NM | Hotspot Resolution Deviation | Context | 1 hr before entry-time |
| 14 | Decision | The Hotspot Resolution Alert is disseminated to the NMf actors | NM | Hotspot Resolution Alert | Action | 1 hr before entry-time |
| 15 | Analysis | INAP monitors the hotspot resolution progress and deviations | INAP | Hotspot Resolution Alert | Context | All the time |

#### 3.5.3.6.3 UC-19: Target Time Deviation Monitoring and Revision

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Analysis | INAP analyses an imbalance | INAP | Imbalance | Context | 1 hrs before entry-time |
| 2 | Decision | INAP send notification of a Hotspot | INAP | Hotspot | Action | 1 hrs before entry-time |
| 3 | Analysis | INAP analyses the flight-list associated to the Hotspot | INAP | Flight-List | Action | 1 hrs before entry-time |
| 4 | Decision | INAP elaborates the solution to resolve the Hotspot based on (t)TTO measures | INAP | List of (t)TTO | Action | 1 hrs before entry-time |
| 5 | Decision | (t)TTO information is sent to the NM system | INAP | (t)TTO | Action | 1 hrs before entry-time |
| 6 | Decision | (t)TTO information is sent to the NMF and AU actors | NM | (t)TTO | Action | 1 hrs before entry-time |
| 7 | Decision | INAP implements the (t)TTO | INAP | (t)TTO | Action | 1 hrs before entry-time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | Decision | NM system calculate TDI and Hotspot deviation (Hotspot Resolution Alert) | NM | TDI | Action | 1 hrs before entry-time |
| 9 | Analysis | INAP monitors the Hotspot Resolution Progress | INAP | Hotspot Resolution Alert, | Context | 1 hrs before entry-time |
| 10 | Decision | INAP manages the residual imbalances taking additional STAM/ STAM Measures leading to a SBT update or RBT revision | INAP | STAM / STAMs Measures | Decision | 1 hrs before entry-time |

### 3.5.3.7 Synchronisation

#### 3.5.3.7.1 UC20: E/R (UDPP - Hotspot) + Extended AMAN (Optispot)

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides local and consolidated network imbalances | INAP, APOC, NM, AU, Extended-AMAN | Imbalances (+ severity + imbalance confidence index) | Context | 2 hrs before entry time |
| 2 | Analysis | INAP analyses the imbalance with the associated imbalance confidence index. | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2 hrs before entry time |
| 3 | Analysis | INAP identifies a Hotspot based on identified | INAP | Imbalances (+ severity + imbalance | Action | 2 hrs before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | safety TMV 'rates' (i.e. entry or occupancy). | | confidence index), TMV rate | | entry time |
| 4 | Decision | INAP publish the Hotspot via the NOP to notify all concerned stakeholders. | INAP | Hotspot | Action | 2 hrs before entry time |
| 5 | Analysis | INAP analyses the Hotspot characteristics and decides to delegate the hotspot resolution to AUs | INAP | Hotspot, flight list,<br><br>Business rules | Action | 2 hrs before entry time |
| 6 | Analysis | AUs analyse the Hotspot characteristics and decides to build a solution using UDPP mechanisms. | AU | Hotspot, flight list,<br><br>Business rules | Action | 2 hrs before entry time |
| 7 | Analysis | AUs send the proposed solution taking into account AU business rules. | AU | TTA | Action | from 1hr UNTIL from 1hr UNTIL 50 min before entry time |
| 8 | Analysis | INAP receives the TTA AU request for implementation. | INAP | TTA | Action | from 1hr UNTIL from 1hr UNTIL 50 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | Decision | INAP decides to implement the proposed AU TTA request. | INAP | (t)TTA | Action | from 1hr UNTIL from 1hr UNTIL 50 min before entry time |
| 9 | Decision | INAP publish the DCB solution to NM via the NOP. | INAP | Hotspot, flight list,<br><br>TTA | Action | from 1hr UNTIL from 1hr UNTIL 50 min before entry time |
| 10 | Decision | NM collect the (t)TTAs, calculates the Network Consolidated Constraints (NCC) and disseminates to the NMf actors the resulting NCCs (TTA) | NM | NCC, TTA | Action | from 1hr UNTIL from 1hr UNTIL 50 min before entry time |
| 11 | Decision | The Collaborative NOP (Imbalance Repository) provides local and consolidated network imbalances | INAP, APOC,<br><br>NM,<br><br>AU, Extended-AMAN | Imbalances (+ severity + imbalance confidence index) | Context | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 12 | Analysis | Extended-AMAN analyses the imbalance with the associated imbalance confidence index. | Extended-AMAN | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 13 | Analysis | Extended-AMAN identifies an area of opportunities to optimise arrival operations based on an identified 'rate' imbalance. | Extended-AMAN | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 14 | Decision | Extended-AMAN publishes the identified OptiSpot to the Collaborative NOP | Extended-AMAN | OptiSpot | Action | 1 hrs – 20 min before entry time |
| 15 | Analysis | Extended-AMAN analyses the OptiSpot characteristics and decides to build a DCB solution taking into account known AU business rules. | Extended-AMAN | OptiSpot, flight list, business rules | Context | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 16 | Decision | Extended-AMAN elaborates a sequence of tTTA measures accommodating (AU, DCB) using what-if | Extended-AMAN | OptiSpot, flight-list, What-if,<br><br>business rules | Action | from 1hr UNTIL from 1hr UNTIL 20 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | entry time |
| 17 | Decision | Extended AMAN sends the tTTA proposals to NM | Extended-AMAN | tTTA | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 18 | Decision | NM collects and analyse the tTTAs proposed by the Extended-AMAN | NM | tTTA | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 19 | Analysis | NM identifies that 2 flights within the Extended-AMAN proposed sequence are already subject to DCB measures (i.e. TTA) from INAP | NM | tTTA/TTA | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 20 | Analysis | NM identifies that for both flights, the proposed tTTA measures by the Extended-AMAN are inside the DCB target | NM | tTTA/TTA | Action | from 1hr UNTIL from 1hr UNTIL 20 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | windows of the INAP flights (TTA). | | | | entry time |
| 21 | Decision | NM calculates the Network Consolidated Constraints (NCC). | NM | (t)TTA/(t)TTO | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 23 | Decision | NM disseminates to the NMf actors the resulting NCCs. | NM | (t)TTA/(t)TTO | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 24 | Decision | Extended AMAN performs a what-if to assess the proposed NCC ((t)TTA) | Extended AMAN | NCC, (t)TTA, what-if | Context | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 25 | Decision | Extended AMAN implements the DCB solutions ((t)TTA) | Extended AMAN | (t)TTA | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 26 | Decision | Extended AMAN monitors the execution of the OptiSpot solutions ((t)TTA) at the hotspot level and at the SBT/RBT level | Extended AMAN | Hotspot resolution alert,<br><br>Target Deviation Indicator | Action | |

#### 3.5.3.7.2 UC21: E/R (Cop-Organizer or Seq) + Extended AMAN to be applied by one En Route ATSU

Here we refer to the extended AMAN as XMAN or iAMAN, which is today not fully reconciled with the airport AMAN.

– XMAN displays delay to be absorbed by upstream En Route sectors (based on the sequence computed by an airport extended AMAN and a pre-agreed delay sharing strategy

– iAMAN elaborates a sequence on an EnRoute metering COP, in order to provide upstream ACCs with speed advisories when relevant

Both tools rely on 'Best Effort' principle for En Route ATCOs to implement the speed advisories.

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 0 | Pre-requisites | - coordinated delay sharing strategy has been established between partners (APT, NM and ANSPs),<br><br>- preliminary DCB analysis (airport needs + impact of Extended AMAN on ATC workload and ATSU capacity to absorb delay + interaction/ compatibility between | | | Context | Strategic Phase |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Extended AMAN and COP Organizer) has been performed in short-term planning/execution phases (several hours before entry time)<br><br>- short-term planning plan has been set (with slots where requests from each specific Ext. AMAN are most likely to be implemented, and slots where COP Organizer is most likely to be needed) | | | | |
| 1 | Analysis | The Collaborative NOP (Imbalance Repository) provides the local and consolidated network imbalances | INAP, APOC | Imbalances (+ severity + imbalance confidence index) | Context | at least 3 hours before entry time |
| 2 | Analysis | INAP analyses the imbalance with the associated imbalance confidence index. | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2hrs-1 hrs before entry time |
| 3 | Decision | INAP decides to activate Extended AMAN service (after analysis from NOP data and XMAN partners) | INAP, eAMAN | collaborative strategy established in short-term planning phase (scenario?), APT needs for delay absorption, ATSU | | 2hrs-1 hrs 30 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | capacity to absorb delay | | |
| 4 | Analysis | Extended AMAN uses updated ETOs (and potentially Airport AMAN sequence, whenever available) to compute delay to be absorbed in upstream ACC and/ or a speed advisory | Extended AMAN | ETOs (radar, EFDs, local FDPS,..), delay sharing strategy, parameter settings (rates for sequencing), Airport AMAN sequence in case of XMAN | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 5 | Decision | INAP defines an area of opportunities to optimise flight profiles thank to Extended AMAN | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 6 | Decision | INAP publishes the OptiSpot 1 to the Collaborative NOP | INAP | OptiSpot1 | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 7 | Decision | INAP distributes the Optispot 1 information | INAP | OptiSpot1 | Action | from 1hr UNTIL from 1hr UNTIL 30 |



| | | | | | | |
|---|---|---|---|---|---|---|
| | | to the CWPs for situation awareness | | | | min before entry time |
| 8 optional | Analysis | AU analyzes the OptiSpot 1 | AU | OptiSpot | Context | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 9 optional | Decision | AU anticipates the OptiSpot and updates the SBT/RBT Margins of Manoeuvre /preference | AU | OptiSpot | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 10 | Analysis | INAP analyzes OptiSpot1 characteristics and decides to prepare a DCB solution using Extended AMAN advisories (tTTOs/ TTL/ speed advisories). | Extended AMAN INAP | OptiSpot1, flight list, business rules | Context | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 11 | Decision | Extended AMAN elaborates tTTO measures accomodating others criterias (AU, DCB) using what-if | Extended AMAN | OptiSpot1, flight-list, What-if, AUs Margins of Manoeuvre | Action | from 1hr UNTIL from 1hr UNTIL 30 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | entry time |
| 12 | Decision | Extended AMAN sends the tTTOs proposal to INAP | Extended AMAN | tTTO | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 13 | Analysis | INAP receives the tTTOs Extended AMAN1 request for implementation and checks complexity prediction and ATC workload. | INAP | tTTO, complexity information and traffic counts | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 14 | Decision | INAP sends the Extended AMAN proposal to NM | INAP | tTTO | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 15 | Decision | NM collect the tTTO, calculates the NCC and disseminates to the NMf actors the proposed NCC (tTTOs | NM | NCC, tTTO + updated target window | Action | from 1hr UNTIL from 1hr UNTIL 30 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | with updated target windows ) | | | | entry time |
| 16 | Analysis | Extended AMAN performs a what-if to assess the proposed NCC (tTTOs + target windows) | Extended AMAN | NCC, tTTOs, what-if | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 17 | Decision | Extended AMAN refines the DCB solutions (tTTOs) | Extended AMAN | tTTOs | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 18 | Decision | INAP decides to distribute the proposed Extended AMAN tTTO request to ATC | INAP | tTTO | Action | 30 min before entry time |
| 19 | Decision | INAP monitors the execution of the OptiSpot 1 solutions (tTTO) at the hotspot level and at the RBT level | Extended AMAN | Hotspot resolution alert, | Action | up to entry time |
| 20 | Decision | NM collects the tTTO and disseminates to the NMf actors the Network Consolidated Constraints (NCC). | NM | Target Deviation Indicator | Action | from 1hr UNTIL from 1hr UNTIL 30 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | entry time |
| 21 | Decision | INAP decides to activate COP Organizer service for COPX, because an imbalance has been detected on COPX between HHmm1 and HHmm2. | INAP | Traffic load on COP (flow count or specific TV), pre-agreed scenarios (business rules) | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 20 | Decision | INAP sets COP Organizer parameters according to coordinated objectives (max throughput, min complexity before COPX…) | INAP | coordinated objectives | | from 1hr UNTIL from 1hr UNTIL 3min before entry time |
| 21 | Analysis | COP Organizer computes a sequence at COPX based on ETOs at COPX | COP Organizer | ETOs updated with available information (radar tracks, EFDs, clearances…), sequence computed by COP Organizer | Action | 40 min before entry time |
| 22 | Decision | Based on the delta between planned sequence and sequence computed by COP Organizer, INAP defines | INAP | TMV rate, performance indicators, local what-if | Action | 40 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | an area of opportunities to optimise | | | | |
| 23 | Decision | INAP publishes the OptiSpot 2 to the Collaborative NOP | INAP | OptiSpot 2 | Action | 40 min before entry time |
| 24 | Analysis | INAP analyzes the OptiSpot 2 characteristics and decides to prepare a DCB solution based on COP Organizer advisories (tTTO/ FL), | INAP | OptiSpot, flight list, business rules (coordinated objectives) | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 25 | Analysis | COP Organizer detects that at least a flight within its DCB solution is already subject to DCB constraints (tTTO from eAMAN) | COP Organizer | Synchronisation, tTTO, DCB solution | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 26 | Analysis | COP Organizer identifies that for concerned flights, the proposed tTTO measures by the COP Organizer is inside the DCB target windows of the eMAN constraints (tTTO). | COP Organizer | Synchronisation, tTTA, tTTO | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 27 | Decision | COP Organizer elaborates tTTO/ FL measures | COP Organizer | OptiSpot, flight-list, What-if, Extended AMAN | Action | from 1hr UNTIL from 1hr |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | accomodating others criterias (AU, DCB,) using what-if | | Advisories, business rules/ coordinated objectives | | UNTIL 20 min before entry time |
| 28 | Decision | COP Organizer sends the tTTO/ FL proposal to INAP | COP Organizer | tTTO/ FL | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 29 | Analysis | INAP receives the tTTO/ FL request for implementation and checks complexity prediction and ATC workload. | INAP | tTTO/ FL, complexity information and traffic counts | Context | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 30 | Decision | INAP sends the tTTO/ FL proposal to NM | INAP | tTTO/ FL | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 31 | Decision | NM collects the tTTO/ FL, calculates the NCC and disseminates to the | NM | NCC, tTTO/ FL | Action | from 1hr UNTIL from 1hr |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | NMf actors the proposed NCC | | | | UNTIL 20 min before entry time |
| 32 | Decision | COP Organizer performs a what-if to assess the proposed NCC (tTTO/ FL) | COP Organizer | NCC, tTTO/ FL, what-if | Action/ Context? | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 33 | Decision | COP Organizer elaborates the DCB solutions (tTTO/ FL) | COP Organizer | tTTO/ FL | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 34 | Analysis | INAP receives the updated tTTO/ FL request for implementation and checks validity. | INAP | tTTO/ FL, complexity information and traffic counts | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 35 | Decision | INAP decides to propose to implement the COP Organizer tTTO/ FL request | INAP | tTTO/ FL | Action | from 1hr UNTIL from 1hr UNTIL 20 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | entry time |
| 36 | Decision | INAP decides to distribute the proposed COP Organizer (tTTO/ FL) request to CWPs | INAP | tTTO/ FL | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 37 | Analysis | INAP monitors Optispots 1 & 2 resolution progress | INAP | | Action | Until entry time |
| 38 | Complete d | Optispots are solved, NOP is updated | | | Context | |

#### 3.5.3.7.3 UC22: Extended AMAN + Extended AMAN to be applied by one En Route ATSU

Here we refer to the extended AMAN as XMAN or iAMAN, which is today not fully reconciled with the airport AMAN.

– XMAN displays delay to be absorbed by upstream En Route sectors (based on the sequence computed by an airport AMAN and a pre-agreed delay sharing strategy

– iAMAN elaborates a sequence on an EnRoute metering COP, in order to provide upstream ACCs with speed advisories when relevant

Both tools rely on 'Best Effort' principle for En Route ATCOs to implement the speed advisories.

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | Pre-requisites | - coordinated delay sharing strategy has been established between partners (APT, NM and ANSPs),<br><br>- preliminary DCB analysis (airport needs + impact of Extended AMAN on ATC workload and ATSU capacity to absorb delay + interaction/ compatibility between two overlapping Extended AMAN) has been performed in short-term planning/execution phases (several hours before entry time)<br><br>- short-term planning plan has been set (with slots where requests from each specific Ext. AMAN are most likely to be implemented,) | | | Context | Strategic Phase |
| 1 | Analysis | The Collaborative NOP (Imbalance Repository) | INAP, APOC | Imbalances (+ severity + | Context | at least 3 hours |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | provides the local and consolidated network imbalances | | imbalance confidence index) | | before entry time |
| 2 | Analysis | INAP analyses the imbalance with the associated imbalance confidence index. | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2 hrs- 1hr before entry time |
| 3 | Decision | INAP decides to activate Extended AMAN 1 service (after analysis from NOP data and XMAN partners) | INAP, eAMAN1 | collaborative strategy established in short-term planning phase (scenario?), APT1 needs for delay absorption, ATSU capacity to absorb delay | | 2hrs- 1hr30min before entry time |
| 4 | Analysis | Extended AMAN1 uses updated ETOs and potentially Airport AMAN sequence, whenever available) to compute delay to be absorbed in upstream ACC and/ or a speed advisory | Extended AMAN 1 | ETOs (radar, EFDs, local FDPS,..), delay sharing strategy, parameter settings (rates for sequencing), Airport AMAN sequence in case of XMAN | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |



| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | Decision | INAP defines an area of opportunities to optimise flight profiles thanks to Extended AMAN1 | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 6 | Decision | INAP publishes the OptiSpot 1 to the Collaborative NOP | INAP | OptiSpot1 | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 7 | Decision | INAP distributes the Optispot 1 information to the CWPs for situation awareness | INAP | OptiSpot1 | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 8 | Analysis | INAP analyzes the OptiSpot1 characteristics and decides to prepare a DCB solution using Extended AMAN 1 advisories (tTTOs, TTL/TTG…). | Extended AMAN1 INAP | OptiSpot1, flight list, business rules | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 9 | Decision | Extended AMAN1 elaborates tTTO measures accomodating others criterias | Extended AMAN 1 | OptiSpot1, flight-list, What-if, AUs Margins of Manoeuvre | Action | from 1hr UNTIL from 1hr UNTIL 30 min |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | (AU, DCB) using what-if | | | | before entry time |
| 10 | Decision | Extended AMAN1 sends the tTTO proposal to INAP | Extended AMAN 1 | tTTO | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 11 | Analysis | INAP receives the tTTOs Extended AMAN1 request for implementation and checks complexity prediction and ATC workload. | INAP | tTTO, complexity information and traffic counts | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 12 | Decision | INAP sends the Extended AMAN1 proposal to NM | INAP | tTTO | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 13 | Decision | NM collect the tTTO, calculates the NCC and disseminates to the NMf actors the proposed NCC | NM | NCC, tTTO + updated target window | Action | from 1hr UNTIL from 1hr UNTIL 30 min |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | (tTTO + updated target window) | | | | before entry time |
| 14 | Decision | Extended AMAN1 performs a what-if to assess the proposed NCC (tTTO + target windows ) | Extended AMAN 1 | NCC, tTTO, what-if | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 15 | Decision | Extended AMAN1 refines the DCB solutions (tTTOs) | Extended AMAN 1 | tTTOs | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 16 | Decision | INAP decides to distribute the proposed Extended AMAN 1 tTTO request to CWPs | INAP | tTTO | Action | 20 min before entry time |
| 17 | Analysis | INAP monitors the execution of the OptiSpot 1 solutions (tTTO) at the hotspot level and at the RBT level | Extended AMAN | Hotspot resolution alert, | Action | Up to the entry time |
| 18 | Decision | INAP decides to activate Extended AMAN2 service (as agreed in pre-tactical phase or | INAP, eAMAN2 | collaborative strategy established in short-term planning phase | Action | 1 hr before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | after analysis of current situation) | | (scenario?), APT needs for delay absorption, ATSU capacity to absorb delay | | |
| 19 | Analysis | Extended AMAN2 uses updated ETOs (and potentially Airport AMAN sequence, whenever available) to compute delay to be absorbed in upstream ACC and/ or a speed advisory | Extended AMAN 2 | ETOs (radar, EFDs, local FDPS,..), delay sharing strategy, parameter settings (rates for sequencing), Airport AMAN sequence in case of XMAN | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 20 | Decision | INAP defines an area of opportunities to optimise flight profiles thank to Extended AMAN2 | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 21 | Decision | INAP publishes the OptiSpot2 to the Collaborative NOP | INAP | OptiSpot2 | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 22 | Decision | INAP distributes the Optispot2 information to the CWPs for situation awareness | INAP | OptiSpot2 | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 23 | Analysis | INAP analyzes the OptiSpot 2 characteristics and decides to prepare a DCB solution using Extended AMAN2 advisories (tTTOs/ TTL/ speed advisories). | Extended AMAN2 INAP | OptiSpot2, flight list, business rules | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 23 | Analysis | Extended AMAN2 detects that at least a flight within its DCB solution is already subject to DCB constraints (tTTO from eAMAN1) | Extended AMAN 2 | Synchronisation, tTTO, DCB solution | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 24 | Analysis | Extended AMAN 2 identifies that for concerned flights, the proposed tTTO measure is inside the DCB target windows of the eMAN1 constraints (tTTO). | Extended AMAN 2 | Synchronisation, Extended AMAN 1 advisories, tTTO | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 25 | Decision | Extended AMAN 2 elaborates tTTO accomodating others criterias (AU, DCB,) using what-if | Extended AMAN 2 | OptiSpot2, flight-list, What-if, Extended AMAN1 Advisories, business rules/ coordinated objectives, AUs Margins of Manoeuvre | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 26 | Decision | Extended AMAN2 sends the tTTO proposal to INAP | Extended AMAN 2 | tTTO | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 27 | Analysis | INAP receives the tTTOs Extended AMAN2 request for implementation and checks complexity prediction and ATC workload. | INAP | tTTO, complexity information and traffic counts | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 28 | Decision | INAP sends the Extended AMAN2 proposal to NM | INAP | tTTO | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 29 | Decision | NM collect the tTTO, calculates the NCC and disseminates to the NMf actors the proposed NCC (tTTOs with updated target windows ) | NM | NCC, tTTO updated target window | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 30 | Analysis | Extended AMAN 2 performs a what-if to assess the proposed NCC (tTTOs + target windows) | Extended AMAN 2 | NCC, tTTO, what-if | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 31 | Decision | Extended AMAN 2 refines the DCB solutions (tTTO) | Extended AMAN 2 | tTTO | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 32 | Analysis | INAP receives the tTTO request for implementation and checks complexity prediction and ATC workload. | INAP | tTTO, complexity information and traffic counts | Action | from 1hr UNTIL from 1hr UNTIL 30 min before entry time |
| 33 | Decision | INAP decides to distribute the proposed | INAP | tTTO | Action | 20 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Extended AMAN 2 request to CWPs | | | | |
| 34 | Analysis | INAP monitors Optispots 1 & 2 resolution progress | INAP | | Action | Until entry time |
| 35 | Completed | Optispots are solved, NOP is updated | | | Context | |

### 3.5.3.8 Spot Management

#### 3.5.3.8.1 UC-31: Hotspot Management

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Analysis | INAP analyses an imbalance using TMV 'Nominal Safety': sustain, peak | INAP | Imbalance, TMV 'nominal safety' | Context | 3 hrs to 30 min before entry-time |
| 2 | Analysis | The traffic is exceeding the peak during 11:05 and 11:25 | INAP | Imbalance | Context | 3 hrs to 30 min before entry-time |
| 3 | Analysis | INAP analyses that the excess of traffic can only be managed by demand measures | INAP | Imbalance, Flight List, Sector configuration | Context | 3 hrs to 30 min before entry-time |
| 4 | Decision | INAP defines a HotSpot with start time: 11:05 and end time 11:25 and | INAP | Imbalance, flight list | Action | 3 hrs to 30 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | severity colour (green, orange, red) | | | | entry-time |
| 5 | Decision | INAP publishes the Hotspot to the NM system (Spot Repository) | INAP | Hotspot | Action | 3 hrs to 30 min before entry-time |
| 6 | Decision | NM disseminates the Hotspot information (time, severity) to NMf actors | NM | Hotspot | Action | 3 hrs to 30 min before entry-time |
| 7 | Decision | INAP implement measures to resolve the HotSpot | INAP | Hotspot, flight list, planned DCB measures | Action | 3 hrs to 30 min before entry-time |
| 8 | Decision | The System recalculates the start time and end time of the Hotspot Final taking into account de recovery period. | INAP or NM (local/network imbalance methodology) | Hotspot, flight list, planned DCB measures | Action | 3 hrs to 30 min before entry-time |
| 9 | Decision | The Hotspot information is updated with the new start time, end time and severity based on the Hotspot final | INAP or NM (local/network imbalance methodology) | Hotspot | Action | 3 hrs to 30 min before entry-time |
| 10 | Decision | NM disseminates the Hotspot information (time, severity) to NMf actors | NM | Hotspot | Action | 3 hrs to 30 min before entry-time |
| 11 | Decision | INAP defines the monitoring threshold | INAP | Monitoring Threshold | Action | 3 hrs to 30 min before entry-time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 12 | Analysis | The system monitors the proper resolution of the Hotspot final according to the traffic prediction vs monitoring threshold | INAP or NM (local/network imbalance methodology | Imbalance, hotspot, monitoring threshold | Context | 3 hrs to 30 min before entry-time |
| 13 | Decision | The System informs INAP about a HotSpot resolution deviation | INAP or NM (local/network imbalance methodology | HotSpot resolution Alert | Action | 3 hrs to 30 min before entry-time |
| 14 | Decision | In the event of new residual imbalances based on the monitoring threshold, INAP takes additional measures to resolve the Hotspot | INAP | Hotspot, imbalance, flight list, DCB measures | Action | 3 hrs to 30 min before entry-time |
| 15 | Decision | INAP sends up to date information to NM to indicate changes of Imbalance and Hotspot information | INAP | Imbalance, Hotspot | Action | 3 hrs to 30 min before entry-time |

#### 3.5.3.8.2 UC-32: Optispot Management

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Analysis | INAP analyses an imbalance using TMV 'rate' | INAP | Imbalance, TMV 'rate' | Context | 3 hrs to 30 min before entry-time |
| 2 | Analysis | The traffic is exceeding the rate during 11:05 and 11:25 | INAP | Imbalance | Context | 3 hrs to 30 min before entry-time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | Decision | INAP defines a OptiSpot with start time: 11:05 and end time 11:25 and rate colour (blue) | INAP | Imbalance, flight list | Action | 3 hrs to 30 min before entry-time |
| 4 | Decision | INAP publishes the OptiSpot to the NM system (Spot Repository) | INAP | OptiSpot | Action | 3 hrs to 30 min before entry-time |
| 5 | Decision | NM disseminates the OptiSpot information (time) to NMf actors | NM | OptiSpot | Action | 3 hrs to 30 min before entry-time |
| 6 | Decision | INAP implement measures to resolve the imbalances | INAP | OptiSpot, flight list, planned DCB measures | Action | 3 hrs to 30 min before entry-time |
| 7 | Decision | The System recalculates the start time and end time of the OptiSpot Final taking into account the recovery period. | INAP or NM (local/network imbalance methodology) | OptiSpot | Action | 3 hrs to 30 min before entry-time |
| 8 | Decision | The OptiSpot information is updated with the new start time, end time and based on the OptiSpot final | INAP or NM (local/network imbalance methodology) | OptiSpot | Action | 3 hrs to 30 min before entry-time |
| 9 | Decision | NM disseminates the OptiSpot information (time, severity) to NMf actors | NM | OptiSpot | Action | 3 hrs to 30 min before entry-time |
| 10 | Decision | INAP defines the monitoring threshold | INAP | Monitoring Threshold | Action | 3 hrs to 30 min before entry-time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11 | Analysis | The System monitors the proper resolution of the OptiSpot final according to the traffic prediction vs monitoring threshold | INAP or NM (local/network imbalance methodology) | Imbalance, OptiSpot, monitoring threshold | Context | 3 hrs to 30 min before entry-time |
| 12 | Decision | The System informs INAP about an OptiSpot resolution deviation | INAP or NM (local/network imbalance methodology) | OptiSpot resolution Alert | Action | 3 hrs to 30 min before entry-time |
| 13 | Decision | In the event of new residual imbalances based on the monitoring threshold, INAP takes additional measures to manage the OptiSpot | INAP | OptiSpot, imbalance, flight list, DCB measures | Action | 3 hrs to 30 min before entry-time |
| 14 | Decision | INAP sends up to date information to NM to indicate changes of OptiSpot information | INAP | Imbalance, OptiSpot | Action | 3 hrs to 30 min before entry-time |

### 3.5.3.9 Collaborative Framework

#### 3.5.3.9.1 UC-33: Hotspot Arrival Management using TTA prepared in the SBT Elaboration process

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides the local and consolidated network imbalances | INAP, APT, NM AU | Imbalances (+ severity + imbalance confidence index) | Action | |
| 2 | Analysis | INAP analyses the imbalance severity and imbalance confidence index and | INAP | Imbalances (+ severity + imbalance | Context | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | decides to trigger an action if there is an identified imbalance to manage | | confidence index) | | |
| 3 | Analysis | AU analyses the consolidated network imbalance severity and imbalance confidence index and decides to trigger an action if there is an identified imbalance to manage | AU | Hotspot, Consolidated network Imbalances (+ severity + imbalance confidence index) | Context | |
| 4 | Analysis | AU anticipates the potential imbalances and decides to update the SBT to alleviate the imbalance using a what-if/what-else tool | AU | Consolidated network Imbalances (+ severity + imbalance confidence index) + what-if | Context | |
| 5 | Decision | AU anticipates the potential imbalances and update the SBT/RBT Margins of Manoeuvre /preference | AU | Consolidated network Imbalances (+ severity + imbalance confidence index) | Action | |
| 6 | Decision | INAP resolves the imbalance applying capacity measures | INAP | Sector configuration | Action | |
| 7 | Analysis | INAP detects a residual imbalance and decide to trigger a demand solution. INAP identifies a hotspot | INAP | Imbalances (+ severity + imbalance confidence index) | Context | |
| 8 | Decision | INAP publishes the hotspot to the Collaborative NOP | INAP | Hotspot | Action | |
| 9 | Analysis | AU analyses the hotspot | AU | Hotspot | Context | |
| 10 | Decision | AU anticipates the potential imbalances and decides to update the SBT to alleviate | AU | Consolidated network Imbalances (+ severity + | Action | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | the imbalance using a what-if/what-else tool | | imbalance confidence index) + what-if | | |
| 11 | Decision | AU anticipates the potential imbalances and updates the SBT/RBT Margins of Manoeuvre /preference | AU | Consolidated network Imbalances (+ severity + imbalance confidence index) | Action | |
| 12 | Decision | INAP prepares the DCB solution (flight-proposal) and performs local what-if to assess the local imbalance impact | INAP | Local What-if | Action | |
| 13 | Decision | INAP sends the DCB flight proposal to NM | INAP | TTA | Action | |
| 14 | Decision | NM collect and disseminates to the NMf actors the proposed DCB measures and multiple constraint information (NCC) | NM | DCB measures, NCC | Action | |
| 15 | Analysis | INAP performs a network what-if to assess and to accommodate the different Performance Indicators (including AU preferences & priorities) and to take into account the multiple TT constraint information (NCC) | INAP | Network What-if | Context | |
| 16 | Decision | INAP coordinates with AU the proposed DCB Measures (TTA) | INAP | TTA<br>What-if | Action | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 17 | Analysis | AU analyses the proposed DCB measures (TTA), perform what-if | AU | DCB measures What-if | Context | |
| 18 | Decision | AU accepts the proposed DCB measures (TTA) | AU | TTA | Action | |
| 19 | Decision | INAP implements the DCB solutions (TTA) | INAP | TTA | Action | |
| 20 | Decision | INAP monitors the execution of the DCB solutions (TTA) at the hotspot level | INAP | Hotspot resolution deviation | Action | |
| 21 | Decision | If necessary, INAP takes additional DCB measures (SBT update or RBT revision) to manage the hotspot resolution deviation | INAP | SBT update RBT revision | Action | |
| 22 | Completed | The hotspot is resolved and finished | INAP | | | |

#### 3.5.3.9.2 UC-34: Hotspot Arrival Management using TTA prepared in the SBT Elaboration process using APOC Limited Delegation

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides the local and consolidated network imbalances | INAP, APT, NM AU | Imbalances (+ severity + imbalance confidence index) | Action | |
| 2 | Analysis | INAP analyses the imbalance severity and imbalance confidence index and decides to trigger an action if there is an identified imbalance to manage | INAP | Imbalances (+ severity + imbalance confidence index) | Context | |
| 3 | Analysis | AU analyses the consolidated network imbalance severity and imbalance confidence index and decides to trigger an action if there is an | AU | Consolidated network Imbalances (+ severity + imbalance | Context | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | identified imbalance to manage | | confidence index) | | |
| 4 | Decision | AU anticipates the potential imbalances and decides to update the SBT to alleviate the imbalance using a what-if/what-else tool | AU | Consolidated network Imbalances (+ severity + imbalance confidence index) + what-if | Action | |
| 5 | Decision | AU anticipates the potential imbalances and update the SBT/RBT Margins of Manoeuvre /preference | AU | Consolidated network Imbalances (+ severity + imbalance confidence index) | Action | |
| 6 | Decision | INAP resolves the imbalance applying capacity measures | INAP | Sector configuration | Action | |
| 7 | Analysis | INAP detects a residual imbalance and decide to trigger a demand solution. INAP identifies a hotspot | INAP | Imbalances (+ severity + imbalance confidence index) | Action | |
| 8 | Analysis | INAP publish the hotspot to the Collaborative NOP | INAP | Hotspot | Action | |
| 9 | Analysis | AU analyses the hotspot | AU | Hotspot | Context | |
| 10 | Decision | AU anticipates the potential imbalances and decides to update the SBT to alleviate the imbalance using a what-if/what-else tool | AU | Consolidated network Imbalances (+ severity + imbalance confidence index) + what-if | Action | |
| 11 | Decision | AU anticipates the potential imbalances and updates the SBT/RBT Margins of Manoeuvre /preference | AU | Consolidated network Imbalances (+ severity + | Action | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | imbalance confidence index) | | |
| 12 | Decision | INAP delegates to the APOC the resolution of the hotspot. A time-out for delegation is set. | INAP | Imbalance, hotspot, flight-list, AU Margins of Manoeuvre and preference, what-if | Action | |
| 13 | Analysis | APOC analyses the hotspot characteristics and decides to apply their business rules (UDPP, AIMA, …) to prepare a DCB solution. | APOC | Imbalance, hotspot, flight-list | Context | |
| 14 | Decision | APOC prepares the DCB solution (flight-proposal) and performs what-if to accommodate the different Performance Indicators and to take into account the multiple TT constraint information (NCC) | APOC | What-if, PI, NCC | Action | |
| 15 | Decision | At the time-out, APOC proposes the DCB solution (TTA) to INAP | APOC | TTA | Action | |
| 16 | Analysis | INAP analyses the proposed DCB solution (TTA) and performs a what-if to analyse the network performance assessment | INAP | TTA<br>What-if | Context | |
| 17 | Decision | If necessary INAP adjusts the DCB solutions (TTA) accommodating the different Performance Indicators and AU pref/ Margins of Manoeuvre | INAP | TTA | Action | |
| 18 | Decision | INAP implements the DCB solutions (TTA) | INAP | TTA | Action | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 19 | Analysis | INAP monitors the execution of the DCB solutions at the hotspot level | INAP | Hotspot resolution deviation | Context | |
| 20 | Decision | If necessary, INAP takes additional DCB measures (SBT update or RBT revision) to manage the hotspot resolution deviation | INAP | SBT update RBT revision | Action | |
| 21 | Completed | The hotspot is resolved and finished | INAP | | | |

#### 3.5.3.9.3 UC-35: Hotspot Arrival Management using TTA prepared in the SBT Elaboration process using APOC Full Delegation

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides the local and consolidated network imbalances | INAP, APT, NM AU | Imbalances (+ severity + imbalance confidence index) | Action | |
| 2 | Analysis | INAP analyses the imbalance severity and imbalance confidence index and decides to trigger an action if there is an identified imbalance to manage | INAP | Imbalances (+ severity + imbalance confidence index) | Context | |
| 3 | Analysis | AU analyses the consolidated network imbalance severity and imbalance confidence index and decides to trigger an action if there is an identified imbalance to manage | AU | Consolidated network Imbalances (+ severity + imbalance confidence index) | Context | |
| 4 | Decision | AU anticipates the potential imbalances and decides to update the SBT to alleviate | AU | Consolidated network Imbalances (+ | Action | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | the imbalance using a what-if/what-else tool | | severity + imbalance confidence index) + what-if | | |
| 5 | Decision | AU anticipates the potential imbalances and update the SBT/RBT Margins of Manoeuvre /preference | AU | Consolidated network Imbalances (+ severity + imbalance confidence index) | Action | |
| 6 | Decision | INAP resolves the imbalance applying capacity measures | INAP | Sector configuration | Action | |
| 7 | Decision | INAP detects a residual imbalance and decide to trigger a demand solution. INAP identifies a hotspot | INAP | Imbalances (+ severity + imbalance confidence index) | Action | |
| 8 | Decision | INAP publishes the hotspot to the Collaborative NOP | INAP | Hotspot | Action | |
| 9 | Analysis | AU analyses the hotspot | AU | Hotspot | Context | |
| 10 | Decision | AU anticipates the potential imbalances and decides to update the SBT to alleviate the imbalance using a what-if/what-else tool | AU | Consolidated network Imbalances (+ severity + imbalance confidence index) + what-if | Action | |
| 11 | Decision | AU anticipates the potential imbalances and updates the SBT/RBT Margins of Manoeuvre /preference | AU | Consolidated network Imbalances (+ severity + imbalance confidence index) | Action | |
| 12 | Decision | INAP fully delegates to the APOC the resolution of the hotspot. | INAP | Imbalance, hotspot, flight-list, AU | Action | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Margins of Manoeuvre and preference, what-if | | |
| 13 | Analysis | APOC analyses the hotspot characteristics and decides to apply their business rules (UDPP, AIMA, …) to prepare a DCB solution (TTA). | APOC | Imbalance, hotspot, flight-list, business rules (UDPP, AIMA) | Action | |
| 14 | Decision | APOC prepares the DCB solution (TTA proposal) and performs what-if to accommodate the different Performance Indicators and to take into account the multiple TT constraint information (NCC) | APOC | What-if<br>NCC | Action | |
| 15 | Decision | APOC implements the DCB solutions (TTA) | INAP | TTA | Action | |
| 16 | Analysis | INAP monitors the execution of the DCB solutions at the hotspot level | INAP | Hotspot resolution deviation | Action | |
| 17 | Decision | In the execution phase, if necessary, INAP takes additional DCB measures (SBT update or RBT revision) to manage the hotspot resolution deviation | INAP | SBT update<br>RBT revision | Action | |
| 18 | Completed | The hotspot is resolved and finished | INAP | | | |

### 3.5.3.9.4 UC-36: Hotspot Arrival Management using tTTA prepared in the RBT Revision process

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides the local and consolidated network imbalances | INAP, APT, NM AU | Imbalances (+ severity + imbalance confidence index) | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 2 | Analysis | INAP analyses the imbalance severity and imbalance confidence index and decides to trigger an action if there is an identified imbalance to manage | INAP | Imbalances (+ severity + imbalance confidence index) | Context | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 3 | Decision | INAP publishes the hotspot to the Collaborative NOP | INAP | Hotspot | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 4 | Analysis | AU analyses the hotspot | AU | Hotspot | Context | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 5 | Decision | AU anticipates the potential imbalances and updates the SBT/RBT Margins of Manoeuvre /preference | AU | Consolidated network Imbalances (+ severity + imbalance confidence index) | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 6 | Decision | INAP prepares the DCB solution and performs what-if to accommodate the different Performance Indicators (including AU preferences & priorities) | INAP | What-if | Action | from 1hr UNTIL 20 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7 | Decision | INAP sends the tTTA to ATC for implementation (format: speed ATC clearance) | INAP | tTTA | Action | from 1hr UNTIL 20 min before entry time |
| 8 | Decision | ATC sends the ATC clearance (speed) to the Flight Crew | INAP | ATC Clearance | Action | from 1hr UNTIL 20 min before entry time |
| 9 | Decision | INAP sends the tTTA to NM | INAP | tTTA | Action | from 1hr UNTIL 20 min before entry time |
| 10 | Decision | NM collect and disseminates to the NMf actors the tTTA measures | NM | tTTA measures | Action | from 1hr UNTIL 20 min before entry time |
| 11 | Decision | INAP monitors the execution of the tTTA at the hotspot level | INAP | Hotspot resolution Alert, ) | Action | from 1hr UNTIL 20 min before entry time |
| 12 | Decision | ATC monitors the execution of the ATC clearance at the RBT level | ATC | | Action | from 1hr UNTIL 20 min before entry time |
| 13 | Decision | If necessary, INAP takes additional DCB measures (RBT revision) to manage the hotspot resolution deviation | INAP | RBT revision | Action | from 1hr UNTIL 20 min before entry time |
| 14 | Completed | The hotspot is resolved and finished | INAP | | | from 1hr UNTIL 20 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | min before entry time |

### 3.5.3.9.5 UC-37: Hotspot En-Route Management using TTO prepared in the SBT Elaboration process

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides the local and consolidated network imbalances | INAP, APT, NM AU | Imbalances (+ severity + imbalance confidence index) | Action | |
| 2 | Analysis | INAP analyses the imbalance severity and imbalance confidence index and decides to trigger an action if there is an identified imbalance to manage | INAP | Imbalances (+ severity + imbalance confidence index) | Context | |
| 3 | Analysis | AU analyses the consolidated network imbalance severity and imbalance confidence index and decides to trigger an action if there is an identified imbalance to manage | AU | Consolidated network Imbalances (+ severity + imbalance confidence index) | Context | |
| 4 | Decision | AU anticipates the potential imbalances and decides to update the SBT to alleviate the imbalance using a what-if/what-else tool | AU | Consolidated network Imbalances (+ severity + imbalance confidence index) + what-if | Action | |
| 5 | Decision | AU anticipates the potential imbalances and update the SBT/RBT Margins of Manoeuvre /preference | AU | Consolidated network Imbalances (+ severity + imbalance | Action | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | confidence index) | | |
| 6 | Analysis | INAP publishes the hotspot to the Collaborative NOP | INAP | Hotspot | Action | |
| 7 | Analysis | AU analyses the hotspot | AU | Hotspot | Context | |
| 8 | Decision | AU anticipates the hotspot and updates the SBT/RBT Margins of Manoeuvre /preference | AU | Consolidated network Imbalances (+ severity + imbalance confidence index) | Action | |
| 9 | Decision | INAP prepares the DCB solution (TTO flight-proposal) and performs a local what-if to assess the local imbalance | INAP | Local what-if | Action | |
| 10 | Decision | INAP sends the TTO proposals to NM | INAP | TTO measures | Action | |
| 11 | Decision | NM collect and disseminates to the NMf actors the TTO measures | NM | TTO measures | Action | |
| 12 | Decision | INAP performs a network what-if to assess and to accommodate the different Performance Indicators (including AU preferences & priorities) and to take into account the multiple TT constraint information | INAP | Network what-if | Action | |
| 13 | Decision | INAP coordinates with AU the proposed TTO Measures | INAP | TTO measures What-if | Action | |
| 14 | Analysis | AU analyses the proposed TTO measures, perform what-if | AU | TTO measures What-if | Context | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 15 | Decision | AU accepts the proposed TTO measures | AU | TTO measures | Action | |
| 16 | Decision | INAP implements the TTO Measures | INAP | TTO measures | Action | |
| 17 | Decision | INAP monitors the execution of the DCB solutions at the hotspot level | INAP | Hotspot resolution deviation | Action | |
| 18 | Decision | If necessary, INAP takes additional DCB measures (SBT update or RBT revision) to manage the hotspot resolution deviation | INAP | SBT update RBT revision | Action | |
| 19 | Completed | The hotspot is resolved and finished | INAP | | | |

#### 3.5.3.9.6 UC-38: Hotspot En-Route Management using tTTO prepared in the RBT Revision process

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides the local and consolidated network imbalances | INAP, APT, NM AU | Imbalances (+ severity + imbalance confidence index) | Action | from 1hr UNTIL 20 min before entry time |
| 2 | Analysis | INAP analyses the imbalance severity and imbalance confidence index and decides to trigger an action if there is an identified imbalance to manage | INAP | Imbalances (+ severity + imbalance confidence index) | Context | from 1hr UNTIL 20 min before entry time |
| 3 | Decision | INAP publishes the hotspot to the Collaborative NOP | INAP | Hotspot | Action | from 1hr UNTIL 20 min before entry time |
| 4 | Analysis | AU analyses the hotspot | AU | Hotspot | Context | from 1hr UNTIL 20 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | min before entry time |
| 5 | Decision | AU anticipates the potential imbalances and updates the SBT/RBT Margins of Manoeuvre /preference | AU | Consolidated network Imbalances (+ severity + imbalance confidence index) | Action | from 1hr UNTIL 20 min before entry time |
| 6 | Decision | INAP prepares the DCB solution and performs what-if to accommodate the different Performance Indicators (including AU preferences & priorities) | INAP | What-if | Action | from 1hr UNTIL 20 min before entry time |
| 7 | Decision | INAP sends the tTTO to ATC for implementation (format: speed ATC clearance) | INAP | tTTO | Action | from 1hr UNTIL 20 min before entry time |
| 8 | Decision | ATC sends the ATC clearance (speed) to the Flight Crew | INAP | ATC Clearance | Action | from 1hr UNTIL 20 min before entry time |
| 9 | Decision | INAP sends the tTTO to NM | INAP | tTTO | Action | from 1hr UNTIL 20 min before entry time |
| 10 | Decision | NM collect and disseminates to the NMf actors the tTTO measures | NM | tTTO measures | Action | from 1hr UNTIL 20 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11 | Decision | INAP monitors the execution of the tTTO at the hotspot level | INAP | Hotspot resolution deviation | Action | from 1hr UNTIL 20 min before entry time |
| 12 | Decision | ATC monitors the execution of the ATC clearance at the RBT level | ATC | | Action | from 1hr UNTIL 20 min before entry time |
| 13 | Decision | If necessary, INAP takes additional DCB measures (RBT revision) to manage the hotspot resolution deviation | INAP | RBT revision | Action | from 1hr UNTIL 20 min before entry time |
| 14 | Completed | The hotspot is resolved and finished | INAP | | | from 1hr UNTIL 20 min before entry time |

#### 3.5.3.9.7 UC-39: Optispot Arrival Management using TTA prepared in the SBT Elaboration process with Extended AMAN Autonomy

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides the local and consolidated network imbalances | INAP, APOC, NM, AU, Extended AMAN | Imbalances (+ severity + imbalance confidence index) | Context | from 1hr UNTIL 20 min before entry time |
| 2 | Analysis | Extended AMAN analyses the imbalance with the associated imbalance confidence index and decides to trigger an action if there is an identified 'rate' imbalance to manage | Extended AMAN | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | from 1hr UNTIL 20 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | Decision | Extended AMAN defines an area of opportunities to optimise | Extended AMAN | Imbalances (+ severity + imbalance confidence index), TMV rate | Context | from 1hr UNTIL 20 min before entry time |
| 4 | Decision | Extended AMAN publishes the OptiSpot to the Collaborative NOP | Extended AMAN | OptiSpot | Action | 1 hrs – 20 min before entry time |
| 5 | Analysis | AU analyses the OptiSpot | AU | OptiSpot | Context | from 1hr UNTIL 20 min before entry time |
| 6 | Decision | AU anticipates the OptiSpot and updates the SBT/RBT Margins of Manoeuvre /preference | AU | OptiSpot | Action | from 1hr UNTIL 20 min before entry time |
| 7 | Analysis | Extended AMAN analyses the OptiSpot characteristics and decides to apply their business rules to prepare a DCB solution (TTA). | Extended AMAN | OptiSpot, flight list, business rules | Context | from 1hr UNTIL 20 min before entry time |
| 8 | Decision | Extended AMAN elaborates TTA measures accommodating others criteria (AU, DCB) using what-if | Extended AMAN | OptiSpot, flight-list, What-if, business rules | Action | from 1hr UNTIL 20 min before entry time |
| 9 | Decision | Extended AMAN sends the TTA proposal to NM | Extended AMAN | TTA | Action | from 1hr UNTIL 20 min before entry time |
| 10 | Decision | NM collect the TTA, calculates the NCC and disseminates to the NMf actors the proposed NCC (TTA) | NM | NCC, TTA | Action | from 1hr UNTIL 20 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11 | Decision | Extended AMAN performs a what-if to assess the proposed NCC (TTA) | Extended AMAN | NCC, TTA, what-if | Context | from 1hr UNTIL 20 min before entry time |
| 12 | Decision | Extended AMAN implements the DCB solutions (TTA) | Extended AMAN | TTA | Action | from 1hr UNTIL 20 min before entry time |
| 13 | Analysis | INAP receives the TTA Extended AMAN request for implementation | INAP | TTA | Context | from 1hr UNTIL 20 min before entry time |
| 14 | Decision | INAP decides to implement the proposed Extended AMAN TTA request | INAP | TTA | Action | from 1hr UNTIL 20 min before entry time |
| 15 | Decision | Extended AMAN monitors the execution of the OptiSpot solutions (TTA) at the hotspot level and at the SBT/RBT level | Extended AMAN | Hotspot resolution alert, Target Deviation Indicator | Action | |

#### 3.5.3.9.8 UC-40: Optispot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Full Autonomy

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides the local and consolidated network imbalances | INAP, APOC, NM AU | Imbalances (+ severity + imbalance confidence index) | Action | |
| 2 | Analysis | APOC analyses the imbalance with the associated imbalance confidence index and decides to trigger an action if there is an identified 'rate' imbalance to manage | APOC | Imbalances (+ severity + imbalance confidence index), TMV rate | Context | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | Decision | APOC defines an area of opportunities to optimise (OptiSpot) | APOC | OptiSpot | Context | |
| 4 | Decision | APOC publishes the OptiSpot to the Collaborative NOP | APOC | OptiSpot | Action | |
| 5 | Analysis | AU analyses the OptiSpot | AU | OptiSpot | Context | |
| 6 | Decision | AU anticipates the OptiSpot and updates the SBT/RBT Margins of Manoeuvre /preference | AU | OptiSpot | Action | |
| 7 | Decision | APOC analyses the OptiSpot characteristics and decides to apply their business rules (UDPP, AIMA …) to prepare a DCB solution. | APOC | OptiSpot, flight list, business rules | Action | |
| 8 | Decision | APOC prepares with AUs the DCB solution (TTA proposal) using what-if | APOC, AU | OptiSpot, flight-list, What-if, business rules | Action | |
| 9 | Decision | APOC sends the TTA proposal to NM | APOC | TTA | Action | |
| 10 | Decision | NM collect the TTA, calculates the NCC and disseminates to the NMf actors the proposed NCC (TTA) | NM | NCC, TTA | Action | |
| 11 | Analysis | APOC and AU performs a network what-if to assess the proposed NCC (TTA) and to accommodate the other PI | | NCC, TTA, what-if | Context | |
| 12 | Decision | APOC implements the DCB solutions (TTA) | APOC | TTA | Action | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 13 | Analysis | APOC monitors the execution of the OptiSpot solutions (TTA) at the hotspot level | APOC | Hotspot resolution alert, | Action | |

### 3.5.3.9.9 UC-41: Optispot Arrival Management using TTA prepared in the SBT Elaboration process with APOC Full Delegation

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides the local and consolidated network imbalances | INAP, APOC, NM AU | Imbalances (+ severity + imbalance confidence index) | Action | |
| 2 | Analysis | INAP analyses the imbalance with the associated imbalance confidence index and decides to trigger an action if there is an identified 'rate' imbalance to manage | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Context | |
| 3 | Decision | INAP defines an area of opportunities to optimise | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | |
| 4 | Decision | INAP publishes the OptiSpot to the Collaborative NOP | INAP | OptiSpot | Action | |
| 5 | Analysis | AU analyses the OptiSpot | AU | OptiSpot | Context | |
| 6 | Decision | AU anticipates the OptiSpot and updates the SBT/RBT Margins of Manoeuvre /preference | AU | OptiSpot | Action | |
| 7 | Decision | INAP delegates (full delegation) to APOC the resolution of the OptiSpot | INAP | OptiSpot | Action | |
| 8 | Decision | APOC prepares with AUs the DCB solution (TTA proposal) using what-if | APOC, AU | OptiSpot, flight-list, What-if, | Action | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | business rules | | |
| 9 | Decision | APOC sends the TTA proposal to NM | IAPOC | TTA | Action | |
| 10 | Decision | NM collect the TTA, calculates the NCC and disseminates to the NMf actors the proposed NCC (TTA) | NM | NCC, TTA | Action | |
| 11 | Analysis | APOC and AU performs a network what-if to assess the proposed NCC (TTA) and to assess the impact for the other PI | | NCC, TTA, network what-if | Context | |
| 12 | Decision | APOC implements the DCB solutions (TTA) | APOC | TTA | Action | |
| 13 | Analysis | APOC monitors the execution of the OptiSpot solutions (TTA) at the hotspot level | INAP | Hotspot resolution alert, | Action | |

### 3.5.3.10 Constraint Reconciliation

#### 3.5.3.10.1 UC42: Dep (CASA/Hotspot) + Arr (AIMA/OptiSpot)

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides local and consolidated network imbalances | INAP, APOC, NM, AU | Imbalances (+ severity + imbalance confidence index) | Context | 3 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | Analysis | INAP analyses the imbalance with the associated imbalance confidence index. | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 3 hrs before entry time |
| 3 | Analysis | INAP identifies a departure Hotspot based on identified safety TMV 'rates' (i.e. entry or occupancy). | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 3 hrs before entry time |
| 4 | Decision | INAP publish the Hotspot via the NOP to notify all concerned stakeholders. | INAP | Hotspot | Action | 3 hrs before entry time |
| 5 | Analysis | INAP analyses the Hotspot characteristics and decides to use the NM CASA mechanism as a DCB solution. | INAP, NM | Hotspot, flight list, | Action | 3 hrs before entry time |
| 6 | Decision | INAP request to NM the activation of a CASA regulation in order to solve the Hotspot. | INAP | Hotspot, flight list,<br>NM CASA regulation | Action | 3 hrs before entry time |
| 7 | Decision | INAP publish the DCB solution via the NOP. | INAP | Hotspot, flight list,<br>NM CASA regulation,<br>CTOT | Action | 2 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | Decision | NM collect the CASA regulation CTOTs, the local-DCB TTOs to calculate the Network Consolidated Constraints (NCC) and disseminates to the NMf actors the resulting NCCs (TTOs,CTOTs) | NM | NCC, TTA | Action | 2 hrs before entry time |
| 9 | Decision | The Collaborative NOP (Imbalance Repository) provides local and consolidated network imbalances | INAP, APOC,<br>NM,<br>AU | Imbalances (+ severity + imbalance confidence index) | Context | 2 hrs before entry time |
| 12 | Analysis | APOC analyses the imbalance with the associated imbalance confidence index. | APOC | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2 hrs before entry time |
| 13 | Analysis | APOC identifies an area of opportunities to optimise arrival operations based on an identified 'rate' imbalance. | APOC | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2 hrs before entry time |
| 14 | Decision | APOC publishes the identified OptiSpot to the Collaborative NOP | APOC | OptiSpot | Action | 2 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 15 | Analysis | APOC analyses the OptiSpot characteristics and decides to build a DCB solution using AIMA rules and principles. | APOC | OptiSpot, flight list, AIMA business rules | Context | 2 hrs before entry time |
| 16 | Decision | AIMA elaborates a sequence of TTA measures accommodating others criterias (AU, DCB) using what-if | APOC | OptiSpot, flight-list, What-if,<br><br>business rules | Action | 2 hrs before entry time |
| 17 | Decision | APOC sends the TTA proposals to NM | APOC | TTA | Action | 2 hrs before entry time |
| 18 | Decision | NM collects and analyse the TTAs proposed by the APOC | NM | TTA | Action | 2 hrs before entry time |
| 17 | Analysis | NM identifies that 2 flights in the proposed APOC sequence are already captured in a published DCB hotspot and are subject to DCB measures (i.e. CTOT) | NM | TTA/TTO<br><br>CTOT | Action | 2 hrs before entry time |
| 17 | Decision | NM applies the Constraint Reconciliation mechanism between Hotspot and Optispot for both flights. | NM | TTA/TTO<br><br>CTOT | Action | 2 hrs before entry time |
| 21 | Decision | NM applies the Margins of Manoeuvre rule between Hotspot and Optispot to calculate the Network | NM | TTA/TTO | Action | 2 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Consolidated Constraints (NCC). | | | | |
| 21 | Decision | NM disseminates to the NMf actors the resulting NCCs. | NM | TTA/TTO | Action | 2 hrs before entry time |
| 22 | Decision | APOC performs a what-if to assess the proposed NCC (CTOT) | APOC | NCC, CTOT, TTA, what-if | Context | 2 hrs before entry time |
| 23 | Decision | APOC implements the DCB solutions (CTOT) | APOC | TTA, CTOT | Action | 2 hrs before entry time |
| 24 | Decision | APOC monitors the execution of the OptiSpot solutions (TTA) at the Optispot level | APOC | OptiSpot Resolution Alert | Action | 2 hrs before entry time |

#### 3.5.3.10.2 UC43: Dep (UDPP/Hotspot) + Arr (UDPP/Hotspot)

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides local and consolidated network imbalances | INAP, APOC, NM, AU | Imbalances (+ severity + imbalance confidence index) | Context | 2 hrs before entry time |
| 2 | Analysis | INAP/APOC(dep) analyses the imbalance at the departure with the | INAP | Imbalances (+ severity + imbalance | Action | 2 hrs before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | associated imbalance confidence index. | | confidence index), TMV rate | | entry time |
| 3 | Analysis | INAP/APOC(dep) identifies a departure Hotspot1 based on identified safety TMV 'rates' (i.e. entry or occupancy). | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2 hrs before entry time |
| 4 | Decision | INAP/APOC(dep) publish the Hotspot1 via the NOP to notify all concerned stakeholders. | INAP | Hotspot | Action | 2 hrs before entry time |
| 5 | Analysis | INAP/APOC(dep) analyse the Hotspot1 characteristics and decides to build a solution using AU's UDPP mechanism. | AU | Hotspot, flight list,<br><br>Business rules | Action | 2 hrs before entry time |
| 6 | Decision | INAP/APOC(dep) decides to delegate the Hotspot1 resolution to AUs. | APOC, AU | Hotspot, flight list,<br><br>Business rules | Action | 2 hrs before entry time |
| 7 | Analysis | AUs analyse the Hotspot1 characteristics and decides to build a solution using UDPP mechanisms. | AU | Hotspot, flight list,<br><br>Business rules | Action | 2 hrs before entry time |
| 8 | Decision | NM collect the TTs, calculates the Network Consolidated Constraints (NCC) and disseminates | NM | NCC, TT | Action | 2 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | to the NMf actors the resulting NCCs (TT) | | | | |
| 9 | Analysis | INAP/APOC(arr) analyses the imbalance at the arrival with the associated imbalance confidence index. | APOC | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2 hrs before entry time |
| 10 | Decision | INAP/APOC(arr) publishes the identified Hotspot2 to the Collaborative NOP | APOC | OptiSpot | Action | 2 hrs before entry time |
| 11 | Analysis | INAP/APOC(arr) analyses the Hotspot2 characteristics and decides to build a DCB solution using UDPP rules and principles. | APOC | OptiSpot, flight list, AIMA business rules | Context | 2 hrs before entry time |
| 12 | Decision | NM collects and analyse the TTAs proposed by the AU for the Hotspot2 | NM | TTA | Action | 2 hrs before entry time |
| 13 | Analysis | NM identifies that 2 flights in the proposed Hotspot2 sequence are already captured in a published DCB hotspot1 and are subject to planned DCB measures (i.e. CTOT) | NM | TTA/TTO<br><br>CTOT | Action | 2 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 14 | Decision | NM applies the Margins of Manoeuvre rule between Hotspot1 and Hotspot2 to calculate the Network Consolidated Constraints (NCC). | NM | CTOT/TTA/TTO | Action | 2 hrs before entry time |
| 15 | Decision | NM disseminates to the NMf actors the resulting NCCs. | NM | CTOT/TTA/TTO | Action | 2 hrs before entry time |
| 16 | Decision | INAP/APOC(dep) and INAP/APOC(arr) performs a what-if to assess the proposed NCC (CTOT) | APOC | NCC, CTOT, TTA, what-if | Context | 2 hrs before entry time |
| 17 | Decision | INAP/APOC(dep) (arr) implements the DCB solutions (CTOT) | APOC | TTA, CTOT | Action | 2 hrs before entry time |

#### 3.5.3.10.3 UC44: Dep (UDPP/Hotspot) + Arr (AIMA/Optispot)

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides local and consolidated network imbalances | INAP, APOC, NM, AU | Imbalances (+ severity + imbalance confidence index) | Context | 2 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | Analysis | INAP analyses the imbalance with the associated imbalance confidence index. | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2 hrs before entry time |
| 3 | Analysis | INAP identifies a departure Hotspot based on identified safety TMV 'rates' (i.e. entry or occupancy). | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2 hrs before entry time |
| 4 | Decision | INAP publish the Hotspot via the NOP to notify all concerned stakeholders. | INAP | Hotspot | Action | 2 hrs before entry time |
| 5 | Analysis | INAP analyses the Hotspot characteristics and decides to delegate the hotspot resolution to APOC(dep). | INAP, NM | Hotspot, flight list,<br><br>Business rules | Action | 2 hrs before entry time |
| 6 | Analysis | APOC(dep) analyse the Hotspot characteristics and decides to build a solution using AU's UDPP mechanism. | AU | Hotspot, flight list,<br><br>Business rules | Action | 2 hrs before entry time |
| 7 | Decision | APOC(dep) decides to delegate the hotspot resolution to AUs. | APOC, AU | Hotspot, flight list,<br><br>Business rules | Action | 2 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | Analysis | AUs analyse the Hotspot characteristics and decides to build a solution using UDPP mechanisms. | AU | Hotspot, flight list,<br><br>Business rules | Action | 2 hrs before entry time |
| 9 | Analysis | AUs send the proposed solution taking into account AU business rules. | AU | CTOT | Action | 2 hrs before entry time |
| 10 | Analysis | APOC(dep) receives the CTOT AU request for implementation. | APOC | CTOT | Action | 2 hrs before entry time |
| 11 | Decision | APOC(dep) decides to implement the proposed AU CTOT request. | APOC | CTOT | Action | 2 hrs before entry time |
| 12 | Analysis | APOC(dep) send the proposed solution taking into account AU business rules. | APOC, INAP | CTOT | Action | 2 hrs before entry time |
| 13 | Analysis | INAP receives the CTOT AU request for implementation. | INAP | CTOT | Action | 2 hrs before entry time |
| 14 | Decision | INAP decides to implement the proposed APOC/AU TTA request. | INAP | CTOT | Action | 2 hrs before entry time |
| 15 | Decision | INAP publish the DCB solution to NM via the NOP. | INAP | Hotspot, flight list,<br><br>CTOT | Action | 2 hrs before entry time |
| 16 | Decision | NM collect the TTs, calculates the Network Consolidated Constraints | NM | NCC, TT | Action | 2 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | (NCC) and disseminates to the NMf actors the resulting NCCs (TT) | | | | |
| 17 | Decision | The Collaborative NOP (Imbalance Repository) provides local and consolidated network imbalances | INAP, APOC, NM, AU | Imbalances (+ severity + imbalance confidence index) | Context | 2 hrs before entry time |
| 18 | Analysis | APOC(arr) analyses the imbalance with the associated imbalance confidence index. | APOC | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2 hrs before entry time |
| 19 | Analysis | APOC(arr) identifies an area of opportunities to optimise arrival operations based on an identified 'rate' imbalance. | APOC | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2 hrs before entry time |
| 20 | Decision | APOC(arr) publishes the identified OptiSpot to the Collaborative NOP | APOC | OptiSpot | Action | 2 hrs before entry time |
| 21 | Analysis | APOC(arr) analyses the OptiSpot characteristics and decides to build a DCB solution using AIMA rules and principles. | APOC | OptiSpot, flight list, AIMA business rules | Context | 2 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 22 | Decision | AIMA elaborates a sequence of TTA measures accommodating others criterias (AU, DCB) using what-if | APOC | OptiSpot, flight-list, What-if,<br><br>business rules | Action | 2 hrs before entry time |
| 23 | Decision | APOC(arr) sends the TTA proposals to NM | APOC | TTA | Action | 2 hrs before entry time |
| 24 | Decision | NM collects and analyse the TTAs proposed by the APOC | NM | TTA | Action | 2 hrs before entry time |
| 25 | Analysis | NM identifies that 2 flights in the proposed APOC sequence are already captured in a published DCB hotspot and are subject to DCB measures (i.e. CTOT) | NM | TTA/TTO<br><br>CTOT | Action | 2 hrs before entry time |
| 26 | Decision | NM applies the Constraint Reconciliation mechanism between Hotspot and Optispot for both flights. | NM | TTA/TTO<br><br>CTOT | Action | 2 hrs before entry time |
| 27 | Decision | NM applies the Margins of Manoeuvre rule between Hotspot and Optispot to calculate the Network Consolidated Constraints (NCC). | NM | CTOT/TTA/TTO | Action | 2 hrs before entry time |
| 28 | Decision | NM disseminates to the NMf actors the resulting NCCs. | NM | CTOT/TTA/TTO | Action | 2 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 29 | Decision | APOC performs a what-if to assess the proposed NCC (CTOT) | APOC | NCC, CTOT, TTA, what-if | Context | 2 hrs before entry time |
| 30 | Decision | APOC(dep) implements the DCB solutions (CTOT) | APOC | TTA, CTOT | Action | 2 hrs before entry time |
| 31 | Decision | APOC(arr) monitors the execution of the OptiSpot solutions (TTA) at the Optispot level | APOC | Hotspot Resolution Alert | Action | 2 hrs before entry time |

#### 3.5.3.10.4 UC45: Dep (CASA/Hotspot) + E/R (Cherry-picking TTO/SBT - Hotspot)

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides local and consolidated network imbalances | INAP, APOC, NM, AU, Extended-AMAN | Imbalances (+ severity + imbalance confidence index) | Context | 3 hrs before entry time |
| 2 | Analysis | INAP E/R analyses the imbalance with the associated imbalance confidence index. | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 3 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | Analysis | INAP E/R identifies a Hotspot based on identified safety TMV 'rates' (i.e. entry or occupancy). | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 3 hrs before entry time |
| 4 | Decision | INAP E/R publish the Hotspot via the NOP to notify all concerned stakeholders. | INAP | Hotspot | Action | 3 hrs before entry time |
| 6 | Decision | INAP E/R define DCB solution and decides to assign TTOs to cherry-picked flights in order to solve the Hotspot. | INAP | Hotspot, flight list,<br><br>TTO | Action | 3 hrs before entry time |
| 7 | Decision | INAP E/R publish the DCB solution to NM via the NOP. | INAP | Hotspot, flight list,<br><br>TTO | Action | 3 hrs before entry time |
| 8 | Decision | NM collect the TTOs, calculates the Network Consolidated Constraints (NCC) and disseminates to the NMf actors the resulting NCCs (TTO) | NM | NCC, TTA | Action | 3 hrs before entry time |
| 9 | Decision | The Collaborative NOP (Imbalance Repository) provides local and consolidated network imbalances | INAP, APOC,<br><br>NM,<br><br>AU, Extended-AMAN | Imbalances (+ severity + imbalance confidence index) | Context | 3 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 14 | Analysis | APOC(dep) analyses the Hotspot characteristics and decides to build a solution using CASA | AU | Hotspot, flight list,<br><br>Business rules | Action | 3 hrs before entry time |
| 24 | Decision | NM collects and analyse the proposed TTs.from CASA and INAP E/R cherry-picking | NM | TTA | Action | 23 hrs before entry time |
| 25 | Analysis | NM identifies that one flight in the proposed CASA sequence is already captured in a published DCB hotspot and are subject to DCB measures (i.e. Cherry picked) | NM | TTA/TTO<br><br>CTOT | Action | 3 hrs before entry time |
| 26 | Decision | NM applies the Constraint Reconciliation mechanism between Hotspots for both flights. | NM | TTA/TTO<br><br>CTOT | Action | 3 hrs before entry time |
| 27 | Decision | NM applies the Most Penalizing Constraint mechanism to calculate the Network Consolidated Constraints (NCC). | NM | TTA/TTO | Action | 3 hrs before entry time |
| 28 | Decision | NM disseminates to the NMf actors the resulting NCCs. | NM | TTA/TTO | Action | 3 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 30 | Decision | APOC(dep) – CASA - and INAP E/R implements the DCB solutions (TTA/TTO) according to the NCC information. | APOC | TTA, CTOT | Action | 3 hrs before entry time |

### 3.5.3.10.5 UC46: E/R (Cherry-picking TTO/SBT - Hotspot) + Arr (UDPP - Hotspot)

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides local and consolidated network imbalances | INAP, APOC, NM, AU, Extended-AMAN | Imbalances (+ severity + imbalance confidence index) | Context | 3 hrs before entry time |
| 2 | Analysis | INAP analyses the imbalance with the associated imbalance confidence index. | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 3 hrs before entry time |
| 3 | Analysis | INAP identifies a Hotspot based on identified safety TMV 'rates' (i.e. entry or occupancy). | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 3 hrs before entry time |
| 4 | Decision | INAP publish the Hotspot via the NOP to notify all concerned stakeholders. | INAP | Hotspot | Action | 3 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | Analysis | INAP analyses the Hotspot characteristics and decides to build a DCB solution taking into account known AU business rules. | INAP | Hotspot, flight list,<br><br>Business rules | Action | 3 hrs before entry time |
| 6 | Decision | INAP define DCB solution and decides to assign TTOs to cherry-picked flights in order to solve the Hotspot. | INAP | Hotspot, flight list,<br><br>TTO | Action | 3 hrs before entry time |
| 7 | Decision | INAP publish the DCB solution to NM via the NOP. | INAP | Hotspot, flight list,<br><br>TTO | Action | 3 hrs before entry time |
| 8 | Decision | NM collect the TTOs, calculates the Network Consolidated Constraints (NCC) and disseminates to the NMf actors the resulting NCCs (TTO) | NM | NCC, TTA | Action | 3 hrs before entry time |
| 9 | Decision | The Collaborative NOP (Imbalance Repository) provides local and consolidated network imbalances | INAP, APOC,<br><br>NM,<br><br>AU, Extended-AMAN | Imbalances (+ severity + imbalance confidence index) | Context | 3 hrs before entry time |
| 10 | Analysis | INAP analyses the imbalance with the | INAP | Imbalances (+ severity + imbalance | Action | 3 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | associated imbalance confidence index. | | confidence index), TMV rate | | |
| 11 | Analysis | INAP identifies an arrival Hotspot based on identified safety TMV 'rates' (i.e. entry or occupancy). | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 3 hrs before entry time |
| 12 | Decision | INAP publish the Hotspot via the NOP to notify all concerned stakeholders. | INAP | Hotspot | Action | 3 hrs before entry time |
| 13 | Analysis | INAP analyses the Hotspot characteristics and decides to delegate the arrival hotspot resolution to APOC. | INAP, NM | Hotspot, flight list,<br><br>Business rules | Action | 3 hrs before entry time |
| 14 | Analysis | APOC analyse the Hotspot characteristics and decides to build a solution using AU's UDPP mechanism. | AU | Hotspot, flight list,<br><br>Business rules | Action | 3 hrs before entry time |
| 15 | Decision | APOC decides to delegate the hotspot resolution to AUs. | APOC, AU | Hotspot, flight list,<br><br>Business rules | Action | 3 hrs before entry time |
| 16 | Analysis | AUs analyse the Hotspot characteristics and decides to build a solution using UDPP mechanisms. | AU | Hotspot, flight list,<br><br>Business rules | Action | 3 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 17 | Analysis | AUs send the proposed solution taking into account AU business rules. | AU | TTA | Action | 3 hrs before entry time |
| 18 | Analysis | APOC receives the TTA AU request for implementation. | APOC | TTA | Action | 3 hrs before entry time |
| 19 | Decision | APOC decides to implement the proposed AU TTA request. | APOC | TTA | Action | 3 hrs before entry time |
| 20 | Analysis | APOC send the proposed solution taking into account AU business rules. | APOC, INAP | TTA | Action | 3 hrs before entry time |
| 21 | Analysis | INAP receives the TTA AU request for implementation. | INAP | TTA | Action | 3 hrs before entry time |
| 22 | Decision | INAP decides to implement the proposed APOC/AU TTA request. | INAP | TTA | Action | 3 hrs before entry time |
| 23 | Decision | INAP publish the DCB solution to NM via the NOP. | INAP | Hotspot, flight list,<br><br>TTO | Action | 3 hrs before entry time |
| 24 | Decision | NM collects and analyse the proposed TTAs. | NM | TTA | Action | 23 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 25 | Analysis | NM identifies that 2 flights in the proposed APOC/UDPP arrival sequence are already captured in a published DCB hotspot and are subject to DCB measures (i.e. Cherry picked) | NM | TTA/TTO<br><br>CTOT | Action | 3 hrs before entry time |
| 26 | Decision | NM applies the Constraint Reconciliation mechanism between Hotspots for both flights. | NM | TTA/TTO<br><br>CTOT | Action | 3 hrs before entry time |
| 27 | Decision | NM applies the Most Penalizing Constraint mechanism to calculate the Network Consolidated Constraints (NCC). | NM | TTA/TTO | Action | 3 hrs before entry time |
| 28 | Decision | NM disseminates to the NMf actors the resulting NCCs. | NM | TTA/TTO | Action | 3 hrs before entry time |
| 29 | Decision | APOC performs a what-if to assess the proposed NCC (TTA/TTO) | APOC | NCC, CTOT, TTA, what-if | Context | 3 hrs before entry time |
| 30 | Decision | APOC implements the DCB solutions (TTA/TTO) | APOC | TTA, CTOT | Action | 3 hrs before entry time |
| 31 | Decision | INAP monitors the execution of the Hotspot solutions (TTA) at the Hotspot level | INAP | Hotspot deviation alert, | Action | 3 hrs before entry time |

#### 3.5.3.10.6 UC47: E/R (Cherry-picking TTO/SBT - Hotspot) + Extended AMAN (Optispot)

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | The Collaborative NOP (Imbalance Repository) provides local and consolidated network imbalances | INAP, APOC,<br><br>NM,<br><br>AU, Extended-AMAN | Imbalances (+ severity + imbalance confidence index) | Context | 2 hrs before entry time |
| 2 | Analysis | INAP analyses the imbalance with the associated imbalance confidence index. | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2 hrs before entry time |
| 3 | Analysis | INAP identifies a Hotspot based on identified safety TMV 'rates' (i.e. entry or occupancy). | INAP | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | 2 hrs before entry time |
| 4 | Decision | INAP publish the Hotspot via the NOP to notify all concerned stakeholders. | INAP | Hotspot | Action | 2 hrs before entry time |
| 5 | Analysis | INAP analyses the Hotspot characteristics and decides to build a DCB solution taking into | INAP | Hotspot, flight list,<br><br>Business rules | Action | 2 hrs before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | account known AU business rules. | | | | |
| 6 | Decision | INAP define DCB solution and decides to assign TTOs to cherry-picked flights in order to solve the Hotspot. | INAP | Hotspot, flight list,<br><br>TTO | Action | from 1hr UNTIL 50 min before entry time |
| 7 | Decision | INAP publish the DCB solution to NM via the NOP. | INAP | Hotspot, flight list,<br><br>TTO | Action | from 1hr UNTIL 50 min before entry time |
| 8 | Decision | NM collect the TTOs, calculates the Network Consolidated Constraints (NCC) and disseminates to the NMf actors the resulting NCCs (TTO) | NM | NCC, TTA | Action | from 1hr UNTIL 50 min before entry time |
| 9 | Decision | The Collaborative NOP (Imbalance Repository) provides local and consolidated network imbalances | INAP, APOC,<br><br>NM,<br><br>AU, Extended-AMAN | Imbalances (+ severity + imbalance confidence index) | Context | from 1hr UNTIL 20 min before entry time |
| 10 | Analysis | Extended-AMAN analyses the imbalance with the associated imbalance confidence index. | Extended-AMAN | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11 | Analysis | Extended-AMAN identifies an area of opportunities to optimise arrival operations based on an identified 'rate' imbalance. | Extended-AMAN | Imbalances (+ severity + imbalance confidence index), TMV rate | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 12 | Decision | Extended-AMAN publishes the identified OptiSpot to the Collaborative NOP | Extended-AMAN | OptiSpot | Action | 1 hrs – 20 min before entry time |
| 13 | Analysis | Extended-AMAN analyses the OptiSpot characteristics and decides to build a DCB solution taking into account known AU business rules. | Extended-AMAN | OptiSpot, flight list, business rules | Context | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 14 | Decision | Extended-AMAN elaborates a sequence of tTTA measures accommodating others criteria (AU, DCB) using what-if | Extended-AMAN | OptiSpot, flight-list, What-if,<br><br>business rules | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 15 | Decision | Extended AMAN sends the tTTA proposals to NM | Extended-AMAN | tTTA | Action | from 1hr UNTIL from 1hr UNTIL 20 min |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | before entry time |
| 16 | Decision | NM collects and analyse the tTTAs proposed by the Extended-AMAN | NM | tTTA | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 17 | Analysis | NM identifies that 2 flights within the Extended-AMAN proposed sequence are already subject to DCB measures (i.e. TTO) from INAP | NM | tTTA/TTO | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 18 | Analysis | NM identifies that for both flights, the proposed tTTA measures by the Extended-AMAN are outside the DCB target windows of the INAP cherry picked flights (TTO) | NM | tTTA/TTO | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 19 | Decision | NM calculates the Network Consolidated Constraints (NCC), for both flights concerned by conflicting measures; NM applies the constraint reconciliation rules mechanism between Hotspot and Optispot measures. | NM | tTTA/TTO | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 20 | Decision | NM disseminates to the NMf actors the resulting NCCs. | NM | tTTA/TTO | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 21 | Decision | Extended AMAN performs a what-if to assess the proposed NCC (tTTA) | Extended AMAN | NCC, tTTA, what-if | Context | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 22 | Decision | Extended AMAN implements the DCB solutions (tTTA) | Extended AMAN | tTTA | Action | from 1hr UNTIL from 1hr UNTIL 20 min before entry time |
| 23 | Decision | Extended AMAN monitors the execution of the OptiSpot solutions (tTTA) at the hotspot level | Extended AMAN | Hotspot resolution alert, | Action | |

#### 3.5.3.11 Constraint Optimisation

#### 3.5.3.11.1 UC-53: Preparation of a DCB Solution based on the Optimization of Primary and Reactionary Delay

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| *1* | Analysis | INAP analysis predicted traffic patterns and deduces workloads within traffic volumes | INAP | Predicted traffic counts and demand to deliver input for capacity function | Action | Pre-tactical |
| *2* | Analysis | AOP analysis predicted traffic patterns and deduces workloads within traffic volumes | AOP | Predicted traffic counts and demand to specify AOP | Action | Pre-tactical |
| *3* | Initiation | AU initiates and updates flight plan data | AU | Updated Flight Plans | Action | Pre-Tactical and tactical |
| *4* | Publish | Initial NOP based on AOPs, ATC capacity planning and network scenarios | NM | Pre-tactical network scenarios | Action | Specification and evaluation of pre-tactical network scenarios |
| *5* | Publish | INAP initiates and updates regulation data based on available capacity profiles and predicted traffic patterns | INAP | Reg start/end times, predicted entries, auto-linked regulations | Action | Pre-tactical and tactical |

| | | | | | | |
|---|---|---|---|---|---|---|
| *6* | Publish | AOP initiates and updates regulation data based on available capacity profiles and predicted traffic patterns | AOP | Reg start/end times, predicted entries | Action | Pre-tactical and tactical |
| 7 | CRO preparation | NM settles issued and exempted sets of flights | NM | Flight lists to be excluded from slot allocation | Action | Tactically Rolling |
| 7 | CRO preparation | NM creates optimization problem instance to be solved | NM | Flight lists and entry slots in according format to be delivered to optimization | Action | Tactically Rolling |
| 8 | Constraint Reconciliation Optimization | NM solves optimization problem | NM | Primary and reactionary delay, departure slots | Action | Tactically Rolling |

### 3.5.3.12 Collaborative NOP

#### 3.5.3.12.1 UC-24: Preparation of E/R DCB solutions taking into account Airport flight impact severity indicator

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Decision | Submit eFPL | AU | eFPL | Action | Up to 3hrs before TO |
| 2 | Analysis | Validate and Integrate Flight Plan in Traffic Demand | Regional ATFCM | Flight Plan, Flight Update Messages | Context | Up to 3hrs before TO |
| 3 | Publication | Share/Update Traffic Demand | Regional ATFCM | Flight details, Airport Flight Severity Impact | Action | All the time |
| 4 | Analysis | Monitor/Update Airport Operations Plan | APOC | Airport Flight Severity Impact | Context | All the time |
| 5 | Analysis | Monitor SBT and Flight Preference | AU | | Context | All the time |
| 6 | Analysis | Monitor Traffic Situation | Local ATFCM (INAP) | | Context | All the time |
| 7 | Decision | Detect and Publish Hotspot | Local ATFCM (INAP) | Hotspot | Action | 3 hrs to 30 min before entry-time |
| 8 | Decision | Prepare DCB Solution based on Airport Flight Severity Impact | Local ATFCM (INAP) | What-If | Action | 3 hrs to 30 min before entry-time |
| 9 | Analysis | Asses Local Impact | Local ATFCM (INAP) | Impact Assessment | Context | 3 hrs to 30 min before entry-time |
| 10 | Analysis | Provide Network Impact Assessment | Regional ATFCM | Impact Assessment | Context | 3 hrs to 30 min before entry-time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11 | Decision | Coordinate DCB Solution | Local ATFCM (INAP) | | Action | 3 hrs to 30 min before entry-time |
| 12 | Decision | Implement DCB Solution | Local ATFCM (INAP) | DCB Measure | Action | 3 hrs to 30 min before entry-time |
| 13 | Decision | Update NOP | Regional ATFCM | CTOT, TTO/TTA, NCC | Action | All the time |
| 14 | Decision | Update Flight SBT | AU | | Action | All the time |

#### 3.5.3.12.2 UC-54: AU Flight Delay Criticality Indicator

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | Request FDCI with CHMI/NOP | AU | | Action | Approx. 4 hrs to 30 min before entry-time |
| 2 | Decision | Request FDCI via NM eHelpdesk | AU | | Action | 3 hrs to 30 min before entry-time |
| 3 | Analysis | Check Compliancy and Update FDCI Status (Rules) | Regional ATFCM | Flight Identification<br>FDCI<br>FDCI Reason | Action | 3 hrs to 30 min before entry-time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | Analysis | Publish and update the NOP | Regional ATFCM | Flight Identification FDCI | Action | 3 hrs to 30 min before entry-time |
| 5 | Analysis | Monitor SBT and FDCI | AU | Rerouting Flight Details | Context | All the time |
| 6 | Event | Delay assigned to FDCI flight | Regional ATFCM | | Context | 3 hrs to 30 min before entry-time |
| 7 | Analysis | Check Network Impact on excluding flight from regulation | Regional ATFCM | Flight Identification FDCI | Action | 3 hrs to 30 min before entry-time |
| 8 | Analysis | Check Local Impact on excluding flight from regulation | Local ATFCM (INAP) | MCDM | Action | 3 hrs to 30 min before entry-time |
| 9 | Action | NMOC excludes selected flight from regulation | Regional ATFCM | Impact Assessment | Action | 3 hrs to 30 min before entry-time |
| 10 | Analysis | Monitor Flights | Local ATFCM (INAP) | FDCI<br>Flight Details | Context | 3 hrs to 30 min before entry-time |
| 11 | Decision | FDCI flight impact by regulation | Local ATFCM (INAP) | Flight Details | Context | 3 hrs to 30 min before entry-time |
| 12 | Analysis | Find Rerouting DCB Solution | Local ATFCM (INAP) | Flight Details | Action | 3 hrs to 30 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | entry-time |
| 13 | Analysis | Check Local Impact on Rerouting Flight | Local ATFCM (INAP) | DCB Measure | Action | 3 hrs to 30 min before entry-time |
| 14 | Decision | Coordinate DCB solution | Local ATFCM (INAP) | | Action | All the time |
| 15 | Analysis | Check Network Impact Assessment on Rerouting | Regional ATFCM | MCDM | Action | All the time |
| 16 | Analysis | Implement DCB Solution | Local ATFCM (INAP) | | Action | All the time |
| 17 | Action | Submit/Update eFPL | AU | | Action | All the time |

#### 3.5.3.12.3 UC-55: AU Flight Delay Criticality Indicator for STAM En Route

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | Submit/Update eFPL | AU | eFPL | Action | Up to 3 hrs before TO |
| 2 | Analysis | Validate and Integrate eFPL in Traffic Demand | Regional ATFCM | Flight Plan, Flight Update Messages | Context | Up to 3hrs before TO |
| 3 | Analysis | Monitor SBT and FDCI | AU | CTOT, FDCI, Flight Details, NCC, TTO/TTA | Context | All the time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | Decision | Request FDCI with CHMI/NOP | AU | | Action | All the time |
| 5 | Decision | Request FDCI via NM eHelpdesk | AU | | Action | All the time |
| 6 | Analysis | Check Compliancy and Update FDCI Status (Rules) | Regional ATFCM | Flight Identification, FDCI, FDCI Reason | Context | 3 hrs to 30 min before entry-time |
| 7 | Decision | Publish and update the NOP | Regional ATFCM | | Action | All the time |
| 8 | Analysis | Monitor Traffic Load | Regional ATFCM | Traffic Demand | Context | All the time |
| 9 | Analysis | Analyse Traffic Situation | Local ATFCM (INAP) | | Context | All the time |
| 10 | Analysis | Detect DCB Imbalance | Local ATFCM (INAP) | | Context | 3 hrs to 30 min before entry-time |
| 11 | Decision | Identify and Publish Declared Hotspot | Local ATFCM (INAP) | Hotspot | Action | 3 hrs to 30 min before entry-time |
| 12 | Decision | Prepare DCB Solution (taking into account FDCI) | Local ATFCM (INAP) | What-If | Action | 3 hrs to 30 min before entry-time |
| 13 | Analysis | Provide Local Impact Assessment | Local ATFCM (INAP) | Impact Assessment | Context | 3 hrs to 30 min before entry-time |
| 14 | Analysis | Provide Network Impact Assessment | Regional ATFCM | Impact Assessment | Context | 3 hrs to 30 min before |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | entry-time |
| 15 | Decision | Coordinate DCB Solution | Local ATFCM (INAP) | | Action | 3 hrs to 30 min before entry-time |
| 16 | Decision | Implement DCB Solution | Local ATFCM (INAP) | DCB Measure | Action | 3 hrs to 30 min before entry-time |

### 3.5.3.13 Flow Management and Flight Planning integration

#### 3.5.3.13.1 UC-56: STAM AU Counter Proposal

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Analysis | Monitor Local DCB | Local ATFCM (INAP) | | Context | All the time |
| 2 | Decision | Identify and Publish Declared Hotspot | Local ATFCM (INAP) | | Action | 3 hrs to 30 min before entry-time |
| 3 | Decision | Prepare DCB Solution | Local ATFCM (INAP) | | Action | 3 hrs to 30 min before entry-time |
| 4 | Decision | Coordinate and Adjust DCB Solution | Local ATFCM (INAP) | Proposed DCB measure and flights | Action | 3 hrs to 30 min before entry-time |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | Decision | Publish DCB measures and flights | Regional ATFCM | | Action | 3 hrs to 30 min before entry-time |
| 6 | Decision | Monitor Flights, how they are affected by the traffic network situation and DCB Solutions | AU | | Action | 3 hrs to 30 min before entry-time |
| 7 | Decision | Assess the impact of an AU provided trial trajectory **or** request the Regional ATFCM for Proposal Trajectories | AU | Trial Trajectory, Negotiating Trajectory | Context | All the time |
| 8 | Analysis | Assess Trajectory What-If | Regional ATFCM | DCB Impact Assessment | Context | All the time |
| 9 | Analysis | Provide Rerouting Alternatives What-Else | Regional ATFCM | Proposal Trajectory, DCB Impact Assessment | Context | All the time |
| 10 | Decision | Book Counter-Proposal | Regional ATFCM | Amended DCB measure and Proposal Flight | Action | 3 hrs to 30 min before entry-time |
| 11 | Decision | Implement DCB Solution | Local ATFCM (INAP) | DCB measure and flights | Action | 3 hrs to 30 min before entry-time |
| 12 | Decision | Update NOP Plan with the implemented DCB Solution | Regional ATFCM | | Action | All the time |
| 13 | Decision | Submit eFPL matching the alternative/counter proposal booked | AU | eFPL | Action | All the time |

### 3.5.3.13.2 UC-60: Enriched DCB information for AUs

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Decision | Submit PFP | AU | PFP | Action | Up to 3 hrs before TO |
| 2 | Analysis | Validate and Integrate Flight Plan in Traffic Demand | Regional ATFCM | Planning Status | Context | Up to 3 hrs before TO |
| 3 | Analysis | Re-assess Traffic Situation | Regional ATFCM | | Action | All the time |
| 4 | Analysis | Provide Consolidated DCB imbalances | Regional ATFCM | DCB Impact Assessment | Action | All the time |
| 5 | Analysis | Monitor Flights | AU | | Action | All the time |
| 6 | Decision | Assess the impact of an AU provided trial trajectory **or** request the Regional ATFCM for Proposal Trajectories | AU | Trial Trajectory, Negotiating Trajectory | Action | 3 hrs to 30 min before entry-time |
| 7 | Analysis | Assess Trajectory (What-If) | Regional ATFCM | DCB Impact Assessment | Action | All the time |
| 8 | Analysis | Provide Rerouting Alternatives (What-Else) | Regional ATFCM | Proposal Trajectory, DCB Impact Assessment | Action | All the time |
| 9 | Decision | Book Opportunity | Regional ATFCM | Negotiating Trajectory | Action | All the time |
| 10 | Decision | Submit eFPL | AU | eFPL | Action | 3 hrs to 30 min |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | before TO |

### 3.5.3.14 AOP-NOP Integration

#### 3.5.3.14.1 UC-57: Network prediction in short-term planning/execution phasesand Airport planning

| N° | Action | Description | Actor | Information | Type | Time |
|---|---|---|---|---|---|---|
| 1 | Analysis | Confirm Traffic Demand Prediction | APOC | API, DPI | Context | 3 hrs to 30 min before entry-time |
| 2 | Analysis | Consolidate Traffic Demand | Regional ATFCM | Flight details, Estimated Landing Time | Context | All the time |
| 3 | Analysis | Monitor/Update Airport Operations Plan | APOC | API, DPI | Context | All the time |
| 4 | Decision | Cancel/Suspend unconfirmed Traffic Demand Prediction | Regional ATFCM | | Action | At predetermined times if AOP confirmation not received |
| 5 | Decision | Submit eFPL | AU | | Action | Up to 3 hrs before TO |
| 6 | Decision | Validate and Integrate Flight Plan in Traffic Demand | Regional ATFCM | eFPL | Action | All the time |
| 7 | Decision | Replace Predicted Flight with Actual Flight Plan | Regional ATFCM | | Action | All the time |

## 3.5.4 Differences between new and previous Operating Methods

**Demand Prediction**

The proposed demand prediction improvement aims at qualifying and improving the Traffic Demand Forecast by adding probabilistic information.

To provide a methodology to quantify the uncertainties of the Demand Prediction in the 6hrs-10 min time horizon. The uncertainty of the Trafic Demand is quantified using a probabilistic count approach. It is based on a probabilistic distribution of trajectories (3D, time) with quantification of uncertainties in model parameters (flight status, cdm/no cdm airports, ...)

The demand data together with the improved PFD including better route information, historical data, and the confirmation of demand by AOP forms the network predicted demand picture.

### Local & network Consolidated Predicted Workload

Depending on the timeframe and related uncertainties, different predicted workload methodologies are proposed to manage different granularity of issues:

- Traffic density management aiming at managing that there are not too many flights in a traffic volume,
- then traffic complexity management aiming at keeping an acceptable level of complexity induced by flights in a traffic volume.

It has been proposed :

- A local complexity methodology
- An Imbalance Confidence Index (ICI) indicating the level of certainty of the predicted imbalance (count, complexity). This Imbalance Confidence Index will be obtained from the processing of the traffic demand prediction and its associated uncertainties.

ANSPs/INAPs identify local imbalances based on theirs local methodologies (entry/occupancy counts, complexity, ). These partial local imbalances are shared with NM and need consolidation to assess the imbalance situation at network level. To ensure the interoperability of the local methodologies, it is proposed to consider consider the severity value of the imbalances as elements to be shared. To support such a capability, an imbalance repository is developed to collect all the local imbalances figures from ANSPs. This Imbalance Repository Service aggregates the local imbalance figures in order to provide a consolidated network imbalance view.

### Network Performance

The Advanced DCB provides capabilities to support the collaborative decision-making under consideration of the different stakeholder perspectives from Airspace Users, Airports, ANSPs and NM. A Stakeholder can express dynamically and precisely to the performance framework their individual needs that others stakeholders can try to accommodate. It moves the performance to quantitative and dynamic (e.g. AUs will be able to express their non-linear cost) approaches. It will allow :

- To guide the NMf decision-making to resolve the hotspots in nominal situations

- To guide the NMf decision-making to recover the critical situations at the network level (Resilience)

**Spot Management**

Regardless the methodology used (EC, OC, weighted complexity, complexity…), the imbalance are characterized with Traffic Monitoring Values (TMV). These thresholds represent different objectives (safety, rate optimisation, critical & crisis situation ….) and are related to different meanings and different category of Spot :

HotSpot Initially introduced in SESAR1 with the peak and sustain thresholds. It aims at preventing excessive ATC workload and to ensure that the traffic delivered to ATC controllers will always be manageable in the safe limits of workload. It represents potential indications in term of controller workload, and implicitly potential non-critical safety risks.
OptiSpot : It aims at preventing bunch (without safety issue) and to ensure that the traffic delivered to ATC controllers will always be manageable in an organised and smoothed way. It aims also at providing room for better use of spare capacity. It defines the context of an optimisation issues. Thus, an Optispot is triggered by TMV (rate marks) violation.
CriticalSpot and CrisisSpot : It aims at detecting the change of the state of the system from nominal to critical and crisis states. TMV-resilience is defined with two thresholds (critical, crisis) It defines the context of critical or crisis issues marked out by a CriticalSpot or a CrisisSpot. Thus, an CriticalSpot is triggered by TMV (critical marks) violation and a CrisisSpot is triggered by TMV (crisis marks) violation

**INAP function**

The INAP function proposes two functions LTM and EAP working on different timeframes and associated levels of uncertainty and granularity, rendering better service to Airspace Users, in close connection with NM, thanks to shared situational awareness regarding the problems identification, solution means and performance objectives. Local DCB actors and Extended ATC Planning actors work within an INAP (Integrated Network and ATC Planning) providing the full capabilities to manage imbalances through assessment of evolving traffic situations and evaluations of opportunities, in order to apply the best performing option between the Dynamic Airspace Configuration, Flow Managements measures (synchronization, sequencing) and Trajectory measures.

**CORSE Catalogue**

The Complexity Reduction Service (CORSE) proposes a full set of methodologies and measures to cover the resolution of problems dealing with safety and optimisation issues to manage traffic density, traffic organisation and traffic interferences in the E/R and Arrival/Departure phases. In particular, Short Term ATFCM Measures (STAMs) will be designed by tools like COP Organizer, COP-Sequencer for En

Route, encompassing proposals for adjustement in all 4 dimensions (vertical, lateral, and longitudinal plans), aiming at minimizing the impact on flight efficiency.

### Target Time Management

To manage the hotspot resolution, INAP or NM can constrain the Time of Entry of flights into the hotspot or the time on a specific waypoint (i.e.the COP, not necessarily being a coordination point between two sectors)with TTO (Target Time Over the congested E/R point) and TTA (Target Time of Arrival at congested Airport) in order to smooth the traffic. Because the Target Time (TTO/TTA) is managed in two different ways depending on whether the TTO/TTA has been prepared in the SBT elaboration and refinement or in the RBT revision processes it has been proposed to distinguish and to introduce :

- TTO/TTA (Target Time Over/Target Time at the Arrival) for measures managed in the SBT elaboration phase
- tTTO/tTTA (tactical Target Time Over/tactical Target Time at the Arrival)for measures managed in the RBT revison phase

### Synchronization

A myriad of functions (ATC, ACC TMA, APT, AU) propose at the same time corrective short-term measures with overlaying horizons which can be affected by concurrent strategies. For this reason, the interaction between DCB and the other ATC, TMA and APT activities needs to be properly managed and synchronized in order to avoid interfering concurrent actions.

### Collaborative Framework

This framework proposes mechanism to support collaborative design involving differents actors between the regional (NM) and/or the sub-regional/local DCB (INAP) and/or the Airport (APOC) and/or AU (FOC) to manage a common agreement on the best accommodation of DCB solutions both for safety issues and areas of opportunities for optimization. Mechanisms like coordination and delegation of role and responsibility have been developed.

### Local Constraint Reconciliation & Global Optimization

Two different approaches depending on whether DCB manages a normal or critical situation. These different contexts imply a clear definition and allocation of roles and responsibilities for INAP and NM, and different local and network DCB mechanisms.

- The Nominal context activates local optimizations. Local INAP actors will play the main role deciding the local solution to apply. In such a context, local methodologies (udpp, aima, cop sequencer, ad-hoc STAM, ….) are used with a constraint reconciliation mechanism in order to manage the local interfering constraints. The resulting DCB solutions optimize the local business needs but might be sub-optimum at the global level. The Constraint Reconciliation mechanism ensures the collection of the locally planned DCB Target-Time solutions to determine the global consistency and to detect which flight trajectories will be affected by multiple constraints interferences and provides a Network Consolidated Constraint (NCC) to the local-DCB actors

- The Critical context activates the global optimization. NM actor will play the main role deciding the solutions to apply at the global level. In such a context, one global methodology (CASA, CRO, Interactive Regulation, …) is used (global optimisation). The resulting DCB solution is an optimized solution at the global level. It supports the NM business needs to recover efficiently a global nominal situations

- Managing with different roles, responsibilities, methodologies these nominal and critical contexts requires a reliable prediction of the network states (nominal, critical), clear definition and allocation of roles and responsibilities for INAP and NM according to the context, and handover mechanisms to shift from local and global decisions/solutions.

**Collaborative NOP**

Enriched DCB information has been proposed :

- AU Simple preference to indicate a preferred action for a flight in case of DCB constraints (or to be offered opportunities).They will be considered by airports in the process of assigning TTAs, within the selection of flights logic and equally they will be considered by LTM/INAP in the process of STAM or TTO assignment within the selection of flights logic.
- Impact Severity Indicator : The airport will send to the NOP as part of Arrival Plan Information and its updates the Impact severity indicator a flight which indicates the impact that the associated SBT will have on the airport planning when a deviation from the scheduled in-block time may occur.
- Congestion Indicator : Network what-if processes congestion indicator consolidated at the network level aiming at simulating the impact of a trajectory in regards with a specific predicted imbalance methodology (Occupancy Count, Complexity…). The what-if can be processed on different scales from a local to a regional view.
- Provision of arrival and departure information in support of network predicted demand

| Activities (in EATMA) that are impacted by the SESAR Solution | Current Operating Method | New Operating Method |
|---|---|---|
| Demande Prediction | None | Probabilistic Count (EC, OC, Complexity) |
| Predicted Workload | Entry Count, Occupancy Count | Enchanced Complexity methodology, Imbalance Confidence Index (ICI), Congestion Indicator (CI) |
| Network Performance | None | Shareable Performance Indicator<br><br>Network State Prediction (Resilience) |
| Hotspot Management | Hotspot | Optispot, Criticalspot, Crisisspot<br><br>Most Important Probem (MIP)<br><br>Spot Resolution Monitoring |
| INAP function | LTM + EAP | Detailled LTM+EAP (ATC link) |
| CORSE Catalogue | None | Additional DCB measures (V-STAM, Cop-sequencer, cop-organizer) |
| Synchronization | None | DCB & Extended AMAN integration |
| Collaborative Framework | Coordination | Delegation, complex coordination |
| Constraint Reconciliation | None | Constraint Reconciliation Management |
| Constraint Optimisation | Realized within RNEST | Network Optimisation (CRO) |
| Collaborative NOP | Network View | Enhanced network view with enriched DCB information (AU preference, Congestion Indicator, Airport impact severity) |

**Table 29: Difference between new and previous Operating Method**

# 4 Safety, Performance and Interoperability Requirements (SPR-INTEROP)

## 4.1 Operational Requirements

### 4.1.1 Demand Prediction

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.01-OSED-GDFI.0010 |

| | |
|---|---|
| Title | Demand Forecast shall be implemented as a collaborative Regional NMf for contribution and consumption by all ATM parties. |
| Requirement | The Demand Forecast shall present the complete Network Impact Forecast for the regional ATM area of responsibility covered by the Network Operation Plan.<br><br>It shal be implemented as:<br><br>• a collaborative Network Management function that is;<br>• accessible by:<br>    ○ the NM itself,<br>    ○ the sub-regional users (FAB)<br>    ○ the ANSPs (FMP, ATC, TWR, TMA, …)<br>    ○ the AUs (WOC, FOC, AOCC, AO, HDLA, …)<br>    ○ and any ATM partner or user (MET, BADA, …);<br>• that can contribute to and/or<br>• consume the Demand Forecast data and information. |
| Status | < in progress> |
| Rationale | The quality of the Network Impact Forecast relies heavily on the availability of a service that is performant and accessible throughout the Network and allows the bi-directional exchange of forecast data and information with all contributors and consumers. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share Network FBT |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| [REQ]Identifier | REQ-09.01-OSED-GDFI.0020 |
|---|---|
| Title | Demand Forecast shall be implemented as a series of independent phases |
| Requirement | Demand Forecasting shall address the different requirements of subsequent phases by means of re-use of common elements but which may exclude elements that are not appropriate.<br><br>The phases are:<br>• Strategic – resulting in a Traffic Orientation Scheme that distributes the traffic across the network based on the major flows – but not including ATFCM measures<br>• Predictive – resulting in a Demand Forecast that includes ATFCM measures but has no SBT/RBT input or no flight execution related information<br>• Pre-Tactical – resulting in a Demand Forecast that includes ATFCM measures and has been enriched with some SBT/RBT input and potentially also flight execution related information (API, pDPI, AU Priorities and Preferences, …)<br>• Tactical – aggregating and integrating all trajectory and flight planning, execution, and termination information |
| Status | < in progress> |
| Rationale | Each phase of Demand Forecasting addresses different needs for different audiences.<br><br>In this OSED version, we will only address the requirements related to the Tactical phase. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share Network FBT |
| <ALLOCATED_TO> | <role> | Regional ATFCM |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.01-OSED-GDFI.0030 |
| Title | Demand Forecast Time Horizon |
| Requirement | The Demand Forecast shall present the complete Network Impact Forecast representing the forecast demand and the targeted DCB measures to deal with the forecasted traffic situation as a rolling picture from the 6 hrs – 10 min time horizon and shall encompass the following information<br>• Forecast Business Trajectory updated with, where appropriate the SBT/RBT<br>• The Count Forecast – representing the adjusted counts<br>• The Solution Forecast – the set of measures that solve the detected imbalances<br>The Imbalance Forecast is assumed to be resolved adequately by the solution forecast. Any imbalances that remain are for tactical resolution and are outside the scope of Demand Forecast. |
| Status | < in progress> |
| Rationale | The demand forecast represents the normalised traffic situation. The normalisation will include the implementation and publication of the Daily Network Plan via the NOP containing the agreed set of measures for the predictable network imbalances (overloads, congestions, saturation) due to predictable network situations (equipment, staffing, military actitivity, meteorological conditions, etc.) |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share network FBT |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-GDFI.0040 |
| Title | Prediction Quality Indicator (preQI) |
| Requirement | The quality of the Network Impact Forecast shall be determined in function of:<br>• The predicted demand – distinguishing high demand and high complexity from low demand and/or low complexity – low demand and/or low complexity signify a positive effect on the preQI<br>• The predicted severe capacity reductions – any source causing severe capacity reduction will have a negative effect on the preQI<br>• The repetitive nature of the traffic situation and the corresponding solutions – any standard traffic situations that can be resolved by standard solutions (also referred to as scenarios) will have a benefitial effect on the preQI<br>• The airspace design – any change in airspace design will have a negative effect on the preQI. As such each AIRAC there will be a need to quantify the effect on the forecast demand of these airspace geometry and corresponding air traffic flow effects. As such this requirement has to be linked to:<br>  ○ Free Route Airspace (FRA)<br>  ○ Dynamic Airspace Configuration (DAC)<br>  ○ Advanced Flexible Use of Airspace (AFUA)<br>  ○ ATS Route Network definition (ARN)<br>  ○ Route Access Definitions (RAD) |
| Status | < in progress> |
| Rationale | The preQI will allow to integrate the Network Impact Forecast in a high confidence environment where the safety requirements are satisfied. High PreQI values will result in increased safety and may lead to the reduction of capacity buffers. This in turn will improve the network performance. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share Network FBT |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-GDFI.0050 |
| Title | Demand Forecast Visualisation |
| Requirement | The Demand Forecast shall be visualised using the Network Performance Monitoring tools. |
| Status | < in progress> |
| Rationale | The Demand Forecast shall not use isolated performance indicators, monitoring values or thresholds, targets or trend indicators but rely on the Network Performance Monitoring framework. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share Network FBT |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-IDFI.0100 |
| Title | Demand Forecast Preparation |
| Requirement | The Demand Forecast shall be initiated by loading the schedules of the flights representing the city pair, unique AircraftIdentification, and timetable. All flights landing, departing and overflying the AoR of the NM are considered.<br><br>These Flight Intentions shall be aggregated with the DDR in order to:<br><br>• add flights that are missing from the DDR<br>• remove flights that are cancelled or no longer operated (in the pre-Tactical period)<br>• compensate for missing schedule information (non-scheduled flights like business or military for pre-Tactical Demand Forecast in the D-6 D-1 pre-Tactical timeframe)<br>• allow for traffic growth adjustments (only for strategic and medium term Demand Forecast) |
| Status | < in progress> |
| Rationale | The Demand Forecast shall reflect the up-to-date schedules from Airports, Aircraft Operators, Business and Military flights. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share Network FBT |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-IDFI.0110 |
| Title | Initial Business Forecast Trajectory Computation |
| Requirement | A trajectory shall be derived for each flight intention in the Demand Forecast taking into account:<br>• the AircraftType and Performance<br>• the applicable timetable<br>• the Aircraft Operator priorities and preferences<br>• the known Airspace Configuration and Capacity<br>• the Meteorological conditions<br>The trajectory shall be derived for each flight intention in the Demand Forecast based on:<br>• the Probabilistic trajectory that matches the conditions of similar flights in a similar context (probable); or<br>• by insertion of a historical trajectory available from an archive when the probability cannot be resolved but which matches the conditions (likely), or<br>• in absence of a match in terms of conditions and context from a path generated by “best guess” (generated) |
| Status | < in progress> |
| Rationale | The Business Forecast Trajectory shall be classified as probable, likely, or generated. The number of flights belonging to these classes shall be input to determine the preQI. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share network FBT |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-IDFI.0120 |
| Title | Subsequent Business Trajectory Forecast Update |
| Requirement | The Business Trajectory Forecast shall be updated:<br>• with the flight planning information provided by the ADEP and/or ADES (API, DPI, …)<br>• with the effects from the ATFCM measures that result from a previous iteration of Network Impact Forecast<br>• or any flight status or event deemed relevant to improve the Demand Forecast |
| Status | < in progress> |
| Rationale | The Business Trajectory Forecast shall be continuously updated until the SBT/RBT or MBT are available such that the network performance can be optimised in function of the latest known network states and flight related events. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share Network FBT |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-IDFI.0130 |
| Title | Count Forecast Calculation |
| Requirement | The FBT shall be used to calculate the load of the airspaces. Where accurate and complete capacity data is available, the load state shall be determined.<br><br>The load state can be compared to historical records such that similar traffic situations can be recognised and suggested for resolution using predefined ATFCM measures, a.k.a. scenarios. This is however not in the scope of this requirement. |
| Status | < in progress> |
| Rationale | The Count Forecast shall be based on Entry and/or Occupancy counts. These values are neither statistical nor probabilistic. The flight is counted in the airspaces it penetrates to allow a historical perspective to be maintained.<br><br>Once a statistical or probabilistic distribution has been applied, it will be near to impossible to keep a record of all the factors that were applied and it is not possible to revert to the deterministic counts any longer, which means that it will become impossible to correlate a count with a set of flights in a certain condition. |
| Category | <Operational>,<Safety> |

[[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share Network FBT |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-IDFI.0140 |
| Title | Imbalance Forecast Calculation |
| Requirement | The load state shall allow to classify the traffic situation as:<br><br>Nominal situation (optispot or hotspot) :<br><br>• adequate: the Traffic Counts are below the monitoring threshold<br>• saturated: the monitoring threshold has been reached but the situation is safe – however there are synchronisation effects and the sequence of aircraft can be suboptimal but the negative effects to individual flights is negligible<br>• perturbed: the monitoring threshold has been exceeded and the traffic is affected in terms of timing or performance in a negative way; the effects are however not considered to be lasting or detrimental<br><br>Non Nominal situation (criticalspot, crisisspot) :<br><br>• critical: a measure is required to distribute the flights in time and space to avoid safety situations or conflicts, the traffic is severely impacted in terms of cost potentially requiring compensation, the situation is usually a consequence of a significant overload or over-delivery<br>• crisis: the traffic situation is heavily disturbed leading to flight cancellations, usually as consequence of a severe capacity reduction<br><br>The load state will be compared to historical records such that similar traffic situations can be recognised and suggested for resolution using predefined ATFCM measures, a.k.a. scenarios.<br><br>Forecast Demand in this version of the OSED will not deal with a crisis load state. |
| Status | < in progress> |
| Rationale | The Imbalance Forecast provides a synthetic view of the traffic demand versus the available capacity. It does not always trigger a measure. It may well be that the counts are below the capacity threshold and still a measure is required; and vice versa; the counts are above the capacity threshold but no measure is needed because the corresponding workload is acceptable and the safety of the aircraft is not in jeopardy. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share Network FBT |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-IDFI.0160 |
| Title | Forecasting Solutions for an imbalanced Traffic Situation. |
| Requirement | Where the load state is classified as Imbalanced, a solution will be defined to remedy the traffic situation that will be reflected in the FBT update |
| Status | < in progress> |
| Rationale | The Demand Forecast has to be updated with the effect of the measures so that the Traffic Demand forecast actually reflects the traffic situation that results from applying these measures. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share Network FBT |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-IDFI.0100 |
| Title | Demand Forecast Preparation |
| Requirement | The Demand Forecast shall be initiated by loading the schedules of the flights representing the city pair, unique AircraftIdentification, and timetable. All flights landing, departing and overflying the AoR of the NM are considered.<br>These Flight Intentions shall be aggregated with the DDR in order to:<br>• add flights that are missing from the DDR<br>• remove flights that are cancelled or no longer operated (in the pre-Tactical period)<br>• compensate for missing schedule information (non-scheduled flights like business or military for pre-Tactical Demand Forecast in the D-6 D-1 pre-Tactical timeframe)<br>• allow for traffic growth adjustments (only for strategic and medium term Demand Forecast) |
| Status | < in progress> |
| Rationale | The Demand Forecast shall reflect the up-to-date schedules from Airports, Aircraft Operators, Business and Military flights. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share Network FBT |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-IDFI.0100 |
| Title | Demand Forecast Preparation |
| Requirement | The Demand Forecast shall be initiated by loading the schedules of the flights representing the city pair, unique AircraftIdentification, and timetable. All flights landing, departing and overflying the AoR of the NM are considered.<br><br>These Flight Intentions shall be aggregated with the DDR in order to:<br><br>• add flights that are missing from the DDR<br>• remove flights that are cancelled or no longer operated (in the pre-Tactical period)<br>• compensate for missing schedule information (non-scheduled flights like business or military for pre-Tactical Demand Forecast in the D-6 D-1 pre-Tactical timeframe)<br>• allow for traffic growth adjustments (only for strategic and medium term Demand Forecast) |
| Status | < in progress> |
| Rationale | The Demand Forecast shall reflect the up-to-date schedules from Airports, Aircraft Operators, Business and Military flights. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share Network FBT |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-IDFI.0100 |
| Title | Demand Forecast Preparation |
| Requirement | The Demand Forecast shall be initiated by loading the schedules of the flights representing the city pair, unique AircraftIdentification, and timetable. All flights landing, departing and overflying the AoR of the NM are considered.<br><br>These Flight Intentions shall be aggregated with the DDR in order to:<br>• add flights that are missing from the DDR<br>• remove flights that are cancelled or no longer operated (in the pre-Tactical period)<br>• compensate for missing schedule information (non-scheduled flights like business or military for pre-Tactical Demand Forecast in the D-6 D-1 pre-Tactical timeframe)<br>• allow for traffic growth adjustments (only for strategic and medium term Demand Forecast) |
| Status | < in progress> |
| Rationale | The Demand Forecast shall reflect the up-to-date schedules from Airports, Aircraft Operators, Business and Military flights. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share Network FBT |
| <ALLOCATED_TO> | <role> | Regional ATFCM |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-VX.0010 |
| Title | Probabilistic Load |
| Requirement | The load methodology (EC, OC, complexity, ….) shall provide the quantification of the load uncertainties : probabilistic load. |
| Status | < in progress> |
| Rationale | The proposed methodology is based on a probabilistic distribution of trajectories (3D, time) with quantification of uncertainties in model parameters (flight status, cdm/no cdm airports...) |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.01-OSED-VX.0020 |
| Title | Vizualization of the Probabilistic Load |
| Requirement | The probabilistic load shall be vizualized on the TV monitoring. |
| Status | < in progress> |
| Rationale | The probabilistic load shall be vizualized on the TV monitoring. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

### 4.1.2 Predicted Workload

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.01-OSED-GCPX.0010 |

| | |
|---|---|
| Title | Predicted Workload Time Horizon |
| Requirement | INAP shall access to Predicted Workload methodologies that shall act in the 6 hrs – 10 min time horizon and shall encompass several methodologies<br>• Network Methods : Count (Entry Count, Occupancy Count)<br>• Local Methods : Complexity, Weighted Count, Extended Interference Detection |
| Status | < in progress> |
| Rationale | INAP can use different predicted workload methodologies according to the time horizon. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-GCPX.0020 |
| Title | Imbalance Confidence Index |
| Requirement | INAP shall access to the Imbalance Confidence Index (ICI) information.. (The ICI calculation shall be based on uncertainty models.) |
| Status | < in progress> |
| Rationale | The Imbalance Confidence Index quantifies the certainty that the imbalance will occur. It is a valuable information for INAP to support the decision-making. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Evaluate Confidence Index |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-GCPX.0030 |
| Title | Segregated Imbalance Confidence Index |
| Requirement | INAP shall have access to a segretated imbalance confidence index (to reflect granularity of prediction)<br>• ICI for Count<br>• ICI for Complexity |
| Status | < in progress> |
| Rationale | The different methodologies (Count, Complexity,…)shall provide the confidence index for the predicted workload. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Evaluate Confidence Index |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-GCPX.0040 |
| Title | Predicted Workload Monitoring Values |
| Requirement | INAP shall have access to the Monitoring Values in order to monitor and detect the predicted workload excess. |
| Status | < in progress> |
| Rationale | Monitoring Values represent the threshold to detect traffic excess. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Traffic Monitoring Value |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-GCPX.0050 |
| Title | Predicted Workload Visualization |
| Requirement | INAP shall have access to the predicted workload Local Visualization that provide information concerning<br>• Local Complexity & Network consolidated complexity<br>• Combination of several methodologies (density, complexity, interferences)<br>• Uncertainty, zoom on complexity factors |
| Status | < in progress> |
| Rationale | INAP shall vizualize key information about the predicted workload methodologies. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-GCPX.0060 |
| Title | Complexity Local Evaluation |
| Requirement | INAP shall have access to the complexity Assessment in order to perform a local traffic evaluation. |
| Status | < in progress> |
| Rationale | INAP shall be able to perform a complexity local evaluation |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Evaluate Imbalance Severities |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-GCPX.0070 |
| Title | Complexity Evaluation at the Network level |
| Requirement | INAP shall have access to the the complexity Assessment at the network level in order to perform a network traffic evaluation |
| Status | < in progress> |
| Rationale | INAP shall be able to perform a complexity evaluation at the network level |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Evaluate Imbalance Severities |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-GCPX.0080 |
| Title | Consolidated Network Imbalance |
| Requirement | NMf actors shall have access to the local imbalance figures that shall be collected to build a real-time, consistant and consolidated network imbalance view. To support such a capability, an imbalance repository is developed to collect all the local imbalances figures from ANSPs. This Imbalance Repository Service aggregates the imbalance figures in order to provide a consolidated network imbalance view. |
| Status | < in progress> |
| Rationale | The different local imbalance figures must be collected and consilidated in order to generate a consolidated network imbalance figure. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Consolidate Network Imbalances |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-GCPX.0090 |
| Title | Local Imbalance Interoperability |
| Requirement | The NMf actors shall have access to aninteroperable local imbalance methodologies that shall ensure the commonality of the imbalance severity values:<br>• Red : Above the peak threshold<br>• Orange : Above the sustain threshold for more than 20 minutes<br>• Yellow : Above the sustain value for less than 20 minutes<br>• Green : Below the sustain threshold |
| Status | < in progress> |
| Rationale | Interoperability between the methodologies provides a common understanding of the colour system being applied to an imbalance. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-GCPX.0100 |
| Title | Congestion Indicator |
| Requirement | NMf actors shall have access to the congestion indicator that value the SBT/RBT consolidated network Imbalance figure. It expresses the severity of the imbalance :<br>- Green : no imbalance (no severity)<br>- Orange : medium imbalance (medium severity)<br>- Red : severe imbalance (high severity) |
| Status | < in progress> |
| Rationale | CI is required to enable a view of all the imbalances that are affecting a SBT/RBT. This helps in understanding the tractectories that can be targeted for solution and also allows for efficient selection and implementation of measures. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Compute Congestion Indicator |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-GCPX.0110 |
| Title | Congestion Indicator Dissemination |
| Requirement | NMf actors shall have access to the Congestion Indicator in order to perform what-if to compare alternate SBT/RBT to identify the best DCB solutions. |
| Status | < in progress> |
| Rationale | NII is required to enable a view of all the imbalances that are affecting a SBT/RBT. This helps in understanding the tractectories that can be targeted for solution and also allows for efficient selection and implementation of measures. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Compute Congestion Indicator |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0010 |
| Title | Complexity assessment criterias |
| Requirement | The LTM/EAP shall be able to assess the traffic complexity based on their local criterias |
| Status | <in progress> |
| Rationale | The complexity tool for estimation, assessment and monitoring of the air traffic situation complexity criterias to be as flexible as possible. This will allow the LTM/EAP to assess traffic complexity based on their needs. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Evaluate Imbalance Severities |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0020 |
| Title | Complexity timeframe and airspace volume selection |
| Requirement | The LTM/EAP shall be able to define and select a specific airspace volume and timeframe to assess complexity |
| Status | <in progress> |
| Rationale | The granularity for the traffic complexity assessment, both in terms of time and airspace volume, might vary depending on the LTM/EAP needs. For this reason, these parameters need to be configurable. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0030 |
| Title | Default period of time for complexity prediction calculation |
| Requirement | The LTM/EAP shall have access to the complexity prediction over a default period of time (e.g. complexity calculated in segments of 10 minutes) |
| Status | <in progress> |
| Rationale | If the operator does not select a particular period of time over which the complexity predictions will be calculated, the system shall be able to provide it by default. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0040 |
| Title | Period of time for complexity prediction calculation |
| Requirement | The LTM/EAP shall be able to select a period of time over which the complexity prediction will be calculated |
| Status | <in progress> |
| Rationale | The LTM/EAP might need to modify the default period of time over which complexity prediction is calculated depending on their needs (e.g. complexity calculated in segments of 5 minutes instead of 10 minutes) |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0050 |
| Title | Visualization of the most probable FPL/trajectory |
| Requirement | The LTM/EAP should be provided with the display of the most probable FPL/trajectory (containing the route with the highest probability to be flown) based on historical and existing FPL/trajectory data |
| Status | <in progress> |
| Rationale | In order to consider the most probable and accurate complexity prediction value, the LTM/EAP might be interested in knowing the most probable FPL/trajectory based on historical and existing FPL/trajectory data. The visualisation of the most probable FPL/Trajectory will provide the user with a demand picture that is likely to be realised; this will lead to better decision making and reduced impact to flights due to application of measures that in reality are not needed (false positives) |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0060 |
| Title | complexity Prediction for INAP |
| Requirement | The LTM/EAP should be provided with complexity prediction over the defined scope (airspace volume) and timeframe selected |
| Status | <in progress> |
| Rationale | The complexity estimation must take into account the parameters defined for complexity assessment, that is, the scope (airspace volume), the timeframe and the period of time over which the complexity will be calculated (e.g. segments of 10 minutes). |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0070 |
| Title | Automatic estimation of complexity |
| Requirement | The LTM/EAP should be provided with complexity prediction automatically calculated by default for the scope and timeframe defined by the INAP actors (e.g. complexity estimations provided every 15 minutes)(Assuming that the system is able to read the current data from the system's environment data) |
| Status | <in progress> |
| Rationale | The LTM/EAP could be interested in being provided with automatic complexity estimations apart from the manual assessments requested |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0080 |
| Title | Complexity timeframe visualization |
| Requirement | The LTM/EAP shall be able to configure the timeframe in which complexity is displayed |
| Status | <in progress> |
| Rationale | Depending on the role, the relevant time horizon of the complexity prediction presentation may be different. For this reason, it is necessary to be able to modify it. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0090 |
| Title | Complexity value visualization |
| Requirement | The LTM/EAP shall be able to visualize complexity values in two variants:<br>a) complexity value calculated by the local tool;<br>b) outcome of the complexity level, based on the set of complexity thresholds established |
| Status | <in progress> |
| Rationale | The EAP/LTM might need to visualize the complexity values in different ways: graphically and numerically. The representation of the outcome of the complexity level will allow a quicker understanding of the air traffic situation, as well as a more efficient identification of the need to propose DCB/DCB measures. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0100 |
| Title | Complexity estimation display |
| Requirement | The LTM/EAP shall be provided with a synthetic geographical visualization of local complexity over their area of responsibility (e.g. by using a heat map) |
| Status | <in progress> |
| Rationale | In order to facilitate the traffic complexity values interpretation, a visual representation of the complexity is needed (e.g. heat maps) |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0110 |
| Title | Complexity indicator value appropriateness |
| Requirement | The LTM/EAP shall be provided with the complexity value depending on the most appropriate complexity indicator for the timeframe selected |
| Status | <in progress> |
| Rationale | Depending on the timeframe selected, the most appropriate indicator to assess complexity might be different. The system shall be able to automatically provide the complexity value based on the appropriate indicator. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0120 |
| Title | Complexity indicator selection |
| Requirement | The LTM/EAP shall be able to select the desired complexity indicators to perform the analysis of the traffic situation, independently of being or not the most appropriate for the timeframe selected |
| Status | <in progress> |
| Rationale | The LTM/EAP might need to know the complexity value provided for all the available complexity indicators within the system, even if these indicators are not the most appropriate for the timeframe selected. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0130 |
| Title | Complexity indicator & imbalance confidence index |
| Requirement | The LTM/EAP shall be able to consult the imbalance confidence index associated to the complexity indicator value predicted |
| Status | <in progress> |
| Rationale | In order to ensure the efficiency of the decision making process, the LTM/EAP shall be aware of the imbalance confidence index with which complexity is being estimated. The imbalance confidence index must be available for all the possible complexity indicators. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <Activity> | Evaluate Confidence Indexes |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0140 |
| Title | Complexity details request |
| Requirement | The LTM/EAP shall be able to request details on the displayed complexity, request solution calculations or change some of the complexity management settings and configuration |
| Status | <in progress> |
| Rationale | In order to get a better understanding of the air traffic situation complexity and propose appropriate measures, the LTM/EAP might need to request all the available information to be displayed regarding complexity and possible solutions to be applied. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0150 |
| Title | Complexity filtering |
| Requirement | The LTM/EAP shall be able to filter complexity information by traffic flows and individual trajectories |
| Status | <in progress> |
| Rationale | The LTM/EAP should be able to manually filter certain traffic flows and individual trajectories for complexity assessment. The LTM/EAP might decide that certain traffic flows or individual trajectories should not be part of the complexity assessment for the defined scope (e.g. OATs or other specific traffic flows that due to its characteristics may be decided not to be included in the scope for the complexity prediction). |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0160 |
| Title | Predicted and actual complexity comparison |
| Requirement | The LTM/EAP shall be able to compare the predicted complexity value and the actual complexity value for a given airspace volume and timeframe |
| Status | <in progress> |
| Rationale | Complexity prediction is complemented with an imbalance confidence index indicating the range in which the prediction may evolve over time horizon. As complexity prediction is a key feature of DCB/DCB, its reliability is crucial for complexity management. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0170 |
| Title | Individual flight complexity contribution |
| Requirement | The LTM/EAP shall be able to select specific flights associated to a time interval and airspace volume from the list of aircraft contributing to complexity to assess the individual contribution of each flight to the global complexity value |
| Status | <in progress> |
| Rationale | The LTM/EAP shall be aware of the contribution of each flight to the global complexity value in order to select the appropriate flights over which DCB measures (e.g. STAM) will be applied. This fact will increase the efficiency of the solutions proposed and will improve the decision making process. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0180 |
| Title | Traffic flow complexity contribution |
| Requirement | The LTM/EAP shall be able to select specific traffic flows associated to a time interval and airspace volume from the list of traffic flows contributing to complexity to assess the individual contribution of each traffic flow to the global complexity value |
| Status | <in progress> |
| Rationale | The LTM/EAP shall be aware of the contribution of each traffic flow to the global complexity value in order to select the appropriate flows of traffic over which DCB measures (e.g. STAM) will be applied. This fact will increase the efficiency of the solutions proposed and will improve the decision making process. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0190 |
| Title | Individual flight complexity contribution within traffic flows |
| Requirement | The LTM/EAP shall be able to select specific flights associated to a traffic flow to assess the individual contribution of each flight to the global traffic flow complexity value |
| Status | <in progress> |
| Rationale | The LTM/EAP might be interested in knowing the complexity root cause of the traffic flows contributing to the global complexity. For this reason, the LTM/EAP might need the individual contribution of the flights that belong to the traffic flow under analysis to the traffic flow global complexity value. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0200 |
| Title | Identification of the most complexity contributor flights |
| Requirement | The LTM/EAP shall have access to an automatic identification of the flights contributing the most to complexity within a specific airspace volume and timeframe (e.g. ranked list) |
| Status | <in progress> |
| Rationale | In order to make the decision making process quicker and more efficient, the LTM/EAP need to have available an automatic identification of the flights contributing the most to complexity (e.g. by means of a ranked list). This will allow a better identification of the most appropriate flights over which DCB measures should be applied. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Evaluate Imbalance Severities |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0210 |
| Title | Complexity what-if assessment |
| Requirement | The LTM/EAP should be able to perform complexity what-if assessments |
| Status | <in progress> |
| Rationale | When proposing a DCB measure, the LTM/EAP might be interested in previously assessing the impact in complexity of the measure application. This should be done by means of complexity what-if assessment functionalities. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Evaluate Imbalance Severities |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0220 |
| Title | Workload Prediction monitoring |
| Requirement | The LTM/EAP should be able to monitor the traffic complexity related to a specific airspace volume and timeframe |
| Status | <in progress> |
| Rationale | The LTM/EAP should be provided with the appropriate tools for monitoring the air traffic complexity situation so as to identify imbalances, thus candidate hotspots. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0230 |
| Title | Complexity thresholds establishment |
| Requirement | The LTM/EAP shall be able to define and establish complexity thresholds for a specific airspace volume and timeframe through an interactive window |
| Status | <in progress> |
| Rationale | In order to detect a complexity overload it is required the existence of thresholds (i.e. complexity limits) that allow LTM/EAP to make decisions in an objective way (e.g. thresholds for a sustainable value, thresholds for peak value, etc). |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Traffic Monitoring Values |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0240 |
| Title | Complexity thresholds modification |
| Requirement | The LTM/EAP shall be able to modify complexity thresholds for a specific airspace volume and/ or flow and timeframe through an interactive window |
| Status | <in progress> |
| Rationale | The LTM/EAP could be interested in modifying the complexity thresholds value during operations. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Traffic Monitoring Values |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0250 |
| Title | Complexity alerts |
| Requirement | The LTM/EAP shall be alerted when the complexity value is above a established threshold |
| Status | <in progress> |
| Rationale | The LTM/EAP awareness of complexity exceeding predefined thresholds needs to be ensured by means of visual alerts displayed in the LTM/EAP's complexity management tool. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0260 |
| Title | Complexity situations classification |
| Requirement | The LTM/EAP shall have an access to an automatic complexity prediction classification (e.g. complexity situations classified as NON-CRITICAL or CRITICAL). This classification should be based on the complexity thresholds defined in the system. |
| Status | <in progress> |
| Rationale | The automatic complexity situations classification based on complexity thresholds facilitates the LTM/EAP's situational awareness and understanding of the air traffic complexity situation, as well as a quicker identification of imbalances (thus, candidate hotspots). |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Evaluate Imbalance Severities |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0270 |
| Title | Complexity situations marking process |
| Requirement | The LTM/EAP shall be able to mark a situation as CRITICAL and request complexity details even if the traffic complexity value is under the established thresholds |
| Status | <in progress> |
| Rationale | Based on their experience and local knowledge, the LTM/EAP might need to mark a situation as CRITICAL, even if the complexity threshold is not exceeded, because the monitoring of this situation is important for some reason. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Evaluate Imbalance Severities |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0280 |
| Title | Complexity post-analysis |
| Requirement | Local DCB actors should be able to perform complexity post-analysis taking into account the stored data |
| Status | <in progress> |
| Rationale | Post analysis of DCB/DCB solutions efficiency in terms of complexity is needed to identify best practice and deficiencies as an input for operational and strategic decision making. Stored data should include information such as 4D trajectory information, complexity predictions, calculations performed, etc. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Evaluate Imbalance Severities |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0290 |
| Title | Airspace sectorisation impact in complexity assessment |
| Requirement | The LTM/EAP shall be able to perform complexity what-if assessments for different airspace configurations and airspace granularities (Dynamic Airspace Configuration) |
| Status | <in progress> |
| Rationale | The complexity tool shall provide complexity predictions on-request for different sectorisation scenarios, selected by the LTM/EAP, before they are operationally applied or scheduled. The human operator may be interested in knowing the complexity prediction of a sector configuration, different from the current one, as it would be active in a specific time period in the future. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0300 |
| Title | Airspace sectorisation proposal for complexity distribution |
| Requirement | The LTM/EAP shall be able to propose airspace sectorisation changes for the optimisation of complexity distribution |
| Status | <in progress> |
| Rationale | In order to optimize the distribution of complexity across sectors, the LTM/EAP shall be able to propose more appropriate sector configurations after performing the adequate complexity what-if analysis. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Implement de-Complexing |
| <ALLOCATED_TO> | <Activity> | Dynamic re-sectorisation |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0310 |
| Title | Airspace information for complexity assessment |
| Requirement | The LTM/EAP shall have available all the updated information regarding airspace configurations, including airspace availability limitations due to weather or special use of airspace reservations (e.g. events) for complexity assessment purposes |
| Status | <in progress> |
| Rationale | Airspace configuration information and airspace availability limitations are needed so as to obtain accurate complexity estimations (for both predicted/actual complexity values and during what-if assessments). |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Daily Operation Plan |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0320 |
| Title | Airspace Reservation impact in complexity calculation |
| Requirement | The LTM/EAP shall be able to measure the impact of the activation/deactivation of an Airspace Reservation (ARES) in complexity |
| Status | <in progress> |
| Rationale | The system and operator's awareness of the activation and deactivation of Airspace Reservation (ARES) impact is essential for the quality of complexity prediction and availability of resolutions. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0330 |
| Title | Complexity tool status awareness |
| Requirement | The LTM/EAP shall be made aware of the system status that indicates if the tool is working properly or in degraded mode (connection failure, no update of environment, computation failure…) |
| Status | <in progress> |
| Rationale | The LTM/EAP’s awareness of the system status is necessary for the validity of the decision making. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0340 |
| Title | Complexity calculation status awareness |
| Requirement | The LTM/EAP shall have an access to the information whether complexity calculation is in progress or done |
| Status | <in progress> |
| Rationale | The LTM/EAP must be visually aware when the complexity prediction is about to change because it is being re-calculated (Operator's situation awareness and time management reasons). |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0350 |
| Title | Modification of predetermined TMV |
| Requirement | The LTM/EAP shall be able to change the predetermined TMV values |
| Status | <in progress> |
| Rationale | their The LTM/EAP shall be able to change the predetermined TMV values |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Traffic Monitoring Values |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0360 |
| Title | Visualisation of demand, workload, complexity peaks and TMV values |
| Requirement | The visualisation of demand, workload, complexity peaks and TMV values shall be displayed within the available operational information |
| Status | <in progress> |
| Rationale | For the TMV values to be useful, the user needs to see them within the available operational information. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0370 |
| Title | Visualisation of demand, workload or complexity peaks with interactive window |
| Requirement | The LTM/EAP shall be able to set the Traffic Monitoring Values (TMV) related to hotspots, using an interactive window. |
| Status | <in progress> |
| Rationale | The user needs to be able to tailor the system to their needs |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-CPX.0380 |
| Title | Visualisation of demand, workload or complexity peaks above thresholds |
| Requirement | The LTM/EAP shall be able to visualize if values of demand, workload or complexity for a given airspace volume are above predetermined thresholds. |
| Status | <in progress> |
| Rationale | Hotspot identification is based on the identification of peaks (using OTMV (occupancy traffic monitoring values). Their visualization provides the user with the potential context and location of a candidate hotspot. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

### 4.1.3 Network Performance

REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-PERF.0001 |
| Title | Shareable Performance Indicators |
| Requirement | NMf actors (NM, INAP, APT, AU) shall define shareable Performance Indicators, threesholds and targets in order to allow an NMf actor to accommodate both its own PIs and external PIs when designing a DCB solution. It shall support a Collaborative performance management. |
| Status | <in progress> |
| Rationale | A NMf actor must design a DCB solution trying to accommodate both own PIs and PIs expressed by the other stakeholders. |
| Category | Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-PERF.0002 |
| Title | Performance Dashboard |
| Requirement | NMf actors shall been able to vizualize the Performance Dashboard displaying the Performance Indicators, Threesholds, Targets of the different stakeholders in order to design solution accomodating the different PIs |
| Status | <in progress> |
| Rationale | NMf actors must been able to vizualize the Performance Dashboard displaying the Performance Indicators, Threesholds, Targets of the different stakeholders in order to design solution accomodating the different PIs |
| Category | Operational> |

[[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-PERF.0003 |
| Title | Performance Management |
| Requirement | NMf actors (NM, INAP, APT, AU) shall design a solution trying to find the best trade-off accomodating the different stakeholder's PIs. This task shall be supported by the Performance Dashboard and What-if assessment. |
| Status | <in progress> |
| Rationale | NMf actors will use a Performance DashBoard and what-if assessment to find the best trade-off accomodating the different stakeholder's PIs |
| Category | Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-PERF.0041 |
| Title | Common Understanding of Performance Indicators |
| Requirement | Each PI shall convey identical understanding for each NMf to support collaboration processes, hence to facilitate Decision Making |
| Status | <in progress> |
| Rationale | Each PI must convey identical understanding for each NMf to support collaboration processes, hence to facilitate Decision Making |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-PERF.0050 |
| Title | Thresholds |
| Requirement | NMf actors shall define Thresholds Minimum/Maximum for each Performance Indicators (PI) |
| Status | <in progress> |
| Rationale | Each PI must defined a dedicated thresholds Minimum/Maximum |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| *<ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-PERF.0060 |
| Title | Threshold Collaborative Management |
| Requirement | NMf actors shall decide **collaboratively and relatively** on threshold definition |
| Status | <in progress> |
| Rationale | Each PI with dedicated thresholds are based on collaborative decision making |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| *<ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-PERF.0070 |
| Title | Trade-off |
| Requirement | NMf actors shall define trade-off to give a value for a set of performance targets in order to support an optimisation driven process |
| Status | <in progress> |
| Rationale | A trade-off is defined to give a value for a set of performance targets in order to support an optimisation driven process |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-PERF.0080 |
| Title | Performance Network Impact Assessment Methodology |
| Requirement | A Performance Network Impact assessment methodology shall be developed in order to guide the collaborative decision-making process accomodating the performance indicators (PI) of the different actors, the thresholds and Performance targets/trade-off |
| Status | <in progress> |
| Rationale | A Performance Network Impact assessment methodology is developed in order to guide the collaborative decision-making process accomodating the performance indicators (PI) of the different actors, the thresholds and Performance targets/trade-off |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-PERF.0090 |
| Title | Network Performance Assessment Tool |
| Requirement | NMf actors shall have access to a Network Performance Assessment tool in order to assess the impact of DCB measures on the performance at the network level and for the individual SBT/RBT : it shall be composed of a Performance Dash-board and what-if |
| Status | <in progress> |
| Rationale | Performance Dash-board and What-if at the network level must be available to assess the network impact of DCB measures. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.01-OSED-PERF.0110 |
| Title | Selection of Performance Indicators |
| Requirement | The Performance Indicators for NMf actors shall be based on :<br>• PI for AU: Margins of Manoeuvre<br>• PI for ANSP : Congestion Indicator<br>• PI for NM : Margins of Manoeuvre<br>• PI for APT : Network State Prediction (Resilience) |
| Status | <in progress> |
| Rationale | Each main stakeholders shall be able to express their Performance Indicators |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
| --- | --- | --- |
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
| --- | --- |
| Identifier | REQ-09.02-OSED-PERF.0120 |
| Title | Impact of each potential measure on the hotspot situation |
| Requirement | For each potential solution, the LTM/EAP shall be able to identify the changes on the hotspot key-parameters: entry counts, occupancy counts, complexity, extended interaction detection. |
| Status | <in progress> |
| Rationale | The user must assess the impact (positive or negative) of each potential solution. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
| --- | --- | --- |
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.01-OSED-NSRI.0010 |
| Title | Network States Visualization |
| Requirement | Network States shall be visualised using the Network Performance Monitoring tools. |
| Status | < in progress> |
| Rationale | Network States shall be based on available data sources and shall rely on the Network Performance Monitoring framework. |
| Category | <Operational> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share Network State |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.01-OSED-NSRI.0020 |
| Title | Network States and Resilience Indication shall be implemented as a collaborative regional NM function. |
| Requirement | Network States and Resilience shall be implemented as an ATFCM functional support for all active DCB actors, i.e. NM, ANSPs, AUs, Airports, and others relevant to local and regional network operations. |
| Status | < in progress> |
| Rationale | The quality of network states and resilience indication relies on the quality of data availability and drives the whole network picture. It therefore needs to be accepted by all actors. |
| Category | <Operational> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | State and Resilience Implementation |
| <ALLOCATED_TO> | <role> | Regional&local ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.01-OSED-NSRI.0030 |
| Title | Historical Network Data Reference Period |
| Requirement | Historical network data sources for the required regulation data sources (ANM, NMIR) have to provide a sufficient time period of at least one month of the actual flight plan period to serve the need for reference data/cases for the evaluation of network states. |
| Status | < in progress> |
| Rationale | Reference data periods need to be selected with care in relation to actual season specific network properties. |
| Category | <Operational> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | State and Resilience Data Reference Period |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.01-OSED-NSRI.0040 |
| Title | Network Resilience Measure Obligation |
| Requirement | The acceptance of collaboratively decided and necessary resilience measures on local and regional level shall be supported and implemented throughout the DCB community as long as the indicated network state is in non-nominal condition. |
| Status | < in progress> |
| Rationale | During periods of non-nominal network states at which resilience indicators support decision making in order to return to a nominal condition, network resilience management is with NM, implementing binding resilience measures from the regional network perspective. |
| Category | <Operational> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | State and Resilience Acceptance |
| <ALLOCATED_TO> | <role> | Regional&local ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

### 4.1.4 Hotspot Management

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0001 |
| Title | Spot-Centric |

| | |
|---|---|
| Requirement | NMf actors shall manage different type of spot category (Hotspot, Optispot), ensuring the proper planning, implementation and monitoring of the problem resolution. |
| Status | < in progress> |
| Rationale | NMf actors manage different type of spot category (Hotspot, Optispot), ensuring the proper planning, implementation and monitoring of the problem resolution. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Create Initial Hotspot |
| <ALLOCATED_TO> | <Activity> | Create Initial Optispot |
| <ALLOCATED_TO> | <Activity> | Prepare and Implement DCB Solution |
| <ALLOCATED_TO> | <Activity> | Define Monitoring Threshold |
| <ALLOCATED_TO> | <Activity> | Update Spot |
| <ALLOCATED_TO> | <Activity> | Monitor Spot |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0010 |
| Title | Type of Traffic Monitoring Values |
| Requirement | NMf actors shall be able to define different types of Traffic Monitoring Values (TMV). These thresholds represent different objectives (safety, rate optimisation, critical & crisis situation ….) and are related to different meanings (TMV-safety, TMV-resilience, TMV-rate) |
| Status | < in progress> |
| Rationale | NMf actors can define different types of Traffic Monitoring Values (TMV). These thresholds represent different objectives (safety, rate optimisation, critical & crisis situation ….) and are related to different meanings (TMV-safety, TMV-resilience, TMV-rate) |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Traffic Monitoring Value |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0011 |
| Title | TMV-safety |
| Requirement | NMf actors shall be able to define safety thresholds (TMV-safety) |
| Status | < in progress> |
| Rationale | TMV-safety: Initially introduced in SESAR1 with the peak and sustain thresholds. It aims at preventing execessive ATC workload and to ensure that the traffic delivered to ATC controllers will always be manageable in the safe limits of workload. It represents the acceptable limits in term of controller workload, and implicitly potential safety risks. TMV-safety are defined with two thresholds (peak, sustain). It defines the context of a safety issues in nominal situations marked out by a **Hotspot**. Thus, a hotspot is triggered by TMV (safety marks) violation. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Traffic Monitoring Value |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0012 |
| Title | TMV-resilience |
| Requirement | NMf actors shall be able to define resilience thresholds (TMV-resilience) |
| Status | < in progress> |
| Rationale | TMV-resilience: It aims at detecting the change of the state of the system from nominal to critical and crisis states. TMV-resilience are defined with two thresholds (critical, crisis) It defines the context of critical or crisis issues marked out by a CriticalSpot or a CrisisSpot. Thus, an CriticalSpot is triggered by TMV (critical marks) violation and a CrisisSpot is triggered by TMV (crisis marks) violation |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Traffic Monitoring Value |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0013 |
| Title | TMV-rate |
| Requirement | NMf actors shall be able to define a rate thresholds (TMV-rate) |

| | |
|---|---|
| Status | < in progress> |
| Rationale | TMV-rate: It aims at preventing bunch and to ensure that the traffic delivered to ATC controllers will always be manageable in an organised and smoothed way. There is no safety issue. It defines the context of an optimisation issues marked out by an Optispot. Thus, an Optispot is triggered by TMV (rate marks) violation. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Traffic Monitoring Value |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0020 |
| Title | Spot Category (1) |
| Requirement | The NMf actors shall shall trigger different category of spot<br>• TMV-safety : Hotspot<br>• TMV-resilience : CriticalSpot, CrisisSpot<br>• TMV-rate : OptiSpot |
| Status | < in progress> |
| Rationale | Different type of TMV generate different type of spot category (hotspot, optispot, …) |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Traffic Monitoring Value |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| Identifier | REQ-09.02-OSED-HSPT.0030 |
|---|---|
| Title | Spot Category (2) |
| Requirement | NMf actors shall determine the category of spot |
| Status | < in progress> |
| Rationale | The Constraint Reconciliation will determine the MIP (Most Important problem) according to the category of spot declared/notified. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Create Initial Hotspot |
| <ALLOCATED_TO> | <Activity> | Create Initial Optispot |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| Identifier | REQ-09.02-OSED-HSPT.0040 |
|---|---|
| Title | Initial Spot |
| Requirement | The initial spot shall correspond to the initial imbalance captured by INAP |
| Status | < in progress> |
| Rationale | Start time/End time of the initial spot corresponds to the initial area determined by the NMf actor |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Create Initial Hotspot |
| <ALLOCATED_TO> | <Activity> | Create Initial Optispot |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0050 |
| Title | Final Spot |
| Requirement | The final spot shall include the recovery period and corresponds to the traffic initially contained in the Initial Spot and smoothed in the available TFV capacity. |
| Status | < in progress> |
| Rationale | The final spot includes the recovery period and corresponds to the traffic initially contained in the Initial Spot and smoothed in the available TFV capacity. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Update Spot |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0060a |
| Title | TMV-Monitoring |
| Requirement | INAP shall define TMV-monitoring threshold to monitor any deviation from the DCB solution |
| Status | < in progress> |
| Rationale | TMV-monitoring is set to detect deviation from the planned hotspot resolution plan. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor Spot |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0060b |
| Title | Alert to monitor solution implementation and efficiency |
| Requirement | INAP shall monitor the final hotspot and generate alerts should the DCB solution deviate during the execution phase and notify the stakeholders |
| Status | < in progress> |
| Rationale | Once the solution has been prepared and implemented, the 'Spot Final' shall be monitored to ensure that the DCB solution is properly executed and is not deviating. It will trigger an automatic alert in case of deviations. Such monitoring mainly aims at ensuring that the spot resolution is progressing correctly and to take additional corrective actions if necessary. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor Spot |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0061 |
| Title | Management of the Hotspot Deviation |
| Requirement | INAP actors shall be informed of the Hotspot Deviation Alert and shall take additional DCB measures if necessary to re-assess the Hospot resolution |
| Status | < in progress> |
| Rationale | INAP actors is informed of the Hotspot Deviation Alert and shall take additional DCB measures if necessary to re-assess the Hospot resolution |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor Spot |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0070 |
| Title | Monitoring workload forecast in relation to hotspots |
| Requirement | INAP shall be able to access workload predictions to monitor their values and know if there are some deviations or changes from initial conditions, not only for new hotspots but also for existing ones. |
| Status | <in progress> |
| Rationale | Hotspots can be identified using three different approaches: demand, workload and complexity. Being aware of changes to any of these parameters is key to the provision of hotspot identification services. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Evaluate Imbalance |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0090 |
| Title | Monitoring flight plan deviations in relation to hotspots |
| Requirement | The system shall highlight the deviations from initial flight plan to ease the identification of changes, not only for new hotspots but also for existing ones. |
| Status | <in progress> |
| Rationale | The estimation of demand, workload and complexity depend strongly on the filed flight plan. Any changes to the flight plan have to be identified as soon as possible (including changes arising from the actual operation of the flight). |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor Spot |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0100 |
| Title | Timeframe and airspace monitoring selection in relation to hotspots |
| Requirement | INAP shall be able to monitor using different timeframe and the airspace when and where he/she wants to monitor the demand, workload, and complexity forecasts, as well as flight plan deviations, in relation to hotspots.. |
| Status | <in progress> |
| Rationale | The system must provide the user with the flexibility to choose when and where he/she wants to analyse the traffic situation. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Apply Imbalance Methdologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT_p.0140 |
| Title | Hotspot severity information |
| Requirement | INAP shall be informed, based on predetermined thresholds, about the severity of the hotspot. The severity (high, medium, low) is obtained according to the rules :<br>- High : > peak threeshold<br>- Medium : > sustain threeshold & > 20 min duration<br>- Low : > sustain threeshold & < 20 min duration |
| Status | <in progress> |
| Rationale | If a threshold is exceeded, the system should notify the user about the fact. This will allow the user to take appropriate action based on the available information. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Traffic Monitoring Value |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |



[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0160 |
| Title | Key-parameters of the potential hotspot |
| Requirement | INAP shall be able to select and display for a potential hotspot, all the different parameters related to its calculation: entry counts, occupancy counts, complexity. |
| Status | <in progress> |
| Rationale | The user need to know several key-parameters to have a better understanding of the hotspot, and to analyse, based upon their experience, the incidence of the potential hotspot. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Apply Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

-----------------------------Definition and implementation of a Hotspot Solution--------------------------

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0170 |
| Title | Extended information about flights within the hotspot. |
| Requirement | Once the hotspot has been identified, INAP shall be able to consult the available information of demand data and flights impacted by the hotspot. This flight list will include the following attributes:<br>• Accurate flight status(e.g. Landed, En-Route)<br>• Aircraft altitude and attitude<br>• Hotspot entry/exit time<br>• Specific mark on flights with previous penalizations in other LTMs<br>• Specific mark on flights concerned by on-going other hotspots |

| | |
|---|---|
| | • Specific mark on flights concerned by on-going other hotspots associated to a proposed/coordinated/released STAM |
| Status | <in progress> |
| Rationale | The definition and implementation of a hotspot solution will be based on the information available on the system. This information should be readily available to the user. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Share Hotpot with Stakeholders |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT_p.0200 |
| Title | Definition of potential solution to the hotspot -> INAP/CORSE |
| Requirement | For each detected hotspot, INAP shall be able to define and store candidate hotspot solutions. The user should be able to further edit these candidate solutions or select them as needed, via the hotspot identifier. |
| Status | <in progress> |
| Rationale | The solution definition process should be able to define and test as many solutions as required, for each detected hotspot. To ensure that no information is lost the user should be able to access these candidate solutions at any time. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Consolidate DCB Measures |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT_p.0210 |
| Title | Definition of candidate solution templates to the hotspot -> INAP/CORSE |
| Requirement | INAP shall be able to define and store solution templates to the hotspot for later reuse. |
| Status | <in progress> |
| Rationale | There are instances where solutions are similar to other ones. The user should be able to reuse the information that was derived by other users or experts. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Consolidate DCB Measures |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT_p.0211 |
| Title | Definition of customizable candidate solution templates to the hotspot -> INAP/CORSE |
| Requirement | These templates shall be customizable by the user and shareable with INAPs from other ACCs/ ANSPs. |
| Status | <in progress> |

| | |
|---|---|
| Rationale | This template shall be customizable by the user and shareable with INAPs from other ACCs/ ANSPs. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Consolidate DCB Measures |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT_p.0260 |
| Title | 2D/3D view of the hotspot information |
| Requirement | INAP shall be able to change the view from the flight list to a 2D/3D view of the airspace of LTM/EAP area of responsibility which integrates the hotspot information and the flight list. |
| Status | <in progress> |
| Rationale | This should provide the user with additional contextual information leading to better decision making. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Share Hotspot with Stakeholders |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0290 |
| Title | Exclusion of some flights from the hotspot measure application |
| Requirement | INAP shall be able to select individual flights to exclude them from the potential STAM or regulation (hotspot measures). |
| Status | <in progress> |
| Rationale | This is part of the what-if capabilities required from the system. This also permits to cherry pick flights. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare and Implement DCB Measures |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0300 |
| Title | Selection of the solution for hotspot |
| Requirement | INAP shall be able to select any solution or combination of solutions for detected hotspot. |
| Status | <in progress> |
| Rationale | After the what-if process has been completed, the user should be able to select the best solution or combination of solutions. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare and Implement DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0330 |
| Title | Hotspot declaration |
| Requirement | INAP shall be able to declare hotspot using a system automatic interface. |
| Status | <in progress> |
| Rationale | In some instances where both the context and the contour conditions are clear, the system should be able to propose automatically a hotspot. In all cases the hotspot will need to be confirmed by the user. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Create Initial Hotspot |
| <ALLOCATED_TO> | <Activity> | Create Initial Optispot |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

-------------------------------------------------Coordination-----------------------------------------------------------

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0340 |
| Title | Hotspot notification |
| Requirement | INAP shall be able to notify NM and AUs the hotspot using a system automatic interface. |

| | |
|---|---|
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Share Hotspot with Stakeholders |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

-------------------------------------------Monitoring of a Hotspot Solution--------------------------------------

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0350 |
| Title | Hotspot monitoring |
| Requirement | INAP shall be able to access the information (key-parameters) of a published hotspot, in order to assess the impact of the proposed solution. |
| Status | <in progress> |
| Rationale | The user must know hotspot key-parameters such as, entry counts or occupancy counts; thus, he or she could assess if the adopted measure has a positive or negative impact. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor Spot |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0360 |
| Title | Hotspot attributes |
| Requirement | INAP shall be able to access the information that defines a published hotspot.<br><br>• Traffic volume name<br>• With effect from<br>• Until<br>• Severity<br>• Reason for decision<br>• Status |
| Status | <in progress> |
| Rationale | Any user must be able to view the hotspot and its defining attributes. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Share Hotspot with Stakeholders |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0370 |
| Title | Hotspot status |
| Requirement | INAP shall be able to access the status information of a published hotspot:<br><br>• Proposed<br>• Coordinated<br>• Abandoned |

| | |
|---|---|
| | • Implemented<br>• Cancelled |
| Status | <in progress> |
| Rationale | The system will provide hotspot status information. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Share Hotspot with Stakeholders |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

------------------------------------------Cancelling of a Hotspot Solution-------------------------------------

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0380 |
| Title | Hotspot cancellation |
| Requirement | INAP shall be able to select a hotspot, with disregard of hotspot status, and cancel it. |
| Status | <in progress> |
| Rationale | If the user decides that a hotspot is no longer required, he or she must be able to cancel it. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Update Spot |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-HSPT.0390 |
| Title | Hotspot cancellation notification |
| Requirement | INAP shall be able to automatically notify to Collaborative NOP when a hotspot has been cancelled. |
| Status | <in progress> |
| Rationale | The system must notify the cancellation to Collaborative NOP and Flight Crews. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Update Spot |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

### 4.1.5 INAP function

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0010 |
| Title | |
| Requirement | The INAP function shall integrate Local DCB function with ATC planning for a seamless & optimized process. |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Analyse EAP DCB Solution |
| <ALLOCATED_TO> | <Activity> | Implement EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0020 |
| Title | DCB and EAP roles within INAP |
| Requirement | En-route local DCB actor shall manage the activities linked to DCB and EAP roles inside the INAP (Integrated Network ATC Planning) function. |
| Status | <in progress> |
| Rationale | Regardless of staffing strategy and local organization, the operating methods, roles, procedures and relevant automation support shall be made available and consistent for the En Route DCB actor(s) (be it the SUP, LTM, EAP(s), etc..) to be able to perform the whole range of activities linked to DCB and EAP roles in ATFCM tactical phase (short-term planning to execution phase). The INAP function shall provide the relevant level of consistency between the roles and their respective methods, procedures and tools. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare LTM DCB Solution |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0030 |
| Title | Integration of Airport planning within INAP |
| Requirement | INAP function shall integrate Local DCB function with Airport planning for a seamless & optimized process. |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Provide Consolidated Local and Regional DCB Imbalances |
| <ALLOCATED_TO> | <Activity> | Share Hotspot with Stakeholders |
| <ALLOCATED_TO> | <Activity> | Share DCB Measures |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0040 |
| Title | |
| Requirement | NMf shall integrate INAP function with Traffic Synchronization for a seamless & optimized process. |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Assess feasibility of TTAs |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0050 |
| Title | |
| Requirement | INAP actors shall be responsible for the identification of local DCB solutions to solve local imbalances. |
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare/Revise DCB Solution and Implement |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0060 |
| Title | |
| Requirement | INAP actors shall endorse new roles and responsibilities in imbalance identification and notification to the Collaborative NOP. |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Detect Local DCB Imbalances |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0070 |
| Title | |
| Requirement | The INAP actors shall have direct access to information linked to local complex situations within the INAP area of responsibility. |
| Status | <in progress> |
| Rationale | The LTM/EAP shall be able to identify<br>- which flights create complexity on the hotspot, from a list proposed by the system.<br>- |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Analyse DCB Imbalance |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP_p.00810 |
| Title | Ranking of complexity generator flights |
| Requirement | During the analysis of a local DCB imbalance, the LTM/EAP shall be able to rank flights that create complexity according to the level of complexity they generate. |
| Status | <in progress> |
| Rationale | This will allow the user to select those flights that have a strongest potential to make an impact onto the network. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Analyse DCB Imbalance |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0090 |
| Title | |
| Requirement | The solutions proposed by INAP actors shall be based on local rules and strategies. |
| Status | <in progress> |
| Rationale | REQ-13.02.03-OSED-0025.0000 to INAP |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare/Revise DCB Solution and Implement |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0100 |
| Title | |
| Requirement | The local rules and strategies for DCB solutions shall be coordinated and agreed between partners beforehand. |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare/Revise DCB Solution and Implement |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0110 |
| Title | |
| Requirement | The INAP actors shall be able to work in the following airspace type: Free Routing, and Fixed Route. |
| Status | <in progress> |
| Rationale | This requirement is linked to the REQ-06.01-SPRINTEROP-FM00.0030, cited above |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare/Revise DCB Solution and Implement |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0120 |
| Title | |
| Requirement | The LTM shall detect, identify and monitor the predicted YOYO flights in the LTM area of responsibility within LTM timeframe |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Analyse DCB Imbalance |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0130 |
| Title | |
| Requirement | The LTM shall detect, identify and monitor the predicted Intruders flights in the LTM area of responsibility, within LTM timeframe |
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Analyse DCB Imbalance |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0140 |
| Title | EAP – LTM/FTM Collaboration |
| Requirement | The Extended ATC Planner (EAP), if implemented, shall work in close collaboration with the Local Traffic Manager (LTM) / Flow Traffic Manager (FTM). |
| Status | <in progress> |
| Rationale | The INAP actors encompass the 'standard' local DCB actor(s) and a possibly new one in charge of Extended ATC Planning, if implemented as a distinct actor. Both these actors will need to work in collaboration for efficient INAP function. This implies a consistent set of closely coordinated working methods, procedures and tool support. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Activity> | Delegate Hotspot Resolution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP_p.0150 |
| Title | |
| Requirement | The EAP shall assess ATCO workload on all TFV in the EAP area of responsibility within a timeframe of one hour. |
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor DCB Imbalance |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0160 |
| Title | |
| Requirement | The EAP shall be able to consult ATFCM relevant flight details within their area of responsibility |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor DCB Imbalance |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP_p.0170 |
| Title | |
| Requirement | The EAP shall monitor filed, regulated or current ATFCM flight profiles on all TFV in the EAP area of responsibility, within a timeframe of one hour |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor DCB Imbalance |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP_p.0180 |
| Title | |
| Requirement | The EAP shall monitor the predicted Occupancy on all TFV in the EAP area of responsibility within a timeframe of one hour |
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor DCB Imbalance |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP_p.0190 |
| Title | |
| Requirement | The EAP shall identify and monitor the predicted Intruders on all potential TFV in the EAP area of responsibility within a timeframe of one hour. |
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor DCB Imbalance |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP_p.0200 |
| Title | |
| Requirement | The EAP shall assess the predicted Complexity on all potential TFV in the EAP area of responsibility up to a timeframe of one hour |
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor DCB Imbalance |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP_p.0210 |
| Title | |
| Requirement | The EAP shall be able to assess any specific predicted Complexity situation impacting one or several TFV and its contributing factors in the EAP area of responsibility up to a timeframe of one hour |
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor DCB Imbalance |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0230 |
| Title | |
| Requirement | The EAP shall be able to identify Hotspot/Optispot |
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor DCB Imbalance |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0250 |
| Title | |
| Requirement | The EAP shall be able to design solutions to a given local complex situation through fine-tuned measures applicable to (a set of) individual trajectorie(s) or flow(s) |
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0260 |
| Title | |
| Requirement | The EAP shall use the CORSE catalogue for local complex situations resolution |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0270 |
| Title | (Very) Short Term ATFCM Measures |
| Requirement | The EAP shall be able to assess efficiency of the (Very) Short Term ATFCM Measures to solve a given local complexity imbalance before selecting it or them. |
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0290 |
| Title | INAP Awareness of existing DCB measures on a flight |
| Requirement | The INAP actors shall be informed of any other DCB measures impacting a flight selected for a (Very) Short-Term ATFCM Measure |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Reconcile Constraints |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0300 |
| Title | Pre-requisite for Synchronization |
| Requirement | The INAP actors shall be able to assess the compatibility of (Very) Short-Term ATFCM Measures under preparation with any other DCB measure impacting the candidate flight(s) |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0320 |
| Title | Sector configuration assessment for (Very) Short-Term ATFCM Measures implementation |
| Requirement | The EAP shall be able to assess the adequacy of the currently planned sector configurations to best accomodate the implementation of their strategy, based on(Very) Short-Term ATFCM Measures |
| Status | <in progress> |
| Rationale | (Very) Short-Term ATFCM Measures |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0330 |
| Title | (Very) Short-Term ATFCM Measures |
| Requirement | Based on automated support, the EAP shall be able to propose any sector configuration deemed more suitable for the implementation of (Very) Short-Term ATFCM Measures proposed to solve local complex situations |
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Refine Airspace Configuration |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0340 |
| Title | (Very) Short-Term ATFCM Measures |
| Requirement | The EAP shall be able to select and prepare (Very) Short-Term ATFCM Measures to solve a given local complex situation inside the EAP area of responsibility |
| Status | <in progress> |
| Rationale | (Very) Short-Term ATFCM Measures |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0350 |
| Title | (Very) Short-Term ATFCM Measures |
| Requirement | The EAP shall be able to assess feasibility of the (Very) Short-Term ATFCM Measures for ATC implementation |
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0360 |
| Title | |
| Requirement | The EAP shall be able to take AUs Margins of Manoeuvre into account in their decision process when preparing solution to a given local complex situation |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0380 |
| Title | (Very) Short-Term ATFCM Measures |
| Requirement | The EAP shall be able to propose a (Very) Short-Term ATFCM Measures to Implementing sector in order to solve a given local complex situation |
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Implement EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0390 |
| Title | (Very) Short-Term ATFCM Measures |
| Requirement | The EAP shall be able to inform all On-Loaded sector(s) inside the ATSU, of every (Very) Short-Term ATFCM Measures in ACCEPTED or IMPLEMENTED status to solve local complex situations |
| Status | <in progress> |
| Rationale | (Very) Short-Term ATFCM Measure |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Activity> | Share DCB Measures |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0400 |
| Title | |
| Requirement | The EAP shall be able to provide any ATC sector within their ATSU with information related to DCB/ATFCM as deemed relevant (either requested by ATC or on EAP initiative) |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Implement EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0410 |
| Title | (Very) Short-Term ATFCM Measures |
| Requirement | The PC shall be able to handle the (Very) Short-Term ATFCM Measures to solve local complex situations sent by EAP within the TFV under their responsibility |
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Analyse EAP DCB Measure |
| <ALLOCATED_TO> | <Activity> | Implement EAP DCB Measure |
| <ALLOCATED_TO> | <role> | ATC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-INAP.0420 |
| Title | |
| Requirement | INAP shall be provided with information coming ATC about the current workload or complexity of the TFVs/ sectors under their responsibility |
| Status | <in progress> |
| Rationale | |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Share ATC Situation |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

### 4.1.6 CORSE Catalogue

[REQ]

| Identifier | REQ-09.02-OSED-CORS.0010 |
|---|---|
| Title | |
| Requirement | CORSE Catalogue shall provide INAP actors (LTM and EAP wherever implemented) with a consistent set of tools to support Complexity Resolution in INAP timeframe, covering DCB and EAP timeframe. |
| Status | <in progress> |
| Rationale | CORSE Catalogue is a local functionality, adapted to the needs of local DCB actors in the short-term planning and execution phases. It encompasses a set of functionalities which could be different from one ANSP to another and even from one ATSU to another in the same ANSP. It can cover a limited number of basic functionalities (such as pre-determined resolution scenarios mapping to pre-identified complexity situations, without any automatic dynamicity and flexibility, nor support for collaborative decision making) to a large number of elaborated tools which can take into account the current situation and a wide range of external parameters (AUs Margins of Manoeuvre , NM and local impact assessment, what-ifs, what-else, etc…) in order to select and propose the most efficient resolution options. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare LTM DCB Solution |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-CORS.0020 |
| Title | |
| Requirement | Whenever LTM and EAP roles are allocated to two different actors, CORSE catalogue shall be made available for both to use the resolution support, in a coordinated manner |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare LTM DCB Solution |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-CORS.0030a |
| Title | |
| Requirement | |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare LTM DCB Solution |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-CORS.0030b |
| Title | |
| Requirement | |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare LTM DCB Solution |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-CORS.0040 |
| Title | |
| Requirement | The INAP actors should be able to manage Margins of Manoeuvre using the CORSE Catalogue |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare LTM DCB Solution |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-CORS.0050a |
| Title | |
| Requirement | INAP actors shall be able to access What-if functionality at network and local levels to assess the performance of the resolution proposal made by CORSE |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-CORS.0050b |
| Title | |
| Requirement | The LTM/EAP shall be able to access pre-planned DCB and DCB measures for hotspots resolution, assess their impact, and when operationally relevant, implement them as a potential solution. |
| Status | <in progress> |
| Rationale | The LTM/EAP shall be able to access pre-planned DCB and DCB measures for hotspots resolution, assess their impact, and when operationally relevant, implement them as a potential solution. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Provide Local Impact Assessment |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-CORS.0051 |
| Title | Select flights and measures for cherry picking to solve complexity situation |
| Requirement | To solve a complexity situation, the LTM/EAP shall be able to select either:<br>- flights for a cherry picking solution,<br>- or STAM measure (Time-based, level capping, rerouting) |
| Status | <in progress> |
| Rationale | Once the what-if process has been completed, the user should be able to select a combination of measures on individual flights and/or traffic flows, among which ground delay, horizontal or vertical rerouting, or time-based airborne measures. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare LTM DCB Solution |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-CORS_p.0051 |
| Title | Selection of flow and associated STAM measures by INAP |
| Requirement | The LTM/EAP shall be able to select a flow and the relevant STAM measure (Time-based, level capping, rerouting), from a list proposed by the system, to be applied on this flow in order to solve the complexity situation. |
| Status | <in progress> |
| Rationale | Once the what-if process has been completed, the user should be able to select both the candidate flow and the STAM measure to be proposed for implementation. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare LTM DCB Solution |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- CORS_p.0052 |
| Title | Modification of flight attributes by INAP |

| | |
|---|---|
| Requirement | The LTM/EAP shall be able to select individual flights from the list and change manually one or more of their trajectory elements in order to simulate and assess the impact on demand, workload or complexity indicators in relation to the complexity situation. |
| Status | <in progress> |
| Rationale | This is part of the what-if capabilities required from the system. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare LTM DCB Solution |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-CORS.0060 |
| Title | |
| Requirement | Pre-coordinated collaborative approach between partners should be facilitated by the use of CORSE when designing the solution to solve complexity situation at local level in the strategic phase |
| Status | <in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare LTM DCB Solution |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-CORS.0070 |
| Title | STAM without declaring an hotspot/optispot |
| Requirement | INAP shall be able to create a STAM for a Flight Crew without declaring an hotspot/optispot |
| Status | <in progress> |
| Rationale | implementation proposal. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare LTM DCB Solution |
| <ALLOCATED_TO> | <Activity> | Prepare EAP DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

### 4.1.7 Target Time Management

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0010 |
| Title | Target Time Measures |
| Requirement | Target Times shall be used as one of the possible solutions to a DCB problem |
| Status | < in progress> |
| Rationale | In case of interferences between DCB and Extended AMAN or airport constraints, coherent solutions must be identified minimizing the risk of imposing multiple penalties to Airspace Users or increased workload ATCo/FC |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare TTO/TTA |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0020 |
| Title | Target Time Proposal Information |
| Requirement | NMf actors shall be able to access the Target Time information that shall contain the following information:<br>▪ Reference measure<br>▪ TT value<br>▪ TT_Fix<br>▪ TT_status (CREATION, UPDATE, CANCELLATION) |
| Status | < in progress> |
| Rationale | Target-Time infomration is composed of reference measure, TT value, TT-fix, TT_status |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Create Update Proposal Flight |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0040 |
| Title | Target Time candidate flights |
| Requirement | INAP actors shall be able to vizuallize a list of candidate flights that could be subject to a Target Time solution to address the hotspot. |

| | |
|---|---|
| Status | < in progress> |
| Rationale | The operator will use this a reference to start the elaboration of the Target Time measures |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Share Hotspot with Stakeholders |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0050 |
| Title | Target Times Proposal |
| Requirement | INAP actors shall propose Target Times to flights in the Hotspot Resolution Area and send the proposal to the NM |
| Status | < in progress> |
| Rationale | Target-Time proposal is sent to the NM |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare TTO/TTA |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0060 |
| Title | Target Time Calculation |
| Requirement | Target Time shall be calculated at the TT_fix point taking into account the EET for the concerned point of the SBT route |
| Status | < in progress> |
| Rationale | EET → Estimated Time required to proceed from one significant point to another.<br>TT_FIX → (latitude and longitude) corresponds to the Hotspot entry time and can be considered as waypoint. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare TTO/TTA |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0070 |
| Title | Target Times publication and dissemination |
| Requirement | The NOP shall publish the TT information and disseminate the TT information to the NMf actors using a subscribe / publish mechanism |
| Status | < in progress> |
| Rationale | The centralisation of the dissemination actions on the NMf will provide greater security against intrusions, less coordination overhead (due to the use of subscribe / publish mechanisms) and greater information coherence. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare TTO/TTA |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0071 |
| Title | TT and tTT |
| Requirement | Target-Time initiated in the SBT or RBT phases shall be distinguished.<br>SBT phase : TTO/TTA<br>RBT phase : tTTO/tTTA |
| Status | < in progress> |
| Rationale | The process and procedure being different, it is introduced the notion of TTO/TTA and tTTO/tTTA |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare TTO/TTA |
| <ALLOCATED_TO> | <role> | Regional ATFCM |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0080 |
| Title | SBT update based on Target Times |
| Requirement | When the Airspace Users accepts the proposed TT, it shall update the concerned SBT based on the Target Time proposal issued by INAP. |
| Status | < in progress> |
| Rationale | AU shall update the SBT to take into account the TT information |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Create Update Proposal Flight |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0090a |
| Title | TTO/TTA Collection |
| Requirement | The Collaborative NOP shall collect from the concerned actors (INAP, APT, NM, AU) the TTO/TTA creation/update/cancellation |
| Status | < in progress> |
| Rationale | The Collaborative NOP collects from the concerned actors (INAP, APT, NM, AU) the TTO/TTA creation/update/cancellation |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Create Update Proposal Flight |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0090b |
| Title | TTO/TTA Dissemination |

| | |
|---|---|
| Requirement | The Collaborative NOP shall disseminate to the concerned actors (INAP, APT, NM, AU) the TTO/TTA creation/update/cancellation |
| Status | < in progress> |
| Rationale | The Collaborative NOP disseminates to the concerned actors (INAP, APT, NM, AU) the TTO/TTA creation/update/cancellation |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Create Update Proposal Flight |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0100a |
| Title | tTTO/tTTA collected in the Collaborative NOP |
| Requirement | The Collaborative NOP shall collect the tTTO/tTTA information |
| Status | < in progress> |
| Rationale | The Collaborative NOP collects from the concerned actors (INAP, APT) the TTO/TTA creation/update/cancellation |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Create Update Proposal Flight |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0100b |
| Title | tTTO/tTTA disseminated |

| | |
|---|---|
| Requirement | The Collaborative NOP shall disseminate the tTTO/tTTA information to NMf actors. |
| Status | < in progress> |
| Rationale | The Collaborative NOP disseminates to the concerned actors (INAP, APT, NM, AU) the TTO/TTA creation/update/cancellation |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Create Update Proposal Flight |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0110 |
| Title | tTTO/tTTA Distribution for implementation |
| Requirement | INAP shall send the tTTO/tTTA to the concerned ATC for implementation (ATC Clearance). It concerns a RBT Revision. |
| Status | < in progress> |
| Rationale | The distribution an implementation of tTTO/tTTA is using the same process/procedure as the one developed for STAM Measures for airborne flight. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Implement TTO/TTA |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0120 |
| Title | TTO/TTA adherence for TT prepared in the SBT Elaboration phase |

| | |
|---|---|
| Requirement | The TTO/TTA adherence management in the execution phase for TT prepared in the SBT Elaboration phase shall be based on the 'best effort' principle for which ATC and Flight Crew apart from separation purposes comply with RBT plan execution. In particular, ATC shall considers the impact of trajectory modification regards to the RBT achievement. |
| Status | < in progress> |
| Rationale | TTO/TTA adherence management in the execution phase for TT prepared in the SBT Elaboration phase shall be based on the 'best effort' principle for which ATC and Flight Crew apart from separation purposes comply with RBT plan execution. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Implement TTO/TTA |
| <ALLOCATED_TO> | <Activity> | Implement ATC Clearance |
| <ALLOCATED_TO> | <role> | ATC |
| <ALLOCATED_TO> | <role> | Flight Crew |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0170 |
| Title | Static Target Window |
| Requirement | A static Target Window (TW) shall be associated [-TW,+TW]to the Target Time |
| Status | < in progress> |
| Rationale | The Target Window shall correspond to the margin of manoeuvre of the flight to achieve the Target Time.<br><br>The static Target Window may depend on the status of the flight |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare TTO/TTA |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0180 |
| Title | Target Window Calculation |
| Requirement | Target Windows shall be expressed as a set of temporal and spatial intervals around a 4D point in which the aircraft shall actually be when transiting in the hotspot |
| Status | < in progress> |
| Rationale | The Target Window is calculated to managed properly the hotspot resolution |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare TTO/TTA |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0190 |
| Title | Target Window Dimensions |
| Requirement | The Target window dimension shall be conditioned by ANSP-specific and AU-specific operating requirements and operational capabilities:<br>(1) The Target Window size shall depend of the navigation capabilities of the aircraft<br>(2) The Target Window size shall be sufficient to provide room for managing fluctuation and to manage conflict in operational conditions |
| Status | < in progress> |
| Rationale | The Target window dimension is conditioned by ANSP-specific and AU-specific operating requirements and operational capabilities: |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare TTO/TTA |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0200 |
| Title | Target Time Deviation  calculation |

| | |
|---|---|
| Requirement | Target Time Deviation shall be calculated through the Target Deviation Indicator (TDI): TDI=TT-ATT, which reflects the difference between the planned Target Time (TT) and the Achievable Target Time (ATT). It aims at processing the Hotspot Resolution Progress |
| Status | < in progress> |
| Rationale | TDI = TT - ATT |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Compute Target Deviation Indicator |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0201 |
| Title | Target Time Deviation Use (1) |
| Requirement | The Target Time Deviation Indicator shall be used only to calculate the Hotspot resolution deviation. |
| Status | < in progress> |
| Rationale | The TDI is used to calculate the Hotspot resolution deviation. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor Spot |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0202 |
| Title | Target Time Deviation Use (2) |
| Requirement | The Target Time Deviation Indicator shall be available to the NMf actors to inform them about the DCB measures deviation at the trajectory level.. |

| | |
|---|---|
| Status | < in progress> |
| Rationale | The Target Time Deviation Indicator shall be available to the NMf actors to inform them about the DCB measures deviation at the trajectory level.. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor Flights |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0230 |
| Title | TTO/TTA adherence |
| Requirement | The pilot and ATC actors shall facilitate adherence to the RBT, including Target Times and associated target windows |
| Status | < in progress> |
| Rationale | The pilot and ATC actors facilitate adherence to the RBT, but it is not mandatory to adhere ro the TTO/TTA |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Implement TTO/TTA |
| <ALLOCATED_TO> | <Activity> | Implement ATC Clerance |
| <ALLOCATED_TO> | <role> | ATC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-TT.0240 |
| Title | tTTO/tTTA adherence |
| Requirement | The pilot and ATC actors shall adherenc to the tTTO/tTTA |
| Status | < in progress> |
| Rationale | The pilot and ATC actors shall adherenc to the tTTO/tTTA |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Activity> | Implement TTO/TTA |
| <ALLOCATED_TO> | <Activity> | Implement ATC Clearance |
| <ALLOCATED_TO> | <role> | ATC |
| <ALLOCATED_TO> | <role> | Flight Crew |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

### 4.1.8 Synchronization

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-SYNC.0010 |
| Title | Synchronization process leading to the distribution of a consolidated DCB measure to INAP |
| Requirement | Thanks to the synchronization process, INAP actors shall receive a single and consolidated DCB measure (and associated target window) to be applied to a flight whenever needed for DCB purposes. |
| Status | <in progress> |
| Rationale | The objective of the automated Synchronization process is to avoid interfering DCB measures to affect a same flight, so that INAP actors can gain unambiguous awareness of the consolidated, feasible and efficient measures that need to be applied for DCB purposes. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Assess capability to act on delay requirement |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED-SYNC.0020 |
| Title | Need for Reconciliation process after Unsuccessful synchronization |
| Requirement | In the case when synchronization process does not allow designing a single consolidated measure and associated target window before a defined time limit, reconciliation process shall be triggered to provide INAP actors with a Network Consolidated Constraint proposal. |
| Status | <in progress> |
| Rationale | After Unsuccessful synchronization process, the constraint reconciliation process shall be triggered at Network level in order to provide the INAP actors with a Network Consolidated Constraint (NCC), so that they are informed about the Network situation and the best trade-off at Network level to solve local interferences. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Assess feasibility of TTAs |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

### 4.1.9 Local Constraint Reconciliation & Global Optimization

REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRM.0001 |
| Title | Collection of local DCB target time solution |
| Requirement | The Constraint reconciliation service shall collect TTO/TTA information (tTTO:tTTA are not concerned) to determine concurrent and interfering Target-Time measure in the planning phase. |
| Status | <in progress> |
| Rationale | The collection of all the TTO/TTA is necessary to determine the network global level of consistency and is a pre-requisite to allow the identification of flight trajectories affected by interfering DCB constraints. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Consolidate DCB Measures |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRM.0010 |
| Title | Network Consolidated Constraint |
| Requirement | NMf actors shall send a Target-Time request to the NM system and shall receive a NCC (Network Consolidated Constraint) reply from NM indicating the eligible Target Time that can be proposed. |
| Status | <in progress> |
| Rationale | After receiving Target-Time request from NMf actors, NM system shall determine and disseminate the eligible Target-Time |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Create Proposed DCB Measure |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRM.0011 |
| Title | Network Consolidated Constraint Update |
| Requirement | NMf actors shall receive updated NCC (Network Consolidated Constraint) corresponding to their Target-Time request until a defined cut-off time. |
| Status | <in progress> |
| Rationale | The NCC information shall be continously re-assessed by the NM system and disseminated to the affected NMf actors. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Share Network Consolidated Constraint |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRM.0012 |
| Title | Use of Network Consolidated Constraint |
| Requirement | NMf actors shall take into account the proposed NCC (Network Consolidated Constraint) to build their DCB solution. |
| Status | <in progress> |
| Rationale | NMf actors shall take into account the proposed NCC (Network Consolidated Constraint) to build their DCB solution. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Assess Network Constraint |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRM.0020 |
| Title | Identification of demand affected by interfering DCB constraints |
| Requirement | The Constraint reconciliation service shall determine which flight trajectories are affected by multiple interfering constraints |
| Status | <in progress> |
| Rationale | Interfering DCB constraints at the network level is a potential source of performance issues. By identifying the flight trajectories affected by interfering DCB constraints, the Constraint reconciliation service will be able to apply the necessary corrective measures (i.e. DCB rules principles) to ensure safety is preserved at the network level. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Identify Concurrent DCB Measures |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRM.0030 |
| Title | Provision of Network Consolidated Constraint (NCC) to local-DCB actors |
| Requirement | The Constraint reconciliation service shall provide a Network Consolidated Constraint (NCC) to target time proposal request from local-DCB actors |
| Status | <in progress> |
| Rationale | The Network Consolidated Constraint (NCC) allows the local-DCB actors to be informed about the Network situation by a network consolidated target-time reply based on their target-time proposal request. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Activity> | Share Network Consolidated Constraint |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRM.0040 |
| Title | Elaboration of the Network Consolidated Constraint (NCC) |
| Requirement | The Constraint reconciliation service shall determine the Network Consolidated Constraint (NCC) based on the categorization of identified DCB "spots" and by applying the DCB priority rules mechanism. |
| Status | <in progress> |
| Rationale | The Network Consolidated Constraint (NCC) determines the eligible constraint based on two main principles:<br>• The categorization of identified DCB "Spot"<br>• The introduction of priority rules to manage conflicting DCB measures depending on the nature of the related DCB "Spot" (i.e. hotspot, optispot) |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Apply Priority Rules Mechanism |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRM.0050 |
| Title | Identification of the Most Important Problem (MIP) for trajectories concerned by interfering DCB constraints. |
| Requirement | The Constraint reconciliation service shall determine the Most Important Problem (MIP) over the identified DCB spots for trajectories concerned by interfering DCB constraints. |
| Status | <in progress> |
| Rationale | The categorization of DCB spots introduces the notion of the Most Important Problem (MIP) that prioritizes the level of criticality. Four main categories of DCB spots have been identified, starting from the most important:<br>• CrisisSpot<br>• CriticalSpot<br>• HotSpot<br>• OptiSpot |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Apply Priority Rules Mechanism |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRM.0060 |
| Title | Application of the DCB rule mechanism |
| Requirement | The Constraint reconciliation service shall apply the correct DCB-rule mechanism depending the nature of the DCB spots (e.g. hotspot, optispot …) identified along the concerned trajectories. |
| Status | <in progress> |
| Rationale | A DCB Target-Time measure associated to a Spot Category inherits of the MIP attribute. It implies that a planned DCB measure for a most important DCB spot will always take priority over a DCB measure for a less important DCB spot.<br><br>Rules and principles have to be defined in order to manage conflicting measures:<br><br>• Between different DCB spot category (extra-category priority)<br><br>• Within a same DCB spot category (intra-category priority) |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Apply Priority Rules Mechanism |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRM.0070 |
| Title | Management of DCB-rules for conflicting DCB measures between different DCB spot category (extra-category priority) |
| Requirement | The DCB-rule mechanism shall manage conflicting DCB measures between different DCB spot category (extra-category priority) |
| Status | <in progress> |
| Rationale | Across the network, a flight trajectory can be subject at the same time by DCB constraints related to different nature of DCB spots. Rule principles between each of them shall be defined and applied in order to take into account the level of criticality of the concerned DCB spots. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Apply Priority Rules Mechanism |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRM.0080 |
| Title | Management of DCB-rules for conflicting DCB measures within a same DCB spot category (intra-category priority) |
| Requirement | The DCB-rule mechanism shall manage conflicting DCB measures within a same DCB spot category (intra-category priority) |
| Status | <in progress> |
| Rationale | In case of a flight trajectory that is subjected at the same time by DCB constraints related to the same nature of DCB spot. Rule principles applicable to the nature of the DCB spot shall be used. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Apply Priority Rules Mechanism |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRM.0090 |
| Title | Use of best effort principle between DCB Hotspots and DCB Optispots conflicting constraints |
| Requirement | The Constraint reconciliation service shall apply the best-effort principle to manage between DCB Hotspots and DCB Optispots conflicting constraints |
| Status | <in progress> |
| Rationale | The BestEffort priority rule considers the Hotspot measures as a higher priority than the OptiSpot measures but uses the mechanism of no-slot-before to look for the first slot available for the OptiSpot measures.<br><br>Because the Constraint Reconciliation Service is continuously recalculating the situation, this first slot available for the OptiSpot measure can be:<br><br>• Overruled by Hotspot measures<br><br>• Pushed further than the requested target-time or earliest available slot provided.<br><br>• Improved in the limit of the requested target-time |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Apply Priority Rules Mechanism |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRM.0100 |
| Title | Use of the Most Penalizing Constraint principle between DCB Hotspots conflicting constraints |
| Requirement | The Constraint reconciliation service shall apply the Most Penalizing Constraint (MPC) principle to manage conflicting constraints between DCB Hotspots |
| Status | <in progress> |
| Rationale | The MPC rule is based on the Most Penalizing Mechanism (MPR) developed and implemented within Network Manager CASA system. The MPC is a target-time measure that applies the most penalizing delay on a trajectory in a declared hotspot.<br><br>In the case where the Constraint Reconciliation Service for the same SBT collects several Target-Time proposals associated to HotSpot, the Network Consolidated Constraint reply to the requesters is equal to the MPC. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Apply Priority Rules Mechanism |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRO.0010 |
| Title | Network Consolidated Regulations |
| Requirement | All anticipated, pre-tactical and tactical regulations shall be made available to CRO in order to regularly update slot allocations. |
| Status | <in progress> |
| Rationale | Slot allocation updates are based on active regulations and corresponding rates. |
| Category | <Operational> |



| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Reg data availability |
| <ALLOCATED_TO> | <role> | Regional&local ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRO.0020 |
| Title | Slot Features |
| Requirement | Slots and correlated planning features (allocation windows, granularity, etc.) should be designed according to comparable standards. |
| Status | <in progress> |
| Rationale | Guarantee uniform slot planning. |
| Category | <Operational> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Slot Planning Features |
| <ALLOCATED_TO> | <role> | Regional&local ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.03-OSED-CRO.0030 |
| Title | Operational Computation |
| Requirement | Operational Computation, depending on the technological environment, should be able to provide slot allocation solutions within a demanded time period. |
| Status | <in progress> |
| Rationale | With regards to a dynamic slot allocation process, time granularity of the CRO initiation process should be based on a CRO computation time minimum. |
| Category | <Operational> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Computation Time |
| <ALLOCATED_TO> | <role> | NM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

### 4.1.10 Collaborative Framework

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-COL.0010 |
| Title | Collaborative Participation of Actors |
| Requirement | The DCB Collaborative Framework shall facilitate the participation of AU, APT, NM and INAP to the Collaborative Decision-making mechanisms providing transparency and feedback of the impact of DCB activities on their operations. |
| Status | <in progress> |
| Rationale | It needs a mechanism to support the collaboraive elaboration of DCB solutions accomodating the business needs of differents local actors. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Provide Consolidated Local and regional DCB Imbalances |
| <ALLOCATED_TO> | <Activity> | Share Hotspot with Stakeholders |
| <ALLOCATED_TO> | <Activity> | Share DCB Measures |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Reconcile Constraint |
| <ALLOCATED_TO> | <Activity> | Update the NOP |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-COL.0020 |
| Title | Provision of Services to Support the Collaborative Framework |
| Requirement | The DCB Collaborative Framework shall support the decision-making based on<br>• The provision of network consolidated imbalances figures<br>• The provision of Hotspot and Optispot information<br>• The provision of what-if capabilities to simulate alternate SBT/RBT based on Performance Indicators<br>• The provision of what-else capabilities to propose alternate SBT/RBT based on Performance Indicators<br>• The provision of Multiple Target Time Constraint information<br>• The provision of AU Priorities and Preferences<br>• The management of Hotspot<br>• The management of DCB Measures |
| Status | <in progress> |
| Rationale | A set of NM Services need to be provided to support the elaboration of local DCB solutions. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Provide Consolidated Local and regional DCB Imbalances |
| <ALLOCATED_TO> | <Activity> | Share Hotspot with Stakeholders |
| <ALLOCATED_TO> | <Activity> | Share DCB Measures |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Reconcile Constraint |
| <ALLOCATED_TO> | <Activity> | Update the NOP |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-COL.0030 |
| Title | Limited Delegation of Responsibility to Resolve Spot |
| Requirement | The DCB Collaborative Framework shall support the limited delegation of responsibility and authority to resolve Spot (Hotspot, Optispot) for a limited duration (time-out) |
| Status | <in progress> |
| Rationale | The limited delegation of responsibility allow INAP to delegate to an other actor the delegation of an hotspot resolution concerning the DCB solution design. At the time-out, INAP will receive the proposed DCB solution from the delegated actor. INAP will analyze the proposed solution and will implment it. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Delegate Hotspot Resolution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-COL.0040 |
| Title | |
| Requirement | The DCB Collaborative Framework shall support the full delegation of responsibility and autority to resolve Spot (Hotspot, Optispot) |
| Status | <in progress> |
| Rationale | The full delegation of responsibility allow INAP to delegate to an other actor the delegation of an hotspot resolution from the DCB solution design until the implementation of DCB measures. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Delegate Hotspot Resolution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-COL.0041 |
| Title | |
| Requirement | The DCB Collaborative Framework shall support the full autonomy of responsibility and autority to identify and resolve Spot (Hotspot, Optispot) |
| Status | <in progress> |
| Rationale | The full autonomy allow INAP to delegate to an other actor the responsibility to identify imbalance and hotspot, to managethe hotspot resolution from the DCB solution design until the implementation of DCB measures. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Delegate Hotspot Resolution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-COL.0050 |
| Title | |
| Requirement | The DCB Collaborative Framework shall support the DCB Measure coordination between actors based on a simple mode (accept/reject) |
| Status | <in progress> |
| Rationale | It is proposed a coordination mechanism to allow INAP to propose and negotiate DCB measure to an other actor which can accept or reject it. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Coordinate DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-COL.0060 |
| Title | |
| Requirement | The DCB Collaborative Framework shall support the DCB Measure coordination between actors based on a complex mode (couter-proposal) |
| Status | <in progress> |
| Rationale | It is proposed a more complex coordination mechanism to allow INAP to propose and negotiate DCB measure to an other actor which can accept, reject, and make couter-proposal. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Coordinate DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-COL.0070 |
| Title | |
| Requirement | The DCB Collaborative Framework shall support the delegation of DCB Measure implementation |
| Status | <in progress> |
| Rationale | It is proposed to allow an actor to delegate the implementation of DCB measures to an other actor (i.e. INAP to ATC). |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Implment DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | ATC |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-COL.0080 |
| Title | |
| Requirement | The DCB Collaborative Framework shall support the spot Management status:<br>• PROPOSED : Spot is capture in a private mode<br>• INTENT : Spot is notified to the Collaborative NOP<br>• CANCELED : Spot is canceled<br>• CLEARED : Spot is resolved<br>• DELEGATED : Spot is delegated |
| Status | <in progress> |
| Rationale | The Hotspot/Optispot will be managed according to different status. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Share Hotspot with Stakeholders |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-COL.0090 |
| Title | |
| Requirement | The DCB Collaborative Framework shall support the DCB Measure Management status:<br><br>• DRAFT : Measure is prepared in a private mode<br>• PROPOSED : Measure is proposed and notified to the Collaborative NOP<br>• FOR COORDINATION : Measure is proposed for coordination<br>  ○ Simple coordination (accept/reject)<br>  ○ Complex coordination (counter-proposal)<br>• COORDINATED : Measure is coordinated<br>• FOR IMPLEMENTATION : Measure is proposed for implementation<br>  ○ Implementation without accept/reject<br>  ○ Implementation with accept/reject (INAP-ATC link)<br>• IMPLEMENTED : Measure is implemented<br>• ABANDONED : Measure is abandoned<br>• FINISHED : Measure has been executed and is terminated |
| Status | <in progress> |
| Rationale | The DCB measures will managed according to different status |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Share Hotspot with Stakeholders |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-COL.0100 |
| Title | DCB Measure Re-implementation |
| Requirement | The INAP actot shall be able to re-implement a DCB measure |
| Status | <in progress> |
| Rationale | In case of a revised RBT, the INAP actor should be able to re-implement a DCB solution, i.e. DCB measure initially implemented in the SBT elaboration phase, then re-implemented with a new target in the RBT revision phase |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Prepare DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-COL.0110 |
| Title | Efficient HMI to support the Collaborative Framework |
| Requirement | The DCB shall provide an efficient HMI to support the Collaborative Framework |
| Status | <in progress> |
| Rationale | Coordination support tool is very complex to support the multiple actor exchange, multiple status of hotspot/optispot and DCB measures. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Provide Consolidated Local and regional DCB Imbalances |
| <ALLOCATED_TO> | <Activity> | Share Hotspot with Stakeholders |
| <ALLOCATED_TO> | <Activity> | Share DCB Measures |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Reconcile Constraint |
| <ALLOCATED_TO> | <Activity> | Update the NOP |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

### 4.1.11 Collaborative NOP

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-FFICE1.0010 |
| Title | Integration of DCB and Flight Planning – Enhanced information for FPL |
| Requirement | An authorized airspace user shall be able to access enhanced DCB information affecting his flight |
| Status | <in progress> |
| Rationale | NOP will provide enhanced and additional DCB information, compared to current operations, as constraints and measures (regulations, overloads, hotspots) to AU to support network traffic situation assessment |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Validate and Integrate Flight Plan in Traffic Demand |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-FFICE1.0020 |
| Title | Integration of DCB and Flight Planning – Enhanced information for PFP |
| Requirement | An authorized airspace user shall be able to access enhanced DCB information affecting his PFP |
| Status | <in progress> |
| Rationale | NOP will provide enhanced and relevant DCB information, as constraints and measures (regulations, overloads, hotspots) to AU to support network traffic situation assessment as from the provision of his PFP |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Validate and Integrate Flight Plan in Traffic Demand |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-FFICE1.0030 |
| Title | Integration of DCB and Flight Planning – congestion indicators |
| Requirement | An authorized airspace user shall be able to access DCB congestion indicators as feedback of his PFP or flight plan submission |
| Status | <in progress> |
| Rationale | NOP will provide relevant DCB congestion indicators to AU , as from the provision of his PFP, in support of AU flight planning process to optimise trajectories or to improve DCB constrained trajectories |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Provide Consolidated DCB Imbalances |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-FFICE1.0040 |
| Title | Integration of DCB and Flight Planning – FPL changes |
| Requirement | With the goal to control the variability of network prediction, NOP shall build protection mechanisms to avoid great number of PFP or flight plan changes for a same flight. |
| Status | <in progress> |
| Rationale | The early and dynamic exchange of the flight planning service and DCB information shall NOT induce significant instability of the network. NOP together with flight planning service will determine the appropiate dynamicity of exchange to balance the increase of network demand predictability versus the network instability. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Consolidate Traffic Demand |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-FFICE1.0050 |
| Title | Integration of DCB and Flight Planning – Provision of FDCI |
| Requirement | An authorized NOP user shall be able to provide the Flight Delay Criticality Indicator (FDCI) for a SBT or RBT. |
| Status | <in progress> |
| Rationale | AU, NMOC or FMP will set a flight as delay critical (FDCI) for regional awareness and in particular to support LTM and airports in their process to propose DCB measures (STAM & TTO for LTM and TTA for airports) and or negotiate trajectories |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Share Traffic Demand |
| <ALLOCATED_TO> | <role> | INAP |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-FFICE1.0051 |
| Title | Integration of DCB and Flight Planning – Access to FDCI |
| Requirement | An authorized NOP user shall be able to retrieve the Flight Delay Criticality Indicator (FDCI) for a SBT or RBT. |
| Status | <in progress> |
| Rationale | NOP will share FDCI to provide regional awareness and in particular to support LTM and airports in their process to propose DCB measures (STAM & TTO for LTM and TTA for airports) and or negotiate trajectories |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Share Traffic Demand |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-FFICE1.0052 |
| Title | Integration of DCB and Flight Planning – FDCI in DCB Process |
| Requirement | The FDCI status of a flight shall be taken into account in the DCB Process |
| Status | <in progress> |
| Rationale | The FDCI status of a flight shall be taken into account in the DCB Process, in particular to support LTM and airports when proposing DCB measures (STAM & TTO for LTM and TTA for airports) and or negotiate trajectories |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Share Traffic Demand |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-FFICE1.0060 |
| Title | Integration of AOP-NOP data and eFPL |
| Requirement | An authorized NOP user shall be abe to access SID, STAR and TTA data of source AOP-NOP |
| Status | <in progress> |
| Rationale | NOP will share the airport impact severity indicator to provide regional awareness and in particular to be included by LTM in their process to propose DCB measures (STAM & TT) and or negotiate trajectories. The ultimate goal being to reduce/avoid knock effect and provide better service and reduce the disrupting impact on AU and airports. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Share Traffic Demand |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-FFICE1.0070 |
| Title | Integration of DCB and Flight Planning – AU counter proposal |
| Requirement | NOP and STAM should be enhanced to support AU in creating a counter proposal in response to a STAM proposed by the LTM affecting the AU flight. |
| Status | <in progress> |
| Rationale | NOP will provide what-if/what-else services to help the AU finding an alternative route-rerouting to improve his DCB constrained trajectory. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Book Counter-Proposal |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-AOP1.0010 |
| Title | Enhanced integration of AOP-NOP |
| Requirement | The authorized user shall be able to access enhanced integrated AOP-NOP for all time phases. |
| Status | <in progress> |
| Rationale | The NOP developments shall cover an enhanced integration of airports and network resulting in more data – but relevant data - exchange and in a timely and automated manner, named rolling data exchange.<br>In particular NOP shall be able to provide the AOP-NOP data SID, STAR and TTA data to better align AU 4d trajectory with AOP and NOP and increase predictability. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Consolidate Traffic Demand |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-AOP1.0060 |
| Title | Network view - Airports constraints & associated impacts |
| Requirement | Authorized user shall have access to major changes or constraints at any airport of the European ATM network. |
| Status | <in progress> |
| Rationale | The airport will provide NOP with Event Planning Information and Contingency Plan that contains elements like the event kind, probability, area or process of airport impacted, expected recovery scenario and possible aircraft type restrictions. This information will allow NOP to establish the network impacts of a sudden or planned capacity changes or reductions due to the event. NOP will share the airport event planning, the constraints and the network impact. Airspace Users would be able to anticipate any changing conditions as early as possible they could adjust flight plans, transfer passengers re-routed or additional fuel taken to allow for a longer period of holding, as required. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Confirm Traffic Demand Prediction |
| <ALLOCATED_TO> | <Activity> | Monitor/Update Airport Operation Plan |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-ASM1.0020 |
| Title | Network view - military exercises status and associated impacts |
| Requirement | Authorized user shall have access to the planned military exercises at any specified time period (during long/mid term planning) and the estimated impact on traffic. |
| Status | <in progress> |
| Rationale | The NOP shall provide access to the planned Military exercises, allowing Airspace Users to be informed of the network associated impacts and act accordingly. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Share Traffic Demand |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-DCB1.0040 |
| Title | Network view - DCB measures and associated impacts |
| Requirement | Authorized user shall have access to the DCB measures being coordinated and applied in the specified area, their status at any moment in time, and the impacted traffic demand (and related trajectories). |
| Status | <in progress> |
| Rationale | Timely access to DCB actions is required, access to DCB actions being prepared (re-routing proposals) and executed may be available, to facilitate airspace users' management of trajectories and to help LTMs/NM ensuring consistency of actions/decisions across the network.<br>There is a need of a mean offering a network view of the DCB measures, constraints, planned actions and associated impacts. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Share DCB Measures |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-DCB1.0070 |
| Title | Network view - consolidated imbalance situation |
| Requirement | Authorized user shall have access to a imbalance repository service providing a consolidated network imbalance view. |
| Status | <in progress> |
| Rationale | The authorized user shall have access to a service which builds a consolidated view allowing to assess the imbalance situation at a network level. To support such a capability, an imbalance repository is developed to collect all the local imbalances figures from ANSPs. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Provide Consolidated DCB Imbalances |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-DCB1.0080 |
| Title | Network forecast - confidence factor |
| Requirement | Authorized user shall find a confidence factor attached to each forecast. |
| Status | <in progress> |
| Rationale | The authorized user shall have access to a confidence factor with each predicted workload methodologies (count, complexity). Shall be part of all the forecast management tools (input/output).<br>For example, prediction shall be provided with a imbalance confidence index indicating the level of certainty of the prediction. |
| Category | <Operational>,Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Provide Probabilistic Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-GEN1.0010 |
| Title | NOP Trajectory - Sharing flight intention via SBT and 4D trajectory |
| Requirement | The authorized AU shall be able to share his flight intention by providing the corresponding SBT evolving to a 4D trajectory. |
| Status | <in progress> |
| Rationale | AU will share the SBT that initially corresponds to the flight intention (long to medium phase) and that will evolve to a 4D trajectory in the short-term phase through a revision process. The time of provision of the SBT will vary from AO to AO. During the period that the SBT is not yet communicated to the NOP, the Network Management Function will use the NM built-up historical flight plan data for its planning. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Validate and Integrate Flight Plan in Traffic Demand |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-GEN1.0015 |
| Title | Spots - Resolution delegation |
| Requirement | The authorized user shall be able to delegate the responsibility to resolve safety spots or areas of optimisation opportunities using a NOP service. |
| Status | <in progress> |
| Rationale | The authorized user shall be able to delegate a Spot resolution, with 3 different levels:<br>o Full Autonomy: full delegation of responsibility and authority to manage a Spot;<br>o Full Delegation: full transfer of responsibility and authority of the resolution. The actor-2 in charge remains accountable of outcome and implementation.<br>o Limited Delegation: the actor-2 proposes a solution to the actor-1. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Delegate Hotspot Resolution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-GEN1.0016 |
| Title | NOP WhatIf service |
| Requirement | Authorized user shall be able to query the NOP with simulation data or scenarios (what-if) integrating usage of KPIs and trends to assess the impact on the network and support their collaborative decision making. |
| Status | <in progress> |
| Rationale | The authorized user shall have access to a service allowing to evaluate the impact on the Network situation (NOP data, indicators, KPI) when providing new elements, supporting impact assessment. The provided data will not modify the NOP data.<br>The NOP WhatIf service evaluates the efficiency of the solution selected for example by the INAP actors. Associated with Network impact analysis service, it enables ATM stakeholders to evaluate the impact onto the network performance of any planned decision, prior to final decisions. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Activity> | Assess Trajectory (What-if) |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-GEN1.0017 |
| Title | NOP WhatElse service |
| Requirement | Authorized user shall have access to WhatElse mechanisms integrating usage of KPIs and trends to support their collaborative decision making. |
| Status | <in progress> |
| Rationale | Extended availability of KPIs and trends to be used jointly with WhatElse mechanisms to support collaborative decision making by all stakeholders at different timeframes.<br>The NOP WhatElse confronts the solutions with their environment, e.g.: constraints, network states and performance |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Provide Rerouting Opportunities (What-Else) |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-GEN1.0020 |
| Title | NOP Trajectory - Sharing flight intention via improved OAT flight plan as SMT |
| Requirement | The authorized Military AU shall be able to share his flight intention by providing an improved OAT Flight Plan in the medium/short term planning phase as a representation of the SMT. |
| Status | <in progress> |
| Rationale | Data describing the MT profile will be shared via the improved OAT Flight Plan in the medium/short term planning phase as a representation of the SMT. The sharing of this data may trigger the CDM process in order to balance the specific MT requirements with the BT requirements. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Validate and Integrate Flight Plan in Traffic Demand |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-GEN1.0040 |
| Title | Network view - Extended common situational awareness (Dynamic Airspace and AFUA) |
| Requirement | Authorized user (civil and military users) shall be able to access an extended common situational awareness into the NOP (Dynamic Airspace and AFUA) thanks to enhanced data exchange based on increased number of B2B services |
| Status | <in progress> |
| Rationale | The NOP will support an increased integration of Air Traffic Flow and Capacity Management (ATFCM), Airspace Management (ASM) and Air Traffic Control (ATC) processes.<br>The NOP will provide the common situational awareness thanks to extended data exchange based on increased number of B2B services (accurate traffic prediction, imbalance confidence index) for both civil and military users.<br>The NOP will also provide services to access Historical data and an accurate traffic forecast, using automated tools allowing to reach an optimal airspace configuration in line with performance targets.<br>Dynamic mobile areas (DMA) are created to support the request of Military Airspace demand. 4D data sets are used for mission trajectory exchange with the NOP.<br>The NOP will evolve to offer real time traffic load prediction, integrating the dynamic changes in ATC sector changes and pattern. It will be based on the latest known traffic prediction and predicted workload information. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Share Traffic Demand |
| <ALLOCATED_TO> | <Activity> | Share Spot with Stakeholders |
| <ALLOCATED_TO> | <Activity> | Share DCB Measures |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| Identifier | REQ-09.03-OSED-GEN1.0080 |
|---|---|
| Title | Security – Compliance with SESAR Policies, law and regulatory requirements |
| Requirement | The NOP data and services shall be compliant with SESAR Policies, law and regulatory requirement. |
| Status | <in progress> |
| Rationale | All the NOP systems and applications shall comply with SESAR policies and standards, with law and regulatory requirements concerning the security. Such compliance shall be regularly verified.<br>Personal information should be protected and handled in accordance with locally applicable laws and regulations.<br>Partially validated in OPS in Step 1. Further validation is planned in SESAR 2020. Not a blocking issue for the achievement of V3. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| Identifier | REQ-09.03-OSED-GEN2.0100 |
|---|---|
| Title | NOP support to information exchange in unplanned events/crisis situation |
| Requirement | The authorized user shall be able to use the NOP in crisis situations or during unplanned events as a support for information exchanges and planning adjustments and sharing. |
| Status | <in progress> |
| Rationale | NOP used in crisis situations as a support for the necessary information exchanges and planning adjustments and sharing to support prompt recovery and return to normal operations. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Provide Network States |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-PRF1.0010 |
| Title | Network Performance - Access to real time awareness |
| Requirement | Authorized user shall have access to real time awareness of network performance via KPIs at local, sub-regional and regional levels, including indication of trends and divergence from targets. The associated data feed shall allow NOP visualizations on Net |
| Status | <in progress> |
| Rationale | Real time awareness of network performance into the NOP via KPIs at local, sub-regional and regional levels, including indication of trends and divergence from targets. Operational network performance targets and objectives are set (by the Network Manager in collaboration with other ATM stakeholders) in Long term planning. Cascaded down in the Network Strategic Plan, they are published into the NOP. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Provide Network States |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-PRF1.0020 |
| Title | Network Performance - Access for Analysis |
| Requirement | The authorized user shall be able to analyse the Network performances indicators by using open and standard technologies (HMI/B2B/devices) provided by the NOP. |
| Status | <in progress> |
| Rationale | The authorized user shall have access to open and standard technologies (HMI/B2B/devices) allowing analysis of the Network performances he is authorized to have access to.<br>This requirement is covering network performance monitoring in Post-OPS phase and as such shall use the NOP Archiving service as well as the NOP Replay capability. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Provide Network States |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-PRF1.0030 |
| Title | Network Performance - Alerting/Warning into the NOP |
| Requirement | The authorized user shall be able to setup alerts or warnings based on any Network performance indicator via NOP services. |
| Status | <in progress> |
| Rationale | The authorized user shall have access to service (B2B or HMI) allowing the authorized actor (like NMOC) or group of actor to setup alerts (email, warning) and warnings when a Network performance indicator is passing a predetermined threshold for any indicator he is authorized to have access to. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Provide Network States |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-PRF1.0040 |
| Title | Network Performance - Indicators generation |
| Requirement | The authorized user shall be able to access the real time value of the Network Performance indicators. |
| Status | <in progress> |
| Rationale | The NOP shall calculate the Network Performance indicators and make the results available into the NOP. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <Activity> | Provide Network States |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-PRF1.0050 |
| Title | NOP WhatBest service |
| Requirement | Authorized user shall have access to WhatBest mechanisms integrating usage of KPIs and trends to support their collaborative decision making. |
| Status | <in progress> |
| Rationale | Extended availability of KPIs and trends to be used jointly with WhatBest mechanisms to support collaborative decision making by all stakeholders at different timeframes.<br>The NOP WhatBest service looks for solutions that have less impact on their environment, e.g.: less constraints, less cases affected, improved network states and improved performance. When possible, catalogue of solutions. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Provide Rerouting Opportunities (What-Else) |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-NPP.0010 |
| Title | Access to Service Consolidated Imbalances |
| Requirement | NMf actors shall be able to access the information of the consolidated network imbalance |
| Status | <in progress> |
| Rationale | The DCB Collaborative NOP shall provide access to the consolidated imbalances figures |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Provide Consolidated DCB Imbalances |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-NPP.0020 |
| Title | Access to Service Spot Information |
| Requirement | The NMf actors shall be able to access the Hotspot and Optispot information |
| Status | <in progress> |
| Rationale | The DCB Collaborative NOP shall provide access to the Hotspot and Optispot information |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Share Spot with Skakeholders |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-NPP.0030 |
| Title | Access to Service DCB Measure Information |
| Requirement | The NMf actors shall have acess to the the DCB Measures |
| Status | <in progress> |
| Rationale | The DCB Collaborative NOP shall provide access to the DCB Measures |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Share DCB Measure |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-NPP.0040 |
| Title | Access to Service What-if Capabilities |
| Requirement | The NMf actors shall have access to the what-if capabilities |
| Status | <in progress> |
| Rationale | The DCB Collaborative NOP shall provide access to the what-if capabilities |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Assess Trajectory (What-if) |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-NPP.0050 |
| Title | Access to Service What-Else Capabilities |
| Requirement | The NMf actors shall be able to access to the what-else capabilities |
| Status | <in progress> |
| Rationale | The DCB Collaborative NOP shall provide access to the what-else capabilities |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Provide Rerouting Opportunities (what-Else) |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-NPP.0060 |
| Title | Access to Service NCC |
| Requirement | The NMf actors shall have access to Multiple Target Time Constraint information, i.e. Network Consolidated Constraint (NCC) |
| Status | <in progress> |
| Rationale | The DCB Collaborative NOP shall provide access to Multiple Target Time Constraint information, i.e. Network Consolidated Constraint (NCC) |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Reconcile Constraint |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.03-OSED-NPP.0070 |
| Title | Access to Service Margins of Manoeuvre and Preference Information |
| Requirement | The NMf actors shall have access to the AU Margins of Manoeuvre & Preferences |
| Status | <in progress> |
| Rationale | The DCB Collaborative NOP shall provide access to the AU Margins of Manoeuvre & Preferences |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Share Traffic Demand |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

## 4.2 SPR

### 4.2.1 Safety Requirements

| | |
|---|---|
| Identifier | REQ-09.01-OSED-SAF.0001 |
| Title | Demand Forecast availability |
| Requirement | The LTM/EAP shall be alerted in case the network FBT information is not received/updated. |
| Status | <in progress> |
| Rationale | This alert will allow the LTM/EAP to identify the occurrence of *Hz#01: No traffic load data provided to users.* Consequently, LTM/EAP will be able to take appropriate actions (e.g. use temporarily only the locally stored FBT |

| | |
|---|---|
| | data, escalate to NM in case FBT information is available at that level, or ask for restrictive regulations otherwise) |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Share Network FBT |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.01-OSED-SAF.0002 |
| Title | Imbalance information availability |
| Requirement | The LTM/EAP shall be alerted in case the network imbalance and/or related information is not received/updated |
| Status | <in progress> |
| Rationale | To allow INAP to identify the occurrence of *Hz#01: No traffic load data provided to users.* Consequently, the LTM/EAP will be able to take appropriate actions (e.g. use temporarily only the locally generated imbalance and/or related information, escalate to NM in case the information is available at that level, or ask for restrictive regulations otherwise) |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Evaluate Imbalance Severities |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.01-OSED-SAF.0003 |
| Title | TMV selection/modification |
| Requirement | Training of the LTM/EAP shall consider the selection / modification of the TMV value |
| Status | <in progress> |
| Rationale | To prevent the LTM/EAP errors in TMV selection/modification with potential for leading to the occurrence of *Hz#03: Incorrect locally generated traffic load data presented to Local ATFCM user.* |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Traffic Monitoring Values |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.01-OSED-SAF.0004 |
| Title | Imbalance Identification |
| Requirement | Training of the LTM/EAP shall consider the evaluation of imbalance severities and/or confidence indexes in view of hotspot identification |
| Status | <in progress> |
| Rationale | To prevent the LTP/EAP errors in the evaluation of imbalance severities and/or confidence indexes in view of hotspot identification with potential for leading to the occurrence of *Hz#04: ATFM measures not implemented or implemented partially by Local ATFCM* |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Evaluate Imbalance Severities |
| <ALLOCATED_TO> | <Activity> | Evaluate Confidence Indexes |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.01-OSED-SAF.0005 |
| Title | Imbalance Identification |
| Requirement | Training of the LTM/EAP shall consider the selection & use of the imbalance methodology to conduct the analysis |
| Status | <in progress> |
| Rationale | To prevent the LTM/EAP errors in the selection & use of the imbalance methodology to conduct the analysis, with potential for leading to the occurrence of *Hz#04: ATFM measures not implemented or implemented partially by Local ATFCM* |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <ALLOCATED_TO> | <Activity> | Apply Imbalance Methodologies |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.02-OSED-SAF.0006 |
| Title | DCB Measure Coordination |
| Requirement | Training of the LTM/EAP and ATC shall consider the coordination of a DCB measure between actors within same ACC (LTM/EAP/ATC) |
| Status | <in progress> |
| Rationale | To prevent the errors in the coordination of a DCB measure between actors within same ACC (LTM/EAP/ATC) with potential for leading to the occurrence of *Hz#04: ATFM measures not implemented or implemented partially by Local ATFCM* |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare and Implement DCB Solution |
| <ALLOCATED_TO> | <Activity> | Implement DCB measure |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | ATC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.02-OSED-SAF.0007 |
| Title | DCB measure implementation |
| Requirement | Training of the LTM/EAP shall consider the implementation of a DCB measure encompassing when the measure is close to its cut-off time |
| Status | <in progress> |
| Rationale | To ensure that the performance of the LTM/EAP allow the timely implementation of the designed DCB measure in order to minimize the occurrence of *Hz#04: ATFM measures not implemented or implemented partially by Local ATFCM* |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Implement DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.02-OSED-SAF.0008 |
| Title | DCB measure implementation |
| Requirement | Training of the ATC actors shall consider the implementation of a DCB measure |
| Status | <in progress> |
| Rationale | To ensure that the performance of the ATC actors allow the timely implementation of the designed DCB measure in order to minimize the |

| | |
|---|---|
| | occurrence of *Hz#04: ATFM measures not implemented or implemented partially by Local ATFCM* |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Implement DCB measure |
| <ALLOCATED_TO> | <role> | ATC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.02-OSED-SAF.0009 |
| Title | |
| Requirement | Training of the LTM/EAP shall consider the new working method for the design of an adequate DCB measure |
| Status | <in progress> |
| Rationale | To prevent LTM/EAP errors in the design of an adequate DCB measure with potential for leading to the occurrence of *Hz#05: Inadequate ATFM measure implemented by Local ATFCM* |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Prepare DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.02-OSED-SAF.0010 |
| Title | Hotspot Resolution Monitoring |
| Requirement | The LTM/EAP shall be alerted in case of the loss of the Impacted hotspot resolution status functionality |
| Status | <in progress> |
| Rationale | To allow LTM/EAP to timely identify the lack of the Impacted Hotspot Resolution Status functionality. Consequently, the LTM/EAP will apply additional means and dedicate specific attention & effort to monitor the hotspot resolution in order to minimize the occurrence of *Hz#05: Inadequate ATFM measure implemented by Local ATFCM* |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor flights |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.02-OSED-SAF.0011 |
| Title | Hotspot Resolution Monitoring |
| Requirement | Training of the LTM/EAP shall consider the Hotspot resolution monitoring and the management of residual imbalances |
| Status | <in progress> |
| Rationale | To ensure the LTM/EAP is sufficiently competent to monitor the hotspot resolution and adequately manage the residual imbalances such as to minimize the occurrence of *Hz#05: Inadequate ATFM measure implemented by Local ATFCM* |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Monitor flights |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.03-OSED-SAF.0012 |
| Title | Delegation of Hotspot Resolution |
| Requirement | Training of the LTM/EAP shall consider the Hotspot resolution delegation process |
| Status | <in progress> |
| Rationale | To ensure the LTM/EAP is sufficiently competent to manage the Hotspot resolution delegation such as to minimize the occurrence of *Hz#04: ATFM measures not implemented or implemented partially by Local ATFCM and Hz#05: Inadequate ATFM measure implemented by Local ATFCM* |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Delegate Hotspot Resolution |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.03-OSED-SAF.0013 |
| Title | Monitoring of delegated Hotspot Resolution |
| Requirement | Training of LTM/EAP shall consider the need for monitoring the delegated hotspots |
| Status | <in progress> |
| Rationale | To ensure the LTM/EAP is sufficiently competent to monitor the delegated hotspot resolution and adequately manage the residual imbalances such as to minimize the occurrence of *Hz#04: ATFM measures not implemented or implemented partially by Local ATFCM and Hz#05: Inadequate ATFM measure implemented by Local ATFCM* |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Analyse implemented DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | REQ-09.03-OSED-SAF.0014 |
| Title | Limited Delegation of Hotspot Resolution |
| Requirement | LTM/EAP shall be provided with a time-out alert notifying the end of the limited delegation |
| Status | <in progress> |
| Rationale | To allow LTM/EAP to timely analyse, adjust and implement the proposed DCB solution (or to create a new DCB solution if no proposal has been received) related to the delegated hotspot such as to minimize the occurrence of *Hz#04: ATFM measures not implemented or implemented partially by Local ATFCM* |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Analyse DCB Solution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| Identifier | REQ-09.03-OSED-SAF.0015 |
|---|---|
| Title | Delegation of Hotspot Resolution |
| Requirement | Local ATFCM shall provide to APOC the conditions for the delegation of hotspot resolution |
| Status | <in progress> |
| Rationale | To ensure that APOC DCB measure proposal is good such as to minimize the occurrence of *Hz#04: ATFM measures not implemented or implemented partially by Local ATFCM and Hz#05: Inadequate ATFM measure implemented by Local ATFCM* |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Delegate hotspot resolution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| Identifier | REQ-09.03-OSED-SAF.0016 |
|---|---|
| Title | Delegation of Hotspot Resolution |
| Requirement | Training of APOC operator shall consider the design and implementation of DCB measures associated with the delegated hotspot resolution |
| Status | <in progress> |
| Rationale | To prevent APOC errors in the design of an adequate DCB measure with potential for leading to the occurrence of *Hz#04: ATFM measures not implemented or implemented partially by Local ATFCM and Hz#05: Inadequate ATFM measure implemented by Local ATFCM* |
| Category | <Safety> |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Activity> | Prepare / Revise DCB solution and implementation |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

### 4.2.2 Performance Requirements for SOLUTION 1

It was considered that Solution 1 is an enabler for solution 2 & 3. In order not to double count the performance targets, there are no performance requirements for the solution 1.

### 4.2.3 Performance Requirements for SOLUTION 2

#### 4.2.3.1 Capacity

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.02-OSED- SPR-0001 |
| Title | Airport Capacity (Consolidation of DCB Measures) |
| Requirement | Airport Capacity will be increased by 0,04% (Sub-Operating Environemnt Level) as a consequence of reduced needs of reconciliation processes of DCB measures with Airport CDM and E-AMAN, an increased accuracy of the arrival sequence thanks to a decrease of the unexpected deviations and fewer number of trajectory changes due to overlaying constraints, and reduced number of holding stacks on the arrival phase due to better TT adherence. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Consolidation of DCB Measures |
| <ALLOCATED_TO> | <role> | LTM/EAP/APOC |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Sub-Operating Environment> | Very Large, Large and Medium APT |

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.02-OSED- SPR-0002 |
| Title | TMA Capacity (INAP) |
| Requirement | The autoamted assistance to solve DCB imbalances and Hotspots in the INAP timeframe will allow the selection of the most suitable solution to reduce the traffic complexity per flight and as a consequence, with the same ATCOs, the sector throughputs will increase and then the CAP will increase by 0,53% at Sub-Operating Environment Level. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | INAP |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC TMA |

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.02-OSED- SPR-0003 |

| | |
|---|---|
| Title | TMA Capacity (Complexity Across Sectors) |
| Requirement | Automated assistance for resolution & shared information towards ATCo at trajectory level will reduce the complexity per flight, as a consequence the same ATCO will manage more flights and the sector throughput will increase, hence the CAP by 0,36% at Sub-Operating Environment |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Complexity Across Sectors |
| <ALLOCATED_TO> | <role> | EAP/MSP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC TMA |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0004 |
| Title | TMA Capacity (ASM Integration into DCB) |
| Requirement | The complete DCB solution that includes Dynamic Airspace Configurations combined with 4D constraints will reduce the demand adjustments as capacity solutions will be on the top priority. The oveloads will be reduced and the spare capacity will be better used increeasing the throuhput through sectors by 0,53% at Sub-Operating Environment Level . |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | ASM Integration into DCB |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC TMA |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0005 |
| Title | TMA Capacity (Consolidation of DCB Measures) |
| Requirement | Capacity will be impacted by 0,36% due to an increase of the accuracy of the arrival sequence thanks to a decrease of the unexpected deviations and fewer number of trajectory changes due to overlaying constraints. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Consolidation of DCB Measures |
| <ALLOCATED_TO> | <role> | LTM/EAP/APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC TMA |

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.02-OSED- SPR-0006 |

| | |
|---|---|
| Title | ER Capacity (INAP) |
| Requirement | The autoamted assistance to solve DCB imbalances and Hotspots in the INAP timeframe will allow the selection of the most suitable solution to reduce the traffic complexity per flight and as a consequence, with the same ATCOs, the sector throughputs will increase and then the CAP will increase by 0,65% at Sub-Operating Environment Level. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | INAP |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC En-Route |

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.02-OSED- SPR-0007 |
| Title | ER Capacity (Complexity Across Sectors) |
| Requirement | Automated assistance for resolution & shared information towards ATCo at trajectory level will reduce the complexity per flight, as a consequence the same ATCO will manage more flights and the sector throughput will increase, hence the CAP by 0,33% at Sub-Operating Environment |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Complexity Across Sectors |
| <ALLOCATED_TO> | <role> | EAP/MSP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC En-Route |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0008 |
| Title | ER Capacity (ASM Integration into DCB) |
| Requirement | The complete DCB solution that includes Dynamic Airspace Configurations combined with 4D constraints will reduce the demand adjustments as capacity solutions will be on the top priority. The oveloads will be reduced and the spare capacity will be better used increeasing the throuhput through sectors by 0,65% at Sub-Operating Environment Level . |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | ASM Integration into DCB |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC En-Route |

#### 4.2.3.2 Punctuality

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0009 |
| Title | Punctuality TMA&ER (ASM Integration into DCB) |
| Requirement | The use of ASM measures on top of 4D restrictions will reduce the demand adjustments helping to stick to the departure time, hence improving Punctuality by 0,30% at VHC TMA&ER, 0,06% at HC TMA&ER, 0,06% at MC TMA&ER and 0,06% at LC TMA&ER. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | ASM Integration into DCB |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC, LC TMA&ER |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0010 |
| Title | Punctuality TMA&ER (Reconciliation of DCB Measures) |
| Requirement | Punctuality will be increased due to a reduction of the reactionary delays by 0,30% at VHC TMA&ER, 0,06% at HC TMA&ER, 0,06% at MC TMA&ER and 0,06% at LC TMA&ER. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Reconciliation of DCB Measures |
| <ALLOCATED_TO> | <role> | LTM/EAP/APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC, LC TMA&ER |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0011 |
| Title | Punctuality APT (Reconciliation of DCB Measures) |
| Requirement | Punctuality will be increased due to a reduction of the reactionary delays and a reduction of the holding stacks by 0,38% at Very Large APT, 0,32% at Large APT and 0,22% at Medium APT. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Reconciliation of DCB Measures |
| <ALLOCATED_TO> | <role> | LTM/EAP/APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Very Large APT, Large APT, Medium APT |

### 4.2.3.3 Predictability

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0012 |
| Title | Predictability TMA (ASM Integration into DCB) |
| Requirement | The use of ASM measures on top of 4D restrictions will reduce the demand adjustments due to unforeseen changes in the trajectories to solve imbalances (e.g. re-routing or level cappings) improving the variability of trajectories and hence improving PRED by 0,32% at VHC TMA, 0,07% at HC TMA and 0,06% at MC TMA. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | ASM Integration into DCB |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC TMA |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0013 |
| Title | Predictability TMA (Reconciliation of DCB Measures) |
| Requirement | Predictability will be possitively impacted by 0,14% at VHC TMA, 0,03% at HC TMA and 0,03% at MC TMA.as a consequence of reduced interferences of the constraints applied over traffic, a better synchronisation of the DCB measures integrating AUs P&P and reducing the number of unexpected deviations. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Reconciliation of DCB Measures |
| <ALLOCATED_TO> | <role> | LTM/EAP/APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC TMA |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0014 |
| Title | Predictability ER (ASM Integration into DCB) |
| Requirement | The use of ASM measures on top of 4D restrictions will reduce the demand adjustments due to unforeseen changes in the trajectories to solve imbalances (e.g. re-routing or level cappings) improving the variability of trajectories and hence improving PRED by 0,06% at VHC ER, 0,02% at HC ER and 0,03% at MC ER. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | ASM Integration into DCB |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC ER |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0015 |
| Title | Predictability ER (Reconciliation of DCB Measures) |
| Requirement | Predictability will be possitively impacted by 0,03% at VHC ER, 0,01% at HC ER and 0,01% at MC ER as a consequence of reduced interferences of the constraints applied over traffic, a better synchronisation of the DCB measures integrating AUs P&P and reducing the number of unexpected deviations. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Reconciliation of DCB Measures |
| <ALLOCATED_TO> | <role> | LTM/EAP/APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC ER |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0016 |
| Title | Predictability APT (Reconciliation of DCB Measures) |
| Requirement | Predictability at APT will be positively impacted by a 0,29% at Very Large APT, 0,24% at Large APT and 0,17% at Medium APT due to the availability of the right data at the right time that will increase Airport Situational Awareness (integrating the airport in the DCB loop), a potential reduction of the interferences of the constraints applied over the traffic, a better synchronisation of the DCB measures integrating AUs P&P and reducing the number of unexpected deviations. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Reconciliation of DCB Measures |
| <ALLOCATED_TO> | <role> | LTM/EAP/APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Very Large, Large, Medium APT |

#### 4.2.3.4 Fuel Efficiency

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0017 |
| Title | Fuel Efficiency TMA (ASM integration into DCB) |
| Requirement | The complete DCB solution that includes Dynamic Airspace Configurations combined with 4D constraints will reduce the demand adjustments as capacity solutions will be on the top priority. The FEFF will be increased by 2,37% at VHC TMA, 0,50% at HC TMA and 0,47% at MC TMA. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | ASM integration into DCB |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC TMA |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0018 |
| Title | Fuel Efficiency TMA (Reconciliation of DCB Measures) |
| Requirement | Fuel Efficiency will be positively impacted by 1,01% at VHC TMA, 0,21% at HC TMA, 0,20% at MC TMA due to a potential reduction of the interferences of the constraints applied over the traffic, a reduced number of constraints to be applied over the same flight and the integration of AUs P&P |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Reconciliation of DCB Measures |
| <ALLOCATED_TO> | <role> | LTM/EAP/APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC TMA |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0019 |
| Title | Fuel Efficiency APT (Reconciliation of DCB Measures) |
| Requirement | Fuel Efficiency will be positevely impacted by 3,56% at Very Large APT, 2,96% at Large APT and 2,06% at Medium APT as a consequence of potential reduction of the interferences of the constraints applied over the traffic and reduced needs of reconciliation processes of DCB measures with Airport CDM and E-AMAN |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Reconciliation of DCB Measures |
| <ALLOCATED_TO> | <role> | LTM/EAP/APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Very Large, Large, Medium APT |

### 4.2.3.5 Cost - Effectiveness

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0020 |
| Title | Cost- Effectiveness TMA (INAP) |
| Requirement | The automated assistance to solve DCB imbalances through a set of STAM Measures (Cherry Piccking and Flows) along with DAC Measures will reduce the traffic complexity avoiding ATCO overloads, balancing the workload among sectors and using spare capacity. All these benefits will allow the ATCO to manage more number of flights and as a consequence to increase the productivity by 0,07% at VHC TMA, 0,01% at HC TMA and 0,01% at MC TMA. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | INAP |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC TMA |

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0021 |
| Title | Cost- Effectiveness TMA (Complexity Across Several Sectors) |
| Requirement | The Automated assistance for resolution & shared information towards ATCo at trajectory level will reduce the ATCO workload per flight, the complexity across several sectors and cross borders will be reduced and the time to handle local complex situations will be reduced. All these benefits will allow ATCO managing more flights and in light hours to reduce the number of ATCOs. As a consequence the CEFF will improve by 0,02% at VHC TMA, 0,005% at HC TMA and 0,004% at MC TMA. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Complexity Across Several Sectors |
| <ALLOCATED_TO> | <role> | EAP/MSP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC TMA |

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0022 |
| Title | Cost- Effectiveness TMA (ASM Integration into DCB) |
| Requirement | The elaboration of a complete DCB solution that includes Dynamic Airspace Configurations combined with 4D constraints to optimally adapt the capacity to the demand and minimise demand adjustments will reduce the overloads and will balance the workload. The worload per aircraft will be less so a higher number of flights will be managed by an ATCO. This would allow to reduce the number of ATCOs for the same traffic demand. The CEFF will improve by 0,14% at VHC TMA, 0,03% at HC TMA and 0,03% at MC TMA. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | ASM Integration into DCB |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC TMA |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0023 |
| Title | Cost- Effectiveness ER (INAP) |
| Requirement | The automated assistance to solve DCB imbalances through a set of STAM Measures (Cherry Piccking and Flows) along with DAC Measures will reduce the traffic complexity avoiding ATCO overloads, balancing the workload among sectors and using spare capacity. All these benefits will allow the ATCO to manage more number of flights and as a consequence to increase the productivity by 0,22% at VHC ER, 0,06% at HC ER and 0,11% at MC ER. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | INAP |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC ER |

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0024 |
| Title | Cost- Effectiveness ER (Complexity Across Several Sectors) |
| Requirement | The Automated assistance for resolution & shared information towards ATCo at trajectory level will reduce the ATCO workload per flight, the complexity across several sectors and cross borders will be reduced and the time to handle local complex situations will be reduced. All these benefits will allow ATCO managing more flights and in light hours to reduce the number of ATCOs. As a consequence the CEFF will improve by 0,07% at VHC ER, 0,02% at HC ER and 0,04% at MC ER. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Complexity Across Several Sectors |
| <ALLOCATED_TO> | <role> | EAP/MSP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC ER |

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0025 |
| Title | Cost- Effectiveness ER (ASM Integration into DCB) |
| Requirement | The elaboration of a complete DCB solution that includes Dynamic Airspace Configurations combined with 4D constraints to optimally adapt the capacity to the demand and minimise demand adjustments will reduce the overloads and will balance the workload. The worload per aircraft will be less so a higher number of flights will be managed by an ATCO. This would allow to reduce the number of ATCOs for the same traffic demand. The CEFF will improve by 0,45% at VHC ER, 0,13% at HC ER and 0,22% at MC ER. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | ASM Integration into DCB |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | VHC, HC, MC ER |

#### 4.2.3.6 Flexibility

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0026 |
| Title | Flexibility TMA& ER (INAP) |
| Requirement | The automated assistance to solve DCB imbalances and Hotspots in the INAP timeframe will allow:<br><br>* the selection of more convenient solutions to affect less number of flights by DCB measures and less variations of original flight plans.<br><br>* the use of spare capacity allowing the late SBT modiffications accomodations.<br><br>All these benefits have a possitive impact on FLEX.<br><br>Besides, sharing the use of spare capacity with NM will allow teh INAP actors to select the DCB measure with less impact on the network impacting less flights due to other local constraints and again imlying a posotive impact of FLEX. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | INAP |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | TMA&ER |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0027 |
| Title | Flexibility TMA& ER (Complexity Across Several Sectors) |
| Requirement | In reduced complexity situations, the military users' operations will be considered in terms of complexity management by integrating the Business Trajectory and Mission Trajectory in the complexity assessment process by these ground based automated tools. This will imply more available airspace capacity for civil traffic allowing late SBT modifications accommodation and threfore a possitive impact on FLEX. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Complexity Across Several Sectors |
| <ALLOCATED_TO> | <role> | EAP/MSP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | TMA&ER |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0028 |
| Title | Flexibility TMA& ER (ASM Integration into DCB) |
| Requirement | The full integrated airspace/4D constraints solution will enable a seamless and coordinated approach from planning to execution phases implying the selection of more convenient solutions to affect less number of flights by DCB and a areduction of delays enabled by an improved prediction of hotspots to avoid imposing needless restrictions. And threfore a possitive impact on FLEX. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | ASM Integration into DCB |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | TMA&ER |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0029 |
| Title | Flexibility TMA& ER &APT (Reconciliation of DCB Measures) |
| Requirement | A better coordination of Airport and Extended AMAN constraints with the other (local and network) DCB constraints will imporve the identification of coherent solutions reducing the number of constraints over the same flight, hence improving the FLEX. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | Reconciliation of DCB Measures |
| <ALLOCATED_TO> | <role> | LTM/EAP/APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | TMA& ER&APT |

### 4.2.3.7 Human Performance

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0030 |
| Title | Human Performance (INAP) |
| Requirement | The automated assistance to anlayse the DCB situation based on accurate environment assessment, relevant indicators and shared information improves the INAP actors' situational awareness and as consequence a HP improvement. Additionally, the decision making of most suitable solutions will have a positive impact (again HP). |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | INAP |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | TMA&ER |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0031 |
| Title | Human Performance TMA& ER (Complexity Across Several Sectors) |
| Requirement | The automated support on performing the planning of individual trajectories (trajectory analysis at short term level) improves the INAP actors situational awareness along with ATCos' and as consequence a HP improvement. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Activity> | Complexity Across Several Sectors |
| <ALLOCATED_TO> | <role> | EAP/MSP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | TMA&ER |

[REQ]

| | |
|---|---|
| Identifier | REQ-09.02-OSED- SPR-0032 |
| Title | Human Performance TMA& ER (ASM Integration into DCB) |
| Requirement | The integration of Airspace Solutions with 4D constraints are obtained through an iterative optimisation and CDM processes involving local, sub-regional and regional levels. This improves the situational awareness of involved actors and as a consequence a possitive impact on HP. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <ALLOCATED_TO> | <Activity> | ASM Integration into DCB |
| <ALLOCATED_TO> | <role> | LTM/EAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | TMA&ER |

### 4.2.4 Performance Requirements for SOLUTION 3

#### 4.2.4.1 Airport Capacity

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.03-OSED-SPR-0001 |

| | |
|---|---|
| Title | Airport Capacity (Sharing of Enriched DCB Information) |
| Requirement | Airport Capacity will be increased by 0.37% (Sub-Operating Environment Level) as a result of the use of Enriched DCB information (e.g. Congestion Indicators, Hotspot information) being used in the flight planning process. |
| Status | < in progress> |
| Rationale | The AU will have greater situational awareness of the DCB environment (Imbalances/Hotspots/Measures) leading to a decrease of the unexpected deviations and fewer number of trajectory changes. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Very Large, Large and Medium APT |

#### 4.2.4.2 TMA Capacity

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.03-OSED-SPR-0002 |
| Title | TMA Capacity (Sharing of Enriched DCB Information) |
| Requirement | TMA Capacity will be increased by 1.779% (Sub-Operating Environment Level) as a result of the use of Enriched DCB information (e.g. Congestion Indicators, Hotspot information) being used in the flight planning process. |
| Status | < in progress> |
| Rationale | The AU will have greater situational awareness of the DCB environment (Imbalances/Hotspots/Measures) leading to a decrease of the unexpected deviations and fewer number of trajectory changes. This will allow for greater stability of the demand picture and better use of available capacity. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | TMA Very High Complexity, TMA High Complexity, TMA Medium Complexity |

#### 4.2.4.3 Enroute Capacity

[REQ]

| [REQ]Identifier | REQ-09.03-OSED-SPR-0003 |
|---|---|
| Title | Enroute Capacity (Sharing of Enriched DCB Information) |
| Requirement | Enroute Capacity will be increased by 1.634% (Sub-Operating Environment Level) as a result of the use of Enriched DCB information (e.g. Congestion Indicators, Hotspot information) being used in the flight planning process. |
| Status | < in progress> |
| Rationale | The AU will have greater situational awareness of the DCB environment (Imbalances/Hotspots/Measures) leading to a decrease of the unexpected deviations and fewer number of trajectory changes. This will allow for greater stability of the demand picture and better use of available capacity. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |

| Relationship | Linked Element Type | Identifier |
| --- | --- | --- |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Enroute Very High Complexity, Enroute High Complexity, Enroute Medium Complexity |

#### 4.2.4.4 Punctuality

[REQ]

| | |
| --- | --- |
| [REQ]Identifier | REQ-09.03-OSED-SPR-0004 |
| Title | Punctuality (DCB supported by FF-ICE services) |
| Requirement | Punctuality will be increased by 0.217% (Sub-Operating Environment Level) as a result of Increased relevance of DCB measures and NMF proposals to AUs |
| Status | < in progress> |
| Rationale | The LTM and NMF will be able to design measures that are more relevant to the traffic situation leading to less flights being impacted by measures. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
| --- | --- | --- |
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Very Large, Large and Medium APT |

[REQ]

| | |
| --- | --- |
| [REQ]Identifier | REQ-09.03-OSED-SPR-0005 |

| | |
|---|---|
| Title | Punctuality (Use of all NOP information to compute optimal trajectory) |
| Requirement | Punctuality will be increased by 0.434% (Sub-Operating Environment Level) as a result of the Trajectory negotiation in reaction to DCB measure occurring with knowledge of Enriched DCB information. |
| Status | < in progress> |
| Rationale | Enriched DCB information will allow for a better negotiation of trajectories leading to less flights being impacted by measures. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Very Large, Large and Medium APT |

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.03-OSED-SPR-0006 |
| Title | Punctuality (Use of all NOP information to compute optimal trajectory) |
| Requirement | Punctuality will be increased by 0.434% (Sub-Operating Environment Level) as a result of the improved process (using preferences) for LTM to propose DCB (STAM & TTs) and/or negotiate trajectories. |
| Status | < in progress> |
| Rationale | Improved processes for LTM to propose DCB measures will allow for a better DCB measures and negotiation of trajectories leading to a reduced impact of measures on the AU trajectory... |

| | |
|---|---|
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | STAM Counter Proposal |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Very Large, Large and Medium APT |

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.03-OSED-SPR-0007 |
| Title | Punctuality (Inclusion of Preferences within the DCB Process) |
| Requirement | Punctuality will be increased by 0.434% (Sub-Operating Environment Level) as a result of the improved process (using preferences) for LTM to propose DCB (STAM & TTs) and/or negotiate trajectories. |
| Status | < in progress> |
| Rationale | Improved processes for LTM to propose DCB measures will allow for a better DCB measures and negotiation of trajectories leading to a reduced impact of measures on the AU trajectory... |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | STAM Counter Proposal |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Sub-Operating Environment> | Very Large, Large and Medium APT |

[REQ]

| [REQ]Identifier | REQ-09.03-OSED-SPR-0008 |
|---|---|
| Title | Punctuality (Collaborative NOP) |
| Requirement | Punctuality will be increased by 0.326% (Sub-Operating Environment Level) as a result of the improved process (using preferences) for LTM to propose DCB (STAM & TTs) and/or negotiate trajectories. |
| Status | < in progress> |
| Rationale | Improved processes for LTM to propose DCB measures will allow for a better DCB measures and negotiation of trajectories leading to a reduced impact of measures on the AU trajectory... |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB Information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Very Large, Large and Medium APT |

[REQ]

| [REQ]Identifier | REQ-09.03-OSED-SPR-0009 |
| --- | --- |
| Title | Punctuality (Collaborative Airport Planning Interface) |
| Requirement | Punctuality will be increased by 0.326% (Sub-Operating Environment Level) as a result of the improved process (using preferences) for LTM to propose DCB (STAM & TTs) and/or negotiate trajectories. |
| Status | < in progress> |
| Rationale | Improved processes for LTM to propose DCB measures will allow for a better DCB measures and negotiation of trajectories leading to a reduced impact of measures on the AU trajectory... |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
| --- | --- | --- |
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB Information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Very Large, Large and Medium APT |

#### 4.2.4.5 Predictability

[REQ]

| [REQ]Identifier | REQ-09.03-OSED-SPR-0010 |
| --- | --- |
| Title | Predictability (SBT management supported by FF-ICE services) |
| Requirement | Predictability will be increased by 1.194% (Sub-Operating Environment Level) as a result of better AU trajectory planning through increased situational awareness of the DCB situation. |
| Status | < in progress> |

| | |
|---|---|
| Rationale | Through consideration of the DCB situation AUs can plan their trajectories to avoid congested areas earlier (should they choose) and therefore reduce the number of unexpected deviations and fewer number of trajectory changes through the life of the flight. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Very Large, Large and Medium APT |

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.03-OSED-SPR-0011 |
| Title | Predictability (Use of all NOP information (enriched DCB information for AUs, Congestion Indicators) to compute optimal trajectory) |
| Requirement | Predictability will be increased by 1.194% (Sub-Operating Environment Level) as a result of better AU trajectory planning through increased situational awareness of the DCB situation. |
| Status | < in progress> |
| Rationale | |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Very Large, Large and Medium APT |

[REQ]

| [REQ]Identifier | REQ-09.03-OSED-SPR-0012 |
|---|---|
| Title | Predictability (Traffic and Demand Forecast) |
| Requirement | Predictability will be increased by 1.592% (Sub-Operating Environment Level) as a result of improved traffic demand predictions. |
| Status | < in progress> |
| Rationale | Use of Network traffic demand prediction that includes AOP schedule data, AOP rolling plan and enhanced route selections and the enhanced information provided to stakeholders provides increased predictability. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Very Large, Large and Medium APT |

#### 4.2.4.6 Fuel Efficiency

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.03-OSED-SPR-0013 |
| Title | Fuel Efficiency (SBT management supported by FF-ICE services.) |
| Requirement | Fuel Efficiency will be increased by 6.557% (Sub-Operating Environment Level) as a result of incorporating enhanced DCB information within the AU trajectory planning process. |
| Status | < in progress> |
| Rationale | Through consideration of the DCB situation AUs can plan their trajectories to avoid congested areas earlier (should they choose) and therefore reduce the number of unexpected deviations and fewer number of trajectory changes through the life of the flight. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Large APT, Large APT and Medium APT, TMA Very High Complexity, TMA High Complexity, TMA Medium Complexity, ER Very High |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| | | Complexity, ER High Complexity, ER Medium Complexity |

[REQ]

| [REQ]Identifier | REQ-09.03-OSED-SPR-0014 |
|---|---|
| Title | Fuel Efficiency (Use of all NOP information) |
| Requirement | Fuel Efficiency will be increased by 6.557% (Sub-Operating Environment Level) as a result of incorporating enhanced DCB information within the AU trajectory planning process. |
| Status | < in progress> |
| Rationale | Through consideration of the DCB situation AUs can plan their trajectories to avoid congested areas earlier (should they choose) and therefore reduce the number of unexpected deviations and fewer number of trajectory changes through the life of the flight. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Large APT, Large APT and Medium APT, TMA Very High Complexity, TMA High Complexity, TMA Medium Complexity, ER Very High Complexity, ER High Complexity, ER Medium Complexity |

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.03-OSED-SPR-0015 |
| Title | Fuel Efficiency (DCB What-If Network Impact Assessment) |
| Requirement | Fuel Efficiency will be increased by 2.1857% (Sub-Operating Environment Level) as a result of an Improved process (using preferences) for LTM to propose DCB (STAM & TTs) and/or negotiate trajectories. |
| Status | < in progress> |
| Rationale | Through consideration of the DCB situation AUs can plan their trajectories to avoid congested areas earlier (should they choose) and therefore reduce the number of unexpected deviations and fewer number of trajectory changes through the life of the flight. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Very Large APT, Large APT and Medium APT, TMA Very High Complexity, TMA High Complexity, TMA Medium Complexity, ER Very High Complexity, ER High Complexity, ER Medium Complexity |

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.03-OSED-SPR-0016 |
| Title | Fuel Efficiency (Inclusion of preferences in SBT for DCB processes) |

| | |
|---|---|
| Requirement | Fuel Efficiency will be increased by 2.1857% (Sub-Operating Environment Level) as a result of an Improved process (using preferences) for LTM to propose DCB (STAM & TTs) and/or negotiate trajectories. |
| Status | < in progress> |
| Rationale | Through the consideration of preferences within the DCB process the LTM/NM can propose measures that are more relevant and take into account the AU preference. These measures will be targeted and therefore reduce the deviation from the preferred trajectory of the AU and also reduce the number of trajectory changes through the life of the flight. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Large APT, Large APT and Medium APT, TMA Very High Complexity, TMA High Complexity, TMA Medium Complexity, ER Very High Complexity, ER High Complexity, ER Medium Complexity |

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.03-OSED-SPR-0017 |
| Title | Fuel Efficiency (Collaborative NOP) |
| Requirement | Fuel Efficiency will be increased by 2.1857% (Sub-Operating Environment Level) as a result of an Improved process (using preferences) for LTM to propose DCB (STAM & TTs) and/or negotiate trajectories. |
| Status | < in progress> |

| | |
|---|---|
| Rationale | Through consideration of the DCB situation AUs can plan their trajectories to avoid congested areas earlier (should they choose) and therefore reduce the number of unexpected deviations and fewer number of trajectory changes through the life of the flight. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Large APT, Large APT and Medium APT, TMA Very High Complexity, TMA High Complexity, TMA Medium Complexity, ER Very High Complexity, ER High Complexity, ER Medium Complexity |

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.03-OSED-SPR-0018 |
| Title | Fuel Efficiency (Collaborative Airport Planning Interface) |
| Requirement | Fuel Efficiency will be increased by 2.1857% (Sub-Operating Environment Level) as a result of an Improved process (using APT Severity) for LTM to |

| | |
|---|---|
| | propose DCB (STAM and TTs) and/or negotiate trajectories through the use of Collaborative Airport Planning Interface (AOP-NOP). |
| Status | < in progress> |
| Rationale | Through consideration of the DCB situation through the Collaborative Airport Planning Interface (AOP-NOP) stakeholders can better create relevant measures, AUs can plan their trajectories to avoid congested areas earlier (should they choose) and therefore reduce the number of unexpected deviations and fewer number of trajectory changes through the life of the flight. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Large APT, Large APT and Medium APT, TMA Very High Complexity, TMA High Complexity, TMA Medium Complexity, ER Very High Complexity, ER High Complexity, ER Medium Complexity |

### 4.2.4.7 ATCO Productivity Enroute/TMA (CEF2)

[REQ]

| [REQ]Identifier | REQ-09.03-OSED-SPR-0019 |
|---|---|
| Title | ATCO Productivity Enroute/TMA (SBT management supported by FF-ICE services.) |
| Requirement | ATCO Productivity will be increased by 0.267% (Sub-Operating Environment Level) as a result of improved AU trajectory planning considering DCB information for situational awareness and decision making. |

| | |
|---|---|
| Status | < in progress> |
| Rationale | Through earlier provision of the flight plan (PFP), the day of operation can be better planned. Resources (ATCOs) and available capacity can be better exploited (utilised better) for the day of operation. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Large APT, Large APT and Medium APT, TMA Very High Complexity, TMA High Complexity, TMA Medium Complexity, ER Very High Complexity, ER High Complexity, ER Medium Complexity |

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.03-OSED-SPR-0020 |
| Title | ATCO Productivity Enroute/TMA (DCB supported by FF-ICE services) |
| Requirement | ATCO Productivity will be increased by 0.267% (Sub-Operating Environment Level) as a result of earlier provision of DCB and NMF proposals. |
| Status | < in progress> |
| Rationale | Through earlier provision of the DCB and NMF proposals, the day of operation can be better planned. Resources (ATCOs) and available capacity can be better exploited (utilised better) for the day of operation. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Large APT, Large APT and Medium APT, TMA Very High Complexity, TMA High Complexity, TMA Medium Complexity, ER Very High Complexity, ER High Complexity, ER Medium Complexity |

[REQ]

| [REQ]Identifier | REQ-09.03-OSED-SPR -0021 |
|---|---|
| Title | ATCO Productivity Enroute/TMA (Use of all NOP information) |
| Requirement | AU Productivity will be increased by 0.267% (Sub-Operating Environment Level) as a result of improved trajectory negotiation in reaction to DCB measure with an understanding of the Enriched DCB information. |
| Status | < in progress> |
| Rationale | Through knowledge of the DCB situation the AU will be able to react to the DCB situation with an understanding of enriched DCB information. The AU will be able to avoid the congested areas resulting in reduced unplanned trajectory changes leading to less workload. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Large APT, Large APT and Medium APT, TMA Very High Complexity, TMA High Complexity, TMA Medium Complexity, ER Very High Complexity, ER High Complexity, ER Medium Complexity |

[REQ]

| [REQ]Identifier | REQ-09.03-OSED-SPR-0022 |
|---|---|
| Title | ATCO Productivity Enroute/TMA (DCB What-If Network Impact Assessment) |
| Requirement | ATCO/AU Productivity will be increased by 0.133% (Sub-Operating Environment Level) as a result of Improved process (using preferences) for LTM to propose DCB (STAM & TTs) and/or negotiate trajectories |
| Status | < in progress> |
| Rationale | Through the use of what-if tools the LTM/NM can propose measures that are more relevant and take into account the AU preference. These measures will be targeted and therefore reduce the deviation from the preferred trajectory of the AU and also reduce the number of trajectory changes through the life of the flight. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Large APT, Large APT and Medium APT, TMA Very High Complexity, TMA High Complexity, TMA Medium Complexity, ER Very High Complexity, ER High Complexity, ER Medium Complexity |

[REQ]

| [REQ]Identifier | REQ-09.03-OSED-SPR-0023 |
|---|---|
| Title | ATCO Productivity Enroute/TMA (Inclusion of preferences in SBT for DCB processes) |
| Requirement | ATCO/AU productivity will be increased by 0.133% (Sub-Operating Environment Level) as a result of an Improved process (using preferences) for LTM to propose DCB (STAM & TTs) and/or negotiate trajectories. |
| Status | < in progress> |
| Rationale | Through the consideration of preferences within the DCB process the LTM/NM can propose measures that are more relevant and take into account the AU preference. These measures will be targeted and therefore reduce the deviation from the preferred trajectory of the AU and also reduce the number of trajectory changes through the life of the flight. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Large APT, Large APT and Medium APT, TMA Very High Complexity, TMA High Complexity, TMA Medium Complexity, ER Very High Complexity, ER High Complexity, ER Medium Complexity |

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.03-OSED-SPR-0024 |
| Title | ATCO Productivity Enroute/TMA (Collaborative NOP) |
| Requirement | ATCO/AU productivity will be increased by 0.133% (Sub-Operating Environment Level) as a result of an Improved process (using preferences) for LTM to propose DCB (STAM & TTs) and/or negotiate trajectories. |
| Status | < in progress> |
| Rationale | Through consideration of the DCB situation AUs can plan their trajectories to avoid congested areas earlier (should they choose) and therefore reduce the number of unexpected deviations and fewer number of trajectory changes through the life of the flight. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Large APT, Large APT and Medium APT, TMA Very High Complexity, TMA High Complexity, TMA Medium Complexity, ER Very High Complexity, ER High Complexity, ER Medium Complexity |

[REQ]

| | |
|---|---|
| [REQ]Identifier | REQ-09.03-OSED-SPR-0025 |
| Title | ATCO Productivity Enroute/TMA (Collaborative Airport Planning Interface) |
| Requirement | ATCO/AU productivity will be increased by 0.133% (Sub-Operating Environment Level) as a result of an Improved process (using APT Severity) for LTM to propose DCB (STAM and TTs) and/or negotiate trajectories through the use of Collaborative Airport Planning Interface (AOP-NOP). |
| Status | < in progress> |
| Rationale | Through consideration of the DCB situation through the Collaborative Airport Planning Interface (AOP-NOP) stakeholders can better create relevant measures, AUs can plan their trajectories to avoid congested areas earlier (should they choose) and therefore reduce the number of unexpected deviations and fewer number of trajectory changes through the life of the flight. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <ALLOCATED_TO> | <Activity> | Enriched DCB information |
| <ALLOCATED_TO> | <role> | LTM/AU/NMF |
| <ALLOCATED_TO> | <Sub-Operating Environment> | Large APT, Large APT and Medium APT, TMA Very High |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| | | Complexity, TMA High Complexity, TMA Medium Complexity, ER Very High Complexity, ER High Complexity, ER Medium Complexity |

## 4.3 Security Requirements

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 001 |
| Title | Security Policy |
| Requirement | The Responsible Organization shall produce, approve, and adopt a security policy which complies with the Reference ATM Security Policy; this security policy shall be communicated to all relevant parties |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req C2.1 |
| Category | Security |

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 002 |
| Title | Security Policy |
| Requirement | The Responsible Organization shall regularly review the security policy and ensure that it remains effective. |
| Status | <in progress> |
| Rationale | From SEASR 1 MSSC Req C2.2 |
| Category | Security |

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 003 |
| Title | Organisation of Information and ATM Service Security |
| Requirement | The Responsible Organization shall provide the resources needed for information and ATM services security and assign roles and responsibilities for all security management functions. |
| Status | <in progress> |
| Rationale | From SESAR MSSC Req C3.1 |
| Category | Security |

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 004 |
| Title | Organisation of Information and ATM Service Security |
| Requirement | The Responsible Organization shall ensure that the implementation of information and ATM services security controls is co-ordinated across the organization. |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req 3.2 |
| Category | Security |

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 005 |
| Title | Organisation of Information and ATM Security |
| Requirement | Information storage and exchange means shall be defined according to information confidentiality/criticality level |
| Status | <in progress> |
| Rationale | From SESAR MSSC Req 3.4 |
| Category | Security |

[

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 006 |

| | |
|---|---|
| Title | Asset Management |
| Requirement | All assets shall be clearly identified and an inventory of all important assets drawn up and maintained. |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req C5.1 |
| Category | Security |

[

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 007 |
| Title | Asset Management |
| Requirement | All information and ATM services associated with information processing facilities shall be ‘owned’ by a designated responsible individual or role. |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req C5.2 |
| Category | Security |

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 008 |
| Title | Asset Management |
| Requirement | C5.3 Rules for the acceptable use of assets shall be identified, documented, and implemented. |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req C5.3 |
| Category | Security |

[

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 009 |
| Title | Asset Management |

| | |
|---|---|
| Requirement | All Information and ATM services shall be classified in terms of its value, legal requirements, sensitivity and criticality to ATM, ATM organizations and stakeholders. |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req C5.4 |
| Category | Security |

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 010 |
| Title | Asset Management |
| Requirement | An appropriate set of procedures for information and ATM services labeling and handling shall be developed and implemented in accordance with the classification scheme adopted. |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req C5.5 |
| Category | Security |

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 011 |
| Title | Asset Management |
| Requirement | There shall be procedures in place for the management of removable media |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req C5.6 |
| Category | Security |

[

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 012 |
| Title | Asset Management |
| Requirement | Media shall be disposed of securely and safely when no longer required, using formal procedures |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req C5.77 |

| | |
|---|---|
| Category | Security |

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 013 |
| Title | Asset Management |
| Requirement | Procedures for the handling and storage of ATM information shall be established to protect ATM services and information from unauthorized disclosure or misuse. |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req C5.8 |
| Category | Security |

[

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 014 |
| Title | Asset Management |
| Requirement | ATM system documentation shall be protected against unauthorized access |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req C5.9 |
| Category | Security |

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 015 |
| Title | Network Security Management |
| Requirement | ATM Networks shall be adequately managed and controlled, in order to be protected from threats, and to maintain security for the ATM systems and applications using the network, including information in transit. |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req C9.1 |
| Category | Security |

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 16 |
| Title | Network Security Management |
| Requirement | Formal exchange policies, procedures, and controls shall be in place to protect the exchange of ATM services and information through the use of all types of communication facilities. Agreements shall be established for the exchange of ATM services and information and software between the Responsible Organization and external parties. |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req C9.2 |
| Category | Security |

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 17 |
| Title | Communications Security |
| Requirement | Information conveyed by electronic messaging shall be appropriately protected. |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req C9.3 |
| Category | Security |

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 018 |
| Title | Compliance |
| Requirement | Compliance to statutory, regulatory and contractual requirements shall be checked, and the correct and authorized use of facilities and assets shall be defined. |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req C13.1 |
| Category | Security |

[REQ]

| | |
|---|---|
| Identifier | REQ-PJ09-OSED-Sec 019 |

| | |
|---|---|
| Title | Compliance |
| Requirement | Any personal or protectively classified information shall be protected in accordance with National and European requirements. |
| Status | <in progress> |
| Rationale | From SESAR 1 MSSC Req C13.2 |
| Category | Security |

## 4.4 INTEROP

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| IER-09.01-OSED-100 | TrafficCountsbyTrafficVolumeRequest | NM, AU, INAP, APT | NM | Request TrafficCountRequest TrafficType CountsInterval CountCalculationType {<br>- ENTRY<br>- OCCUPANCY<br>- WEIGHTEDOCCUPANCY<br>- COMPLEXITY<br>} | UC04, UC05 | Traffic Demand | | Predicted Workload *Different methodologies to detect the imbalance can be requested: entry count, occupancy count, weighted occupancy, complexity, …* | TrafficCountService |
| IER-09.01-OSED-100b | TrafficCountsbyTrafficVolumeReply | NM | NM, AU, INAP, APT | TrafficCountReplyData, ICI | UC04, UC05 | DCB Imbalance | | Predicted Workload *The imbalance figure is provided (TrafficCountReplyData)with the associated Imbalance Confidence Index (ICI)* | TrafficCountService |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| IER-09.01-OSED-102 | LocalCongestionIndicatorRequest | NM, AU, INAP, APT | NM | Date<br>TFV name<br>Start/End time | UC04, UC05 | DCB Imbalance | | Predicted Workload<br>*The local imbalance figure for a TFV is qualified by a congestion indicator that can be requested.* | LocalTrafficCountService |
| IER-09.01-OSED-102b | LocalCongestionIndicatorReply | NM | NM, AU, INAP, APT | CI, ICI | UC04, UC05 | DCB Imbalance | | Predicted Workload<br>*The local congestion indicator (CI) qualifying the imbalance figure for a TFV is provided. In addition, the Imbalance Confidence Index (ICI) is provided.* | LocalTrafficCountService |
| IER-09.01-OSED-104 | NetworkCongestionIndicatorRequest | NM, AU, INAP, APT | NM | Flight_Id<br>Date | UC06, UC07, UC08 | DCB Imbalance | | Predicted Workload<br>*The consolidated imbalance figure for the complete trajectory is qualified by a congestion indicator that can be requested.* | TrafficCountService |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| IER-09.01-OSED-104b | NetworkCongestionIndicatorReply | NM | NM, AU, INAP, APT | IC, ICI | UC06, UC07, UC08 | DCB Imbalance | | Predicted Workload *The congestion indicator (CI) qualifying the imbalance figure for a complete trajectory is provided. In addition, the Imbalance Confidence Index (ICI) is provided.* | TrafficCountService |
| IER-09.01-OSED-200 | What-ifRequest | NM, AU, INAP, APT | NM | TypeRequest {Network, HotspotId, Flight_id} FBT STAMMeasures SetKPI {ReactionaryDelay, ATFCMDelay, TFVCongestionIndicator, …} | UC09, UC10 | What-If | | Network Performance *The Network Performance can be requested at different levels (Network/Resilience, Hotspot, flight) to simulateimpacts on KPIs (reactionary delay, Congestion indicator, ATFCM delay, …)* | NetworkPerformance |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| IER-09.01-OSED-200b | What-ifReply | NM | NM, AU, INAP, APT | ReactionaryDelay<br>ATFCMDelay<br>TFVCongestionIndicator<br>NetworkState<br>.... | UC09, UC10 | DCB Impact Assessment | | Network Performance<br>*The Network Performance is provided at different levels (Network/Resilience, Hotspot, flight) to simulate impacts on KPIs (reactionary delay, Congestion indicator, ATFCM delay, …)* | NetworkPerformance |
| IER-09.01-OSED-202 | What-elseRequest | NM, AU, INAP, APT | NM | TypeRequest<br>{HotspotId, Fligh_Id}<br>FBT | UC09, UC10 | What-Else | | Network Performance<br>*The Network Performance can be requested to provide alternate trajectories solution to avoid hotspots.* | NetworkPerformance |
| IER-09.01-OSED-202b | What-elseReply | NM | NM, AU, INAP, APT | FBT' | UC09, UC10 | DCB Impact Assessment | | Network Performance<br>*The Network Performance is providing alternate trajectories to avoid hotspots* | NetworkPerformance |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| IER-09.01-OSED-204 | NetworkStateRequest | NM, AU, INAP, APT | NM | | UC11 | Network Resilience Indicators | | Network State *The network state can be requested.* | NetworkPerformance |
| IER-09.01-OSED-204b | NetworkStateReply | NM | NM, AU, INAP, APT | NetworkState {Stable undisturbed nominal, Slight network diruptions, Critical network state, Crisis network state} SeverityMagnitude DisruptionDuration PredictedNextStep {Stable undisturbed nominal, Slight network diruptions, | UC11 | Network Resilience Indicators | | Network Performance *The network state is provided to characterize the situation (Stable undisturbed nominal, Slight network diruptions, Critical network state, Crisis network state), the duration of the disruption and the predicted next state.* | NetworkPerformance |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Critical network state, Crisis network state} | | | | | |
| IER-09.03-OSED-001 | XCDM_DelegationCreation_Request | NM, AU, INAP, APT | NM, AU, INAP, APT | Date<br>Hotspot Id<br>Status {not_delegated, delegated}<br>Delegated Flight Id<br>NonDelegatedFlightId<br>ActorInitiator<br>DelegatedActor<br>TimeOut | UC33, UC34, UC35, UC36, UC37, UC38, UC39, UC40, UC41 | Delegate Hotspot Resolution | | MCDM Management<br>*A NMf actor can request a delegation of responsibility to an other delegated actor to manage the hotspot resolution. The flights concerned by the delegation are specified as well as the modalities of the delegation.* | M-CDMMeasure |
| IER-09.03-OSED-002 | XCDM_DelegationCreation_Request | NM, AU, INAP, APT | NM, AU, INAP, APT | Date<br>Hotspot Id<br>Status {not_delegated, delegated}<br>{Proposed DCB Measures} | UC12 | Delegate Hotspot Resolution | | MCDM Management<br>*A LTM actor can request a delegation of responsibility to an other EAP actor to manage the hotspot resolution.* | M-CDMMeasure |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| | | | | ActorInitiator<br>DelegatedActor<br>requiredmaxdelay<br>TimeOut | | | | | |
| IER-09.03-OSED-002b | XCDM_DelegationCreation_Reply | NM, AU, INAP, APT | NM, AU, INAP, APT | Date<br>Hotspot Id<br>Status | UC33, UC34, UC35, UC36, UC37, UC38, UC39, UC40, UC41 | Delegate Hotspot Resolution | | MCDM Management<br>*The delegated NMf actor can accept or reject the delegation request* | M-CDMMeasure |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| IER-09.03-OSED-005 | XCDM_DelegationUpdatel_Request | NM, AU, INAP, APT | NM, AU, INAP, APT | Date<br>Hotspot Id<br>Status<br>Update {changemodedelegation, cancel} | UC33, UC34, UC35, UC36, UC37, UC38, UC39, UC40, UC41 | Delegate Hotspot Resolution | | MCDM Management<br>*INAP can update a collaboration mode or cancel a delegation of responsibility to manage the hotspot resolution.* | M-CDMMeasure |
| IER-09.03-OSED-005b | XCDM_DelegationUpdateReply | NM, AU, INAP, APT | NM, AU, INAP, APT | Date<br>Hotspot Id<br>Status | UC33, UC34, UC35, UC36, UC37, UC38, UC39, UC40, UC41 | Delegate Hotspot Resolution | | MCDM Management<br>*The delegated NMf actor can acknowledge the delegation cancellation* | M-CDMMeasure |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| IER-09.03-OSED-007 | MCDM_StateUpdate_Request | NM, AU, INAP, APT | NM, AU, INAP, APT, ATC | Date<br>Topic ID<br>ActorInitiator<br>ActorImplementor<br>MCDM state {<br>- DRAFT<br>- PROPOSED_FOR_SIMPLE_COORDINATION<br>- PROPOSED_FOR_COMPLEX_COOORDINATION<br>- COORDINATED<br>- IMPLEMENTING<br>- IMPLEMENTED<br>- ABANDONED<br>- INTERUPTED<br>- FINISHED<br>} | UC33, UC34, UC35, UC36, UC37, UC38, UC39, UC40, UC41 | Proposed (Agree) DCB Measure Implement DCB measures | | MCDM Management<br>*An NMf actor can request a delegation of implementation to an ATC actor* | M-CDMMeasure |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| | | | | STAMMeasures | | | | | |
| IER-09.03-OSED-008 | MCDM_StateUpdate_Request | NM, AU, INAP, APT | NM, AU, INAP, APT, ATC | Date<br>Topic ID<br>ActorInitiator<br>ActorImplementor<br>MCDM state {<br>- DRAFT<br>- PROPOSED_FOR_SIMPLE_COORDINATION<br>- PROPOSED_FOR_COMPLEX_COOORDINATION<br>- COORDINATED<br>- IMPLEMENTING<br>- IMPLEMENTED<br>- ABANDONED<br>- INTERUPTED | UC33, UC34, UC35, UC36, UC37, UC38, UC39, UC40, UC41 | Proposed (Agree) DCB Measure Implement DCB measures | | MCDM Management<br>*A NMf actor can request a complex coordination with an other NMf actor* | M-CDMMeasure |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| | | | | - FINISHED<br>}<br>STAMMeasures | | | | | |
| IER-09.03-OSED-007b | MCDM_StateUpdate_Reply | NM, AU, INAP, APT | NM, AU, INAP, APT | Date<br>Topic ID<br>STAMMeasures | UC33, UC34, UC35, UC36, UC37, UC38, UC39, UC40, UC41 | | | MCDM Management<br>*The ATC actor can accept/reject the implemenation request*<br>*The NMf actor can reply (counter-proposal, accept, reject) to the complex coordination request (STAMMeasures counter-proposal).* | M-CDMMeasure |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| IER-09.03-OSED-100 | CRM_GetNCC_Request | NM, AU, INAP, APT | NM | - Hotspot ID<br>- Flight ID<br>- TT Constraint + TW | UC42, UC43, UC44, UC45, UC46, UC47, UC48, UC49, UC50, UC51, UC52, UC53 | Proposed DCB Measure | | Constraint Reconciliation Management<br>*A NMF actor can request a Target-Time proposal(including Target Window) to the NIMS/ConstraintReconciliation system* | ConstraintReconciliation |
| IER-09.03-OSED-100b | CRM_GetNCC_Reply | NM | NM, AU, INAP, APT | NCC<br>NCC context | UC42, UC43, UC44, UC45, UC46, UC47, UC48, UC49, UC50, UC51, UC52, UC53 | NCC | | Constraint Reconciliation Management<br>*The NIMS/ConstraintReconciliation sends a reply to inform about the Network Consolidated Constraint (elligible Target Time). Nota : The elligible Target Time is processed according to the Constraint* | ConstraintReconciliation |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | *Reconciliation priority rules.* | |
| IER-09.03-OSED-102 | CRM_GetContext_Request | NM, AU, INAP, APT | NM | Hotspot ID | UC42, UC43, UC44, UC45, UC46, UC47, UC48, UC49, UC50, UC51, UC52, UC53 | CRM information | | Constraint Reconciliation Management *A NMF actor can request the context of multiple constraints for flights included in a hotspot to the NIMS/ConstraintReconciliation system* | ConstraintReconciliation |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| IER-09.03-OSED-102b | CRM_GetContext_Reply | NM | NM, AU, INAP, APT | List of Flight<br>- NCC context | UC42, UC43, UC44, UC45, UC46, UC47, UC48, UC49, UC50, UC51, UC52, UC53 | CRM information | | Constraint Reconciliation Management<br>*The NIMS/ConstraintReconciliation sends a reply to inform about the context of multiple constraints for a flight.* | ConstraintReconciliation |
| IER-09.03-OSED-104 | CRM_GetContext_Request | NM, AU, INAP, APT | NM | Flight ID | UC42, UC43, UC44, UC45, UC46, UC47, UC48, UC49, UC50, UC51, UC52, UC53 | CRM information | | Constraint Reconciliation Management<br>*A NMF actor can request the context of multiple constraints for a flight to the NIMS/ConstraintReconciliation system* | ConstraintReconciliation |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| IER-09.03-OSED-104b | CRM_GetContext_Reply | NM | NM, AU, INAP, APT | List of - Flight<br>- NCC context | UC42, UC43, UC44, UC45, UC46, UC47, UC48, UC49, UC50, UC51, UC52, UC53 | CRM information | | Constraint Reconciliation Management<br>*The NIMS/ConstraintReconciliation sends a reply to inform about the context of multiple constraints for a flight.* | ConstraintReconciliation |
| IER-09.03-OSED-400 | PutEnrichedInformation | AU, APT | NM, | AU Preference<br>Margins of Manoeuvre<br>Congestion Indicator | UC55, UC56, UC60 | Network Performance | | EnrciheDCBInformation<br>*NMf actors setup enriched DCB information associated to a flight* | EnricheDCBInformation |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| IER-09.03-OSED-401 | GetEnrichedInformation | AU, INAP, APT | NM | AU Preference<br>Margins of Manoeuvre<br>Congestion Indicator | UC55, UC56, UC60 | Network Performance | | EnricheDCBInformation<br>*NMf actors retrieves enriched DCB information associated to a flight* | EnricheDCBInformation |
| IER-09.02-OSED-100 | HotspotPublication | NM, AU, INAP, APT | NM | Hotspot<br><br>*Date*<br>*HotspotId*<br>*TFV*<br>*Type*<br>*Status* | UC31, UC 32 | Hotspot Optispot | | HotspotManagement<br>*INAP defines and publishes a HotSpot due to an excess of traffic after analysing an imbalance using TMV.* | HotspotManagement |
| IER-09.02-OSED-101 | MonitoringThresholdsNotification | NM, AU, INAP, APT | NM | Monitoring Thresholds<br><br>*OTMVPlans*<br>- *TrafficVolumeId,*<br>- *DurationHourMinute,*<br>- *OTMVPlanForDuration*<br>*tvsOTMVs* | UC31, UC32 | Hotspot Resolution Monitoring | | HotspotManagement<br>*INAP defines the monitoring thresholds so as to monitor the proper resolution of the Hotspot according to the traffic prediction vs these thresholds.* | HotspotManagement |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| IER-09.02-OSED-102 | SpotSharing | NM | NM, AU, INAP, APT | Hotspot<br>OptiSpot<br><br>*Dataset*<br>*DateYearMonthDay*<br>*TrafficVolumeId*<br>*DurationHourMinute*<br>*HotspotKind* | UC31, UC32, UC17, UC18, UC19. | Hotspot<br>OptiSpot | | HotspotManagement<br>*NM disseminates the Hotspot information (time, severity) to NMf actors. This request is the first step for the spot sharing with stakeholders.* | HotspotManagement |
| IER-09.02-OSED-103 | SpotResolutionStatusUpdate<br>GetMonitoring | NM | NM, AU, INAP, APT | SpotResolutionStatus<br><br>*Date*<br>*Hotspot*<br>*HotspotId*<br>*HotspotStatus* | UC31, UC32, UC17, UC18, UC19 | Hotspot Resolution Monitoring | | HotspotManagement<br>*NM monitors the Spot resolution, informs INAP about the spot resolution status and alerts it in case of any resolution deviation is detected.* | HotspotManagement |

Founding Members

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| IER-09.02-OSED-200 | DCBMeasureProposal | NM, AU, INAP, APT | NM, AU, INAP, APT | Proposed DCB Measures | UC17, UC18, UC19 | Proposed DCB Measure | | STAMMeasures *INAP elaborates a solution to resolve the Hotspot based on DCB measures. INAP sends the proposed DCB Measures to the NM system.*<br><br>*NM disseminates the DCB Measures information to NMf and AU actors.* | STAMMeasures |
| IER-09.02-OSED-201 | DCBMeasureUpdate | NM, AU, INAP, APT | NM, AU, INAP, APT | Agreed DCB Measure | UC17, UC18, UC19 | Update Proposed Flight Plan | | STAMMeasures *Agreed DCB Measure information is sent to the NM system. NM sends the agreed DCB Measures information to the NMF and AU actors.* | STAMMeasures |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| IER-09.02-OSED-202 | DCBMeasureImplementation | INAP | ATC | Implemented DCB Measure | UC 17, UC18 | Implemented DCB Measure | | STAMMeasures<br>*ATC informs NM about the implementation of the DCBMeasure alons with the Revised RBT after having sent the ATC Clearance related to the measure to the Flight Crew.* | STAMMeasures |
| IER-09.02-OSED-203 | TDIUpdate | NM | NM, AU, INAP, APT | Target Deviation Indicator | UC17, UC18, UC19 | Target Deviation Indicator | | STAMMeasures<br>*The Target Deviation Indicator is calculated to provide information on Hotspot Resolution Deviation.*<br>*TDI is sent to the INAP.* | STAMMeasures |

| Identifier | Name | Issuer | Intended Addressees | Information Element | Involved Operational Activities | Op | Sys | Rationale | Service Identifier |
|---|---|---|---|---|---|---|---|---|---|
| IER-09.02-OSED-204 | HotspotResolution Alert | NM | NM, AU, INAP, APT | Hotspot Resolution Alert<br><br>SpotResolutionStatus could fit. | UC31, UC32 | Impacted Hotspot Resolution Status | | STAMMeasures<br>*The hotspot resolution alert is disseminated to the NMf actors in case any anomaly in the resolution is detected.* | STAMMeasures |
| IER-09.01-OSED-205 | FDCIRequest | NM, AU, INAP, APT | NM | Flight Identifier<br>FDCI<br>FDCI Reason<br>FDCI Delay Theshold | UC54, UC55 | FDCI | | Predicted Workload<br>Different methodologies to detect the imbalance can be requested: entry count, occupancy count, weighted occupancy, complexity, … | TrafficCountService |
| IER-09.01-OSED-206 | FDCIReply | NM | NM, AU, INAP, APT | FDCI Status | UC54, UC55 | FDCI | | Predicted Workload<br>The imbalance figure is provided (TrafficCountReplyData)with the associated Imbalance Confidence Index (ICI) | TrafficCountService |

[REQ]

| | |
|---|---|
| Identifier | IER-09.01-OSED-100 |
| Title | TrafficCountsbyTrafficVolume |
| Requirement | NMf actor shall request imbalance figures with associated confidence index selecting different methodologies (entry count, occupancy count, weighted occupancy, complexity) |
| Status | <in progress> |
| Rationale | Different methodologies to detect the imbalance can be requested: entry count, occupancy count, weighted occupancy, complexity, … The imbalance figure is provided (TrafficCountReplyData)with the associated Imbalance Confidence Index (ICI) and the prediction quality indicator PreQI |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <SATISFIES> | <Information Exchange> | Traffic Demand (FBT) |
| <SATISFIES> | <Information Exchange> | DCB Imbalance |
| <ALLOCATED_TO> | <Information Flow> | NM-INAP |
| <ALLOCATED_TO> | <Information Flow> | NM-AU |
| <ALLOCATED_TO> | <Information Flow> | NM-APOC |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodology |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.01-OSED-102 |
| Title | LocalCongestionIndicator |
| Requirement | NMf actor shall have access to the Congestion Indicator and associated confidence index generated by local actors. |
| Status | <in progress> |
| Rationale | The local imbalance figure for a TFV is qualified by a congestion indicator that can be requested. The local congestion indicator (CI) qualifying the imbalance figure for a TFV is provided. In addition, the Imbalance Confidence Index (ICI) is provided. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <SATISFIES> | <Information Exchange> | Congestion Indicator |
| <SATISFIES> | <Information Exchange> | Confidence Index |
| <SATISFIES> | <Information Exchange> | Imbalance Severity Value |
| <ALLOCATED_TO> | <Information Flow> | INAP-NM |
| <ALLOCATED_TO> | <Information Flow> | INAP-AU |
| <ALLOCATED_TO> | <Information Flow> | INAP-APOC |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodology |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.01-OSED-104 |
| Title | NetworkCongestionIndicator |
| Requirement | NMf actor shall have access to the Congestion Indicator and associated confidence index generated by the NM actor. |
| Status | <in progress> |
| Rationale | The consolidated imbalance figure for the complete trajectory is qualified by a congestion indicator that can be requested. The congestion indicator (CI) qualifying the imbalance figure for a complete trajectory is provided. In addition, the Imbalance Confidence Index (ICI) is provided. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <SATISFIES> | <Information Exchange> | Congestion Indicator |
| <SATISFIES> | <Information Exchange> | Confidence Index |
| <SATISFIES> | <Information Exchange> | Imbalance Severity Value |
| <ALLOCATED_TO> | <Information Flow> | NM-INAP |
| <ALLOCATED_TO> | <Information Flow> | NM-AU |
| <ALLOCATED_TO> | <Information Flow> | NM-APOC |
| <ALLOCATED_TO> | <Activity> | Apply Probabilistic Imbalance Methodology |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.01-OSED-200 |
| Title | What-if |
| Requirement | The NMf actor shall have access to what-if to simulate DCB measure impact valuing KPI effect at different levels (flight, hotspot, network). |
| Status | <in progress> |
| Rationale | The Network Performance can be requested at different levels (Network/Resilience, Hotspot, flight) to simulate impacts on KPIs (reactionary delay, Congestion indicator, ATFCM delay, …). The Network Performance is provided at different levels (Network/Resilience, Hotspot, flight) to simulate impacts on KPIs (reactionary delay, Congestion indicator, ATFCM delay, …) |

| | |
|---|---|
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <SATISFIES> | <Information Exchange> | What-if |
| <SATISFIES> | <Information Exchange> | DCB Impact Assessment |
| <ALLOCATED_TO> | <Information Flow> | NM-INAP |
| <ALLOCATED_TO> | <Information Flow> | NM-AU |
| <ALLOCATED_TO> | <Information Flow> | NM-APOC |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.01-OSED-202 |
| Title | What-else |
| Requirement | The NMf actor shall have access to the what-else capability to find alternate trajectory to avoid hotspots. |
| Status | <in progress> |

| | |
|---|---|
| Rationale | The Network Performance can be requested to provide alternate trajectories solution to avoid hotspots. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <SATISFIES> | <Information Exchange> | What-Else |
| <SATISFIES> | <Information Exchange> | DCB Impact Assessment |
| <ALLOCATED_TO> | <Information Flow> | INAP-AU |
| <ALLOCATED_TO> | <Activity> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.01-OSED-204 |
| Title | NetworkState |
| Requirement | The NMf actor shall have access to the Network State prediction. |
| Status | <in progress> |
| Rationale | The network state can be requested. The network state is provided to characterize the situation (Stable undisturbed nominal, Slight network diruptions, Critical network state, Crisis network state), the duration of the disruption and the predicted next state. |

| | |
|---|---|
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.01 |
| <SATISFIES> | <Information Exchange> | Provide Network Impact Assessment |
| <ALLOCATED_TO> | <Information Flow> | INAP-NM |
| <ALLOCATED_TO> | <Activity> | Provide Network State |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.02-OSED-100 |
| Title | Hotspot Publication |
| Requirement | INAP shall be able to acess Hotspot/Optispot declaration. |
| Status | <in progress> |
| Rationale | INAP defines and publishes a HotSpot due to an excess of traffic after analysing an imbalance using TMV. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <SATISFIES> | <Information Exchange> | Hotspot |
| <SATISFIES> | <Information Exchange> | Optispot |
| <ALLOCATED_TO> | <Information Flow> | NM-INAP |
| <ALLOCATED_TO> | <Activity> | Share Hotspot with Stakeholders |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.02-OSED-101 |
| Title | MonitoringThresholdsNotification |

| | |
|---|---|
| Requirement | INAP shall be able to define the Hotspot/Optispot monitoring threshold |
| Status | <in progress> |
| Rationale | INAP defines the monitoring thresholds so as to monitor the proper resolution of the Hotspot according to the traffic prediction vs these thresholds. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <SATISFIES> | <Information Exchange> | Monitoring Threshold |
| <ALLOCATED_TO> | <Information Flow> | NM-INAP |
| <ALLOCATED_TO> | <Activity> | Define Monitoring Threshold |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.02-OSED-102 |
| Title | SpotSharing |
| Requirement | NM actor shall be able to disseminate the Hotspot/Optispot information |
| Status | <in progress> |

| | |
|---|---|
| Rationale | NM disseminates the Hotspot information (time, severity) to NMf actors. This request is the first step for the spot sharing with stakeholders. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <SATISFIES> | <Information Exchange> | Hotspot |
| <SATISFIES> | <Information Exchange> | Optispot |
| <ALLOCATED_TO> | <Information Flow> | NM-INAP |
| <ALLOCATED_TO> | <Information Flow> | NM-AU |
| <ALLOCATED_TO> | <Information Flow> | NM-APOC |
| <ALLOCATED_TO> | <Activity> | Share Hotspot with Stakeholders |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.02-OSED-103 |
| Title | SpotResolutionStatusUpdate |
| Requirement | NM shall be able to monitor the proper resolution of the Hotspot/Optispot in the execution phase and to send alert to NMF actors in case of deviations. |
| Status | <in progress> |
| Rationale | NM monitors the Spot resolution, informs INAP about the spot resolution status and alerts it in case of any resolution deviation is detected. |

| | |
|---|---|
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <SATISFIES> | <Information Exchange> | Hotspot Resolution Monitoring Information |
| <ALLOCATED_TO> | <Information Flow> | NM-INAP |
| <ALLOCATED_TO> | <Information Flow> | NM-APOC |
| <ALLOCATED_TO> | <Activity> | Monitor Spot Resolution |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.02-OSED-200 |
| Title | DCBMeasureProposal |
| Requirement | INAP shall be able to send DCB measures proposal to NM |

| | |
|---|---|
| Status | <in progress> |
| Rationale | INAP elaborates a solution to resolve the Hotspot based on DCB measures. INAP sends the proposed DCB Measures to the NM system. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <SATISFIES> | <Information Exchange> | Proposed DCB Measure |
| <ALLOCATED_TO> | <Information Flow> | NP-INAP |
| <ALLOCATED_TO> | <Activity> | Share DCB Measures |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.02-OSED-201 |
| Title | DCBMeasureUpdate |
| Requirement | NM shall be able to disseminate DCB Measures update to NMF actors |
| Status | <in progress> |
| Rationale | Updated DCB Measure information is sent to the NM system. NM sends the agreed DCB Measures information to the NMF and AU actors |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <SATISFIES> | <Information Exchange> | Agreed DCB Measure |
| <ALLOCATED_TO> | <Information Flow> | NM-INAP |
| <ALLOCATED_TO> | <Information Flow> | NM-AU |
| <ALLOCATED_TO> | <Information Flow> | NM-APOC |
| <ALLOCATED_TO> | <Activity> | Share DCB Measures |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.02-OSED-202 |
| Title | DCBMeasureImplementation |
| Requirement | INAP shall be able to inform NM about the implementation of DCB Measures |
| Status | <in progress> |
| Rationale | INAP informs NM about the implementation of the DCBMeasure along with the Revised RBT after having sent the DCB measures to ATC for implementation. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <SATISFIES> | <Information Exchange> | Implemented DCB Measure |
| <ALLOCATED_TO> | <Information Flow> | NM-INAP |
| <ALLOCATED_TO> | <Activity> | Share DCB Measures |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.02-OSED-203 |
| Title | TDIUpdate |
| Requirement | NM shall be able to inform INAP about the Target Deviation Indicator |
| Status | <in progress> |
| Rationale | The Target Deviation Indicator is calculated to provide information on Hotspot Resolution Deviation.<br><br>TDI is sent to the INAP. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <SATISFIES> | <Information Exchange> | Target Deviation Indicator |
| <ALLOCATED_TO> | <Information Flow> | NM-INAP |
| <ALLOCATED_TO> | <Activity> | Compute Target Deviation Indicator |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.02-OSED-204 |
| Title | HotspotResolutionAlert |
| Requirement | NM shall be able to inform INAP about the Hotspot Resolution Deviation |
| Status | <in progress> |
| Rationale | The hotspot resolution alert is disseminated to the NMf actors in case any anomaly in the resolution is detected |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.02 |
| <SATISFIES> | <Information Exchange> | Spot Resolution Alert |
| <ALLOCATED_TO> | <Information Flow> | NM-INAP |
| <ALLOCATED_TO> | <Activity> | Monitor Spot Resolution |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.02-OSED-205 |
| Title | FDCIRequest |
| Requirement | AU shall be able to inform NM about the delay criticality (FDCI) of a flight. |
| Status | <in progress> |
| Rationale | The FDCI is disseminated to the authorized NMf actors in case for compliancy and to be taken into account in the DCB process |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <SATISFIES> | <Information Exchange> | FDCI, FDCI Reason, FDCI Delay Threshold |
| <ALLOCATED_TO> | <Information Flow> | AU-NM |
| <ALLOCATED_TO> | <Activity> | Check Compliancy and Update FDCI Status (Rules) |
| <ALLOCATED_TO> | <role> | AU |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.02-OSED-206 |
| Title | FDCIReply |
| Requirement | NM shall be able to inform AU about the status and compliancy of the FDCI request |
| Status | <in progress> |
| Rationale | NM checks the compliancy of the FDCI requests |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <SATISFIES> | <Information Exchange> | FDCI Status |
| <ALLOCATED_TO> | <Information Flow> | NM-AU |
| <ALLOCATED_TO> | <Activity> | Monitor SBT and FDCI |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

[REQ]

| | |
|---|---|
| Identifier | IER-09.03-OSED-001 |

| | |
|---|---|
| Title | XCDM_DelegationCreation |
| Requirement | NMF actor shall request a delegation of responsibility to manage the resolution of an hotspot. The flights concerned by the delegation can be specified or not. |
| Status | <in progress> |
| Rationale | A NMF actor can request a delegation of responsibility to an other delegated actor to manage the hotspot resolution. The flights concerned by the delegation are specified as well as the modalities of the delegation. The delegated NMf actor can implemn or reject the delegation request |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <SATISFIES> | <Information Exchange> | Hotspot Resolution Delegation |
| <SATISFIES> | <Information Exchange> | Optispot Resolution Delegation |
| <ALLOCATED_TO> | <Information Flow> | INAP-APOC |
| <ALLOCATED_TO> | <Activity> | Delegate Hotspot Resolution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

REQ]

| | |
|---|---|
| Identifier | IER-09.02-OSED-002 |
| Title | XCDM_DelegationCreation2 |

| | |
|---|---|
| Requirement | NMF actor shall request a delegation of responsibility to manage the resolution of an hotspot including on-going proposed DCB Measures. |
| Status | <in progress> |
| Rationale | A LTM actor can request a delegation of responsibility to an other EAP actor to manage the hotspot resolution. The delegated NMf actor can accept or reject the delegation request |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <SATISFIES> | <Information Exchange> | Hotspot Resolution Delegation |
| <SATISFIES> | <Information Exchange> | Optispot Resolution Delegation |
| <ALLOCATED_TO> | <Information Flow> | INAP-APOC |
| <ALLOCATED_TO> | <Activity> | Delegate Hotspot Resolution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

REQ]

| | |
|---|---|
| Identifier | IER-09.03-OSED-005 |
| Title | XCDM_DelegationUpdate |
| Requirement | INAP shall update the delegation status : update the collaboration mode or cancel a delegation |
| Status | <in progress> |

| | |
|---|---|
| Rationale | INAP can update the delegation mode or cancel a delegation. The delegated NMf actor will acknowledge the delegation update. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <SATISFIES> | <Information Exchange> | Hotspot Resolution Delegation |
| <SATISFIES> | <Information Exchange> | Optispot Resolution Delegation |
| <ALLOCATED_TO> | <Information Flow> | NM-INAP |
| <ALLOCATED_TO> | <Activity> | Delegate Hotspot resolution |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

REQ]

| | |
|---|---|
| Identifier | IER-09.03-OSED-007 |
| Title | MCDM_StateUpdate |
| Requirement | An INAP actor shall request a delegation of DCB Measures implementation of DCB Measures to ATC.<br><br>NOTE : MCDM has been developed in SESAR1. In wave2, the delegation of implementation from INAP to ATC has been added. |
| Status | <in progress> |
| Rationale | An INAP actor can request a delegation of DCB Measures implementation to an ATC actor. The ATC can accept or reject. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <SATISFIES> | <Information Exchange> | Proposed DCB Measure |
| <SATISFIES> | <Information Exchange> | ATC reply |
| <ALLOCATED_TO> | <Information Flow> | INAP-ATC |
| <ALLOCATED_TO> | <Activity> | Implement DCB Measure |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

| | |
|---|---|
| Identifier | IER-09.03-OSED-008 |
| Title | MCDM_StateUpdate2 |
| Requirement | An INAP actor shall initiate a coordination including a counter-proposal mechanism. |
| Status | <in progress> |
| Rationale | An NMf actor can request a delegation of implementation to an ATC actor. A NMf actor can request a complex coordination with an other NMf actor. The ATC actor can accept/reject the implemenation request. The NMf actor can reply (counter-proposal, accept, reject) to the complex coordination request (STAMMeasures counter-proposal). |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <SATISFIES> | <Information Exchange> | Proposed DCB Measure |
| <SATISFIES> | <Information Exchange> | Counter Proposal |
| <ALLOCATED_TO> | <Information Flow> | INAP-AU |
| <ALLOCATED_TO> | <Activity> | Coordinate DCB Measure |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

REQ]

| | |
|---|---|
| Identifier | IER-09.03-OSED-100 |
| Title | CRM_GetNCC |
| Requirement | A NMF actor shall proposed a Target-Time to NM and shall received a Network Consolidated Constraint from NM. |
| Status | <in progress> |
| Rationale | A NMF actor can request a Target-Time proposal(including Target Window) to the NIMS/ConstraintReconciliation system). The NIMS/ConstraintReconciliation sends a reply to inform about the Network Consolidated Constraint (elligible Target Time). Nota : The elligible Target Time is processed according to the Constraint Reconciliation priority rules. |
| Category | <Operational>,<Safety> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <SATISFIES> | <Information Exchange> | Proposed DCB Measure |
| <SATISFIES> | <Information Exchange> | NCC (Network Consolidated Constraint) |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Information Flow> | NM-INAP |
| <ALLOCATED_TO> | <Information Flow> | NM-APOC |
| <ALLOCATED_TO> | <Activity> | Reconcile Constraints |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

REQ]

| | |
|---|---|
| Identifier | IER-09.03-OSED-102 |
| Title | CRM_GetContext |
| Requirement | An NMF actor shall access to the multiple constraints information affecting a flight or a list of flights in an hotspot. |
| Status | <in progress> |
| Rationale | A NMF actor can request the context of multiple constraints for flights included in a hotspot to the NIMS/ConstraintReconciliation system. The NIMS/ConstraintReconciliation sends a reply to inform about the context of multiple constraints for a flight. |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <SATISFIES> | <Information Exchange> | Proposed DCB Measure |
| <SATISFIES> | <Information Exchange> | CRM Information |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <Information Flow> | NM-INAP |
| <ALLOCATED_TO> | <Information Flow> | NM-AU |
| <ALLOCATED_TO> | <Information Flow> | NM-APOC |
| <ALLOCATED_TO> | <Activity> | Reconcile Constraints |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

REQ]

| | |
|---|---|
| Identifier | IER-09.03-OSED-400 |
| Title | EnrichedInformation |
| Requirement | NMf actors shalll setup and retrieve enriched DCB information associated to a flight |
| Status | <in progress> |
| Rationale | NMf actors shalll setup and retrieveenriched DCB information associated to a flight (AU Preference, Margins of Manoeuvre, Congestion Indicator) |
| Category | <Operational> |

[REQ Trace]

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <ALLOCATED_TO> | <SESAR Solution> | PJ09.03 |
| <SATISFIES> | <Information Exchange> | Congestion Indicator |
| <SATISFIES> | <Information Exchange> | Flight Simple Preference |

| Relationship | Linked Element Type | Identifier |
|---|---|---|
| <SATISFIES> | <Information Exchange> | Flight priority (Margins of Manoeuvre) |
| <SATISFIES> | <Information Exchange> | Airport Flight Severity Impact |
| <ALLOCATED_TO> | <Information Flow> | NM-INAP |
| <ALLOCATED_TO> | <Information Flow> | NM-AU |
| <ALLOCATED_TO> | <Information Flow> | NM-APOC |
| <ALLOCATED_TO> | <Activity> | Compute Traffic Demand |
| <ALLOCATED_TO> | <role> | INAP |
| <ALLOCATED_TO> | <role> | APOC |
| <ALLOCATED_TO> | <role> | AU |
| <ALLOCATED_TO> | <role> | Regional ATFCM |
| <ALLOCATED_TO> | <Sub-Operating Environment> | DCB_Env |

# 5 References and Applicable Documents

## 5.1 Applicable Documents

### Content Integration


[1] B.04.01 D138 EATMA Guidance Material

[2] EATMA Community pages

[3] SESAR ATM Lexicon


### Content Development


[4] B4.2 D106 Transition Concept of Operations SESAR 2020


### System and Service Development


[5] 08.01.01 D52: SWIM Foundation v2

[6] 08.01.01 D49: SWIM Compliance Criteria

[7] 08.01.03 D47: AIRM v4.1.0

[8] 08.03.10 D45: ISRM Foundation v00.08.00

[9] B.04.03 D102 SESAR Working Method on Services

[10]B.04.03 D128 ADD SESAR1

[11]B.04.05 Common Service Foundation Method


### Performance Management


[12]B.04.01 D108 SESAR 2020 Transition Performance Framework

[13]B.04.01 D42 SESAR2020 Transition Validation

[14]B.05 D86 Guidance on KPIs and Data Collection support to SESAR 2020 transition.

[15]16.06.06-D68 Part 1 –SESAR Cost Benefit Analysis – Integrated Model

[16]16.06.06-D51-SESAR_1 Business Case Consolidated_Deliverable-00.01.00 and CBA

[17]Method to assess cost of European ATM improvements and technologies, EUROCONTROL (2014)

[18]ATM Cost Breakdown Structure_ed02_2014

[19]Standard Inputs for EUROCONTROL Cost Benefit Analyses

[20]16.06.06_D26-08 ATM CBA Quality Checklist

[21]16.06.06_D26_04_Guidelines_for_Producing_Benefit_and_Impact_Mechanisms

### Validation

[22]03.00 D16 WP3 Engineering methodology

[23]Transition VALS SESAR 2020 - Consolidated deliverable with contribution from Operational Federating Projects

[24]European Operational Concept Validation Methodology (E-OCVM) - 3.0 [February 2010]

### System Engineering

[25]SESAR Requirements and V&V guidelines

### Safety

[26]SESAR, Safety Reference Material, Edition 4.0, April 2016

[27]SESAR, Guidance to Apply the Safety Reference Material, Edition 3.0, April 2016

[28]SESAR, Final Guidance Material to Execute Proof of Concept, Ed00.04.00, August 2015

[29]SESAR, Resilience Engineering Guidance, May 2016

### Human Performance

[30]16.06.05 D 27 HP Reference Material D27

[31]16.04.02 D04 e-HP Repository - Release note

### Environment Assessment

[32]SESAR, Environment Reference Material, alias, "Environmental impact assessment as part of the global SESAR validation", Project 16.06.03, Deliverable D26, 2014.

[33]ICAO CAEP – "Guidance on Environmental Assessment of Proposed Air Traffic Management Operational Changes" document, Doc 10031.

### Security

[34]16.06.02 D103 SESAR Security Ref Material Level

[35]16.06.02 D137 Minimum Set of Security Controls (MSSCs).

[36]16.06.02 D131 Security Database Application (CTRL_S)

## 5.2 Reference Documents

[37]ED-78A GUIDELINES FOR APPROVAL OF THE PROVISION AND USE OF AIR TRAFFIC SERVICES SUPPORTED BY DATA COMMUNICATIONS.[15]

15

# Appendix A Cost and Benefit Mechanisms

## A.1 Stakeholders identification and Expectations

This section describes the stakeholders involved in PJ09.01, PJ09.02, PJ09.03.

| Stakeholder | Involvement | Why it matters to stakeholder |
|---|---|---|
| **ANSP** | Both Direct and Indirect.<br>Direct involvement through participation in SESAR 2020 as Partners.<br>Not all European ANSPs are directly involved in SESAR 2020, but they will still be impacted.<br>To provide KPIs for monitoring performance. | • Improved predictability and better targeted delays thanks to better planning, as predictability enables reduction of precautionary measures<br>• Flexibility legitimately offered to AU close to execution must match the flexibility at ANSP level so as not to undermine the benefits of a planned and optimised operation<br>• Optimised airspace capacity by coordinated configuration of airspace from planning to execution phase, including more reliable demand prediction and data sharing between all the stakeholders<br>• Optimised use of the available capacity by predicting complexity and adjusting flows of traffic accordingly<br>• Collaborative planning to result in more cost-effective and equitable solutions<br>• Benefits from aligned flexibility between AUs and ANSPs<br>• Operational feasibility and potential benefits of the concept and tools<br>• Improved cost efficiency by more efficient planning of staff allocation in accordance with traffic expectations and optimum use of available human resources<br>• Compliance to local performance targets reconciled with sub-regional/regional targets<br>• Appropriate tools and procedures for performance monitoring and reporting |
| **ANSP ops staff: FMPs** | Direct<br>End-Users<br>To analyse the traffic, coordinate and implement DCB solutions. | • Improvement in the workload distribution through effective management of predicted and understood peaks<br>• No increase of the workload for ANSP actors compared to current operations<br>• Maintaining or increasing current level of safety<br>• Impact assessment on qualification, roles & responsibilities of OPS staff (tools, procedures…)<br>• Appropriate tools, process and procedures for identifying traffic complexity and imbalances |

| Stakeholder | Involvement | Why it matters to stakeholder |
|---|---|---|
| | | • Appropriate tools and procedures to support collaborative and coordinated Network, and local/sub-regional performance monitoring and management<br>• Appropriate tools to have adequate opportunities to share with the network and other actors regarding possible (What-If) options of action |
| **Airspace Users: Airlines, Business Aviation, Military, General Aviation** | Direct<br>Provide KPIs for monitoring performance | • Consistent and appropriate trajectory prediction and monitoring (tactical phase)<br>• Increased punctuality / predictability thanks to integrated planning<br>• Increased flexibility whilst in the planning and tactical phases, by providing AUs with availability of real time performance monitoring and prediction<br>• Reduced fuel burn and consequently improved environmental impact<br>• Be aware of, and understand, network constraints<br>• Evidence of an improvement of predictability by increasing shared situation awareness<br>• Improved resource planning<br>• Confidence that an appropriate and efficient scenario will be used in any situation<br>• Balance of AUs needs with all other DCB actors' needs in terms of performance<br>• Improved participation in the process needed to reach an agreement on demand and capacity |
| **Airspace Users ops staff: Pilots, Flight Crew, Flight dispatchers** | Both Indirect and Direct<br>Direct involvement of Flight Dispatchers as updating information<br>Indirect for pilots and flight crew as following the collaborative decisions | • Maintaining or increasing current level of safety<br>• Impact assessment on qualification, roles & responsibilities of OPS staff (tools, procedures…)<br>• Improved punctuality/predictability and fuel efficiency<br>• Greater awareness of potential and actual hotspots impacting an individual flight<br>• Be alerted as soon as possible of specific flight operations that can be out of the plan due to ATFCM issues<br>• Increased efficiency of operations plan recovery<br>• Improved trajectory predictability (i.e. track miles) |
| **Airport Operators** | Direct<br>Provide KPIs for monitoring performance | • Better managed and targeted delays thanks to better planning and traffic sequencing<br>• Evidence of an improvement of predictability by increasing shared situation awareness (e.g. regulation risk in extended horizons by the use of confidence index, E-DPI, etc)<br>• Improved resource planning<br>• Effective cooperation between Airport and Network<br>• Better arrival predictability as an enabler for more efficient Airport operations |

| Stakeholder | Involvement | Why it matters to stakeholder |
|---|---|---|
| | | • Better managed arrival flows help airports to manage their capacity more efficiently<br>• Feasible and seamless DCB process managed at network level and fully integrated with airports |
| **Ground Industry** | Direct involvement through participation in SESAR 2020<br>To provide tools that fulfils with the operational expectations | • Detailed operational and performance requirements for the system and tools development<br>• End-user acceptance of systems<br>• Development of industrial prototypes as preparation to future deployment of validated operational improvements<br>• Concept technologically feasible<br>• Coherent integration with other systems and tools |
| **Sub-regional units (FABs)** | Indirect as only participation of local and regional | • Optimised capacity usage and performance by collaboration<br>• Improved predictability by better planning and traffic ordering<br>• Improved cost efficiency through an optimum use of available human resources<br>• Effective cooperation to find sub regional solutions to manage the risk of saturation and congestion with minimum disruption to traffic<br>• Achievement of Performance Targets |
| **European Network Manager** | Direct involvement through participation in the concept | • Optimised network usage and performance by better sharing of data and collaboration between actors<br>• Improved situation awareness and anticipation with appropriate tools to evaluate the best possible solution<br>• Improved predictability by better planning and traffic sequencing<br>• Improved cost efficiency through an optimum use of available capacity and human resources<br>• Effective cooperation between all the stakeholders to find the best way of managing the risk of saturation and congestion<br>• Appropriate tools and procedures to support collaborative and coordinated Network management activities throughout planning and execution phases<br>• Appropriate tools and procedures for performance monitoring and reporting<br>• Achievement of Network Performance Targets |

| Stakeholder | Involvement | Why it matters to stakeholder |
|---|---|---|
| **Research Institutes** | Direct and indirect | • Being able to publish within the project topic<br>• Getting supported by industry on applied research topics<br>• Being able to cover the required costs |
| **SESAR Joint Undertaking (SJU)** | Direct involvement through leadership in SESAR 2020 | • Adherence to timeline & budget<br>• Ensure the concept definition and validation activities fulfil with the general SJU approach<br>• Coherent and agreed validation requirements<br>• Evidence of expected benefits and expected neutral or negative impacts<br>• Consistent and progressive validation<br>• Evidence to support decision making of whether the SESAR concept at network level will be able to achieve the assigned objectives. |

**Table 30 : Stakeholder's expectations for Solution 09.01**

| Stakeholder | Involvement | Why it matters to stakeholder |
|---|---|---|
| **ANSPs** | To implement the dynamic DCB solutions | ○ Expect to significantly improve quality of service through the integration of dynamic airspace configuration and trajectory constraint management.<br>○ Expect to optimised the use of airspace capacity and reduce delays through a better planning.<br>○ Expect to integrate the INAP function as a link between what's done at local and network level in the DCB process.<br>○ Expect to increase capacity, predictability and punctuality thanks to more reliable prediction of the demand/workload using complexity indicators.<br>○ Expect to improve cost efficiency through an optimum use of available human resources and residual capacity.<br>○ Expect to maintain or increase the level of safety.<br>○ Expect to gain interaction with Airspace Users taking into account their Preferences and Priorities in the DCB process.<br>○ Expect to gain situational awareness through a collaborative planning with all stakeholders. |

| | | | |
|---|---|---|---|
| **Airport Operators** | To request dynamic DCB solutions for the airports | | ○ Expect to improve quality of service by fully integration of the Airports in the DCB process at local and network level.<br>○ Expect to achieve a between situational awareness through the integration in the INAP process.<br>○ Expect to achieve a better resource planning through its integration as an INAP actor. |
| **Airspace Users: Airlines, Business Aviation, Military, General Aviation** | End User | | ○ Expect to obtain evidence of improved predictability by considering airspace users preferences when selecting optimum DCB solutions.<br>○ Expect to obtain a significant efficiency improvement thanks to the management of the airspace configurations and the residual capacity to meet users' expectations.<br>○ Expect to obtain evidence of the improvement on punctuality, with an increased adherence to arrival and departure times.<br>○ Expect to achieve a balance between AUs needs and other DCB actors when selecting a DCB measure.<br>○ Expect to have a reduction on the average fuel burnt through the decrease of trajectory changes<br>○ Expect to achieve an improved participation in the process of deriving an appropriate measure |
| **Airspace Users ops staff: Pilots, Flight Crew, Flight dispatchers** | End User | | ○ Expect to experience a decrease in workload through the adoption of DAC measures that result in less trajectory changes.<br>○ Expect to make a better use of the available ATM resources<br>○ Expect to maintain the level of safety |
| **Network Manager** | To assess, approve and implement local dynamic DCB solutions based on the subsidiarity principle. | | ○ Expect to optimise network usage through better exchange of information between actors.<br>○ Expect to significantly improve predictability through the integration of dynamic airspace configuration and trajectory constraint management.<br>○ Expect to increase capacity, predictability and punctuality thanks to more reliable |

| | | |
|---|---|---|
| | | prediction of the demand/workload using complexity indicators, thanks to a better integration of Network Management measures with extended ATC planning activities and thanks to the involvement of airspace users in the DCB process.<br>○ Expect to improve cost efficiency through an optimum use of available human resources and residual capacity.<br>○ Expect to increase situation awareness in order to assess the best solutions both at local and network level. |
| **Industry** | To provide trial platforms | ○ Expect to generate and assess technical requirements to help mature and prove the validation concepts.<br>○ Expect to gather evidence to help them decide on continued investments and/or concept implementation<br>○ Expect to promote the benefits of the concept.<br>○ Expect to achieve the integration with other systems and tools. |
| **SJU** | Programme coordinator | ○ Ensure the concept definition and validation activities comply with the general SJU approach.<br>○ Expect to gather evidence that support the achievements obtained with the validation of the concept.<br>○ Expect to gather evidence of the positive, negative or neutral benefits obtained with the concept. |
| **European Commission** | Participation through SJU | ○ Expect to increase economic power and position of Europe in the air-traffic sector.<br>○ Expect to increase capacity and efficiency.<br>○ Support for the implementation of the SES. |

**Table 31 : Stakeholder's expectations for Solution 09.02**

| Stakeholder | Involvement | Why it matters to stakeholder |
|---|---|---|
| **ANSPs** | To implement the local-DCB solutions | Expect to increase capacity thanks to more reliable prediction of the demand using pre-flight intentions and a more efficient usage of the available capacity within the area of responsibility they manage.<br><br>Expect a reduction in the number of tactical interventions |

| Stakeholder | Involvement | Why it matters to stakeholder |
|---|---|---|
| | | Expect to improve cost efficiency through an optimum use of available human resources. |
| **Airport Operators** | To request DCB solutions for the airports | Expect to improve quality of service by fully integration of the Airports into the Network.<br><br>Expect delay reduction and increase in situation awareness as they will be included in the DCB process.<br><br>Expect to obtain evidence of improved predictability by AOP/NOP integration |
| **Airspace Users** | End User | Expect to obtain evidence of improved predictability by considering airspace users preferences when selecting optimum/local DCB solutions.<br><br>Expect to obtain a significant efficiency improvement as they will be included in the DCB process (FF-ICE) |
| **Network Manager** | To assess, approve and implement local dynamic DCB solutions based on the subsidiarity principle. Reconciliation of DCB measures in case of multiple conflicting constraints between the different actors Airports, ACCs and AUs.<br><br>Network monitoring and supervision | Effective cooperation between all the stakeholders to optimise Network usage.<br><br>Appropriate tools and procedures to support collaborative and coordinated Network management activities throughout planning and execution phases.<br><br>Appropriate tools and procedures to support coordinated Network constraint management, in case of multiple conflicting constraints, with an agreed set of categories for imbalances and a set of prioritisation rules . |
| **Industry** | To provide tools that fulfils with the operational expectations | To obtain a clear and consistent set of operational requirements for the system development |
| **SJU** | Programme coordinator | Ensure the concept definition and validation activities comply with the general SJU approach. |

| Stakeholder | Involvement | Why it matters to stakeholder |
|---|---|---|
| **European Commission** | Participation through SJU | Expect to increase economic power and position of Europe in the air-traffic sector.<br>Expect to increase capacity and efficiency.<br>Support for the implementation of the SES. |

**Table 32 : Stakeholder's expectations for Solution 09.03**

## A.2 Benefits mechanisms

This chapter provides description of DAC benefit mechanism.

It is based mainly on SESR I outcomes i.e. project SWP 07.05.04. It has been identified that two Models of DAC management developed in 08-01 Solution do not change BIM mechanism for each models and it is identical for both models.

The following Legend describes the meaning of the symbols reported in the Benefit and Input Mechanism:

| Column Title | Box Shape | Column Description |
|---|---|---|
| **Feature** | Feature | Introduces one of the new features that the project is bringing to the world of ATM |
| **Impact Area** | Impact Area A | Sub categories used to group indicators and positive/negative impacts to help orient the reader (may not always be necessary) |
| **Indicators** | Indicator A | Aspects which can be measured (or calculated from other metrics) to identify if the expected positive and negative impacts are actually realised. These need to be measured in the validation exercises |
| **Positive or Negative Impacts** | Impact 1 | Describes the expected positive or negative impacts |
| **KPA** | KPA 1 | KPAs linked to the positive or negative impacts |

**Table 33 : Benefit Mechanism Syntax - Columns**

The boxes in these columns are linked by numbered arrows which represent the mechanisms.

| | |
|---|---|
| 1 | The numbers provide links to the mechanism descriptions in the text. |

**Table 34 : Benefit Mechanism Syntax – Mechanisms**

The arrows associated with the Indicators and the Positive or Negative Impacts are:

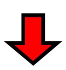
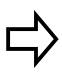
| | |
|---|---|
|  | A beneficial decrease<br><br>e.g. a reduction in $CO_2$ emissions (indicator) or a reduction in controller workload (positive impact) |
|  | A detrimental increase<br><br>e.g. an increase in $CO_2$ emissions (indicator) or an increase in controller workload (negative impact) |
|  | A beneficial increase<br><br>e.g. an increase in no. of movements (indicator) or an increase in safety (positive impact) |
|  | A detrimental decrease<br><br>e.g. a reduction in no. of movements (indicator) or a reduction in safety (negative impact) |
|  | A change in the indicator, a positive or negative impact is expected but with current knowledge the direction is still not clear. Can be coloured to show the main expectation. It is preferable to use a direction arrow, however this is provided as a 'last resort', for example where input from a TA expert is required. |

**Table 35 : Benefit Mechanism Syntax – Coloured Arrows**

### A.2.1 Traffic & Demand Forecast in 4D trajectory Management Context – DCB-0211

***Description***

The BIM only focusses on Wave 1 of the traffic and demand forecast in 4D trajectory management context.

As the OI aims at improving the traffic and demand forecast to get an early picture of the traffic prediction and to better plan and solve the potential issues, only the NM and INAP stakeholders are impacted (so called NMF stakeholders – Network Management Function).

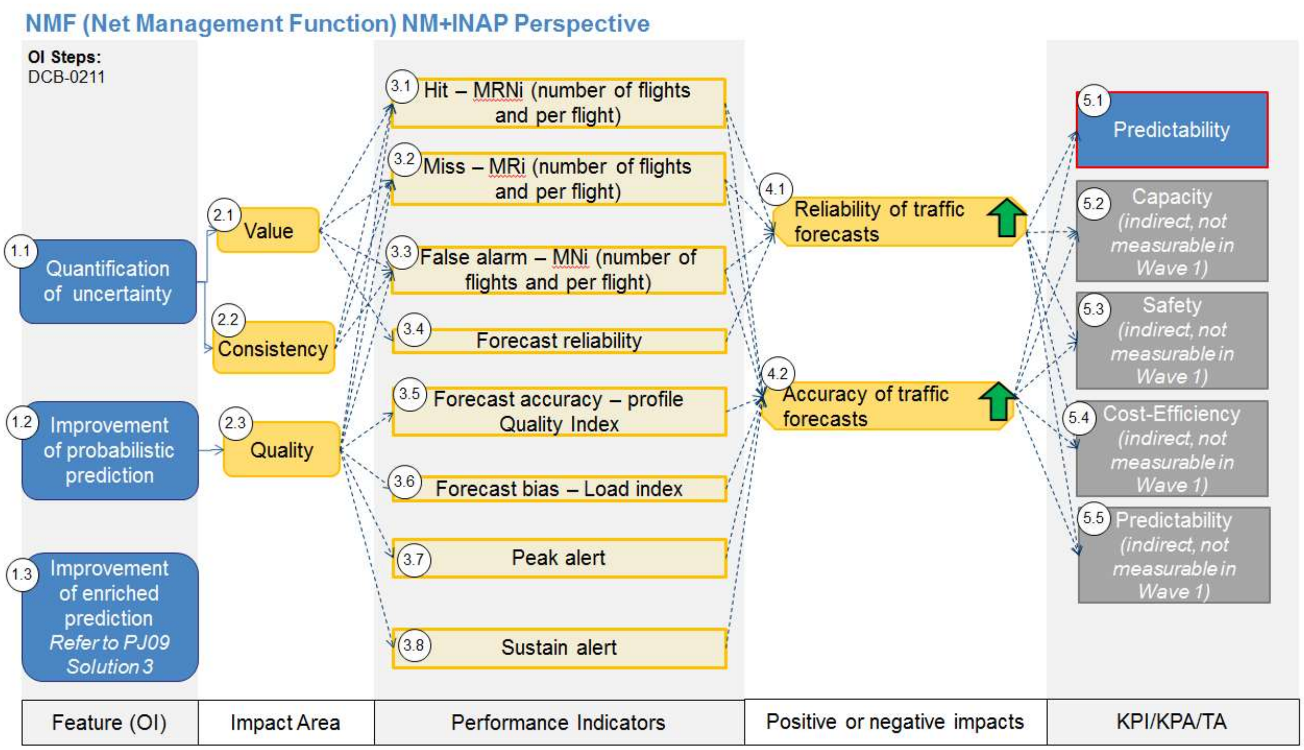



**Figure 101 : BIM_DCB-0211**

### *Features*

**(1.1)** Quantification of the uncertainty: Determining the uncertainty of the demand by using historical and archive data and developing a probabilistic model of uncertainty.

**(1.2)** Improvement of the probabilistic prediction: Providing a better prediction of the demand based on various forecasts: flight trajectories, demand, count and capacity.

**(1.3)** Improvement of the enriched prediction: APTs provide their information into the AOP/NOP portal in order to improve the demand prediction. This feature is planned to be validated as part of Solution

3 and will be connected to the features 1.1 and 1.2 by the end of Wave 1 / beginning of Wave 2. The feature 1.3 is not considered for the rest of the BIM.

### *Impact Areas*

**(2.1)** Value: The Quantification of the uncertainty (1.1) has an impact on Value. The Value is the degree to which the forecast helps a decision maker to realize some incremental economic and/or other benefit. The quantification of the uncertainty when used in the probabilistic prediction should help to determine whether the probabilistic forecast is valuable/worth or not.

**(2.2)** Consistency: The Quantification of the uncertainty (1.1) has an impact on Consistency. Consistency is the degree to which the forecast corresponds to the forecaster's best judgement about the situation, based upon his/her knowledge base. In other words, whether the situation is what the forecaster was expected or not.

**(2.3)** Quality: The Improvement of the probabilistic prediction (1.2) has an impact on Quality. The Quality is the degree to which the forecast corresponds to what actually happened. This reflects the prediction and how close it was from the actual demand.

### *Performance Indicators*

To ease the understanding, the performance indicators are described with the Solution name and their related NM name (Solution name – NM name).

**(3.1)** Hit – MRNi: Number of flights forecasted to occur which did occur. The total number of flights could be the same in the forecast and in the actual traffic but could contain different flights – a flight forecasted to occur is late, whereas a flight forecasted to occur later is in advance. As a result, the number of hits will be measured from a general perspective with the total number of flights, but also in a more detailed way, by considering the individual flights.

**(3.2)** Miss – MRi: Number of flights not forecasted to occur but which did occur. The misses are important to be considered as they can directly impact Safety. Based on the same reasoning as for the Hits, the number of misses will be measured from a general perspective with the total number of flights, but also in a more detailed way, by considering the individual flights.

**(3.3)** False alarm – MNi: Number of events forecasted to occur but which did not occur. The false alarms are important to be considered as they can directly impact Capacity. Based on the same reasoning as for the Hits, the number of misses will be measured from a general perspective with the total number of flights, but also in a more detailed way, by considering the individual flights.

**(3.4)** Forecast Reliability: Proportion of forecasted flights that did not appear. By comparison between the actual forecast and the probabilistic prediction, the best forecast reliability is the closest to 1.

$$\text{FR} = 1 - \frac{\text{False alarms}}{\text{Hits+False alarms}}$$

With: False alarms: Event forecasted to occur, but did not occur
Hits: Event forecasted to occur, and did occur

**(3.5)** Forecast Accuracy – Profile Quality Index (PQI): Proportion of forecasted flights that did occur. By comparison between the actual forecast and the probabilistic prediction, the best forecast accuracy is the closest to 1.

$$\text{Acc} = \frac{\text{Hits}}{\text{Hits+Misses+Fal} \quad \text{alarms}}$$

With: Correct negatives: Event forecasted not to occur, and did not occur
Hits: Event forecasted to occur, and did occur

**(3.6)** Forecast Bias – Load Index: Comparison between forecasted flights versus observed flights. A good forecast bias is equal to 1. If it is below 1, this means the results are under forecasted, which can represent a risk as there will be more demand than forecasted. If it is above 1, this means the results are over forecasted, which leads to inefficiency as measures might be implemented whereas the initial demand will be lower than forecasted.

$$\text{BIAS} = \frac{\text{Total forecasted}}{\text{Total actual}}$$

With: Hits: Event forecasted to occur, and did occur
False alarms: Event forecasted to occur, but did not occur
Misses: Event forecasted not to occur, but did occur

**(3.7)** Peak alert**:** Comparison between the actual forecast and the probabilistic prediction of the detection of the periods when the number of flights above the Peak Capacity.

**(3.8)** Sustain alert: Comparison between the actual forecast and the probabilistic prediction of the detection of the periods when the number of flights above the Sustain Capacity for a duration ≥ X minutes.

### *Positive or negative impacts*

**(4.1)** Reliability of the forecast: The Quantification of the uncertainty (1.1) should have a positive impact on the Reliability of the traffic forecasts. Reliability can be defined as a measure of how dependably an observation is exactly the same when repeated. As the Quantification of uncertainty is based on historical data and models, the lower the uncertainty will be, the more reliable the prediction.

**(4.2)** Accuracy of the forecast: The Improvement of probabilistic prediction (1.2) should have a positive impact on the Accuracy of the traffic forecasts. Accuracy can be defined as the degree to which a measurement represents the true value of something, qualified as the quality. Here, the better the accuracy, the closer to the truth the demand forecast.

### *Key Performance Areas*

**(5.1)** Predictability: It has to be noted that the use in the BIM of the Predictability KPA in 5.1 from the SESAR Performance Framework does not relate to the entire flight duration as it is defined by SESAR. Indeed, the flight duration is not the focus of PJ09.01 and cannot be currently measured. As such, the Predictability as defined here focuses on the number of flights in a particular sector at a given time. Further discussion is required with PJ19.4 regarding the use of this definition within the SESAR Performance Framework.

**(5.2)** Capacity: A more reliable and accurate demand prediction can lead to a better planning and can have a positive impact on Capacity. However the BIM only reflects the Demand forecast itself with no actions taken and no connection with the Performance Dashboard. Capacity is integrated in the BIM but the related benefits will be measured in Wave 2 when connecting Demand with Complexity and Performance.

**(5.3)** Safety: A more reliable and accurate demand prediction can lead to a better view of potential overloads and can have a positive impact on Safety. However the BIM only reflects the Demand forecast itself with no integration of the Complexity feature and no connection with the Performance Dashboard. Safety is integrated in the BIM but the related benefits will be measured in Wave 2 when connecting Demand with Complexity and Performance.

**(5.4)** Cost-Efficiency: A more reliable and accurate demand prediction can lead to a better planning of ATC staff and to a better awareness of potential overloads with anticipated measures taken towards AUs, which can have a positive impact on Cost-Efficiency. However the BIM only reflects the Demand forecast itself with no actions taken and no connection with the Performance Dashboard. Cost-Efficiency is integrated in the BIM but the related benefits will be measured in Wave 2 when connecting Demand with Complexity and Performance.

**(5.5)** Predictability: A more reliable and accurate demand prediction can lead to a better planning and a better awareness of potential overloads with anticipated measures taken towards AUs, which can have a positive impact on Predictability. However the BIM only reflects the Demand forecast itself with no actions taken and no connection with the Performance Dashboard. Predictability is integrated in the BIM but the related benefits will be measured in Wave 2 when connecting Demand with Complexity and Performance.

## A.2.2 Automated Support for Traffic Complexity Assessment – CM-0103-B

### *Description*

Automated tools adapted to Step 2 operations (planning and execution): including user preferred trajectory and 4D data, continuously monitor and evaluate traffic workload and complexity in defined airspace volumes according to predefined parameters. These tools will provide accurate and timely prediction on upcoming congestions and appropriate input to tools handling hotspots/ complexity resolution.

The objective is to design advanced tools for both Network Management function (planning and execution phases) and extended ATC planning to monitor and assess ATC workload/complexity and to provide input to complexity resolution tools.

ATC Workload/complexity assessment: Analysing aircraft trajectories using SBT/RBT and other demand information, added with the use of validated complexity metrics, allows prediction of complexity coupled with demand to evaluate predicted ATC workload. In medium to short term planning phase, DCB (through CDM) operates with look ahead times in which information on traffic and airspace organisation might be still at the level of intentions. Because of this uncertainty, complexity and workload assessment may need to be evaluated in a different way than in short term to execution phase, where it can be done with more accurate data. ATC Workload/complexity resolution: The workload/complexity assessment is used by resolution tools in order to support them in finding solutions to hotspots/complex situation at different level of accuracy of the prediction data.

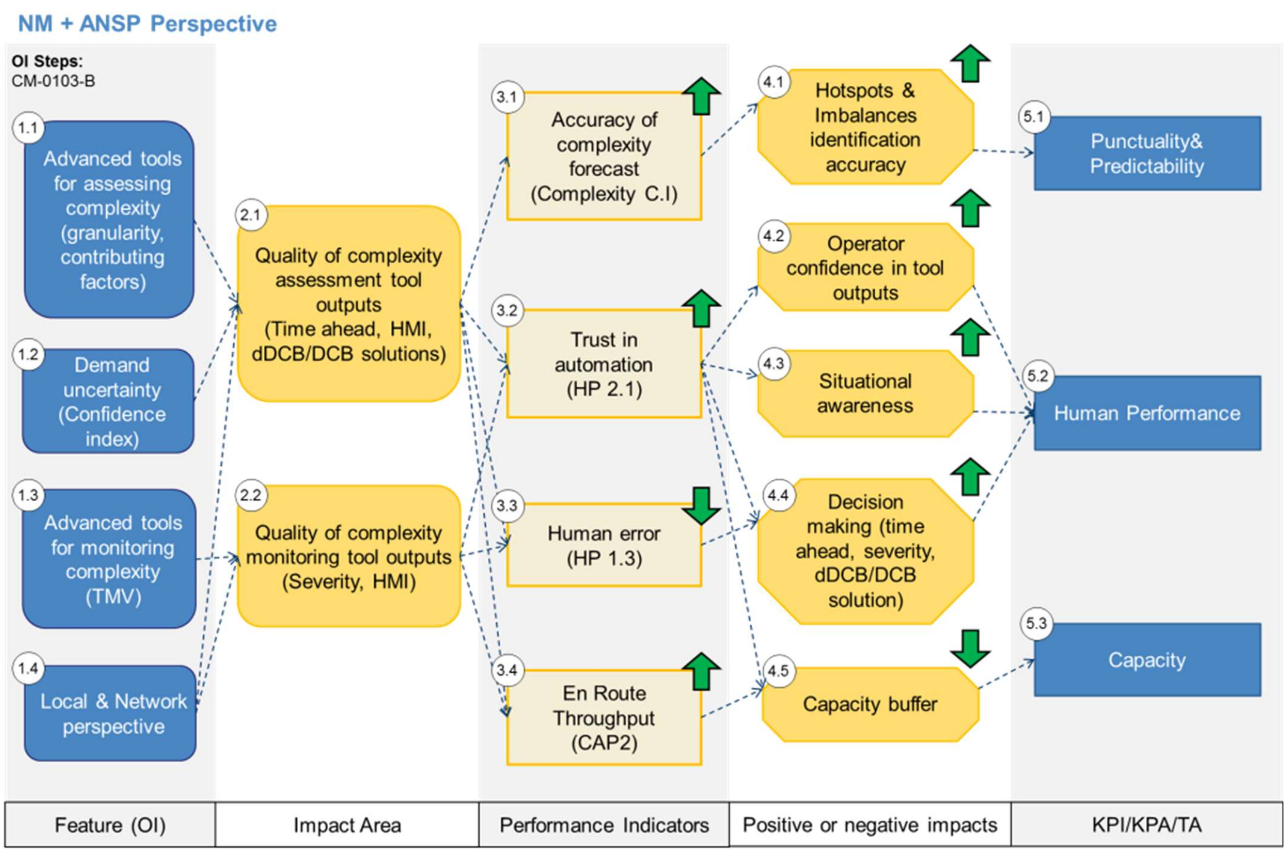



**Figure 102 : BIM_CM-0103-B**

### *Features*

**(1.1)** Advanced tools for assessing complexity (granularity, contributing factors): The design of advanced tools for assessing complexity will provide automated support for both NM and ANSPs to assess traffic complexity within a defined airspace volume, and to provide inputs to complexity resolution tools in finding solutions to hotspots/complex situations.

These advanced tools will be influenced by:

- The granularity in which complexity is assessed, related to the number of factors or elements that the user/system takes into account when determining complexity, considering both airspace and time horizon. Depending on the timeframe and related uncertainties, different DCB filters and methodologies will be applied to manage different granularity of issues.
- Different contributing factors, such as the characteristics of the flights contributing to the imbalance (number of interactions, ascending/descending flights…).

**(1.2)** Demand uncertainty (Confidence index): Demand uncertainty (Confidence Index) means that the way in which ATC complexity is evaluated may change depending on the traffic demand information accuracy (e.g. in medium to short term planning phase, traffic and airspace organisation information might be still at level of intentions; whereas in short term to execution phase the information should be more accurate). This feature will take as an input the OI DCB-0211 Traffic and Demand Forecast in 4D Trajectory Management Context.

**(1.3)** Advanced tools for monitoring complexity (TMV): The design of advanced tools for monitoring complexity will provide automated support for both NM and ANSPs to monitor traffic complexity within a defined airspace volume, and to provide inputs to complexity resolution tools in finding solutions to hotspots/complex situations.

Based on a set of Traffic Monitoring Values (TMV), these tools will allow the identification of nominal, critical and crisis situations, as well as hotspots and optispots.

**(1.4)** Local & Network perspective : This feature means that both local and network actors will have an accurate vision of hotspots and imbalances at local and regional levels.

### *Impact Areas*

**(2.1)** Quality of complexity assessment tool outputs (Time ahead, HMI, DCB/DCB solutions):

- The design, refinement and optimisation of advanced and automated tools for assessing traffic complexity will increase the quality of the complexity assessment outputs for the different imbalances and hotspots granularity selected. This granularity, which varies in terms of time horizon and airspace volume will be selected accordingly, based on the time the information is received.

The tool also provides a level of detail that allows the involved actors to see the characteristics of an airspace volume and specific flights, to help him making a decision (DAC and DCB solutions).

Furthermore, the HMI will also have influence on the quality of assessment. The display of information is essential for all the presented features in order for the actors involved to be well informed of the situation, and to act accordingly.

- The demand uncertainty (confidence index) will impact on the quality of the complexity assessment outputs, since the use of more accurate traffic demand information will improve the representativeness of the complexity metric/indicator values. This will also determine the way in which complexity should be assessed (metric/indicator to be used).
- Depending on the vision of how complexity is calculated (local or network level) the quality of complexity assessment tool outputs will be impacted. Moreover, the involved actors are aware of the effect of their actions both at local and regional levels.

**(2.2)** Quality of complexity monitoring tool outputs (Severity, HMI):

- The design, refinement and optimisation of advanced and automated tools for monitoring traffic complexity will increase the quality of the complexity monitoring tool outputs.

In particular, the tool will impact on the quality of complexity monitoring related to the severity of the situation, which is determined by the Traffic Monitoring Values.

The HMI will also have influence on the quality of complexity monitoring. The display of information is essential for all the presented features in order for the actors involved to be well informed of the situation and to act accordingly.

- Depending on the vision of how complexity is calculated (local or network level), the quality of complexity monitoring tool outputs will be impacted. Moreover, the involved actors are aware of the effect of their actions both at local and regional levels.

### *Performance Indicators*

**(3.1)** Accuracy of complexity forecast (Complexity C.I): The improvement of the quality complexity assessment tool outputs, by reducing the uncertainty of the assessment, will increase the accuracy of complexity forecast (Complexity Confidence Index)

**(3.2)** Trust in automation (HP 2.1): The improvement of the quality complexity assessment/monitoring tool outputs, by reducing the uncertainty of the assessment/monitoring, will increase the involved actors' trust in automation.

**(3.3)** Human error (HP 1.3): The improvement of the quality complexity assessment/monitoring tool outputs, by reducing the uncertainty of the assessment/monitoring, will lead to a reduction in the human errors committed by the operators involved in terms of decision making processes, as the complexity information available will be more accurate.

**(3.4)** En-Route Throughput (CAP2): The improvement of the quality complexity assessment/monitoring tool outputs will increase the airspace capacity, since it will allow the reduction of the capacity buffer declared.

### *Positive or negative impacts*

**(4.1)** Hotspots & Imbalances identification accuracy: The increase of the complexity forecast accuracy will lead to an increase of the hotspots and imbalances identification accuracy.

**(4.2)** Operator confidence in tool outputs: The increase of the operators' confidence in automation will increase the operators' confidence in the tool outputs, that is, the traffic complexity values predicted.

**(4.3)** Situational awareness: The increase of the operators' confidence in automation due to the improvement on the quality of complexity tool outputs will increase the situational awareness of the actors involved, since they will have more support in their tasks as well as a better understanding of the traffic complexity within a defined airspace volume.

**(4.4)** Decision making (time ahead, severity, DCB/DCB solution): The increase of the operators' trust in automation and the reduction in the number of human errors committed will lead to a more efficient and accurate decision making process, improving the quality and effectiveness of the DCB/DCB solutions proposed. In particular, the decision making process will be improved regarding:

- Selection of solution – Time ahead: The determination of the granularity via the time and methodology to use will help the actors involved in making a decision.
- Selection of solution – Severity: The determination of the severity of the situation via the thresholds (critical, crisis, hotspot, optispot) will help the actors involved in making a decision.
- Selection of solution – DCB/DAC solution: The increase of trust in automation will improve the selection of the appropriate DCB/DAC solution by improving decision making processes. Moreover, it will minimise the impacted flights: the determination of the individual flights that have an impact on complexity will help the actors involved to limit his actions on a limited number of flights rather than on a large number of flights.

**(4.5)** Capacity buffer: The increase of operators' trust in automation will allow a reduction of the capacity buffer declared and used to protect air traffic controllers, since the traffic complexity information will be more accurate.

### *Key Performance Areas*

**(5.1)** Punctuality & Predictability: Predictability, not as defined in SESAR but as the consequence of a better detection of hotspots, allows the actors involved to act in advance.

**(5.2)** Human Performance: The increase of operator confidence in complexity tool outputs, situational awareness and decision making, will have a positive impact on Human Performance KPA.

**(5.3)** Capacity**:** The reduction of the capacity buffer declared will have a positive impact on Capacity KPA, by increasing the nominal declared capacity.

## A.2.3 Network Performance Assessment for Distributed Network Operation – DCB-0212

***Description***

The BIM only focusses on Wave 1 of Network Performance Assessment for Distributed Network Operation context.

It only covers the Tactical phase. The planning, pre-tactical and post-operations phases will be addressed in Wave 2. The feature covers both nominal and critical/crisis situations.

The OI aims at identifying the common indicators amongst all involved stakeholders to quantify the network performance and help for the decision-making. It has to be noted that the Network Performance Assessment is aimed at helping the INAP and NM actors to make a decision based on indicators provided by other stakeholders. The implementation of the decision and its results are developed in PJ09 Solution 3 "Collaborative DCB". These two features are closely linked and so are their performances. In Solution 1, the implementation of the decision and the analysis of the impacts are not considered.

The Network Performance monitoring and management impacts all the actors. As such, three BIMs have been developed: NMF, AUs and APTs.

Diagram 1: NMF perspective: NM + INAP

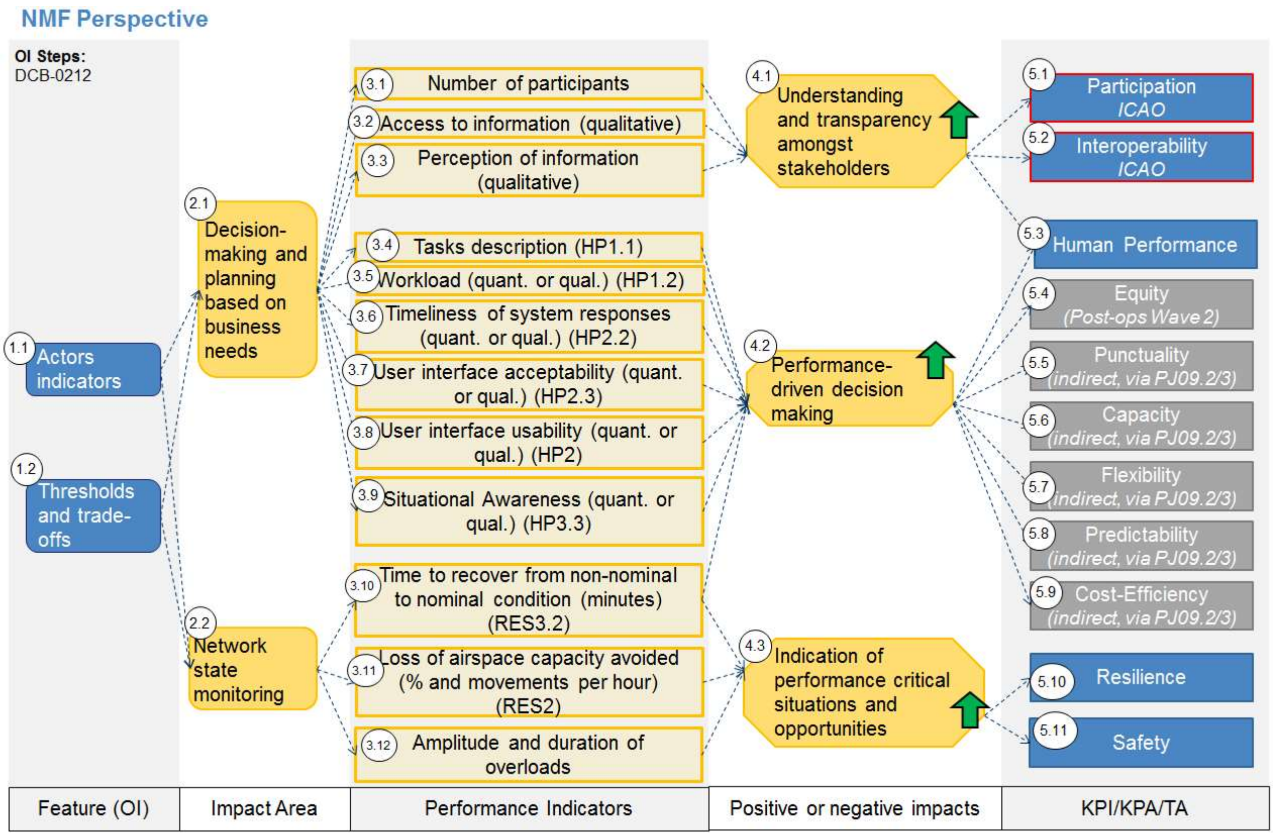



**Figure 103 : BIM_DCB-0212 – Network Management Function (NM + INAP)**

### *Features*

**(1.1)** Actors indicators: The different actors (APTs, AUs, INAP and NM) provide their indicators to the Performance Dashboard.

**(1.2)** Thresholds and trade-offs: Each actor provides his high and low thresholds and trade-offs that will be considered by the other actors during the coordination.

### *Impact Areas*

**(2.1)** Decision-making and planning based on business needs: By providing their indicators (1.1), thresholds and trade-offs (1.2), the actors express their business needs which will be considered during the coordination process when solving a situation.

**(2.2)** Network state monitoring: The Network situation will be displayed to the actors through KPIs and inform them when the situation goes from nominal to critical or crisis situation, or/and in case of a degradation of the performance indicators, based on indicators (1.1), thresholds and trade-offs (1.2).

### *Performance indicators*

**(3.1)** Number of participants**:** Number of participants that provide information. It should be equal to the number of actors using the tool.

**(3.2)** Access to information: Qualitative indicator that determines if the information is transparent to every participant.

**(3.3)** Perception of information: Qualitative indicator that determines if the information is understandable and clear enough to every participant.

**(3.4)** Tasks description (HP1.1): Qualitative measure that determines if the roles, procedures and responsibilities are clear and understood by every actor.

**(3.5)** Workload (HP1.2): Both qualitative and quantitative measures that determine if the new operating methods increase or not the NMF workload.

**(3.6)** Timeliness of system responses (HP2.2): Both qualitative and quantitative methods that measures the time for the system to integrate an action and to update the information.

**(3.7)** User interface acceptability (HP2.3): Qualitative measure that determines if the HMI interface design is acceptable by the actors.

**(3.8)** User interface usability (HP2): Qualitative measure that determines whether the system is usable by the actors.

**(3.9)** Situational awareness (HP3.3): Qualitative measure that determines if the level of communication and information provided is enough for the actors to be aware of the Network and local situations.

**(3.10)** Time to recover from non-nominal to nominal condition (minutes) (RES3.2): It determines how effective the anticipation, handling and recovery from degraded conditions to nominal conditions are.

**(3.11)** Loss of airspace capacity avoided (RES2): By a better coordination between the actors to find the optimum solution, it measures the percentage of airspace capacity that has been saved.

**(3.12)** Amplitude and duration of overloads: The Safety indicators presented in the Performance Framework are not representative of Solution 1 as they are related to the risk of collisions and/or incidents. PJ09.01 intends to better predict traffic demand and complexity. As such, it is more relevant to measure the amplitude and duration of the overloads in order to verify that they are correctly predicted and as a consequence, that the complexity and the risk of overload are limited.

### *Positive or negative impacts*

**(4.1)** Understanding and transparency amongst stakeholders: The Decision-making and planning based on business needs (2.1) should have a positive impact on the understanding and transparency amongst stakeholders. Besides each actor's own KPIs, the performance framework will provide a common set of KPIs, understandable and transparent to all actors. This should increase the understanding of the impact of local measures on the other involved stakeholders.

**(4.2)** Performance-driven decision making: The Decision-making and planning based on business needs (2.1) should have a positive impact on the Performance-driven decision-making. The business needs will be correctly reflected on an easy-to-use HMI, showing the indicators, thresholds and trade-offs of each actor.

**(4.3)** Indication of performance critical situations and opportunities: The Network state monitoring (2.2) should have a positive impact on the Indication of performance critical situations and opportunities. The performance dashboard will show the current and future hotspots, and the possible solutions to solve them via the provided thresholds.

### *Key Performance Areas*

**(5.1)** Participation**:** The understanding and transparency amongst stakeholders (4.1) depends on the involvement and participation of the actors in the process, and the use of the performance dashboard. The Participation KPA is an ICAO KPA (red circled in the diagram) and should be considered in the validation activity as it is a key element for the success of the performance monitoring and management.

**(5.2)** Interoperability: The understanding and transparency amongst stakeholders (4.1) depends on the involvement and interoperability of the actors in the process, by providing their indicators, thresholds and trade-offs. The Interoperability KPA is an ICAO KPA (red circled in the diagram) and should be considered in the validation activity as it is a key element for the success of the performance monitoring and management.

**(5.3)** Human Performance: The performance-driven decision-making (4.2) can have an impact on the Human Performance KPA as the decision–making process takes place through an HMI, based on the information received and on communication between the actors. Besides, the risk of increased workload is possible, due to the choice of actions and the number of information to take into account.

**(5.4)** Equity**:** The Equity definition as used here is different from the one in the Performance Framework as it does not only focus on Airspace Users and further refinement with PJ19.4 is needed. The performance-driven decision-making process (4.2) should satisfy all the actors, through the use of thresholds and trade-offs. It will be measured in Wave 2 in Post-Operations assessment.

**(5.5)** Punctuality: The performance-driven decision-making (4.2) should not have any negative impact on Punctuality, as the performance dashboard will allow taking earlier decisions on specific flights, which should limit the delay on other flights. As we will not implement any solutions during the exercises in Wave 1, it will be measured in Wave 2 in Post-Operations assessment.

**(5.6)** Capacity: The performance-driven decision-making (4.2) should have an impact on Capacity by managing the En-route and TMA complexity more efficiently. As we will not implement any solutions during the exercises in Wave 1, it will be measured in Wave 2 in Post-Operations assessment.

**(5.7)** Flexibility: The performance-driven decision-making (4.2) should have an impact on Flexibility caused by the generation of new flight plans and modification of trajectories due to the chosen actions. As we will not implement any solutions during the exercises in Wave 1, it will be measured in Wave 2 in Post-Operations assessment.

**(5.8)** Predictability: The performance-driven decision-making (4.2) should have an impact on Predictability through the variance of differences between actual and flight plan or RBT durations caused by the selected measures. As we will not implement any solutions during the exercises in Wave 1, it will be measured in Wave 2 in Post-Operations assessment.

**(5.9)** Cost-Efficiency: The performance-driven decision-making (4.2) should have an impact on ATC cost as the process should improve the controller productivity, due to a better managed traffic flow. As we will not implement any solutions during the exercises in Wave 1, it will be measured in Wave 2 in Post-Operations assessment.

**(5.10)** Resilience: The indication of performance critical situations and opportunities (4.3) should have a positive impact on Resilience caused by the anticipation and handling of degraded conditions and the improvement of the recovery from degraded condition to the nominal situation.

**(5.11)** Safety: The indication of performance critical situations and opportunities (4.3) should not have any impact on Safety. The traffic complexity will be displayed, where traffic demand is higher than capacity; which represents overloads. The overloads should correctly reflect the actual traffic through the amplitude and durations of the peaks.

Diagram 2: AU perspective

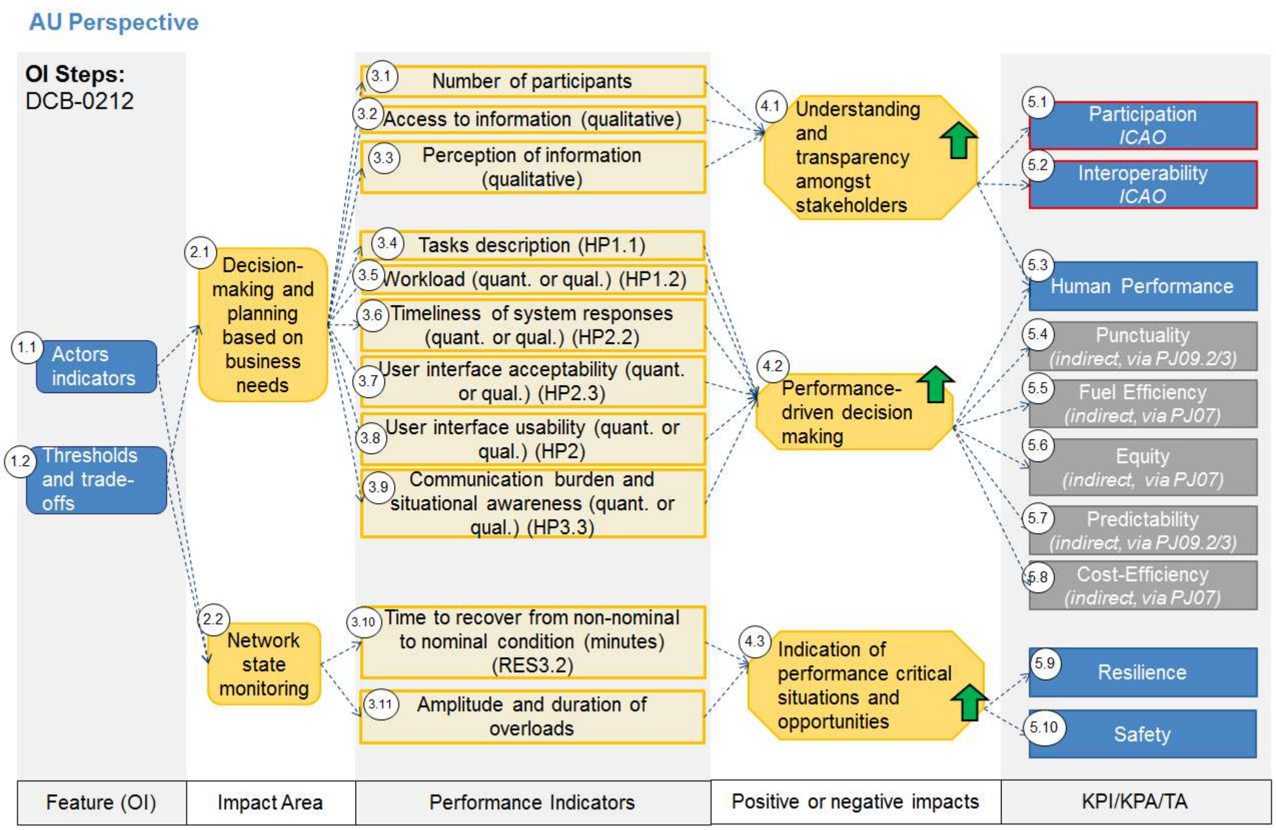



**Figure 104 : BIM_DCB-0212 – Airspace Users**

### *Features*

**(1.1)** Actors indicators: The different actors (APTs, AUs, INAP and NM) provide their indicators to the Performance Dashboard.

**(1.2)** Thresholds and trade-offs: Each actor provides his high and low thresholds and trade-offs that will be considered by the other actors during the coordination.

### *Impact Areas*

**(2.1)** Decision-making and planning based on business needs: By providing their indicators (1.1), thresholds and trade-offs (1.2), the actors express their business needs which will be considered during the coordination process when solving a situation.

**(2.2)** Network state monitoring: The Network situation will be displayed to the actors through KPIs and inform them when the situation goes from nominal to critical or crisis situation, or/and in case of a degradation of the performance indicators, based on indicators (1.1), thresholds and trade-offs (1.2).

### *Performance indicators*

**(3.1)** Number of participants: Number of participants that provide information. It should be equal to the number of actors using the tool.

**(3.2)** Access to information: Qualitative indicator that determines if the information is transparent to every participant.

**(3.3)** Perception of information: Qualitative indicator that determines if the information is understandable and clear enough to every participant.

**(3.4)** Tasks description (HP1.1**):** Qualitative measure that determines if the roles, procedures and responsibilities are clear and understood by every actor.

**(3.5)** Workload (HP1.2): Both qualitative and quantitative measures that determine if the new operating methods increase or not the AU workload.

**(3.6)** Timeliness of system responses (HP2.2): Both qualitative and quantitative methods that measures the time for the system to integrate an action and to update the information.

**(3.7)** User interface acceptability (HP2.3): Qualitative measure that determines if the HMI interface design is acceptable by the actors.

**(3.8)** User interface usability (HP2): Qualitative measure that determines whether the system is usable by the actors.

**(3.9)** Situational awareness (HP3.3): Qualitative measure that determines if the level of communication and information provided is enough for the actors to be aware of the Network and local situations.

**(3.10)** Time to recover from non-nominal to nominal condition (minutes) (RES3.2): It determines how effective the anticipation, handling and recovery from degraded conditions to nominal conditions are.

**(3.11)** Amplitude and duration of overloads: The Safety indicators presented in the Performance Framework are not representative of Solution 1 as they are related to the risk of collisions and/or incidents. PJ09.01 intends to better predict traffic demand and complexity. As such, it is more relevant to measure the amplitude and duration of the overloads in order to verify that they are correctly predicted and as a consequence, that the complexity and the risk of overload are limited.

### *Positive or negative impacts*

**(4.1)** Understanding and transparency amongst stakeholders: The Decision-making and planning based on business needs (2.1) should have a positive impact on the understanding and transparency amongst stakeholders. Besides each actor's own KPIs, the performance framework will provide a common set of KPIs, understandable and transparent to all actors. This should increase the understanding of the impact of local measures on the other involved stakeholders.

**(4.2)** Performance-driven decision making: The Decision-making and planning based on business needs (2.1) should have a positive impact on the Performance-driven decision-making. The business needs will be correctly reflected on an easy-to-use HMI, showing the indicators, thresholds and trade-offs of each actor.

**(4.3)** Indication of performance critical situations and opportunities: The Network state monitoring (2.2) should have a positive impact on the Indication of performance critical situations and opportunities. The performance dashboard will show the current and future hotspots, and the possible solutions to solve them via the provided thresholds.

***Key Performance Areas***

**(5.1)** Participation: The understanding and transparency amongst stakeholders (4.1) depends on the involvement and participation of the actors in the process, and the use of the performance dashboard. The Participation KPA is an ICAO KPA (red circled in the diagram) and should be considered in the validation activity as it is a key element for the success of the performance monitoring and management.

**(5.2)** Interoperability: The understanding and transparency amongst stakeholders (4.1) depends on the involvement and interoperability of the actors in the process, by providing their indicators, thresholds and trade-offs. The Interoperability KPA is an ICAO KPA (red circled in the diagram) and should be considered in the validation activity as it is a key element for the success of the performance monitoring and management.

**(5.3)** Human Performance: The performance-driven decision-making (4.2) can have an impact on the Human Performance KPA as the decision–making process takes place through an HMI, based on the information received and on communication between the actors. Besides, the risk of increased workload is possible, due to the choice of actions and the number of information to take into account.

**(5.4)** Punctuality: The performance-driven decision-making (4.2) should not have any negative impact on Punctuality, as the performance dashboard will allow taking earlier decisions on specific flights, which should limit the delay on other flights. As we will not implement any solutions during the exercises in Wave 1, it will be measured in Wave 2 in Post-Operations assessment.

**(5.5)** Fuel Efficiency: The performance-driven decision-making (4.2) should not have any negative impact on Fuel Efficiency as it will permit to select specific flights for coordinated solutions (STAM measures) while the rest of the flights will remain unchanged. It will be measured in Wave 2 in Post-Operations assessment.

**(5.6)** Equity: The Equity definition as used here is different from the one in the Performance Framework as it does not only focus on Airspace Users and further refinement with PJ19.4 is needed. The performance-driven decision-making process (4.2) should satisfy all the actors, through the use of thresholds and trade-offs. It will be measured in Wave 2 in Post-Operations assessment.

**(5.7)** Predictability: The performance-driven decision-making (4.2) should have an impact on Predictability through the variance of differences between actual and flight plan or RBT durations caused by the selected measures. As we will not implement any solutions during the exercises in Wave 1, it will be measured in Wave 2 in Post-Operations assessment.

**(5.8)** Cost-Efficiency: The performance-driven decision-making (4.2) should have an impact on ATC cost as the process should improve the controller productivity, due to a better managed traffic flow. As we will not implement any solutions during the exercises in Wave 1, it will be measured in Wave 2 in Post-Operations assessment.

**(5.9)** Resilience: The indication of performance critical situations and opportunities (4.3) should have a positive impact on Resilience caused by the anticipation and handling of degraded conditions and the improvement of the recovery from degraded condition to the nominal situation.

**(5.10)** Safety: The indication of performance critical situations and opportunities (4.3) should not have any impact on Safety. The traffic complexity will be displayed, where traffic demand is higher than capacity; which represents overloads. The overloads should correctly reflect the actual traffic through the amplitude and durations of the peaks.

Diagram 3: APT perspective

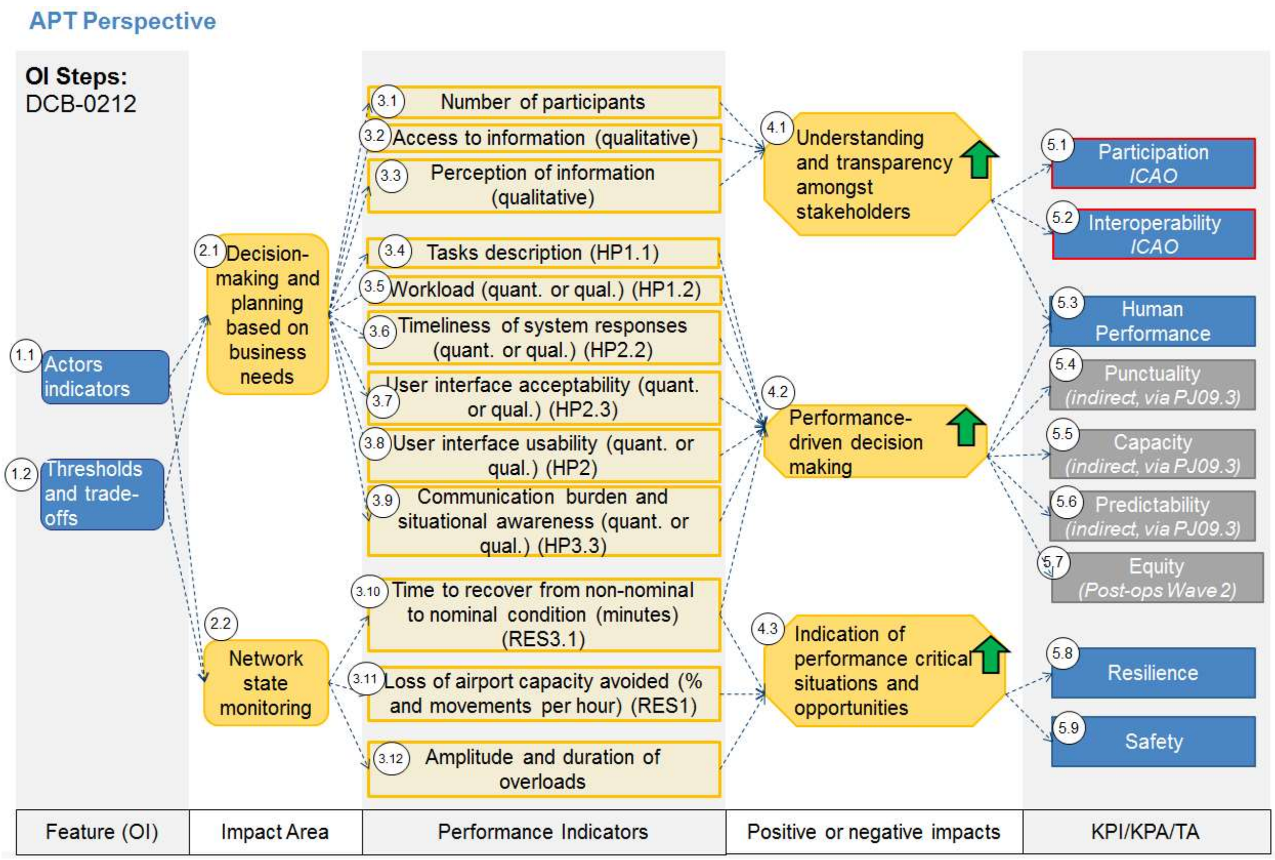



**Figure 105 : BIM_DCB-0212 – Airport**

### *Features*

**(1.1)** Actors indicators: The different actors (APTs, AUs, INAP and NM) provide their indicators to the Performance Dashboard.

**(1.2)** Thresholds and trade-offs: Each actor provides his high and low thresholds and trade-offs that will be considered by the other actors during the coordination.

### *Impact Areas*

**(2.1)** Decision-making and planning based on business needs: By providing their indicators (1.1), thresholds and trade-offs (1.2), the actors express their business needs which will be considered during the coordination process when solving a situation.

**(2.2)** Network state monitoring: The Network situation will be displayed to the actors through KPIs and inform them when the situation goes from nominal to critical or crisis situation, or/and in case of a degradation of the performance indicators, based on indicators (1.1), thresholds and trade-offs (1.2).

***Performance indicators***

**(3.1)** Number of participants**:** Number of participants that provide information. It should be equal to the number of actors using the tool.

**(3.2)** Access to information: Qualitative indicator that determines if the information is transparent to every participant.

**(3.3)** Perception of information: Qualitative indicator that determines if the information is understandable and clear enough to every participant.

**(3.4)** Tasks description (HP1.1): Qualitative measure that determines if the roles, procedures and responsibilities are clear and understood by every actor.

**(3.5)** Workload (HP1.2): Both qualitative and quantitative measures that determine if the new operating methods increase or not the APT workload.

**(3.6)** Timeliness of system responses (HP2.2): Both qualitative and quantitative methods that measures the time for the system to integrate an action and to update the information.

**(3.7)** User interface acceptability (HP2.3): Qualitative measure that determines if the HMI interface design is acceptable by the actors.

**(3.8)** User interface usability (HP2): Qualitative measure that determines whether the system is usable by the actors.

**(3.9)** Situational awareness (HP3.3): Qualitative measure that determines if the level of communication and information provided is enough for the actors to be aware of the Network and local situations.

**(3.10)** Time to recover from non-nominal to nominal condition (minutes) (RES3.1): It determines how effective the anticipation, handling and recovery from degraded conditions to nominal conditions are.

**(3.11)** Loss of airspace capacity avoided (RES1): By a better coordination between the actors to find the optimum solution, it measures the percentage of airport capacity that has been saved.

**(3.12)** Amplitude and duration of overloads: The Safety indicators presented in the Performance Framework are not representative of Solution 1 as they are related to the risk of collisions and/or incidents. PJ09.01 intends to better predict traffic demand and complexity. As such, it is more relevant to measure the amplitude and duration of the overloads in order to verify that they are correctly predicted and as a consequence, that the complexity and the risk of overload are limited.

***Positive or negative impacts***

**(4.1)** Understanding and transparency amongst stakeholders: The Decision-making and planning based on business needs (2.1) should have a positive impact on the understanding and transparency amongst stakeholders. Besides each actor's own KPIs, the performance framework will provide a common set of KPIs, understandable and transparent to all actors. This should increase the understanding of the impact of local measures on the other involved stakeholders.

**(4.2)** Performance-driven decision making: The Decision-making and planning based on business needs (2.1) should have a positive impact on the Performance-driven decision-making. The business needs will be correctly reflected on an easy-to-use HMI, showing the indicators, thresholds and trade-offs of **each actor.**

**(4.3)** Indication of performance critical situations and opportunities: The Network state monitoring (2.2) should have a positive impact on the Indication of performance critical situations and opportunities. The performance dashboard will show the current and future hotspots, and the possible solutions to solve them via the provided thresholds.

***Key Performance Areas***

**(5.1)** Participation: The understanding and transparency amongst stakeholders (4.1) depends on the involvement and participation of the actors in the process, and the use of the performance dashboard. The Participation KPA is an ICAO KPA (red circled in the diagram) and should be considered in the validation activity as it is a key element for the success of the performance monitoring and management.

**(5.2)** Interoperability: The understanding and transparency amongst stakeholders (4.1) depends on the involvement and interoperability of the actors in the process, by providing their indicators, thresholds and trade-offs. The Interoperability KPA is an ICAO KPA (red circled in the diagram) and should be considered in the validation activity as it is a key element for the success of the performance monitoring and management.

**(5.3)** Human Performance: The performance-driven decision-making (4.2) can have an impact on the Human Performance KPA as the decision–making process takes place through an HMI, based on the information received and on communication between the actors. Besides, the risk of increased workload is possible, due to the choice of actions and the number of information to take into account.

**(5.4)** Punctuality: The performance-driven decision-making (4.2) should not have any negative impact on Punctuality, as the performance dashboard will allow taking earlier decisions on specific flights, which should limit the delay on other flights. As we will not implement any solutions during the exercises in Wave 1, it will be measured in Wave 2 in Post-Operations assessment.

**(5.5)** Capacity: The performance-driven decision-making (4.2) should have an impact on Capacity by managing the En-route and TMA complexity more efficiently. As we will not implement any solutions during the exercises in Wave 1, it will be measured in Wave 2 in Post-Operations assessment.

**(5.6)** Predictability: The performance-driven decision-making (4.2) should have an impact on Predictability through the variance of differences between actual and flight plan or RBT durations caused by the selected measures. As we will not implement any solutions during the exercises in Wave 1, it will be measured in Wave 2 in Post-Operations assessment.

**(5.7)** Equity: The Equity definition as used here is different from the one in the Performance Framework as it does not only focus on Airspace Users and further refinement with PJ19.4 is needed. The performance-driven decision-making process (4.2) should satisfy all the actors, through the use of thresholds and trade-offs. It will be measured in Wave 2 in Post-Operations assessment.

**(5.8)** Resilience: The indication of performance critical situations and opportunities (4.3) should have a positive impact on Resilience caused by the anticipation and handling of degraded conditions and the improvement of the recovery from degraded condition to the nominal situation.

**(5.9)** Safety: The indication of performance critical situations and opportunities (4.3) should not have any impact on Safety. The traffic complexity will be displayed, where traffic demand is higher than capacity; which represents overloads. The overloads should correctly reflect the actual traffic through the amplitude and durations of the peaks.

### A.2.4 CM-0104-B Automated support to INAP (Integrated Network Management and ATC Planning) function

***Description***

Local DCB actors and Extended ATC Planning actors are working within an INAP (Integrated Network and ATC Planning) working environment providing access to all capacity and flow/trajectory management options and shared ATFCM/ATC situation awareness on both DCB and ATC sides.

The local roles within INAP (corresponding to Local Traffic Management and Extended ATC Planning) will be able to assess and resolve local complex situations (e.g. hotspots) through assessment of evolving traffic situation and evaluation of opportunities, in order to identify and manage the best performing option between Dynamic Airspace Configuration measures, flow management measures and trajectory measures (e.g. strategic de-confliction/synchronization).

This OI includes the set-up of an automated interface and related procedures between Local NM function and ATC Planning, to optimize the ATM resource management and improve the effectiveness of complexity resolutions through collaborative rules and decision approach involving all the relevant actors.

The major objective of INAP function is to optimize ATC team's workload by managing traffic complexity: providing support to the control team level of operation will improve situation awareness in the dynamic airspace management environment and provide solutions with best performance effects in terms of service and use of resources.

## *Diagram 1: ANSP perspective*

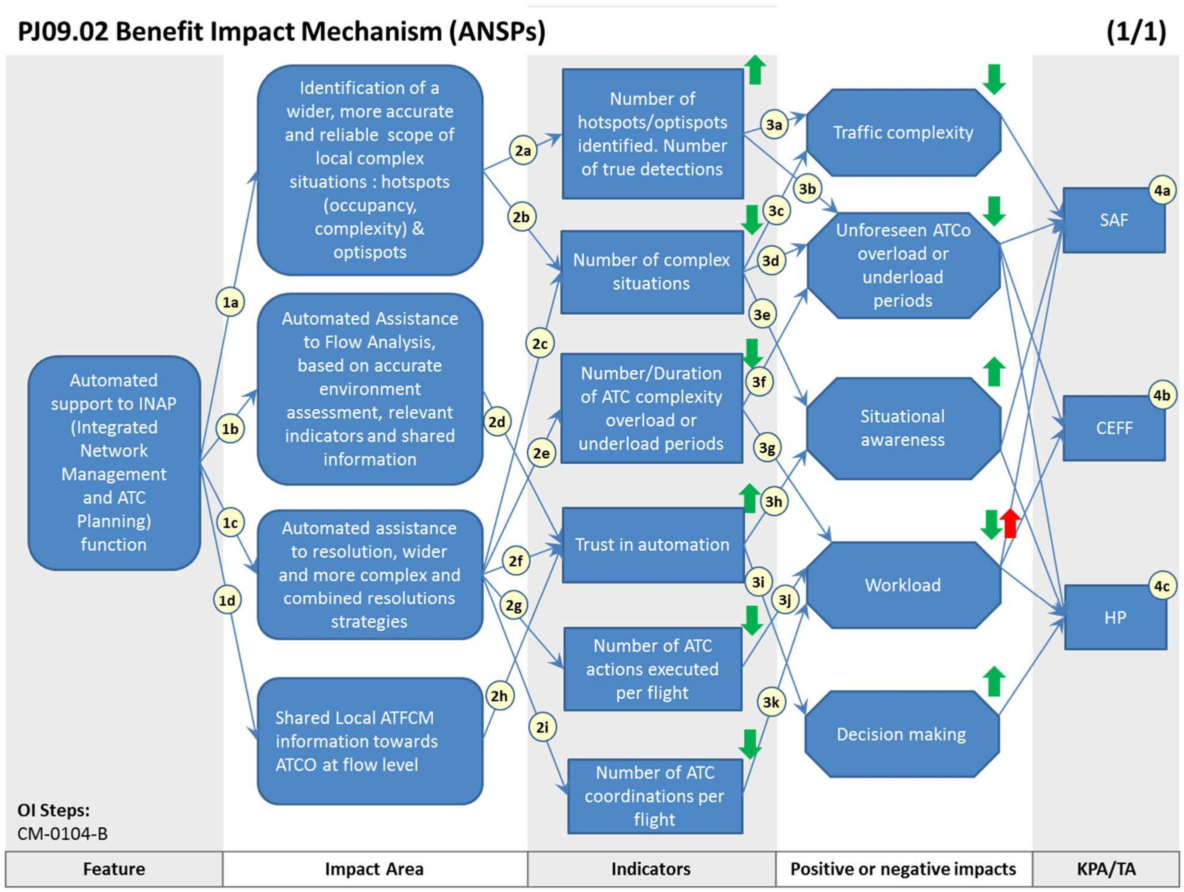



**Figure 106 : CM-0104-B Benefit Impact Mechanism (ANSP)**

### *Features*

There is a single feature for the stakeholder (ANSPs) affected by the aim of this OI step.

- Automated support to INAP (Integrated Network Management and ATC Planning): The use of automated tools and procedures between Local NM function and ATC Planning in order to optimize the ATM resource management and improve the effectiveness of complexity resolutions.

### *Impact Areas*

Regarding this OI, four impact areas have been identified.

**(1a)** Identification of a wider, more accurate and reliable scope of local complex situations: hotspots (occupancy, complexity) & optispots: The INAP provides tools and accurate data to identify a wider scope of situations: in addition to the hotspots of CM-0104-A based on occupancy peaks to identify hotspots based on complexity criteria and optispots. The identification is also more reliable accurate thanks to the tools.

**(1b)** Automated Assistance to Flow Analysis based on accurate environment assessment, relevant indicators and shared information: The INAP provides a large set of automated tools to assist INAP actors in their decision to solve or not a given situation with DCB measures thanks to accurate environment indicators and shared information with all stakeholders.

**(1c)** Automated assistance to resolution, wider and more complex and combined resolutions strategies: The INAP provides assessment tool to be used at LTM timeframe to assist him/her in the resolution through CORSE, which helps to choose the most suitable solution between measures.

**(1d)** Shared Local ATFCM information towards ATCO at flow level:The INAP provides automated tool to share ATFCM information at flow level towards ATCo, such as regulations and hotspots information.

***Indicators***

**(2a)** Number of hotspots/optispots identified. Number of true detections: As the identification covers a wider scope of local complex situations, the number of identified hotspots and optispots will increase. In addition, there will be not only an improvement in hotspots and optispots identification, but also an increase in the number of true detections.

**(2b)(2c)** Number of complex situations: Thanks to a better identification of the local complex situations, and the application of resolution strategies in a prior timeframe, the number of complex situations will be reduced.

**(2e)** Number/Duration of ATC complexity overload or underload periods: The use of automated assistance to solve complexity situations will allow to reduce the number and duration of ATC complexity overload or underload periods because of the better understanding and managing of these complex situations.

**(2d)(2f)(2h)** Trust in automation: The automated assistance to flow analysis, to resolution, and the sharing of local ATFCM information between actors, will allow improving the quality of the complexity assessment and resolution, and it will increase the involved actors' trust in automation.

**(2g)** Number of ATC actions executed per flight:The use of automated assistance to solve complexity situations will allow reducing the number of ATC actions executed per flight.

**(2i)** Number of ATC coordinations per flight: The use of automated assistance to solve complexity situations will allow reducing the number of ATC coordinations per flight.

***Positive or negative impacts***

**(3a)(3c)** Traffic complexity: The reduction of the number of complex situations and the increase of the number of hotspots/optispots identified (Number of true detections) will alleviate the traffic complexity.

**(3b)(3d)(3f)** Unforeseen ATCo overload or underload periods: The reduction of complex situation as well as the number of trueidentified hotspots/optispots and the reduction of the number and/or duration of ATC complexity overload or underload periods, will allow reducing the unforeseen ATCo overload or underload periods.

**(3e)(3h)** Situational awareness: The reduction of the number of complex situations due to the improvement on the identification and resolution of complex situations will increase the situational awareness of the actors involved, since they will have more support in their tasks as well as a better understanding of the complex situations within a defined airspace volume.

**(3g)(3j)(3k)** Workload: The ATCo workload will decrease because of the reduction both of the number of ATC actions per flight and the number of ATC coordinations per flight. The reduction of the number and/or duration of ATC complexity overload or underload periods, could have a negative impact in the ATCo workload, since it could be increased by the reduction of underload periods.

**(3i)** Decision making: The increase of the actor' trust in automation will lead to a more efficient and accurate decision making process.

***Key Performance Areas***

**(4a)** Safety (SAF): Safety will be impacted by the reduction of the traffic complexity, the reduction of unforeseen ATCo overload or underload periods, the improvement of the actors' situational awareness, and the reduction of ATCo workload. It is important to highlight that the increase in ATCo workload by the reduction on the number and/or duration of ATC complexity underload periods, could have a negative impact on safety.

**(4b)** Cost Efficiency (CEFF): Cost Efficiency will be impacted because of an increase of the air traffic controller productivity by reducing the unforeseen ATCo underload periods and increasing the ATCo workload.

**(4c)** Human Performance (HP): Human Performance will be impacted by the increase of the actors' situational awareness, the reduction ATCo workload, the improvement in the decision making process and the reduction of unforeseen ATCo overload or underload periods.

### A.2.5 CM-0302 Ground based Automated Support for Managing Traffic Complexity Across Several Sectors

***Description***

The system provides support for smoothing flows of traffic and de-conflicting flights in a multi-sector/multi-unit environment. Controllers are assisted in alleviating traffic complexity, traffic density, and traffic flow problems.

Currently, there is a gap between the management of traffic flows at European level and the control of flights in individual sectors. The objective is to provide support to the Multi Sector Planner on performing the planning of individual trajectories using advanced planning tools and consequently reducing complexity in his extended planning horizon (across several sectors)

MIL: Should also include analysis of the opportunity to combine the service for BT and MT (or not) in reduced complexity situations.

### *Diagram 1: ANSP perspective*

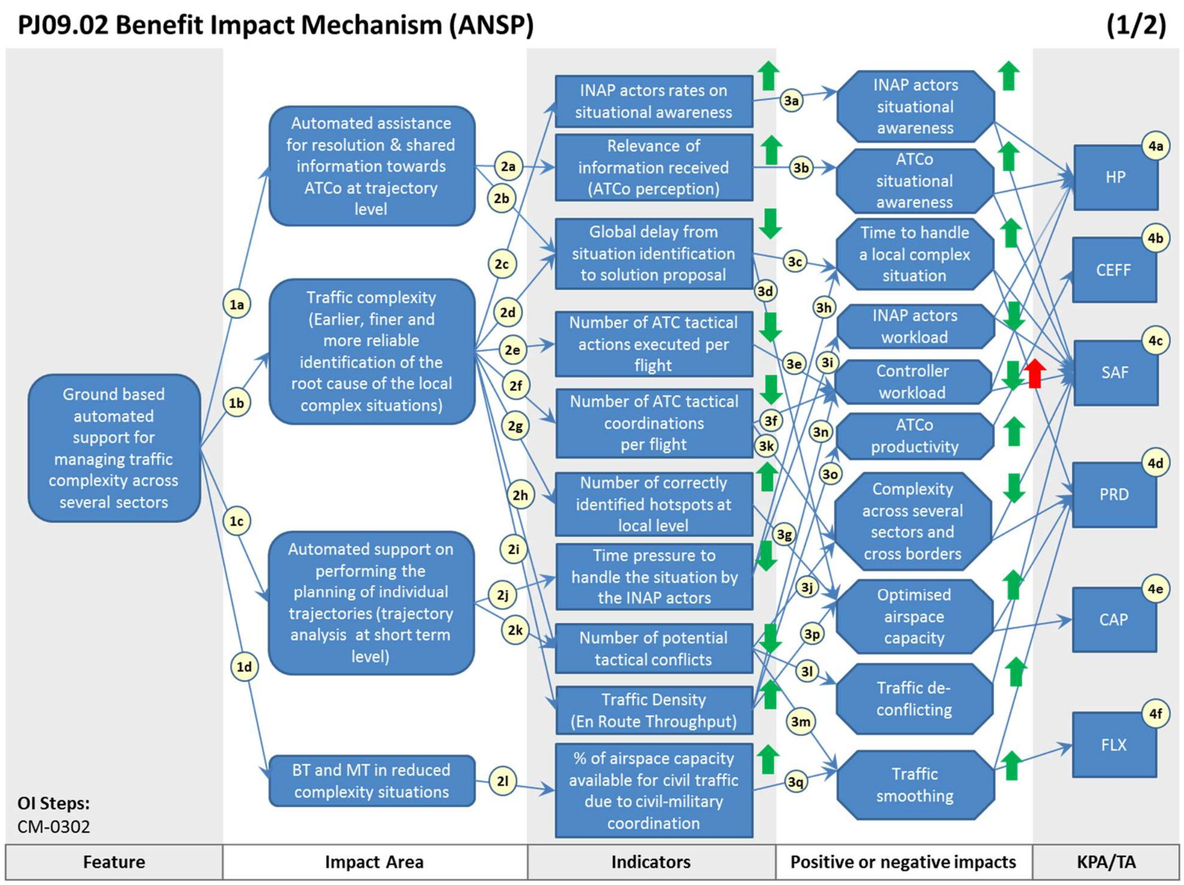



**Figure 107 : CM-0302 Benefit Impact Mechanism (ANSP)**

### *Features*

There is a single feature common for the two stakeholders (ANSP and NM) affected by the aim of this OI step.

- Ground based automated support for managing traffic complexity across several sectors: The use of automated tools in support of traffic complexity management by the INAP actors for smoothing flows and de-conflicting flights in a multi-sector environment.

### *Impact Areas*

The impact areas established for this OI Step Benefit Impact Mechanism are the following:

**(1a)** Automated assistance for resolution & shared information towards ATCO at trajectory level: The INAP actors' terminal provides automated tools to share information towards ATCo regarding the measures that need to be applied. This will make more efficient and smooth the processes of measures acceptance/refusal/analysis between INAP actors and ATCos.

**(1b)** Traffic complexity: The use of automated ground based tools by the INAP actors will allow a better traffic complexity management process. These tools will assist and help the INAP actors in understanding the root cause of a given local complex situation by providing them with earlier, finer, and more reliable information (e.g. TP accuracy, INAP actors Interference Detection tool, Meteorological information available at the INAP timeframe).

**(1c)** Automated support on performing the planning of individual trajectories: The INAP actors will be assisted by these automated tools for managing traffic complexity on performing the planning of individual trajectories, allowing a better planning of the situation both at local and, consequently, at regional level. The use of these assessment tools at the INAP actors' timeframe will support them in the resolution of complex situations, through CORSE, at individual trajectory level: they will help the INAP actors in choosing the most suitable solution between flow and trajectory measures and trajectory measures between themselves.

**(1d)** BT and MT in reduced complexity situations: In reduced complexity situations, the military users' operations will be considered in terms of complexity management by integrating the Business Trajectory and Mission Trajectory in the complexity assessment process by these ground based automated tools.

### *Indicators*

**(2a)** Relevance of information received (ATCo perception):The automated assistance for sharing information towards ATCo at trajectory level will increase the relevance of the information received according to the ATCo perception.

**(2b)** Global delay from situation identification to solution proposal: The automated assistance for resolution and sharing information towards ATCo at trajectory level will allow a reduction of the time elapsed between the identification of a complex situation and the solution proposal.

**(2c)** INAP actors' rates on situational awareness: The improvement of the traffic complexity management process due to the use of automated tools will increase the INAP actors' rates on situational awareness because of earlier, finer and more reliable identification of the root cause of a local complex situation.

**(2d**) Global delay from situation identification to solution proposal: Since the root cause of the local complex situation will be identified more efficiently due to the use of automated tools for traffic complexity management, the time elapsed between the identification of a complex situation and the solution proposal will be decreased. The INAP actors will improve the feeling of controlling the situation.

**(2e)** Number of ATC tactical actions executed per flight: The improvement of the traffic complexity management process due to the use of automated tools will lead to earlier, finer and more reliable identification of the root cause of a local complex situation, increasing the accuracy and efficiency of the solutions proposed to solve the situation. This improvement of the traffic complexity management and resolution will lead to a reduction of the number of ATC tactical actions executed per flight by the ATCo in the tactical phase (since complexity can be associated to the number of interactions between flights, by alleviating complexity the INAP actors will reduce the need of the ATCo to act on a flight during the tactical phase to solve potential conflicts).

**(2f)** Number of ATC tactical coordinations per flight: The improvement of the traffic complexity management process due to the use of automated tools will lead to earlier, finer and more reliable identification of the root cause of a local complex situation, increasing the accuracy and efficiency of the solutions proposed to solve the situation. This will lead to a reduction of the number of ATC tactical coordinations per flight that would be needed in the tactical phase, because of an anticipated alleviation of traffic complexity across sectors.

**(2g)** Number of correctly identified hotspots at local level: The use of automated tools for traffic complexity management will lead to a better identification of the root cause of a local complex situation and, consequently, this will increase the accuracy of the hotspots identification process by the INAP actors (earlier, finer and more reliable complexity information).

**(2h)** Number of potential tactical conflicts: The improvement of the traffic complexity management process due to the use of automated tools will lead to earlier and more efficient de-complexity processes. Therefore, the number of potential conflicts that could appear in the tactical phase will be reduced.

**(2i)** Traffic Density (En-Route Throughput): The use of automated tools for traffic complexity management will allow an increase of the traffic density within a given area because of the better complexity alleviating process that can be performed.

**(2j)** Time pressure to handle the situation by the INAP actors: The automated support on performing the planning of individual trajectories, assisting the trajectory analysis at short term level, will allow the INAP actors to analyse the situation quicker and more efficiently. Then, the time pressure to handle the situation by the INAP actors will decrease.

**(2k)** Number of potential tactical conflicts: The automated support on performing the planning of individual trajectories, assisting the INAP actors on trajectory analysis at short term level, will lead to a better planning of aircraft trajectories and to a reduction of traffic complexity. Therefore, the number of potential conflicts that could appear in the tactical phase will be decreased because of earlier de-complexity processes.

**(2l)** % of airspace capacity available for civil traffic due to civil-military coordination: The integration of the military users' operations in the traffic complexity assessment and management process will allow a better use of the military areas, increasing the airspace capacity available for civil traffic if the appropriate civil-military coordination is performed.

***Positive or negative impacts***

**(3a)** INAP actors' situational awareness: The INAP actors' situational awareness will be positively increased because of (2c).

**(3b)** ATCo's situational awareness: Since the relevance of the information received, according to the ATCo's perception, will increase, then the ATCo's situational awareness will be improved.

**(3c)(3h)** Time to handle a local complex situation: The time to handle a local complex situation by the INAP actors will be increased because of a reduction in the time elapsed between the identification of the complex situation and the solution proposal, as well as the fact that the time pressure to handle the situation by the INAP actors will be decreased.

**(3i)** INAP actors' workload: The INAP actors' workload will be smoothed and reduced because of a decrease in the time pressure to handle the situation.

**(3e)(3f)** Controller workload: The ATCo workload will decrease because both the number of ATC tactical actions per flight and ATC tactical coordinations per flight that would be needed in the tactical phase will be reduced.

**(3n)** Controller workload: The ATCo workload will be negatively increased because of an increase of the traffic density.

**(3o)** ATCo's productivity: The productivity of the air traffic controllers will be increased because of the increase of traffic density.

**(3j)(3k)** Complexity across several sectors and cross borders: The reduction of the number of potential tactical conflicts and the number of ATC tactical coordinations will alleviate the complexity across several sectors and cross borders.

**(3d)(3g)(3p)** Optimised airspace capacity: The airspace capacity use will be optimised because of a reduction in the global delay from situation identification to solution proposal (solving situations at the minimum time and allowing INAP actors to act on other things), an increase of the number of correctly identified hotspots, and an increase of the traffic density.

**(3l)** Traffic de-conflicting: A reduction in the number of potential tactical conflicts will lead to a more efficient traffic de-conflicting process.

**(3m)(3q)** Traffic smoothing: A reduction in the number of potential tactical conflicts and the increase of the airspace capacity available for civil traffic due to civil-military coordination will lead to smoother traffic flows.

### *Key Performance Areas*

**(4a)** Human Performance (HP): Human Performance will be impacted by the increase of the INAP actors and ATCo situational awareness, and the reduction of INAP actors and ATCo workload.

**(4b)** Cost Efficiency (CEFF): Cost Efficiency will be impacted because of an increase of the air traffic controller productivity.

**(4c) S**afety (SAF): Safety will be impacted by the reduction of the complexity across several sectors and cross borders, a more efficient traffic de-conflicting process, and a positive impact on INAP actors and ATCo situational awareness (increase) and workload (reduction).

**(4d)** Predictability (PRD): Predictability will be impacted as a consequence of the increase in the time to handle a local complex situation, a reduction of the complexity across several sectors and cross borders, the optimisation of the airspace capacity, and smoother traffic flows.

**(4e)** Capacity (CAP): The optimisation of the airspace capacity will positively impact on airspace capacity.

**(4f)** Flexibility (FLX): Flexibility will be increased due to an improvement of the traffic smoothing.

*Diagram 2: NM perspective*

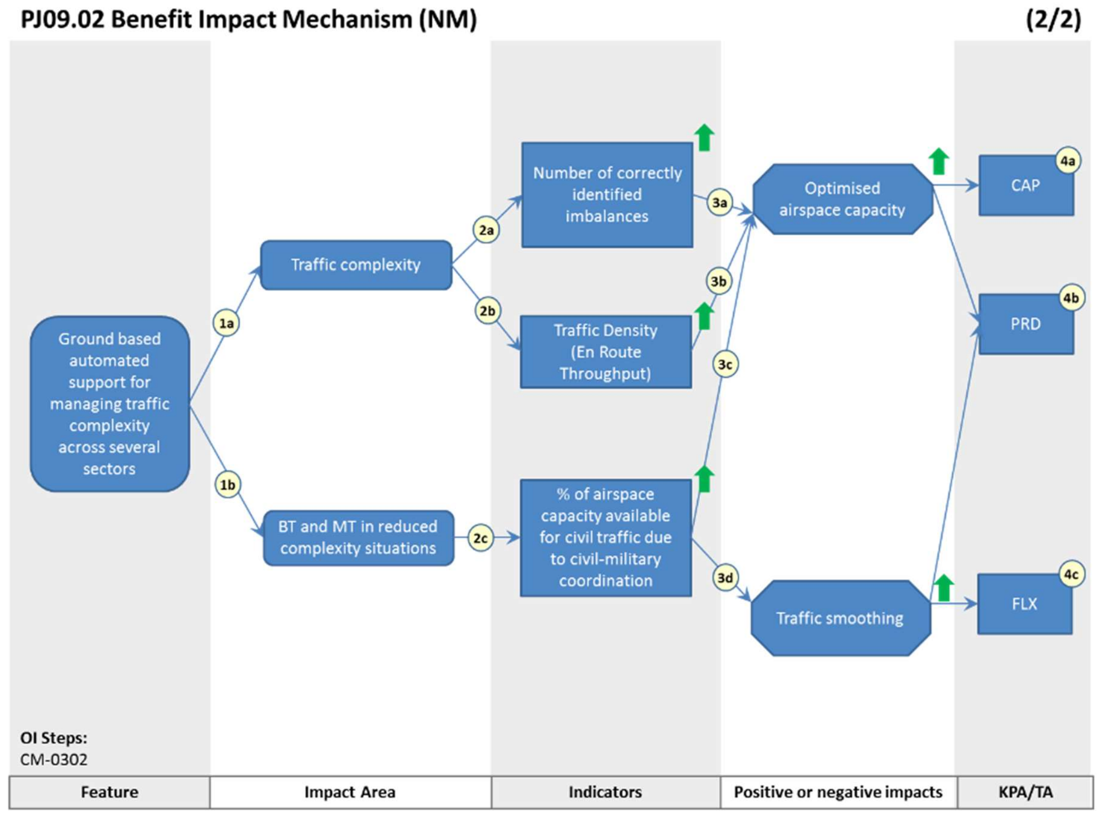



**Figure 108 : CM-0302 Benefit Impact Mechanism (NM)**

### *Impact Areas*

The impact areas established for this OI Step Benefit Impact Mechanism are the following from the NM perspective. This BIM is presented as a side effect of the OI Step CM0302, being the ANSP the main impacted. From this network perspective, the BIM is focused on the air traffic system capacity.

**(1a)** Traffic complexity: The use of automated ground based tools by the NM actor will allow a better traffic complexity management process. These tools will assist and help the NM actor in understanding the root cause of a given network complex situation by providing them with earlier, finer, and more reliable information.

**(1b)** BT and MT in reduced complexity situations: In reduced complexity situations, the military users' operations will be considered in terms of complexity management by integrating the Business Trajectory and Mission Trajectory in the complexity assessment process by these ground based automated tools.

***Indicators***

**(2a)** Number of correctly identified imbalances: The use of automated tools for traffic complexity management will lead to a better identification of the root cause of a network complex situation and, consequently, this will increase the accuracy of the imbalances identification process by the NM actor (earlier, finer and more reliable complexity information).

**(2b)** Traffic Density (En-Route Throughput): The use of automated tools for traffic complexity management will allow an increase of the traffic density at network level because of the better complexity alleviating process that can be performed at local level.

**(2c)** % of airspace capacity available for civil traffic due to civil-military coordination: The integration of the military users' operations in the traffic complexity assessment and management process will allow a better use of the military areas, increasing the airspace capacity available for civil traffic if the appropriate civil-military coordination is performed.

***Positive or negative impacts***

**(3a)(3b)(3c)** Optimised airspace capacity: The airspace capacity use will be optimised because of an increase of the number of correctly identified imbalances, an increase of the traffic density, and an increase of the airspace capacity available for civil traffic due to civil-military coordination.

**(3d)** Traffic smoothing: An increase of the airspace capacity available for civil traffic due to civil-military coordination will lead to smoother traffic flows.

***Key Performance Areas***

**(4a)** Capacity (CAP): The optimisation of the airspace capacity will positively impact on airspace capacity.

**(4b)** Predictability (PRD): Predictability will be impacted as a consequence of the optimisation of the airspace capacity and smoother traffic flows.

**(4c)** Flexibility (FLX): Flexibility will be increased due to an improvement of the traffic smoothing.

### A.2.6 DCB-0210 Full integration of Dynamic Airspace Configurations into DCB

***Description***

The aim of this OI is to elaborate the complete DCB solution that includes Dynamic Airspace Configurations combined with 4D constraints to optimally adapt the capacity to the demand and minimise demand adjustments. Integrated Airspace/4D constraints solutions are obtained through an iterative optimisation and CDM processes involving local, sub-regional and regional levels. ATM resource (including airspace and ground resources) management efficiency will be improved through a seamless integration of Airspace Management functions and Dynamic Airspace Configurations (DAC) into the advanced DCB and ATC planning processes.

The definition of full integrated airspace/4D constraints solution will enable a seamless and coordinated approach from planning to execution phases.It requires the development of a new timeline (strategic, pre-tactical, tactical) to adjust the capacity with a better anticipation based on new operating method, role and responsibility.Integrated workflow and new tools will be designed for the iNWP (Integrated Network Working Position): airspace configuration optimizer, what-if, messaging, to support CDM processes, as well as local actors, AUs and NM activities.

***Diagram 1: ANSP perspective***

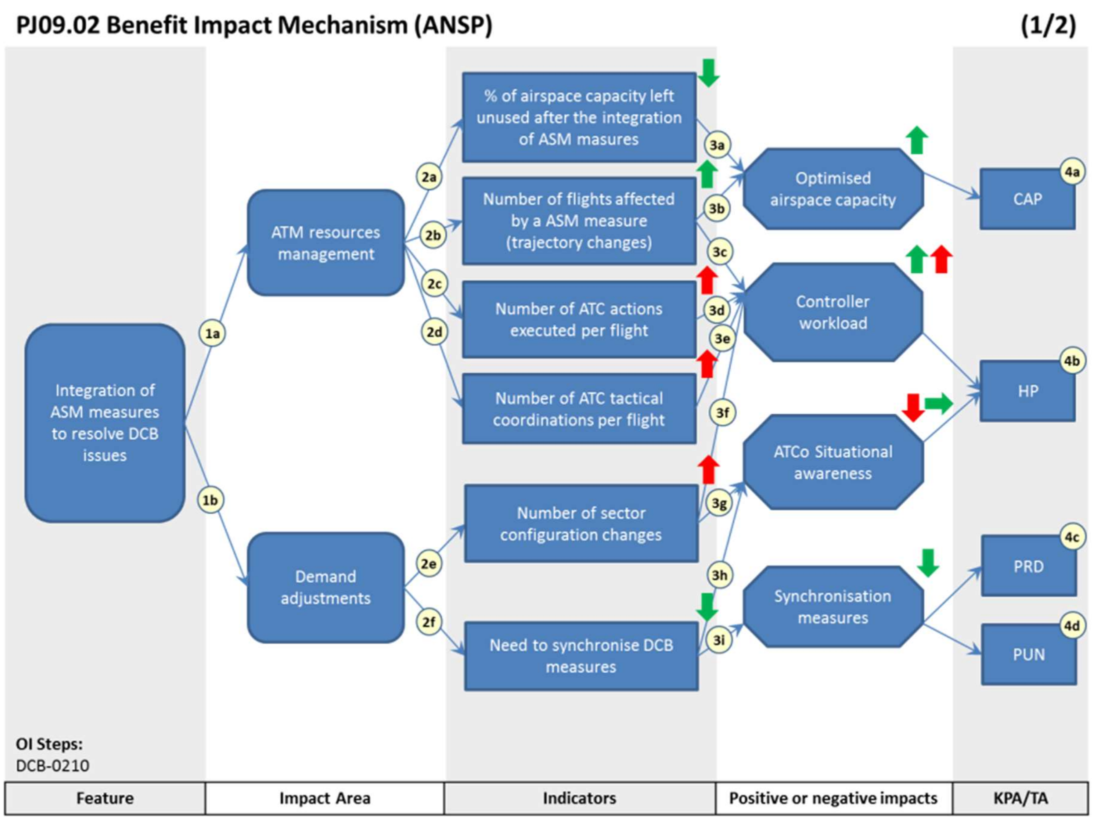



Figure 109 : DCB-0210 Benefit Impact Mechanism (ANSP)

### *Features*

There is a single feature for the stakeholders (ANSP and AUs) affected by the aim of this OI step.

- Integration of ASM measures to resolve DCB conflicts: OI DCB-2010 aims at elaborating the complete DCB solution that includes Dynamic Airspace Configuration combined with 4D constraints to optimally adapt the capacity to the demand and minimise demand adjustments.

***Impact Areas***

**(1a)** ATM resource management: The integration of ASM measures into DCB will result in an improved ATM resource management, understanding ATM resources as airspace capacity and controllers workforce.

**(1b)** Demand adjustments: The integration of ASM measures into DCB will result in capacity adjustments rather than demand adjustments and therefore the number of aircraft affected by trajectory changes will decrease.

***Indicators***

**(2a)** Percentage of airspace capacity left unused after the integration of ASM measures: The improvements in the management of airspace capacity due to the integration of ASM measures into DCB will result in capacity adjustments aiming at reducing the percentage of airspace left unused. With the integration of ASM measures, sectors will split and/or recombine in an optimised manner.

**(2b)** Number of flights affected by an ASM measure (trajectory changes): The number of aircraft affected by an ASM measure will increased due to the integration of ASM measures into DCB as part of the improved use of airspace capacity.

**(2c)** Number of ATC actions executed per flight: with the integration of ASM measures, controllers will execute a higher number of actions per flight in order to assure a correct transference of flights

**(2d)** Number of ATC tactical coordinations per flight**:** Controllers will perfume more tactical coordinations per flight due to the increase in capacity adjustments in order to ensure the transference of flights between sectors.

**(2e)** Number of sector configuration changes: The increase in capacity adjustments will result in an improvement of the demand adjustments: aircraft will be affected by less 4D constraints because of the increase in the number of sector configuration changes.

**(2f)** Need to synchronise DCB measures: ASM measures need to be synchronised with 4D constraints (in case they exist for the considered flight).

***Positive or negative impacts***

**(3a)(3b)** Optimised airspace capacity: There will be a positive increase in the optimised used of airspace capacity due to the inclusion of ASM measures that will result in less parts of the airspace not correctly used and less trajectory changes.

**(3c)(3d)(3e)(3f)** Controller workload: The inclusion of ASM measures will result in a negative increase of the controller workload due to the increase in the number of actions and tactical coordinations per flight. On the other hand, the inclusion of these ASM measures will positively increase the controller workload.

**(3g)(3h)** ATCO situational awareness: Situational awareness will be negatively impacted due to the constant changes in sector configuration brought by the integration of ASM measures. The need to synchronise DCB measures will also influence situational awareness, but the impact expected in neutral.

**(3i)** Synchronisation measures: The integration of ASM measures will reduce the need to synchronise 4D constraints, because less 4D constraints will be applied to flights.

***Key Performance Areas***

**(4a)** Capacity (CAP): Capacity KPA will be positively affected by the integration of ASM measures due to the optimisation of capacity usage.

**(4b)** Human Performance (HP): The impact on controller workload and situation awareness results in an impact in the Human Performance KPA.

**(4c)** Predictability (PRD): The synchronisation of ASM measures with other 4D constraints will influence predictability KPA.

**(4d)** Punctuality (PUN): The synchronisation of ASM measures with other 4D constraints will influence punctuality KPA.

***Diagram 2: Airspace User perspective***

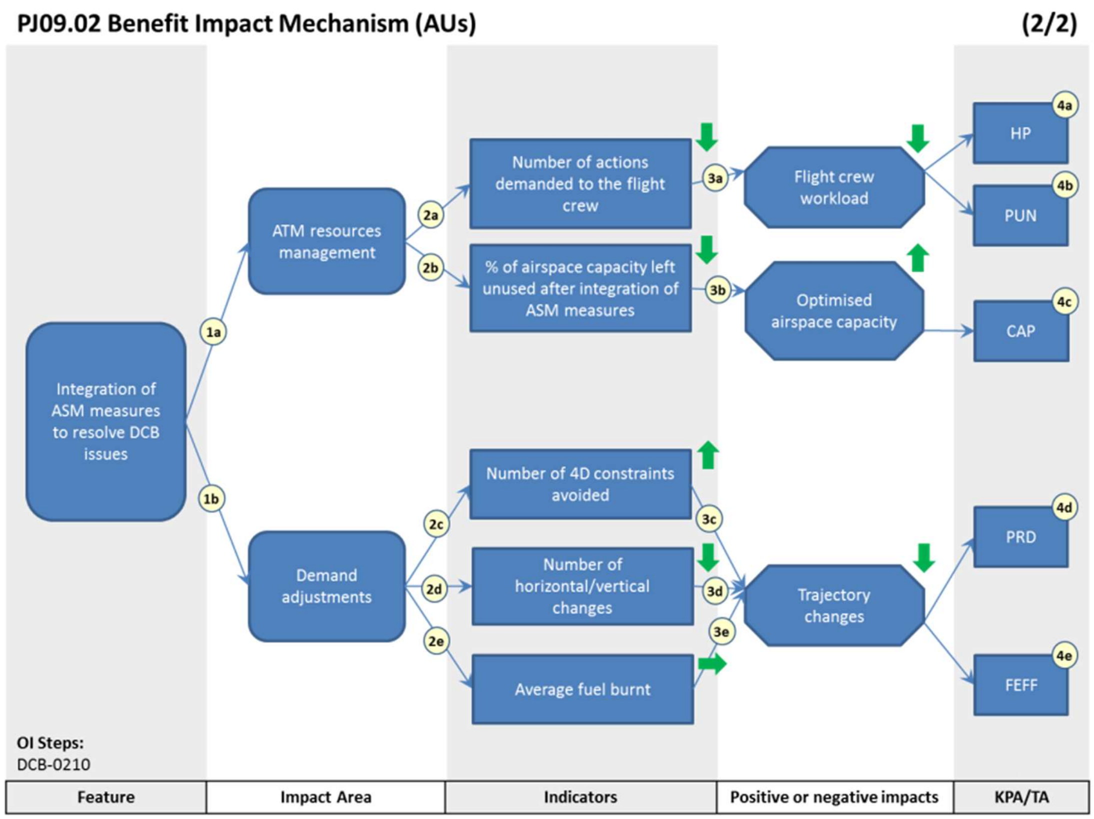



**Figure 110 : DCB-0210 Benefit Impact Mechanism (AUs)**

### *Impact Areas*

**(1a)** ATM resource management: The integration of ASM measures into DCB will result in an improved ATM resource management, understanding ATM resources as airspace capacity and controllers workforce.

**(1b)** Demand adjustments: The integration of ASM measures into DCB will result in capacity adjustments rather than demand adjustments and therefore the number of aircraft affected by trajectory changes will decrease.

### *Indicators*

**(2a)** Number of actions demanded to the flight crew: The integration of ASM measures will reduce the number of actions demanded to the crew since the adjustments will be performed in the capacity and not the demand.

**(2b)** Percentage of airspace capacity left unused after the integration of ASM measures**:** The improvements in the management of airspace capacity due to the integration of ASM measures into DCB will result in capacity adjustments aiming at reducing the percentage of airspace left unused. With the integration of ASM measures, sectors will split and/or recombine in an optimised manner.

**(2c)** Number of 4D constraints avoided: Flights will be affected by less 4D constraints due to the capacity adjustments.

**(2d)** Number of horizontal/vertical changes: Flights will be affected by less horizontal and/or vertical changes due to the capacity adjustments.

**(2e)** Average fuel burnt: The integration of ASM measures will affect the average fuel burnt, but it is unknown whether it will be reduced or increased.

***Positive or negative impacts***

**(3a)** Flight crew workload: Fewer actions will be demanded to the flight crew due to the reduction in the number of trajectory changes.

**(3b)** Optimised airspace capacity: The integration of ASM measures will make possible the increase in the number of aircraft flying through the sky, due to an optimisation of airspace capacity.

**(3c)(3d)(3e)** Trajectory changes: Aircraft will suffer less trajectory changes due to the capacity adjustments.

***Key Performance Area***

**(4a)** Human Performance (HP): The impact on crew workload results in an impact in the Human Performance KPA.

**(4b)** Punctuality (PUN): The impact on crew workload will affect punctuality KPA, increasing the adherence to the expected arrival and departure times.

**(4c)** Capacity (CAP): ASM measures integration allows more aircraft to fly through the sky thanks to the optimised use of airspace capacity, affecting Capacity KPA.

**(4d)** Predictability (PRD): Predictability will be impacted as a consequence of the reduction in trajectory changes.

**(4e)** Fuel Efficiency (FEFF): Given the reduction of trajectory changes there will be a non-defined impact in the average fuel burnt, which can be either positive or negative.

## A.2.7 DCB-0213 Consolidation and facilitation of Target Times between local DCB, Airport CDM and Extended Arrival Management

***Description***

In case of Airport and Extended Arrival sequencing induced constraints are overlaying Network constraints, collaborative trajectory revision may be required for ensuring reconciliation of local DCB measures (STAM measures - e.g. locally applied Target Times, Miles-In-Trail, Minimum Departure Intervals) with Airport CDM and traffic sequencing activities (E-AMAN, XMAN).

Expected benefits from the reconciliation include coherency between the different processes, enhanced predictability from common usage of most up-to-date flight data by all users, including impact of already applied constraints, and minimised impact on Airspace Users operations.

In case of interferences between DCB and Extended AMAN or Airport constraints, coherent solutions must be identified minimizing the risk of imposing multiple penalties to Airspace Users or increased workload for ATCO/FC.

***Diagram 1: Airspace User perspective***

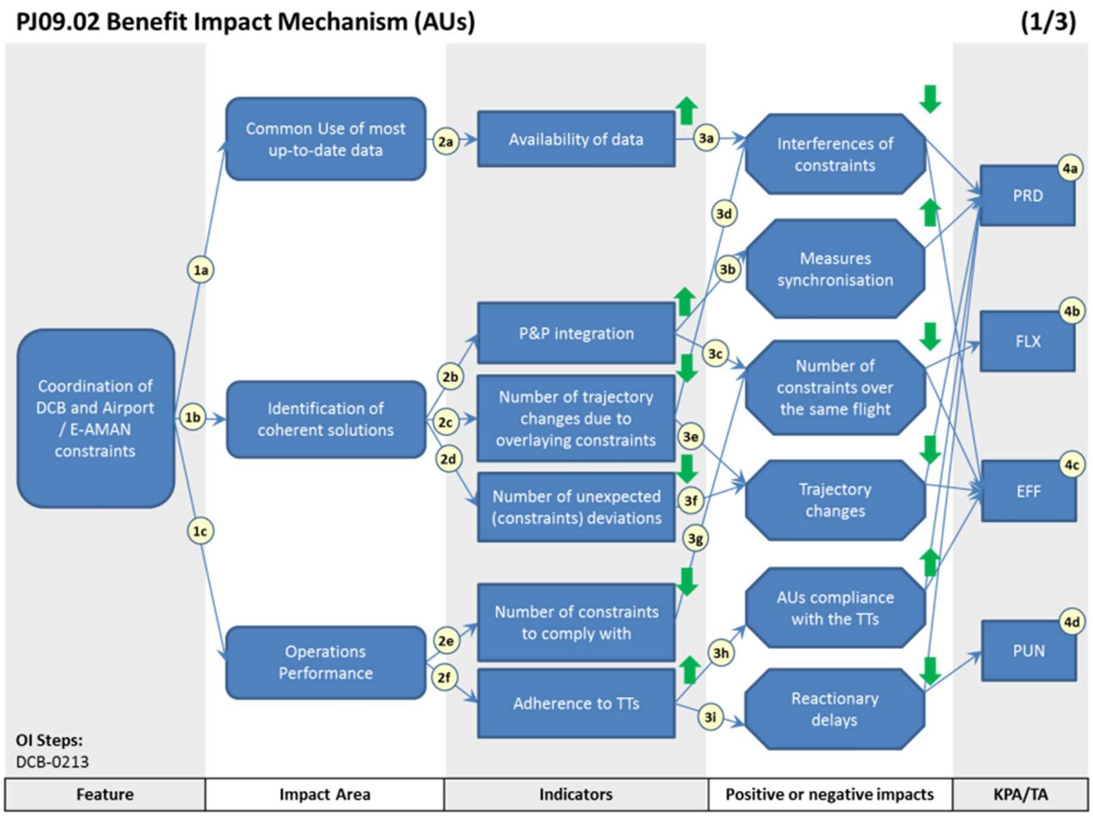



Figure 111 : DCB-0213 Benefit Impact Mechanism (AUs)

### *Features*

There is a single feature common for the three stakeholders affected by the aim of this OI step.

- Coordination of DCB and Airport / E-AMAN constraints: Providing a better coordination of Airport and Extended AMAN constraints with the other (local and network) DCB constraints to avoid the need for reconciliation.

### *Impact Areas*

The impact areas are also common for the three stakeholders affected by the OI Step.

**(1a)** Common Use of most up-to-date data: A better coordination of local and network DCB constraints impacts on the availability and use of the most up-to-date data by all the stakeholders affected by a DCB measure. The Common Use of most up-to-date data allows the decision maker to analyse the impact or requirement of a new constraint.

**(1b)** Identification of coherent solutions: A better coordination of local and network DCB constraints has an impact on the identification of coherent solutions. The Identification of coherent solutions minimizes the risk of imposing multiple penalties to Airspace Users.

**(1c)** Operations Performance: A better coordination of local and network DCB constraintshas an impact on the performance of the operations. The performance of the flight(s) is always impacting by the number of measures/constraints applied to it. A better coordination of constrains taking into account the needs, preferences and priorities of the stakeholders involved will provide a better performance of the operations.

***Indicators***

**(2a)** Availability of Data: The same data is available at the same time for all the stakeholders. The system is able to distribute and share the required data at the required moment. The availability of data will be a subjective measure by querying the stakeholders involved. It is important to take it into account as it impacts directly on the Predictability and Efficiency of Operations.

**(2b)** P&P integration: The preferences and priorities of all the stakeholders are known and taking into account during the flight. Thus, in case an action at local or network level is needed the impact on the stakeholders' P&P should be reduced to a minimum.The availability of data will be a subjective measure by querying the stakeholders involved. The knowledge and integration of the P&P will impact on the Predictability and Efficiency of the operations as well as on Flexibility.

**(2c)** Number of trajectory changes due to overlaying constraints: Number of trajectory changes not forecasted to occur which did occur due to overlaying constraints. The number of trajectory changes will be measured from a general perspective with the total number of flights, but also in a more detailed way, by considering individual flights.

**(2d)** Number of unexpected (constraints) deviations: Number of deviations (requiring a DCB constraint) not forecasted to occur and which did occur. The number of unexpected deviations will be measured from a general perspective with the total number of flights.

**(2e)** Number of constraints to comply with: Number of constraints imposed over a Flight that the Airspace User, the Airport or the Controller has to comply with to optimise the performance of the operations.

**(2f)** Adherence to TTs or Deviation from TTs: The adherence to the TTs may vary depending on the actions taken by the controllers over the flights. The way to measure the adherence to the TT will be by comparison between the initial flight plan and the last performance of the flight recorded in the simulator. We could also do the comparison between the initial FPL and some of the updates if needed.

***Positive or negative impacts***

**(3a)(3d)** Interferences of constraints*:* since the availability of data will be higher and accurate and the number of trajectory changes due to overlaying constraints will be reduced, the interferences of constraints will decrease.

**(3b)** Measure Synchronisation: due to a higher integration of the Airspace User Preferences and Priorities into the DCB process, the synchronisation of the measures will increase.

**(3c)(3g) N**umber of constrains over the same flight: thanks to an improvement on the P&P integration process and the decrease of the number of constraints to comply with, the number of constrains over the same flight will be reduced.

**(3e)(3f)** Trajectory changes: since the number of overlaying constraints over the same flight and the number of unexpected deviations will be decrease, the number of trajectory changes will be decreased too.

**(3h)** AUs compliance with the TTs: the adherence to the associated TTs will increase and thus, the AUs compliance with the TTs will improve.

**(3i)** Reactionary Delays: due to an increase adherence to the TTs, the reactionary delay will be decreased.

### *Key Performance Areas*

**(4a)** Predictability: Predictability will be impacted as a consequence of reduced interferences of the constraints applied over traffic, a better synchronisation of the DCB measures integrating AUs P&P and reducing the number of unexpected deviations, a reduced number of trajectory changes derived from fewer number of trajectory changes due to overlaying constraints and fewer unexpected deviations, an improvement on the AUs compliance with an allocated Target Time, and reduced reactionary delays.

**(4b)** Flexibility: Flexibility will be increased due to a reduced number of constraints to be applied over the same flight and the integration of AUs P&P.

**(4c)** Efficiency: Efficiency will be impacted due to a potential reduction of the interferences of the constraints applied over the traffic, a reduced number of constraints to be applied over the same flight and the integration of AUs P&P, a reduced number of trajectory changes derived from fewer number of trajectory changes due to overlaying constraints and fewer unexpected deviations, and an improvement on the AUs compliance with an allocated Target Times.

**(4d)** Punctuality: Punctuality will be increased due to a reduction of the reactionary delays.

## *Diagram 2: ANSP perspective*

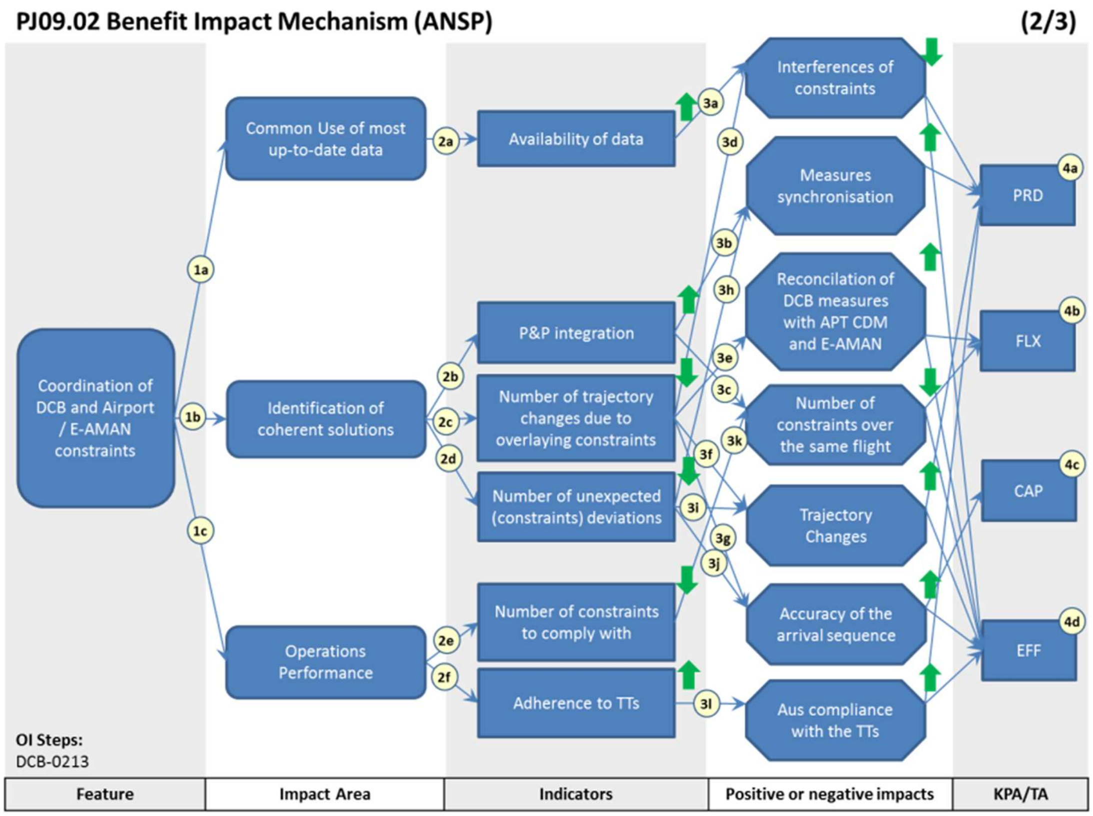



**Figure 112 : DCB-0213 Benefit Impact Mechanism (ANSP)**

### *Indicators*

**(2a)** Availability of Data: The same data is available at the same time for all the stakeholders. The system is able to distribute and share the required data at the required moment. The availability of data will be a subjective measure by querying the stakeholders involved. It is important to take it into account as it impacts directly on the Predictability and Efficiency of Operations.

**(2b)** P&P integration: The preferences and priorities of all the stakeholders are known and taking into account during the flight. Thus, in case an action at local or network level is needed the impact on the stakeholders' P&P should be reduced to a minimum.The availability of data will be a subjective measure by querying the stakeholders involved. The knowledge and integration of the P&P will impact on the Predictability and Efficiency of the operations as well as on Flexibility.

**(2c)** Number of trajectory changes due to overlaying constraints: Number of trajectory changes not forecasted to occur which did occur due to overlaying constraints. The number of trajectory changes will be measured from a general perspective with the total number of flights, but also in a more detailed way, by considering individual flights.

**(2d)** Number of unexpected (constraints) deviations: Number of deviations (requiring a DCB constraint) not forecasted to occur and which did occur. The number of unexpected deviations will be measured from a general perspective with the total number of flights.

**(2e)** Number of constraints to comply with: Number of constraints imposed over a Flight that the Airspace User, the Airport or the Controller has to comply with to optimise the performance of the operations.

**(2f)** Adherence to TTs or Deviation from TTs: The adherence to the TTs may vary depending on the actions taken by the controllers over the flights. The way to measure the adherence to the TT will be by comparison between the initial flight plan and the last performance of the flight recorded in the simulator. We could also do the comparison between the initial FPL and some of the updates if needed.

***Positive or negative impacts***

**(3a)(3d)** Interferences of constraints*:* since the availability of data will be higher and accurate and the number of trajectory changes due to overlaying constraints will be reduced, the interferences of constraints will decrease.

**(3b)(3h) Measure Synchronisation:** due to a higher integration of the Airspace User Preferences and Priorities into the DCB process and the decrease on the number of unexpected deviations, the synchronisation of the measures will increase.

**(3e)** Reconciliation of DCB measures with APT CDM and E-AMAN: the reduction of the number of trajectory changes due to overlaying constraints will decreased and as consequence, the reconciliation of DCB measures with the Airport CDM and Extended AMAN processes will be improved.

**(3c)(3k)** Number of constrains over the same flight: thanks to an improvement on the P&P integration process and the decrease of the number of constraints to comply with, the number of constrains over the same flight will be reduced.

**(3f)(3i)** Trajectory changes: since the number of overlaying constraints over the same flight and the number of unexpected deviations will be decrease, the number of trajectory changes will be decreased too.

**(3g)(3j)** The accuracy of the arrival sequence will improve due to the reduction of the number of trajectory changes due to overlaying constraints and the number of unexpected deviations**.**

**(3l)** AUs compliance with the TTs: the adherence to the associated TTs will increase and thus, the AUs compliance with the TTs will improve.

***Key Performance Areas***

**(4a)** Predictability: Predictability will be impacted as a consequence of reduced interferences of the constraints applied over traffic, a better synchronisation of the DCB measures integrating AUs P&P and reducing the number of unexpected deviations, a reduced number of trajectory changes derived from fewer number of trajectory changes due to overlaying constraints and fewer unexpected deviations and an improvement on the AUs compliance with an allocated Target Time.

**(4b)** Flexibility: Flexibility will be increased due to a reduction on the need of a reconciliation process of DCB measures with Airport CDM and E-AMAN, a reduced number of constraints to be applied over the same flight and considering the AUs P&P

**(4c)** Capacity: Capacity will be impacted due to an increase of the accuracy of the arrival sequence thanks to a decrease of the unexpected deviations and fewer number of trajectory changes due to overlaying constraints.

**(4d)** Efficiency: Efficiency will be increased as a consequence of potential reduction of the interferences of the constraints applied over the traffic, a reduced need of reconciliation process of DCB measures with Airport CDM and E-AMAN, a reduced number of constraints to be applied over the same flight and considering the AUs P&P, a reduced number of trajectory changes derived from fewer number of trajectory changes due to overlaying constraints and fewer unexpected deviations,an increased accuracy of the arrival sequence thanks to a decrease of the unexpected deviations and fewer number of trajectory changes due to overlaying constraints, and an improvement on the AUs compliance with an allocated Target Time.

***Diagram 3: Airport perspective***

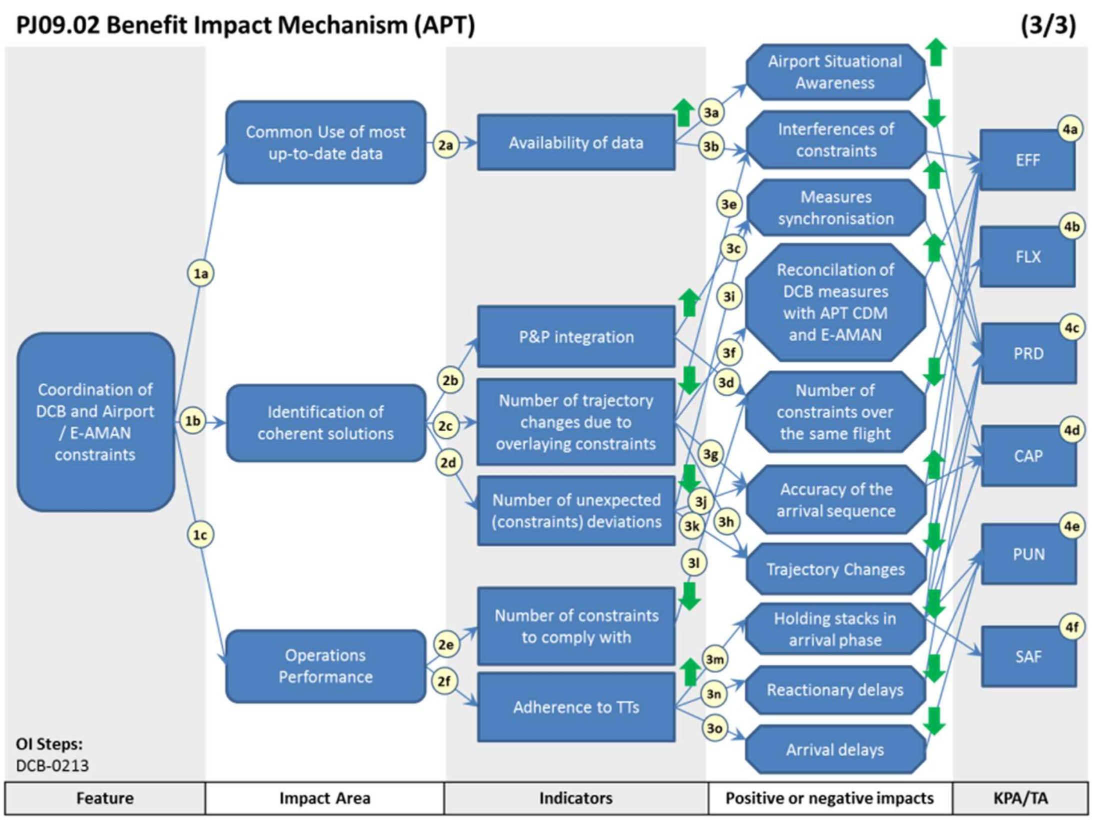



**Figure 113 : DCB-0213 Benefit Impact Mechanism (APT)**

### *Indicators*

**(2a)** Availability of Data**:** The same data is available at the same time for all the stakeholders. The system is able to distribute and share the required data at the required moment. The availability of data will be a subjective measure by querying the stakeholders involved. It is important to take it into account as it impacts directly on the Predictability and Efficiency of Operations.

**(2b)** P&P integration: The preferences and priorities of all the stakeholders are known and taking into account during the flight. Thus, in case an action at local or network level is needed the impact on the stakeholders' P&P should be reduced to a minimum.The availability of data will be a subjective measure by querying the stakeholders involved. The knowledge and integration of the P&P will impact on the Predictability and Efficiency of the operations as well as on Flexibility.

**(2c)** Number of trajectory changes due to overlaying constraints: Number of trajectory changes not forecasted to occur which did occur due to overlaying constraints. The number of trajectory changes will be measured from a general perspective with the total number of flights, but also in a more detailed way, by considering individual flights.

**(2d)** Number of unexpected (constraints) deviations: Number of deviations (requiring a DCB constraint) not forecasted to occur and which did occur. The number of unexpected deviations will be measured from a general perspective with the total number of flights.

**(2e)** Number of constraints to comply with: Number of constraints imposed over a Flight that the Airspace User, the Airport or the Controller has to comply with to optimise the performance of the operations.

**(2f)** Adherence to TTs or Deviation from TTs: The adherence to the TTs may vary depending on the actions taken by the controllers over the flights. The way to measure the adherence to the TT will be by comparison between the initial flight plan and the last performance of the flight recorded in the simulator. We could also do the comparison between the initial FPL and some of the updates if needed.

### *Positive or negative impacts*

**(3a)** Airport Situational Awareness will increase thanks to an improved availability of data.

**(3b)(3e)** Interferences of constraints*:* since the availability of data will be higher and accurate and the number of trajectory changes due to overlaying constraints will be reduced, the interferences of constraints will decrease.

**(3c)(3i)** Measure Synchronisation: due to a higher integration of the Airspace User Preferences and Priorities into the DCB process and the decrease on the number of unexpected deviations, the synchronisation of the measures will increase.

**(3f)** Reconciliation of DCB measures with APT CDM and E-AMAN: the reduction of the number of trajectory changes due to overlaying constraints will decreased and as consequence, the reconciliation of DCB measures with the Airport CDM and Extended AMAN processes will be improved.

**(3d)(3k**) Number of constrains over the same flight: thanks to an improvement on the P&P integration process and the decrease of the number of constraints to comply with, the number of constrains over the same flight will be reduced.

**(3g)(3j)** The accuracy of the arrival sequence will improve due to the reduction of the number of trajectory changes due to overlaying constraints and the number of unexpected deviations**.**

**(3h)(3l)** Trajectory changes: since the number of overlaying constraints over the same flight and the number of unexpected deviations will be decrease, the number of trajectory changes will be decreased too.

**(3m)** Holding stacks in arrival phase**:** The number of holding stacks in arrival phase will decrease due to a better adherence to TTs.

**(3n)** Reactionary Delays: due to an increase adherence to the TTs, the reactionary delay will be decreased.

**(3o)** Arrival delays: The arrival delays at the airport will be decreased thanks to a better adherence to the TTs.

***Key Performance Areas***

**(4a)** Efficiency**:** Efficiency will be impacted as a consequence of potential reduction of the interferences of the constraints applied over the traffic, reduced needs of reconciliation processes of DCB measures with Airport CDM and E-AMAN, increased accuracy of the arrival sequence thanks to a decrease of the unexpected deviations and fewer number of trajectory changes due to overlaying constraints, reduced number of trajectory changes derived from fewer number of trajectory changes due to overlaying constraints and fewer unexpected deviations, and a reduced number of holding stacks on the arrival phase due to TT adherence that will improve Flight and Fuel Efficiency.

**(4b**) Flexibility: Flexibility will be increased due to a reduced number of constraints to be applied over the same flight and considering the AUs P&P

**(4c)** Predictability: Predictability will be impacted due to the availability of the right data at the right time that will increase Airport Situational Awareness (integrating the airport in the DCB loop), a potential reduction of the interferences of the constraints applied over the traffic, a better synchronisation of the DCB measures integrating AUs P&P and reducing the number of unexpected deviations, a reduced number of trajectory changes derived from fewer number of trajectory changes due to overlying constraints and fewer unexpected deviations, a reduction of the holding stacks on the arrival phase (knock-on effect), and a reduction on the reactionary delays.

**(4d)** Capacity: Airport Capacity will be increased as a consequence of reduced needs of reconciliation processes of DCB measures with Airport CDM and E-AMAN, an increased accuracy of the arrival sequence thanks to a decrease of the unexpected deviations and fewer number of trajectory changes due to overlaying constraints, and reduced number of holding stacks on the arrival phase due to better TT adherence.

**(4e)** Punctuality: Punctuality will be impacted due to reduced number of holding stacks on the arrival phase because of better TT adherence, reduced reactionary delays, and reduced arrival delays (also due to better adherence to TT which will increase punctuality for airlines and airports, better complying with schedules).

**(4f)** Safety: Safety will be impacted due to a reduced number of holding stacks on the arrival phase (fewer aircraft in the terminal area).

Additionally, and since no negative impacts have been identified for this OI step by the expert group, the positive impacts are ranked considering the importance of each impact on the validation activities to be performed.

### A.2.8 FF-ICE Planning Services (AUs) - AUO-0207 / DCB-0217

***Description***

The BIM only focusses on Wave 1 of the traffic and demand forecast in 4D trajectory management context.

In the planning phase the SBT management processes are aligned with ICAO FF-ICE increment 1 scenarios and services, giving the opportunity to the Airspace Users to be more involved in DCB processes. SBT management will start with the provision of PFP by AUs triggering trajectory negotiation processes and ATM constraints information exchanges along the planned trajectories.

NOP will be enriched to provide the evolving DCB information to AUs (network DCB constraints, congestion Indicators along and around their trajectories and route opportunities) to support them in the calculation of optimal or less constraint trajectories. The information will be provided earlier than current operations (SBT phase) supporting the PFP concept in FF-ICE. NOP will benefit in this exchange from early AU trajectories that should improve DCB planning and network predictability and will support informed decision making of NOP actors.

Note: The BIM detailed in Appendix B.1 have been developed for the joint 09-03 and 07-01 validation exercise. The red boxes in the diagrams highlight the BIM elements that are considered to specifically relate to the 09-03 aspects of the validation.

In case of interferences between DCB and Extended AMAN or Airport constraints, coherent solutions must be identified minimizing the risk of imposing multiple penalties to Airspace Users or increased workload for ATCO/FC.

***Airspace User Perspective***

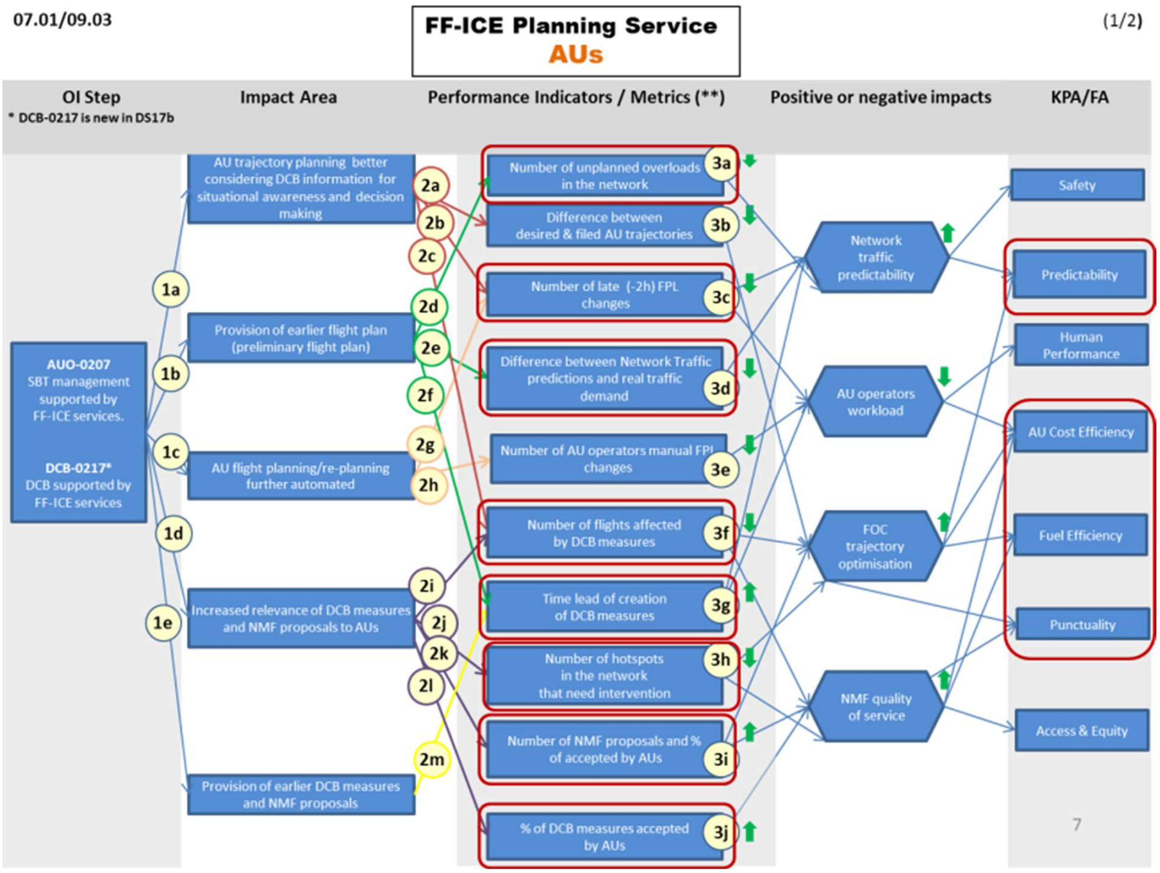



**Figure 114 : DCB-0217 Benefit Impact Mechanism (AU)**

### *Features*

- AUO-0207 : SBT management supported by FF-ICE services
- DCB-0130-B-a : DCB supported by FF-ICE services

### *Impact Areas*

**(1a)** Common awareness on demand capacity imbalances and DCB measures will improve the planning processes; allowing AUs to adapt their trajectories according to the actual situation while minimizing the impact. As a result, the optimized planning will be closer to actual execution.

**(1b)** FF-ICE planning services will facilitate the AU to earlier negotiate accurate SBTs with NM and LTM, allowing all of them to anticipate their decision making processes and hence providing early FPL.

**(1c)** SBT Management supported by FF-ICE Services will allow to exchange standardized and enriched flight plan messages, and thus will permit more automation on planning management in a CDM environment.

**(1d)** DCB supported by FF-ICE planning service will increase relevance of DCB measures and NMF proposals to AUs as NMF will have better flight plan information earlier through AU provision of PFP. NM and LTM will improve DCB measures based on more trustable planning information.

**(1e)** DCB supported by FF-ICE planning service will allow for the provision of earlier DCB measures and NMF proposals due to the earlier assessment of the demand thanks to the provision of flight plan information through AU provision of PFP.

***Indicators***

**(2a)** Taking into account DCB information for situation awareness and decision making will allow AU to better align the filed trajectory to their desired one.

**(2b)** AU trajectory planning taking into account DCB information will produce planned trajectories closer to the actual execution ones, which will reduce the number of tactical FPL changes.

**(2c)** AU awareness on accurate DCB measures will allow to file or negotiate trajectories avoiding congested areas, reducing the number of flights directly affected by DCB measures.

**(2d)** Earlier flight plan information will support DCB planning and reduce uncertainty, more accurate planning will reduce the number of unplanned overloads.
Earlier flight plan information will reduce the uncertainty associated with the detecting overloads which will reduce the number of unplanned overloads.

**(2e)** Provision of PFP together with the subsequent trajectory negotiation will provide an earlier stable plan already adapted to DCB, reducing the gap between traffic predictions and real traffic.

**(2f)** The provision of early flight plans will improve the traffic demand , that will allow to have DCB measures in place earlier.

**(2g)** The automation of flight planning/re-planning could anticipate the FPL changes due to DCB constraints , therefore the number of FPL changes in the last 2 hours will be reduced.

**(2h)** Flight planning/re-planning automation will reduce the number of AU operators manual changes.

**(2i)** The number of unnecessary DCB measures or late activation of DCB measures due to inaccurate demand will be reduced. In the first case less flights will be affected, and in the second one more trajectories will have the opportunity to negotiate to avoid it. In addition it would be expected some trajectory adaptation avoiding hot spots which will reduce the number of flights directly affected by DCB measures.

**(2j)** Increasing relevance of DCB measures and NMF proposals will allow to better manage network effect and minimize the creation of new hotspots.

**(2k)** The planning service will allow in particular to standardise the provision of trajectory optimisation proposals for local DCB processes.

A better network DCB situation will help to identify proposals and alternatives better aligned to AU criteria and performance.

**(2l)** Increasing the relevance of DCB measures will reduce the proportion of cases where the AU will search for alternative solutions. Increasing the relevance of NMF proposals thanks to more accurate planning information will allow AU to accept more NMF proposals.

**(2m)** Time lead of creation of DCB measures will increase as a result of earlier provision of DCB measures and NMF proposals.

### *Positive or negative impacts*

**(3a)** A reduced number of unplanned overloads in the network will lead to an increased in Network traffic predictability which is linked to Predictability and Safety.

**(3b)** Reducing the difference between their desired & filed trajectories will allow FOC to better optimize their trajectories which is linked to Predictability, Punctuality, Fuel Efficiency and AU Cost Efficiency.

**(3c)** Fewer late (-2H) FPL changes will contribute to earlier stability in traffic demand that will increase Network traffic predictability which is liked to Predictability and Safety. It will also reduce AU operators workload since late FPL changes requires coordination with the flight crew. This is linked to AU Cost Efficiency and Human Performance.

(3d) Reducing the difference between Network traffic prediction and real traffic demand thanks to early provision of flight plan already taking into account the DCB situation will increase Network traffic predictability which is linked to Predictability and Safety.

**(3e)** Fewer manual FPL changes will reduce AU operator workload which is linked to AU Cost Efficiency and Human Performance. Obviously, It should be checked in validation exercises that in the transition phase the new PFP tasks will compensate the workload reduction due to automation.

**(3f)** Fewer number of flights affected by DCB measures will allow more flights to maintain their optimised trajectory, which is linked to Punctuality, Fuel Efficiency and AU Cost Efficiency. AU will benefit a better quality of service from NMF as the number of flights affected by DCB measures will decrease and this is linked to Punctuality, Fuel Efficiency and Access & Equity.

**(3g)** Increasing time lead for DCB measure creation will allow the AU operators to react earlier which is less effort consuming, this is linked to AU Cost Efficiency and Human Performance. It will also increase Network traffic predictability which is linked to Predictability and Safety.

**(3h)** Fewer number of Hotspots in the network will allow more flights to maintain their optimised trajectory, which is linked to Punctuality, Fuel Efficiency and AU Cost Efficiency. AU will benefit a better quality of service from NMF as the number of Hotspots will decrease and this is linked to Punctuality, Fuel Efficiency, AU Cost Efficiency and Access & Equity.

**(3i)** Increasing the percentage of NMF proposals accepted by AU will improve the FOC trajectory optimisation as the proposal not only satisfy the specific trajectory AU needs but also is accommodated taking into account the impact on the network situation. This is linked to Punctuality, Fuel Efficiency and AU Cost Efficiency. AU will also benefit a better quality of service from NMF as the number of accurate NMF proposals will increase and this is linked to Punctuality, Fuel Efficiency, AU Cost Efficiency and Access & Equity.

**(3j)** A good % of DCB measures accepted by AU is a good indication that DCB measures are feasible and convenient for AU. AU will benefit a better quality of service from NMF and this is linked to Punctuality, Fuel Efficiency and AU Cost Efficiency.

***Key Performance Areas***

**(4a)** Predictability: Predictability will be improved thanks to a reduced number of late trajectory changes and unplanned overloads. Consequently, any foreseeable reactionary delay could be better anticipated by the AU, and related impact will be reduced.

**(4b)** AU Cost Efficiency: AU Cost Efficiency will be improved thanks to optimised trajectories (with late changes, less flights impacted by DCB measures) and reduction of the AU operation center workload.

**(4c)** Fuel Efficiency: Thanks to more relevant measures and given the reduction of flights impacted by DCB measures, including delay reduced to minimum, the initial trajectory will be better achieved, and as such, a reduction in fuel burnt is expected.

**(4d) Punctuality**: Punctuality will be increased due to better use of capacity thanks to more adequate measure. At airport level, the punctuality is improved thanks to a reduction of the reactionary delays.

**NMF – Regional and Local Perspective**

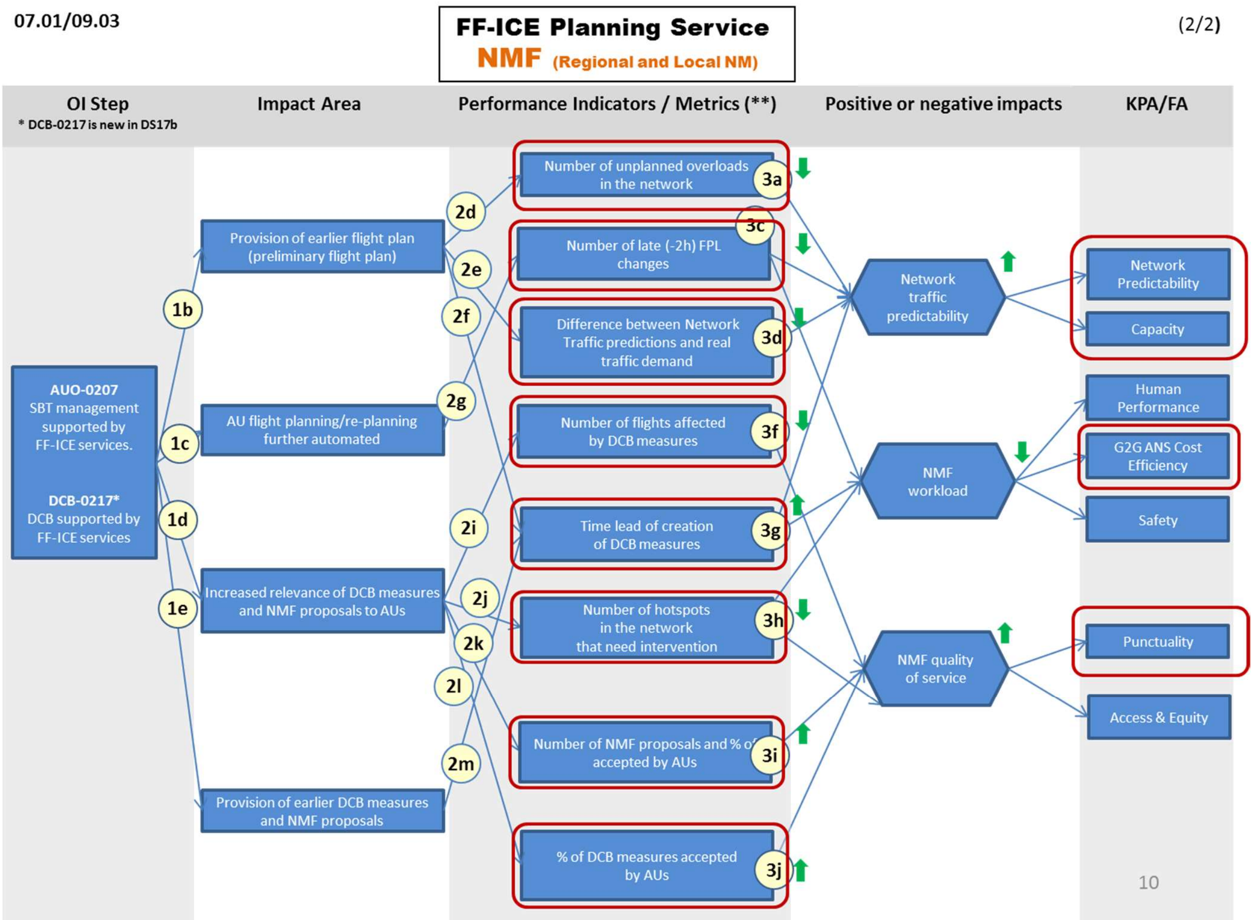



Figure 115 : DCB-0217 Benefit Impact Mechanism (NMF)

### *Features*

- AUO-0207 : SBT management supported by FF-ICE services
- DCB-0130-B-a : DCB supported by FF-ICE services

### *Impact Areas*

**(1b)** See AUs Stakeholder group

**(1c)** See AUs Stakeholder group

**(1d)** See AUs Stakeholder group

**(1e)** See AUs Stakeholder group

### *Indicators*

**(2d)** See AUs Stakeholder group

**(2e)** See AUs Stakeholder group

**(2f)** See AUs Stakeholder group

**(2g)** See AUs Stakeholder group

**(2i)** See AUs Stakeholder group

**(2j)** See AUs Stakeholder group

**(2k)** See AUs Stakeholder group

**(2l)** See AUs Stakeholder group

**(2m)** See AUs Stakeholder group

### *Positive or negative impacts*

**(3a)** A reduced number of unplanned overloads in the network will lead to an increased in Network traffic predictability which is linked to Network Predictability and indirectly to Capacity.

**(3c)** Fewer tactical FPL changes will increase Network traffic predictability which is linked to Network Predictability and indirectly to Capacity as higher predictability would eventually reduce capacity buffer. Fewer tactical FPL changes will also reduce NMF workload which is linked to Human Performance, G2G ANS Cost Efficiency and Safety.

**(3d)** Reducing the difference between Network traffic prediction and real traffic demand thanks to early provision of flight plan already taking into account the DCB situation will increase Network traffic predictability which is linked to Network Predictability and indirectly to Capacity.

**(3f)** AU will benefit a better quality of service from NMF as the number of flights affected by DCB measures will decrease and this is linked to Punctuality and Access & Equity.

**(3g)** Increasing time lead for DCB measure creation will improve the Network Traffic predictability which is linked to Predictability and will allow operators to react earlier which is less effort consuming and therefore linked to to Human Performance, G2G ANS Cost Efficiency and Safety.

**(3h)** AU will benefit a better quality of service from NMF as the number of Hotspots will decrease and this is linked to Punctuality and Access & Equity. Fewer number of Hotspots will reduce NMF workload which is linked to Human Performance, G2G ANS Cost Efficiency and Safety.

**(3i)** AU will benefit a better quality of service from NMF as the number of accurate NMF proposals will increase and this is linked to Punctuality and Access & Equity.

**(3j)** A good % of DCB measures accepted by AU is a good indication that DCB measures are feasible and convenient for AU. AU will benefit a better quality of service from NMF and this is linked to Punctuality and Access & Equity.

#### *Key Performance Areas*

**(4a)** Predictability: Predictability will be improved thanks to a reduced number of late trajectory changes and unplanned overloads. Consequently, any foreseeable reactionary delay could be better anticipated by the AU, and related impact will be reduced.

**(4b)** AU Cost Efficiency: AU Cost Efficiency will be improved thanks to optimised trajectories (with late changes, less flights impacted by DCB measures) and reduction of the AU operation center workload.

**(4c)** Fuel Efficiency: Thanks to more relevant measures and given the reduction of flights impacted by DCB measures, including delay reduced to minimum, the initial trajectory will be better achieved, and as such, a reduction in fuel burnt is expected.

**(4d) Punctuality**: Punctuality will be increased due to better use of capacity thanks to more adequate measure. At airport level, the punctuality is improved thanks to a reduction of the reactionary delays.

### A.2.9 Enriched DCB Information for AUs (AUs) - AUO-0219 / DCB-0214

#### *Description*

The BIM only focusses on Wave 1 of the traffic and demand forecast in 4D trajectory management context.

As the OI aims at improving the toolset for Network Impact Assessment by using What-If capability to support decision making processes in the context of UDPP, A-CDM and other APOC processes. The availability of query mechanisms and what-if functionalities provides all operational stakeholders with operational information to support their needs (e.g. SBT planning, DCB decision making and approval processes).

Note: The BIM detailed in Appendix B.1 have been developed for the joint 09-03 and 07-01 validation exercise. The red boxes in the diagrams highlight the BIM elements that are considered to specifically relate to the 09-03 aspects of the validation.

## AU Perspective

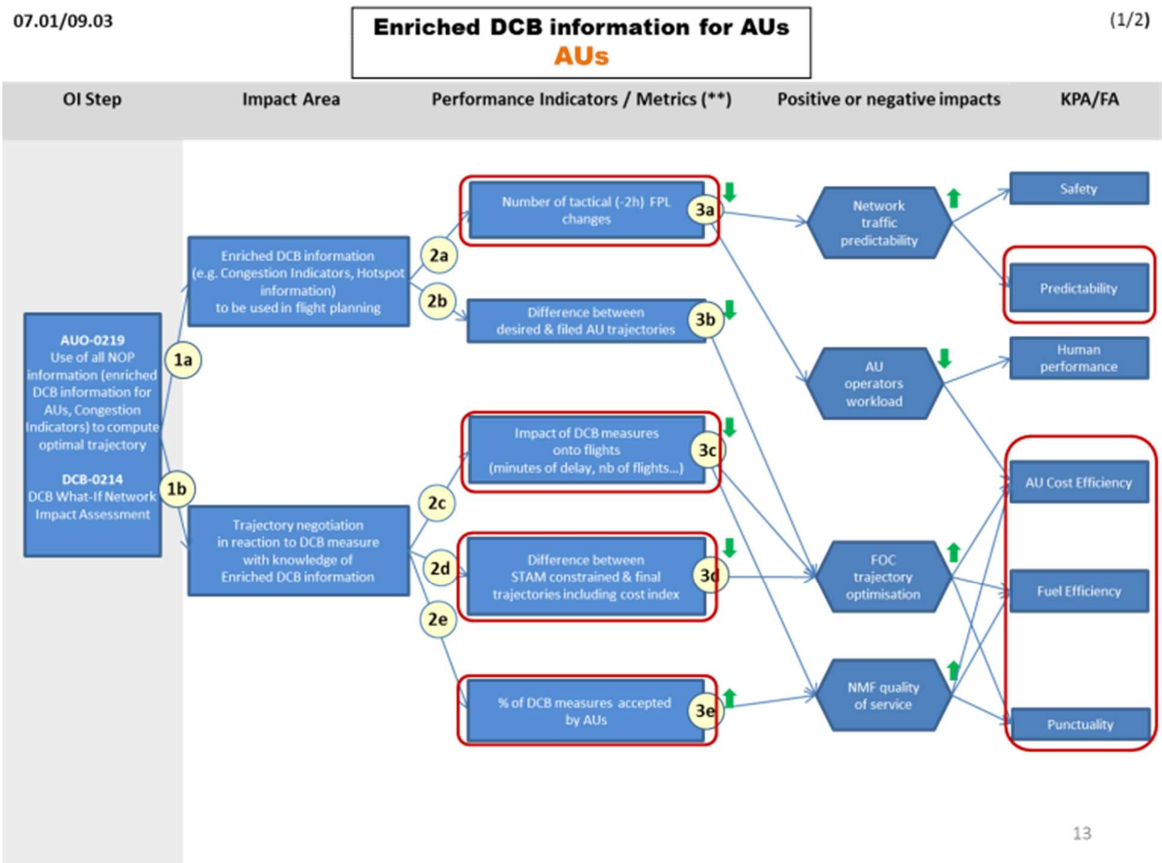



**Figure 116 : DCB-0214 Benefit Impact Mechanism (AU)**

### *Features*

- AUO-0219 : Use of all NOP information (enriched DCB information for AUs, Congestion Indicators) to compute optimal trajectory

### *Impact Areas*

**(1a)** Providing accurate and enriched DCB information (e.g. Congestion indicators, Hotspot Information) to AUs will allow them to better plan their Flights.

**(1b)** AUs will take into account enriched DCB information (e.g. Congestion indicators, Hotspot Information) during the trajectory negotiation process when they have to react to a STAM measure.

**(2a)** AU trajectory planning taking into account enriched DCB information (e.g. Congestion indicators, Hotspot Information) will produce planned trajectories closer to the actual execution ones, which will reduce the number of tactical FPL changes.

**(2b)** Taking into account enriched DCB information (e.g. Congestion indicators, Hotspot Information) for situation awareness and decision making will allow AU to better align the filed trajectory to their desired one.

**(2c)** The impact of DCB measures will be reduced as AUs will have the possibility to adapt their trajectories considering Hotspot Information. Therefore, the number of flights affected by DCB measures will decrease.

**(2d)** AU will be able to react to a constrained trajectory proposed by a STAM measure, by means of an AU counterproposal. The latter would provide an AU trajectory less penalizing considering the cost index of the possible alternatives.

**(2e)** The enriched DBC information will allow AU to better understand the reason of DCB measures and to apply the proposition.

***Positive or negative impacts***

**(3a)** Fewer late (-2H) FPL changes will increase Network traffic predictability which is liked to Predictability and Safety. It will also reduce AU operators workload since late FPL changes requires coordination with the flight crew. This is linked to AU Cost Efficiency and Human Performance.

**(3b)** Reducing the difference between their desired & filed trajectories will allow FOC to better optimise their trajectories which is linked to Punctuality, Fuel Efficiency and AU Cost Efficiency.

**(3c)** Reducing the impact number of DCB measures (in terms of minutes of delay, number of flights affected, …) will allow more flights to maintain their optimised trajectory, which is linked to Punctuality, Fuel Efficiency and AU Cost Efficiency. AU will benefit a better quality of service from NMF as the number of flights affected by DCB measures will decrease and this is linked to Punctuality, Fuel Efficiency and AU Cost Efficiency,

**(3d)** Reducing the impact of the STAM measure (reduce impact on cost index) will allow more flights to maintain their optimised trajectory, which is linked to Punctuality, Fuel Efficiency and AU Cost Efficiency. AU will benefit a better quality of service from NMF as the number of flights affected by DCB measures will decrease and this is linked to Punctuality, Fuel Efficiency and AU Cost Efficiency.

**(3e)** A good % of DCB measures accepted by AU is a good indication that DCB measures are feasible and convenient for AU. AU will benefit a better quality of service from NMF and this is linked to Punctuality, Fuel Efficiency and AU Cost Efficiency.

### *Key Performance Areas*

**(4a) Predictability**: Predictability will be improved thanks to a reduced number of tactical flight plan changes. As such, the traffic prediction will be known more in advance.

**(4b) AU Cost Efficiency**: AU Cost Efficiency will be improved thanks to optimised trajectories (with late changes, less flights impacted by DCB measures) and reduction of the AU operation center workload.

**(4c) Fuel Efficiency**: Thanks to more relevant measures and given the reduction of flights impacted by DCB measures, including delay reduced to minimum, the initial trajectory will be better achieved, and as such, a reduction in fuel burnt is expected.

**(4d) Punctuality**: Punctuality will be increased due to better use of capacity thanks to more adequate measure. At airport level, the punctuality is improved thanks to a reduction of the reactionary delays.

## NMF – Regional and Local Perspective

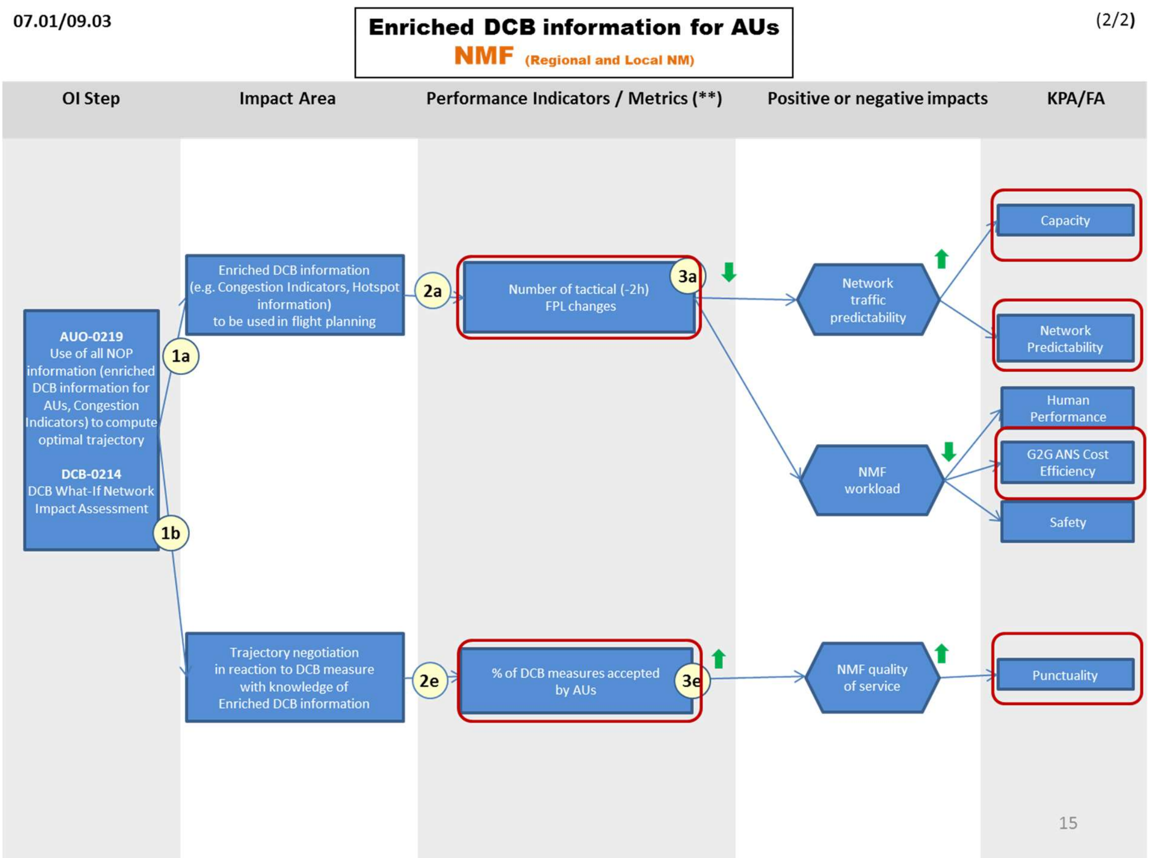



Figure 117 : DCB-0214 Benefit Impact Mechanism (NMF)

### *Features*

- AUO-0219 : Use of all NOP information (enriched DCB information for AUs, Congestion Indicators) to compute optimal trajectory
- DCB-0214 : DCB what-if Network Impact Assessment

### *Impact Areas*

**(1a)** See AUs Stakeholder group

**(1b)** See AUs Stakeholder group

### *Indicators*

**(2a)** See AUs Stakeholder group

**(2e)** See AUs Stakeholder group

### *Indicators*

**(3a)** Fewer tactical FPL changes will increase Network traffic predictability which is linked to Network Predictability and indirectly to Capacity. Fewer tactical FPL changes will also reduce NMF workload which is linked to Human Performance, G2G ANS Cost Efficiency and Safety.

**(3e)** A good % of DCB measures accepted by AU is a good indication that DCB measures are feasible and convenient for AU and that AU benefits of a better quality of service from NMF and this is linked to Punctuality, Fuel Efficiency and AU Cost Efficiency,

### *Key Performance Areas*

**(4a) Capacity**: A more reliable and accurate demand prediction can lead to a better planning and can have a positive impact on Capacity. However, the BIM only reflects the Demand forecast itself with no actions taken and no connection with the Performance Dashboard. Capacity is integrated in the BIM but the related benefits will be measured in Wave 2 when connecting Demand with Complexity and Performance.

**(4b) Network Predictability**: will be improved thanks to a reduced number of tactical flight plan changes. As such, the traffic prediction will be known more in advance.

**(4c) G2G ANS Cost Efficiency:** Cost is reduced thanks to less last minutes overloads perturbations/changes. It comes from a better Network traffic predictability (less tactical FPL changes, increased time lead for DCB measure creation) and fewer Hotspots.

**(4d) Punctuality**: Punctuality will be increased due to better use of capacity thanks to more adequate measure. At airport level, the punctuality is improved thanks to a reduction of the reactionary delays.

## A.2.10 AU Simple Preferences - AUO-0208 / DCB-0103-B /AO-0801-B

### *Description*

The BIM detailed in Appendix B.1 have been developed for the joint 09-03 and 07-01 validation exercise. The red boxes in the diagrams highlight the BIM elements that are considered to specifically relate to the 09-03 aspects of the validation.

### AU Perspective

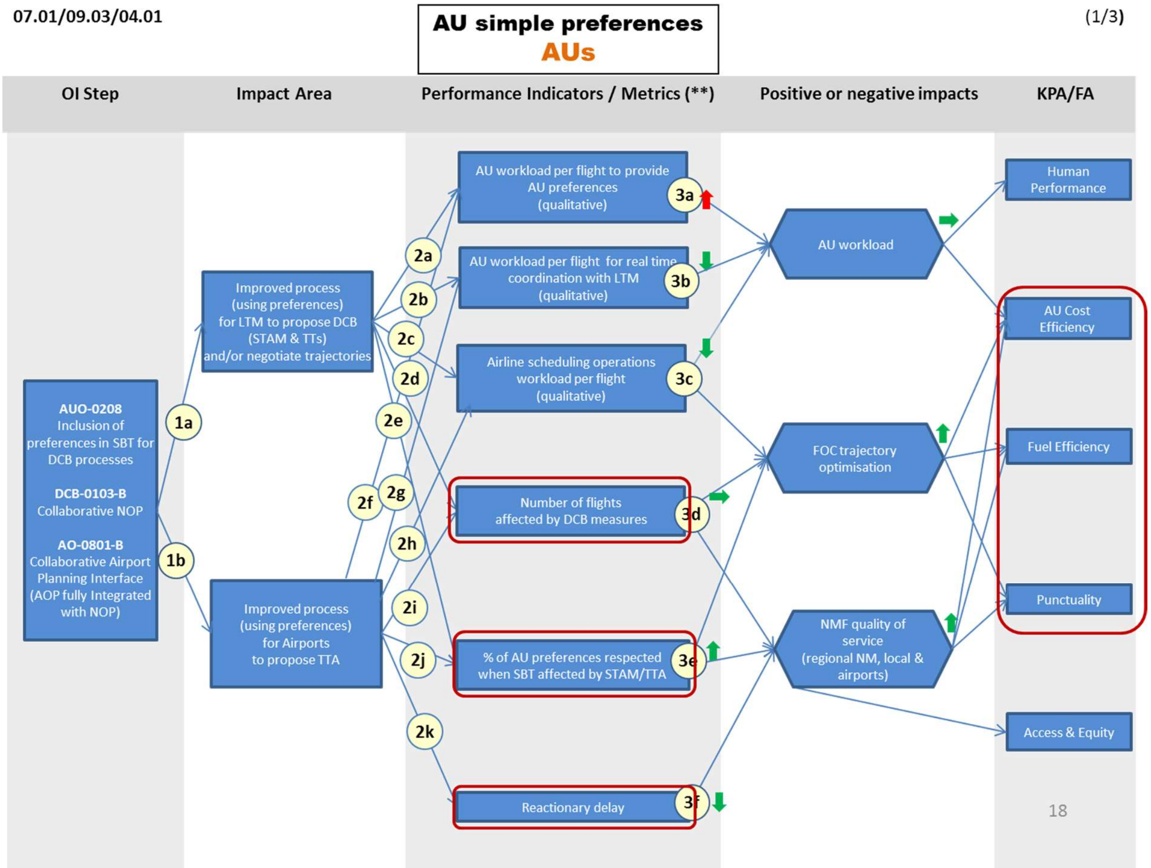



**Figure 118 : DCB-0213 Benefit Impact Mechanism (AU)**

### *Features*

- AUO-0208 : Inclusion of preferences in SBT for DCB processes
- DCB-0103-B-b ; Collaborative NOP
- AO-0801-B : Collaborative Airport Planning Interface (AOP fully integrated with NOP)

### *Impact Areas*

**(1a)** Including AU preferences in SBT will improve DCB processes allowing LTM to propose DCB measures (STAM & TTs) and/or negotiate trajectories.

**(1b)** Including AU preferences in SBT will improve DCB processes allowing Airports to propose TTAs with improved knowledge from AU indicator.

### *Indicators*

**(2a)** Allowing LTM to use AU preferences to propose DCB measures and/or negotiate trajectories will increase AU workload as he will have to provide preference information per flight.

**(2b)** Allowing LTM to use AU preferences to propose DCB measures and/or negotiate trajectories will decrease AU workload as some coordination (by phone today) will be avoided.

**(2c)** Time preferences (in particular) will allow LTM to take decisions that minimise the impact on airline scheduling.

**(2d)** The number of flights affected by DCB measures is expected to remain stable

**(2e)** In today operations, LTM takes decision on SBT changes without knowledge of AU preferences; it is expected that providing the LTM this information, the % of AU preferences respected when SBT affected by STAMs will increase.

**(2f)** Allowing Airports to use AU preferences to propose TTAs will increase AU workload as he will have to provide preference information per flight.

**(2g)** Allowing Airports to use AU preferences to propose TTAs will decrease AU workload as some coordination (by phone today) will be avoided

**(2h)** Time preferences (in particular) will allow Airports to take decisions that minimise the impact on airline scheduling.

**(2i)** The number of flights affected by DCB measures is expected to remain stable.

**(2j)** In today operations, Airports takes decision on SBT changes without knowledge of AU preferences; it is expected that the % of AU preferences respected when SBT affected by TTAs will increase.

**(2k)** Time preferences provided by AUs will in most of the case minimize reactionary delay.

***Positive or negative impacts***

**(3a)** AU workload will remain stable or will not increase significantly (remain acceptable) as the workload to provide AU preferences will be balanced by time saving in coordination. This is linked to Human Performance and AU Cost Efficiency.

**(3b)** In the future, the AU workload could reduce depending on the level of automation to generate preferences

**(3c)** FOC Trajectory includes the departure time; Minimising the impact on airline scheduling will allow to have departure times closer to the optimum and thus FOC trajectory could be considered as optimised. The flight is optimised in terms of time or 3D trajectory (gain on delay or gain on fuel). This is linked to Fuel Efficiency, AU Cost Efficiency and Punctuality. Minimising the impact on airline scheduling will also reduce AU Workload which is linked to Human Performance and AU Cost Efficiency.

**(3d)** As the number of flights affected by DCB measures should remain stable, quality of service from NMF will remain the same.

**(3e)** Increasing the percentage of AU preferences respected when SBT is affected by STAM/TTA will improve the FOC trajectory optimization which is linked to Punctuality, Fuel Efficiency and AU Cost Efficiency. AU will also benefit a better quality of service from NMF as the number of accurate NMF proposals will increase and this is linked to Punctuality, Fuel Efficiency, AU Cost Efficiency and Access & Equity.

**(3f)** Reducing the reactionary delay due to DCB measure will contribute to respect the Airline schedule. This will improve NMF quality of service and it is linked to Punctuality, Fuel Efficiency, AU Cost Efficiency and Access & Equity.

### *Key Performance Areas*

**(4a) AU Cost Efficiency**: AU Cost Efficiency will be improved thanks to optimised trajectories (with late changes, less flights impacted by DCB measures) and reduction of the AU operation centre workload.

**(4b) Fuel Efficiency**: Thanks to more relevant measures and given the reduction of flights impacted by DCB measures, including delay reduced to minimum, the initial trajectory will be better achieved, and as such, a reduction in fuel burnt is expected.

**(4c) Punctuality**: Punctuality will be increased due to a reduction of the reactionary delays.

## NMF / Regional / Local Perspective

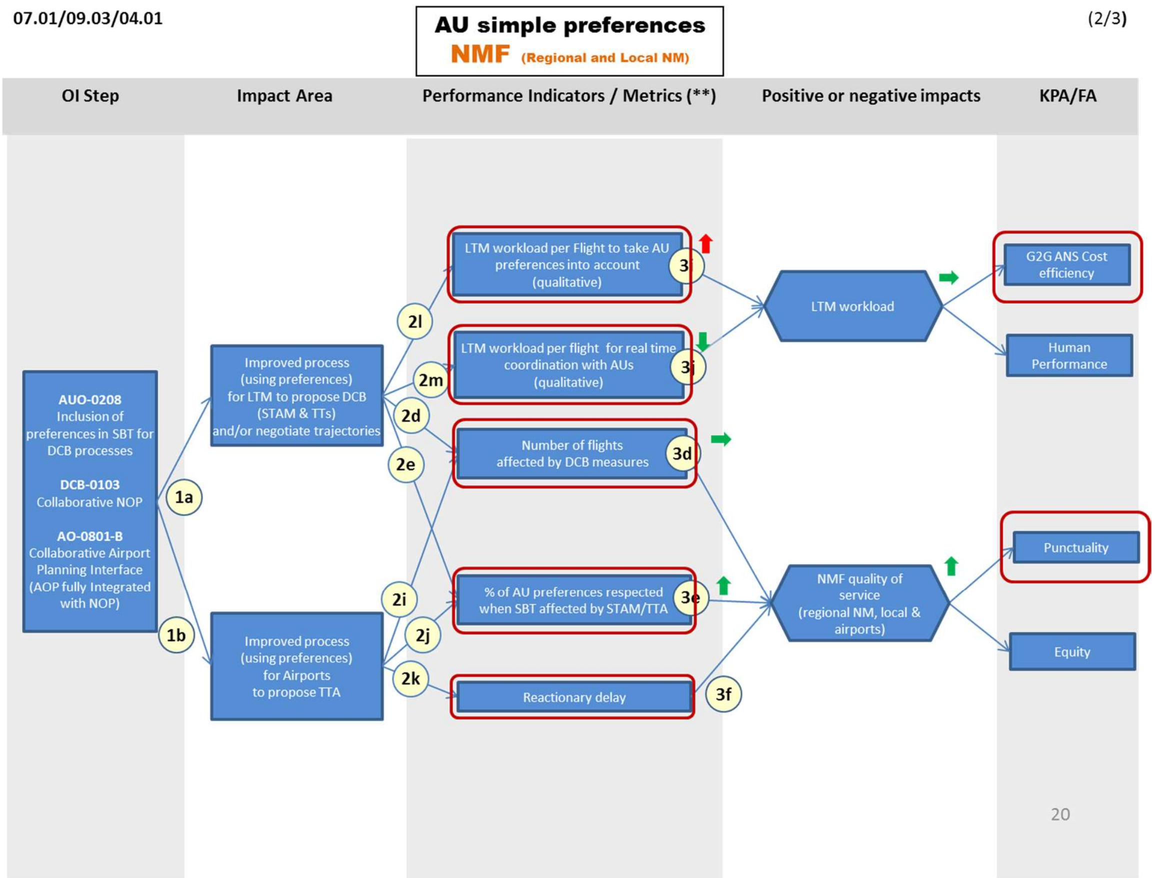



**Figure 119 : DCB-0214 Benefit Impact Mechanism (NMF)**

### *Features*

- AUO-0208 : Inclusion of preferences in SBT for DCB processes
- DCB-0103-B-b ; Collaborative NOP
- AO-0801-B : Collaborative Airport Planning Interface (AOP fully integrated with NOP)

### *Impact Areas*

**(1a)** See AUs Stakeholder group

**(1b)** See AUs Stakeholder group

### *Indicators*

**(2d)** See AUs Stakeholder group

**(2e)** See AUs Stakeholder group

**(2i)** See AUs Stakeholder group

**(2j)** See AUs Stakeholder group

**(2k)** See AUs Stakeholder group

**(2l)** Taking into account AU preferences when proposing DCB measures and/or negotiate trajectories will increase LTM workload as he will have manage new information.

**(2m)** Taking into account AU preferences when proposing DCB measures and/or negotiate trajectories will decrease LTM workload as some coordination (by phone today) will be avoided.

### *Positive or negative impacts*

**(3d)** See AUs Stakeholder group

**(3e)** AU preferences , especially time preferences, punctuality and to avoid knock-on effect, when respected will contribute to an overall network situation and overall better NMF quality of service for all stakeholders

**(3f)** AU preferences , especially time preferences, punctuality and to avoid knock-on effect, when respected will contribute to an overall network situation and overall better NMF quality of service for all stakeholders

**(3i)** LTM workload will remain stable or will not increase significantly (remain acceptable) as the workload to take into account AU preferences will be balanced by time saving in coordination. This is linked to Human Performance and G2G ANS Cost Efficiency.

**(3j)** In the future, the AU workload could reduce depending on the level of automation to generate preferences.

### *Key Performance Areas*

**(4a) G2G ANS Cost Efficiency:** Cost is reduced thanks to less last minutes overloads perturbations/changes. It comes from a better Network traffic predictability (less tactical FPL changes, increased time lead for DCB measure creation) and fewer Hotspots.

**(4b) Punctuality**: Punctuality will be increased due to a reduction of the reactionary delays.

## Airports Perspective

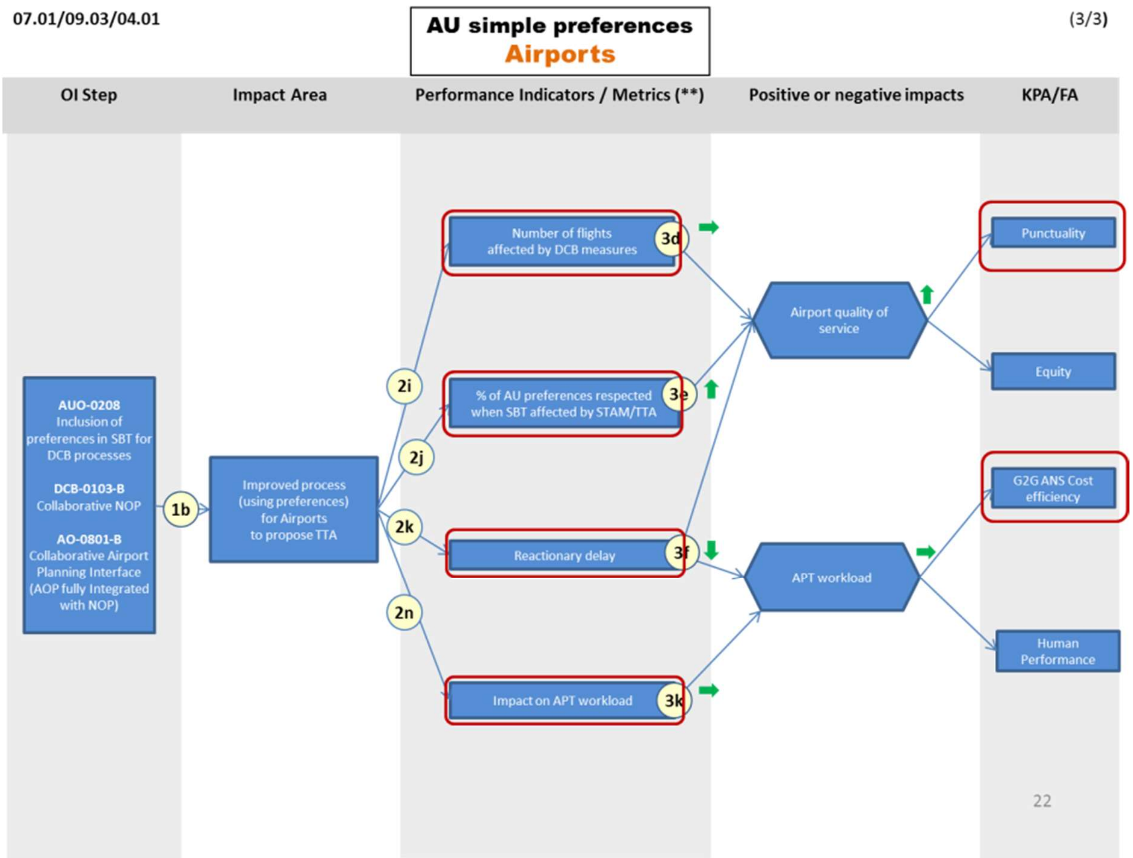



**Figure 120 : DCB-0214 Benefit Impact Mechanism (APT)**

### *Features*

- AUO-0208 : Inclusion of preferences in SBT for DCB processes
- DCB-0103-B-b ; Collaborative NOP
- AO-0801-B : Collaborative Airport Planning Interface (AOP fully integrated with NOP)

### *Impact Areas*

**(1b)** See AUs Stakeholder group

*Indicators*

**(2i)** See AUs Stakeholder group

**(2j)** See AUs Stakeholder group

**(2k)** See AUs Stakeholder group

**(2n)** New processes to include preferences into TTA proposals will not significantly increase APT workload, most of the process will be automated. Furthermore an slight increase workload should compensate the effort diminution due to a better planning.

*Positive or negative impacts*

**(3d)** The number of flights affected by DCB measures (in this case TTAs) will normally decrease or at worse it will be as today with classical measures and not AU preferences. Furthermore the TTAs allocated taking into account the AU preferences and the impact at airport level will produce a better arrival sequence helping to mitigate the delay impact both on AU business and airport operations. This is linked to Punctuality and Equity.

**(3e)** Increase on % of AU preferences respected will better satisfy the AU needs and also will improve the AU perception on the NM quality of service. This is linked to Punctuality and Equity.

**(3f)** Reduction on reactionary delay will provide more flights matching the schedule which reduces the APT workload managing deviations from planning. This is linked to G2G ANS Cost efficiency and Human Performance.

**(3k)** As most of the process will be automated, the increase in workload should compensate the effort diminution due to a better planning and the diminution of reactionary delays. This is linked to G2G ANS Cost efficiency and Human Performance.

*Key Performance Areas*

**(4a) Punctuality**: Punctuality will be increased due to a reduction of the reactionary delays.

**(4b) G2G ANS Cost Efficiency:** Cost is reduced thanks to less last minutes overloads perturbations/changes. It comes from a better Network traffic predictability (less tactical FPL changes, increased time lead for DCB measure creation) and fewer Hotspots.

### A.2.11 DCB Collaborative Framework - DCB-0215

### *Description*

The BIM only focusses on Wave 1 of theDCB Collaborative Framework context. The OI aims at the consolidation of imbalances and arbitration of trajectory management solutions. It will support the necessary collaborative exchange, coordination and negotiation between NM, local DCB, Airport and AUs. It will ensures that all actors' constraints, priorities and preferences are taken into account when agreeing on shared business trajectories

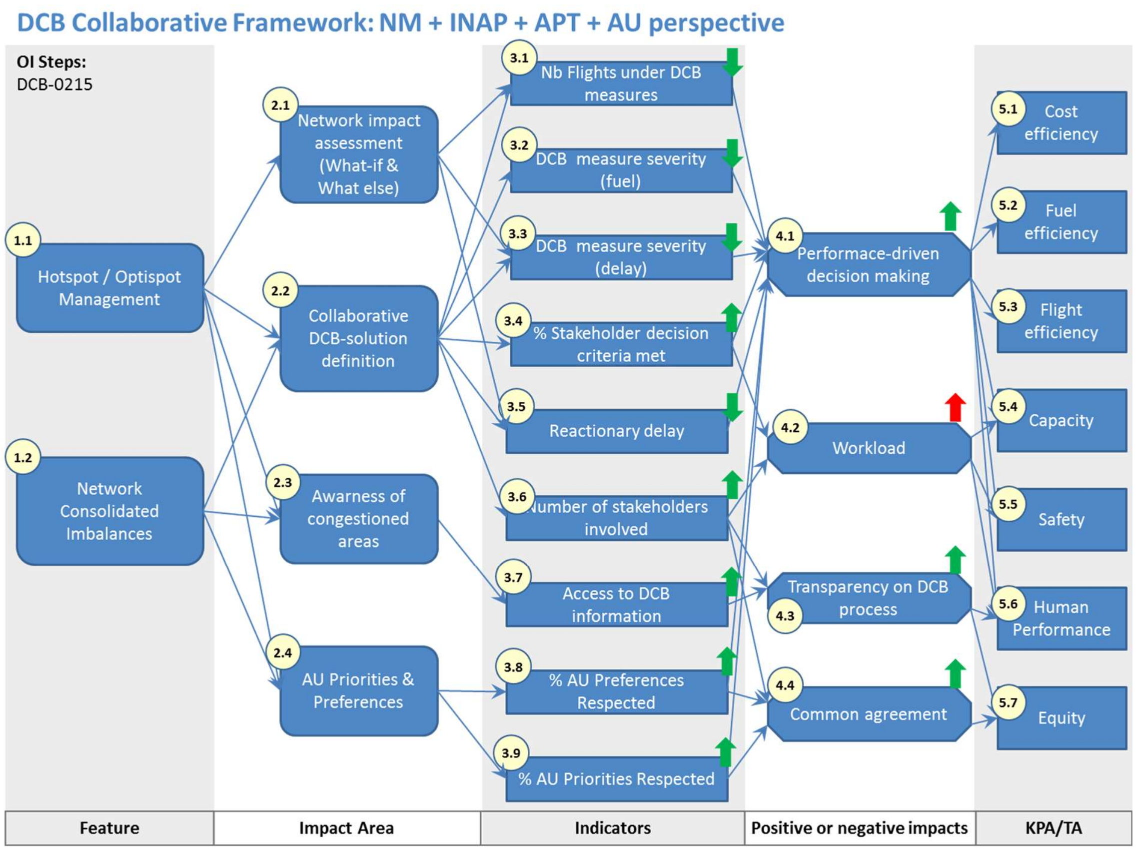



**Figure 121 : DCB-0215 Benefit Impact Mechanism**

### *Features*

**(1.1)** Hotspot/Optispot Management: allow NM and INAP actors to create, modify, cancel and delegate a(n) Hotspot/Optispot. As soon as a(n) Hotspot/Optispot is notified, the information is available to all actor, allowing them to anticipate potential SBT/RBT penalties and minimise the SBT/RBT impact

**(1.2)** Network Consolidated Imbalances: Allow local-DCB actors to evaluate the Network situation for flight(s) eligible for DCB measures. This information is provided by Network services in the form of consolidated target times in reply to local DCB actors' proposal request.

### *Impact Areas*

**(2.1)** At any time what-if capabilities allow to all actors to simulate the alternate SBT/RBT providing performance values concerning the selected/targeted Performance Indicators (imbalances figures, reactionary delay …).

**(2.2)** Improvements in transparency and Network situation awareness will enable a DCB Solution plan that reflects a common agreement amongst stakeholders. Decision-making and actions planning will be based on business needs, such as: which criteria to consider for solving a situation and what the thresholds and trade-offs are when coordinating with the other actors

**(2.3)** Imbalances and Hotspot/Optispot information is available to all actors allowing them to anticipate potential SBT/RBT penalties and minimise the SBT/RBT impacts.

**(2.4)** AU can continuously express and refine their priorities and preference on a flight by flight basis. This information will be used by NMF actors during the DCB solution definition.

### *Indicators*

**(3.1)** Coordinated DCB solution resulting from the usage of the network impact assessment services will result in a reduced number of flights under DCB measures.

**(3.2)** Coordinated DCB solution implementations will resolve imbalance and avoid unplanned tactical resolution by controller and/or holding and lead to optimised flown flight profile thus reducing aircraft fuel consumption and CO2 emissions.

**(3.3)** Coordinated DCB solution implementations will be agreed in SBT/RBT and lead to avoid classical slot mechanism and therefore reduce delay.

**(3.4)** The introduction of stakeholders criteria during the DCB solution definition will improve significantly the collaborative and performance driven decision making to reach a common agreement.

**(3.5)** Coordinated DCB solution implementations will seek to reduce reactionary improving by thus network operations.

**(3.6)** A high level of stakeholders involved reflects a good level of collaboration/cooperation for the whole DCB collaborative process.

**(3.7)** An increase number of DCB information shared to stakeholders will improve the perception and transparency of the DCB process, benefiting to reach a common agreement.

**(3.8)** AU will provide their preferences when having the choice between several local DCB solutions, that lead to more AU's preferences taken into account and will result in more flight flying a less penalising trajectory and allowing a common agreement.

**(3.9)** AU will provide their priority when having the choice between several flight being affected by a local DCB solutions and lead to more AU's priority taken into account and will result in more flight flying their preferred trajectory and allowing a common agreement.

### *Positive or negative impacts*

**(4.1)** By expressing the business needs, the performance-driven decision making process should be improved

**(4.2)** It is anticipated from Local DCB actors to have new roles as to manage (i.e. to resolve or to delegate hotspot) and coordinate local DCB solutions with Airports and AUs, that will lead to an increase for their workload. Nonetheless the DCB collaborative framework process and toolbox will ease the DCB solution definition and coordination tasks minimizing the impacts on the workload at an acceptable level.

**(4.3)** By fully sharing DCB information and promoting collaboration and cooperation, transparency on the DCB process will be improved.

**(4.4)** Information sharing, use of business criteria to define DCB solution will lead to improved common agreement.

### *Key Performance Areas*

**(5.1) (5.2)** Cost, Fuel efficiency will be improved thanks to optimized 4D profile flown by airspace users with limited tactical interventions.

**(5.3)** Thanks to better defined DCB solution, the number of flights under DCB measures will be reduced associated to collaborative decision and stakeholder's business criteria taken into account, Flight efficiency will be improved.

**(5.4)** Better defined DCB solution will result in a better usage of capacity allowing a reduction in declared capacity safety buffer and higher throughput.

**(5.5)** Level of safety will be maintained as today

**(5.6)** It is anticipated from Local DCB actors to have new roles as to manage (i.e. to resolve or to delegate hotspot) and coordinate local DCB solutions with Airports and AUs, that will lead to an increase for their workload. Nonetheless the DCB collaborative framework process and toolbox will ease the DCB solution definition and coordination tasks minimizing the impacts on Human Performance at an acceptable level.

**(5.7)** Equity will be improved thanks to Collaborative decision making and DCB solutions that reflect common agreement.

## A.2.12 Constraint Reconciliation - AUO-0108

### *Description*

The BIM only focusses on Wave 1 of Constraint Reconciliation context. To ensure network operation stability in case of multiple conflicting constraints, the OI will provide the adequate set of tools and procedures to allow the foreseen DCB solutions to be implemented in order to meet either local and/or regional performance targets.

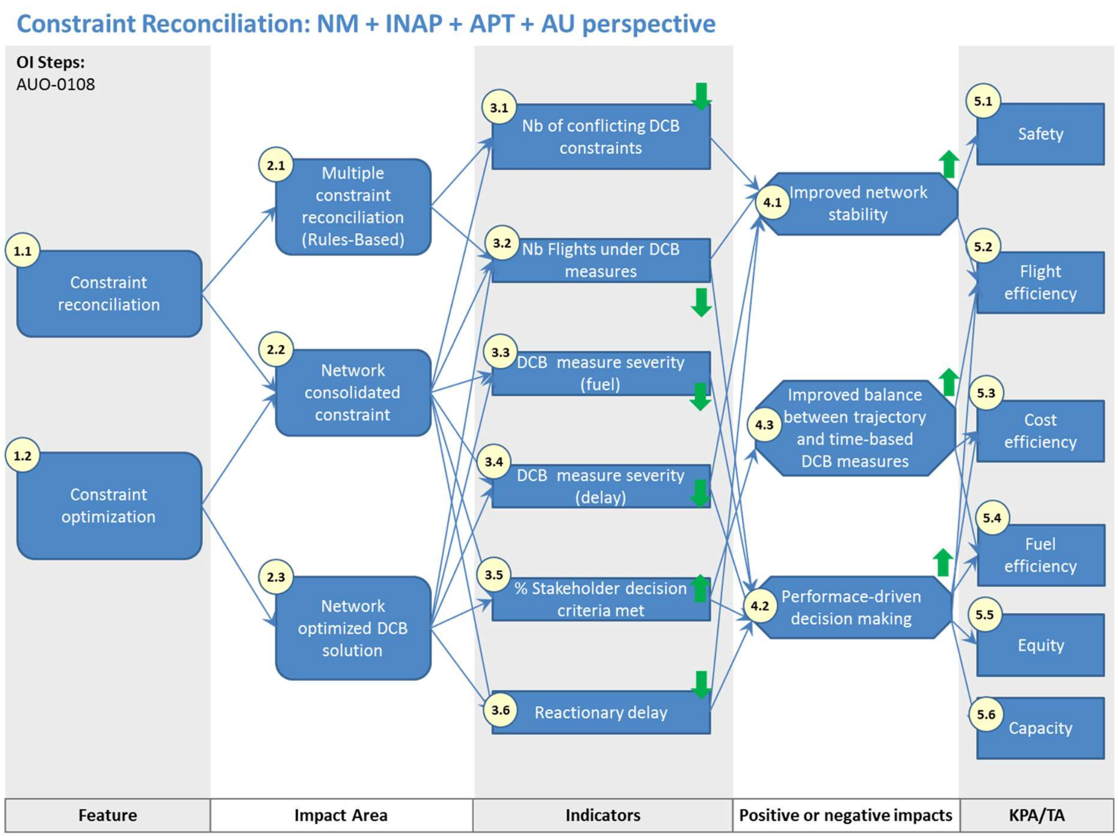



**Figure 122 : AUO-0108 Benefit Impact Mechanism**

### *Features*

**(1.1)** Constraint Reconciliation : At network level, this mechanism shall ensure the management of interfering constraints. By collecting the locally planned DCB Target and providing Network Consolidated Constraint (NCC) to the local-DCB actors which allow them to be informed about the Network situation

**(1.2)** Constraint Optimization : At network level will determine the best optimum DCB solution taking into account all stakeholders business criteria thanks to the Collaborative DCB Framework

***Impact Areas***

**(2.1)** The categorization of DCB spots is a rule based mechanism that enables to adapt correctly the DCB solution to use according to the DCB spots level of criticality (i.e. CrisisSpot, CriticalSpot, HotSpot, OptiSpot).

**(2.2)** The Network Consolidated Constraint (NCC) determines the eligible constraint based on the categorization of identified DCB "Spot" and the priority rules to manage conflicting DCB measures (that depends on the nature of the related DCB "Spot")

**(2.3)** At network level will determine the best optimum DCB solution taking into account all stakeholders business criteria thanks to the Collaborative DCB Framework.

***Indicators***

**(3.1) (3.2)** By correctly fitting the DCB solution to be applied and the DCB spot level of criticality, the number of flights under DCB measures and the conflicting measures will be reduced.

**(3.3)** Coordinated DCB solution implementations will resolve imbalance and avoid unplanned tactical resolution by controller and/or holding and lead to optimised flown flight profile thus reducing aircraft fuel consumption and $CO_2$ emissions.

**(3.4)** Coordinated DCB solution implementations will be agreed in SBT/RBT and lead to avoid classical slot mechanism and therefore reduce delay.

**(3.5)** The introduction of stakeholders criteria during the DCB solution definition (i.e. optimized solution, NCC) will improve significantly the collaborative and performance driven decision making to reach a common agreement.

**(3.**6) Coordinated DCB solution implementations will seek to reduce reactionary improving by thus network operations.

***Positive or negative impacts***

**(4.1)** By avoiding multiple and conflicting constraints to be applied on a same trajectory, the constraint reconciliation/optimization mechanism will ensure network operations stability and will preserve operations safety.

**(4.2)** Optimized DCB solution definition using stakeholder decision criteria such as AU preferences & priorities will improve the balance between trajectory and time-based DCB measures.

**(4.3)** By expressing the business needs, the performance-driven decision making process should be improved

### *Key Performance Areas*

**(5.1)** Thanks to improved network stability, the level of safety will be maintained.

**(5.2)** Thanks to better defined DCB solution, the number of flights under DCB measures will be reduced associated to collaborative decision and stakeholder's business criteria taken into account, Flight efficiency will be improved.

**(5.3) (5.4)** Cost, Fuel efficiency will be improved thanks to optimized 4D profile flown by airspace users with limited tactical interventions.

**(5.5)** Equity will be improved thanks to optimized DCB solutions that reflect common agreement.

**(5.6)** Better defined DCB solution will result in a better usage of capacity allowing a reduction in declared capacity safety buffer and higher throughput.

## A.3 Costs mechanisms

The cost mechanisms is developed in the PJ09 CBA document.