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SESAR Solution 38 SPR-INTEROP/OSED for V3 - Part I

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PJ07-W2 OAUO

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Abstract

The purpose of this document is to describe how Airspace Users can interact better with the Network Management Function for defining the trajectory of a flight in the planning phase by enhancing the integration of AU trajectory definition and network management processes.

This final OSED addresses the following operational improvements (OIs):

- AUO-0219: Use of Enriched DCB Information and Enhanced What-Ifs to Improve AU Flight Planning;
- AUO-0208: Use of Simple AU Preferences in DCB Processes.

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1 Executive Summary

The main objective of Solution 38 is to develop requirements and validate procedures and workflows for Flight Operations Centres, enabling them to interact better with other ATM stakeholders and especially with the Network Manager. This with regard to trajectory definition in the planning phase and the amendment of it in execution, by enhancing the integration of AU trajectory definition and network management processes.

This final OSED addresses the following operational improvements (OIs):

- AUO-0219: Use of Enriched DCB Information and Enhanced What-Ifs to Improve AU Flight Planning;
- AUO-0208: Use of Simple AU Preferences in DCB Processes.

The first OI can be considered as complementary as far as DCB information to Airspace Users is concerned.

The second OI consists of the provision of new information (Proactive FDCI) provided by the Airspace User to NMF to indicate the importance of some critical flights to progress on time, or another preference as for instance flight level preference. Hence, flow management should preferably assign - when possible - no delay or limited ATFCM delay to those flights and adapt the measure to AU preference.

In terms of maturity assessment, the following table provides a summary of W2 results (when applicable):

Operational Improvement/OI	Maturity level at the end of W2	Comments
AUO-0219 Use of Enriched DCB Information and Enhanced What-Ifs to Improve AU Flight Planning	V3 completed.	Main concept – protection hotspots – agreed by all stakeholders. One feature, the notion of unplanned flight, not mature enough and has been removed from the scope of the solution.
AUO-0208 Use of Simple AU Preferences in DCB Processes	V3 completed.	Pro-active FDCI concept agreed by all stakeholders. Rules/procedures for initial implementation agreed.

Table 1: Summary of W2 results

Four validation exercises have been performed: EXE-PJ07W238-01 and EXE-PJ07W238-02 with focus on Enriched DCB.
EXE-PJ07W238-03 with focus on P-FDCI. EXE-PJ07W238-04 integrated both conceptual subjects.
Those exercises have allowed to reach the V3 maturity status for both subjects.
Detailed information on the validation results and especially their final conclusions and recommendations, is available in the relevant section of the VALR.

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For both subjects, the OSED distinguishes between core requirements and non-mandatory requirements. Those requirements which might need some further minor conceptual refinements, could be deployed in a second step based on the gaining experience in operations.

The OSED also includes a clarification at conceptual level on the articulation between FDCI and UDPP, two means for AUs to express their business priorities.

Note: The scope of the initial OSED covered additional OIs AUO-0207 (Preliminary Flight Plan) and OI AUO-0206 (FOC management of the RBT). OI AUO-0207 will be developed in SESAR 3. OI AUO-0206 was not considered mature enough to be part of this OSED and a separate OSED will be developed in SESAR 2020 W2. Further development is also planned in SESAR 3.

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2 Introduction

2.1 Purpose of the document

The purpose of this document is to describe the operational concept and to provide requirements related to SESAR PJ07-W2 OAUO Solution 38.

2.2 Scope

This is the V3 OSED/SPR-INTEROP for PJ07-W2 Solution 38. The scope includes requirements for an extended Planning Service based on collaborative flight planning process and AU criticality indicators within the context of the European regional implementation and provides input use cases for the definition of the validation exercises

2.3 Intended readership

The intended audience is:

- PJ07 - Collaborative Arrival Management (Sol 39)
- PJ09 - INAP & DAC (Sol 44)
- PJ09 - Enhanced Network Traffic Prediction and shared complexity representation (Sol 45)
- PJ18-2a – Trajectory Based Operations (TBO)
- NM implementation projects (CTM & FDPFDE)

2.4 Background

Many programs, projects and initiatives have contributed to the domain of business trajectory management.

Previous work on FF-ICE Planning Service has mainly been performed by ICAO and related R&D within the framework of SESAR 1, as described below.

4D Trajectory information exchange concepts have been developed by the ICAO Air Traffic Management Requirements and Performance Panel (ATMRPP), and are included in the *Manual on Flight and Flow Information for a Collaborative Environment (FF-ICE)*, which was released in 2012 as ICAO Doc 9965 [11].

Hence in preparation for FF-ICE/1 (FF-ICE Planning) implementation, the ATMRPP Panel developed ICAO flight planning provisions referred as FF-ICE provisions. These provisions include the definition of the FF-ICE Planning Service, eFPLs and eFPL updates, and trial requests to evaluate a possible alternative or change to preliminary flight plans or to eFPLs.

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To support these provisions, R&D work related to the FF-ICE Planning Service was done in SESAR 1 project 07.06.02 Step 2, with the main concept developed being the process of submission of the Airspace User's 4D business trajectory to the Network Management Function (NMF) for accommodation in the ATM network during the Business Trajectory Short Term Planning Phase.

SESAR 1 project 07.06.02 Step 1 has also analysed the FF-ICE Planning, and in particular as an evolution of the Extended Flight Plan processes to align with the FF-ICE Provisions.

To give proper continuity, also during SESAR 1 (WP11.1, EXE 713) the EFPL concept was developed and validated reaching a V3 maturity level. This development constitutes the supporting element for the eFPL concept mentioned previously.

More recently, other initiatives were also developed in SESAR 2020 W1 (Sol 07.01). This is the case, for example, of AOWIR development; this development is strongly related to the trial request mentioned above.

The validation activities about AOWIR permitted,

1) concerning the concept clarification, to confirm that this improvement supported efficiently both AU-driven and FMP-driven decision processes as mentioned below:

   - AUs monitoring their fleet and re-optimising their flight trajectories taking into account DCB constraints and information.
   - Improved CDM process in the context of DCB cherry-picking measures. AUs use enriched DCB information and what-if functions to decide to either accept FMP/NM proposals or propose effective counter proposals.

2) regarding the performance assessment, to demonstrate that the use of enhanced what-if (together with enriched DCB) in the context of the flight planning:
   - should improve departure punctuality (only applicable winter period), and
   - has not a negative impact on Equity.

Also, according to the FF-ICE Provisions, "A Preliminary Flight Plan communicates the operator's best estimate of their current intended route/trajectory and serves as the basis for ATFM Planning before a Filed Flight Plan is submitted; this R&D work about PFP concept was foreseen to be validated during this W2, but the subject will not be addressed due to the effort reduction resulting from CORONA crisis. However, some references to PFP were kept for a better processes comprehension (e.g. Flight Planning Milestones)

R&D work related to the criticality of some flights given by the AU has been developed in SESAR 1 W1 under the FDCI concept. This FDCI information was identified by the AU as an efficient mechanism to notify critical flights to NM/FMP; by sharing this information via the NOP increased significantly the situational awareness for all stakeholders.

The *Manual on Flight and Flow Information for a Collaborative Environment* (FF-ICE) also refers to the possibility given to the AU to provide an indication of the relative priority of a flight within an operator's set of flights (i.e. Operator flight priority).

To conclude, even though the purpose of the FF-ICE Planning Service was to "facilitate ATM and operator planning for flights in airspaces where significant constraints exist, and/or where air traffic demand at times exceeds, or is expected to exceed, the declared capacity of the air traffic control services concerned", other research activities will also provide the appropriate services that will

complement such FF-ICE Planning Service; these complementary services being not part of the FF-ICE Planning Service are aligned with the ICAO environment and in some cases provide additional research improvements.

~~Note: This OSED is focused on Enriched DCB and Protection Hotspot developments to support the first validation exercises planned during 2021; the relevant material to support later exercises, should be considered draft and will be consolidated and finalised during 2021.~~

2.5 Structure of the document

The structure of the document is as follows:

- Chapter 1 provides the executive summary
- Chapter 2 provides a general introduction to the solution, including purpose, scope, the intended audience and the background
- Chapter 3 provides a description of the solution, the detailed operational environment and the detailed operating method
- Chapter 4 provides a description of the Safety, Performance and Interoperability requirements
- Chapter 5 indicates references and other applicable documents
- Appendix A:
  - A1 Stakeholders identification and Expectations
  - Benefits mechanism

2.6 Glossary of terms

Term	Definition	Source of the definition
ASP	A unit involved in performing air traffic management responsibilities introduced in the PANS-ATM (Doc 4444).	ATMOPSP/5-WP/28
Airspace Constraints	ATM Constraints resulting from Strategic ATFCM Activities, that organize the traffic into traffic flows to make the best use of available capacity; the routeing organization is defined by a list of restrictions on specific points, ATS route segments, DCT segments or sectors in both the upper and lower airspace. They can be static or dynamic. Static are constraints that NMF can no longer resolve within the framework of the extended FF-ICE Planning Service process; while dynamic are constraints that NMF can resolve within the framework of the extended Planning Service process.	This OSED
ATC Unit	An ATC Unit is a unit responsible for providing ATC (Air Traffic Control) services (Aerodrome Tower, Approach, Area Control Centre)	

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ATM Constraint	ATM Constraint is a condition that restricts the use of the airspace and limits the individual AU, Airport and ANSP in its most optimal operation with the purpose to optimize the operations on a network level (regional, sub-regional and local level)	SESAR 2020 Concept of Operations[12]
DCB Constraints	ATM Constraints originating from Demand Capacity Balancing (DCB) that impact a trajectory. Example of DCB Constraints: ATFM regulations, Scenarios and STAM applied to a flight	This OSED
DCB Trajectory Measure	A trajectory change notified to an AU for a flight due to DCB Constraints. Example: CTOT or Target Time (TT), re-routing or level capping imposed in the context of Scenarios or STAMs	This OSED
Enriched DCB information	In addition to DCB Constraints and DCB Trajectory Measures, information provided to the AU to give awareness of DCB information along the trajectory. This includes hotspot information (resolution and protection) and traffic volume load.	This OSED
eASP	The symbol used to designate an ASP that is capable of receiving and responding to FF-ICE Messages, as required.	ICAO 4444 PANS proposed amendment from ATMRPP[15]
FDCI	FDCI is a parameter provided by the Airspace User to indicate the importance for the flight to progress on time.	This OSED
Filed Flight Plan (FPL or eFPL)	The flight plan including any associated updates as filed by the pilot, an operator or a designated representative for use by air traffic services units. It is often referred to as an ATS flight plan.	ATMOPSP/5-WP/28
Filing Status	The expected operational acceptability for a submitted Filed Flight Plan.	ICAO 4444 PANS[9]
HotSpot	A local demand/capacity imbalance on the day of operations, which may result from a complex traffic situation or a short period of high demand. A hotspot is created to raise awareness of the situation and may act as a precursor to solving the imbalance (STAM or ATFM regulation).	STAM CONOPS[17]
Infringer flights (Protection Hotspot)	If a re-filing flight on loads a protection hotspot, the flight will be considered as a protection hotspot infringer. Note: The term infringer was questioned by the operational expert in the context of Sol38 during the final conclusions meeting. It was suggested to replace it by a better fitting term, without providing such. The term infringer shall be replaced in following documents and activities; i.e. deployment, but in absence of a better one, it is kept in this OSED.	This OSED
Network Management Function (NMF) / Network Operations (NO) (Regional or Local)	This document contains both acronyms, NMF and NO. According to the EATMA information, the difference between both lies in the answer to the following questions. • Who is doing what: Network Operations (Regional or Local) • What is being dome: Network Management Function	
Planning Status	The expected operational acceptability and applicable constraints for a submitted Preliminary Flight Plan	ICAO 4444 PANS [9]
Preliminary Flight Plan	The flight plan submitted by an operator or a designated representative to conduct collaborative planning of a flight, prior to filing a flight plan for use by ATS units.	ATMOPSP/5-WP/28
Pro-active FDCI	Pro-active FDCI: issued for really critical flights, with no reported delay yet and before any DCB measure is allocated to the flight. The	This OSED

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	intention is that NMF consider this information before implementing any measure.	
Protection Hotspot	Hotspot associated to a traffic volume usually close to saturation to protect an airspace from undesired rerouted flights and prevents the application of DCB measures (e.g. ATFCM regulation, cherry picking measures). This is a new kind of hotspot. In the rest of this document, the term "protection hotspot" is used when referring to this specific type of hotspot	This OSED
Provisional Delay	The indicative and non-final ATFCM delay incurred by a flight subject to a CASA regulation before the time at which the slot is issued 2 hours before EOBT. This delay may vary as a result of, for instance, slot revision which re-assigns the slots dynamically in function of the changing traffic demand	NM
Short Term ATFCM Measures (STAM)	Specific and dedicated measures for demand capacity balancing (DCB) applied to a limited number of targeted airborne and/or pre-departure flights or flows reducing the complexity and/or demand of anticipated/ identified local traffic peaks on the day of operations	STAM CONOPS[17]
Simple Preferences	Simple preferences is information provided by the Airspace User to NMF to indicate the importance for the flight to progress on time (FDCI) or other indication as for instance flight level preferences.	This OSED
Slot Issue Time (SIT1)	The time at which the NM issues the SAM to the AO and ATC at the aerodrome of departure.	ATFCM USERS MANUAL
Scenarios	Scenarios are an ATFCM solution to Network capacity bottlenecks or specific operational needs of an ANSP.	ATFCM Operations Manual [9]
Unplanned flights	It is a flight that after submitting the eFPL or change the eFPL increases or decreases the traffic load of the TV (less than 2 hours before EOBT of the eFPL, for which the change is occurred due to FPL, CHG or refile).	This OSED
What-if	When the DCB measures affect the AU operations, the AU looks at alternative trajectories based on their operational route library, selects one or several options to avoid the DCB measures and ask to analyse the DCB impact on the alternative trajectories. The alternative trajectory might avoid crossing hotspots that could result in double penalization such as re-routing and the increased severity of the hotspot due to new traffic load. By using a tool such as the What-if reroute (AOWIR) permits the operator to find alternative routes. The tool enables the operator to identify if there is a regulation impacting the alternative route and provides associated delay in that case but does not give the existence and severity of other hotspots along the alternative route that could potentially impact the operators and generate more instability in the Network if operators are not aware about congestion information.	
What-else	When the DCB measures affect the AU operations, the AU asks for alternative trajectory options to NMF in order to avoid the DCB measures, and analyses the DCB impact of the alternative trajectories provided by NMF. The alternative trajectory will avoid crossing hotspots that could result in double penalization (the rerouting and the increased severity of the hotspot due to new unexpected traffic load).	

Table 2: Glossary of terms

2.7 List of Acronyms

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Acronym	Definition
4DT	Four Dimensional Trajectory
ACARS	Aircraft Communication Addressing and Reporting System
AFTN	Aeronautical Fixed Telecommunication Network
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information Regulation And Control
AIS	Aeronautical Information Services
ANSP	Air Navigation Service Provider
AOWIR	Aircraft Operator What-If-Reroute
ASM	Airspace Management
ASP	Air Service Provider
ATFCM	Air Traffic Flow and Capacity Management
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATMRPP	Air Traffic Management Requirements and Performance Panel
ATS	Air Traffic Service
AU	Airspace User
AUP	Airspace Use Plan
AWACS	Airborne Warning and Control System
BA	Business Aviation
CACD	Central Airspace and Capacity Database
CDL	Configuration Deviation List
CDM	Collaborative Decision Making
CDR	Conditional Route
CFSP	Computerised flight plan service provider
CLI	Congestion Level Indicator
CNS	Communication Navigation and Surveillance
CONOPS	Concept of Operations
CR	Change Request
CTOT	Calculated Take-Off Time
DCB	Demand Capacity Balance
DCT	Direct Routing

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eASP	Air Service Provider that is equipped for conducting FF-ICE procedures or interoperability
EATMA	European ATM Architecture
E-ATMS	European Air Traffic Management System
EAUP	European Airspace Use Plan
EET	Estimated Elapsed Time
EUUP	European Updated Airspace Use Plan
ECAC	European Civil Aviation Conference
eFPL	FF-ICE FPL
EOBT	Estimated Off-Block Time
ETDO	Extended diversion time operations
ETFMS	Enhanced Tactical Flow Management System
ETOPS	Extended range Twin engine Operational Performance Standards
FDCI	Flight Delay Criticality Indicator
FF-ICE	Flight & Flow Information for a Collaborative Environment
FL	Flight Level
FLS	Flight Suspension message
FMP	Flow Management Position
FOC	Flight Operation Centre (also known as “OCC”)
FTM	Flight Time for MET validity
FUA	Flexible Use of Airspace
GA	General Aviation
GRIB	GRIdded Binary / General Regularly distributed Information in Binary form
HPAR	Human Performance Assessment Report
ICAO	International Civil Aviation Organization
INTEROP	Interoperability Requirements
KPA	Key Performance Area
LoA	Letter of Agreement
LTM	Local Traffic Manager
MEL	Minimum Equipment List
METAR	METeorological Aerodrome or Aeronautical Report
NM	Network Manager

NMF	Network Management Function
NO	Network Operations (Regional or Local)
NOP	Network Operations Plan
NOTAM	Notice To Airmen
OCC	Operations Control Centre (also named in this document “FOC”)
OI	Operational Improvement
OPAR	Operational Performance Assessment Report
OSED	Operational Service and Environment Definition
PAR	Performance Assessment Report
P-FDCI	Proactive Flight Delay Criticality Indicator
PFP	Preliminary Flight Plan
PIRM	Programme Information Reference Model
PTRs	Profile Tuning Restriction
QoS	Quality of Service
R&D	Research and Development
RAD	Route Availability Document
RBT	Reference Business Trajectory
R-FDCI	Reactive Flight Delay Criticality Indicator
RNAV	Area Navigation
RPAS	Remotely Piloted Aircraft Systems
RSA	Restricted Airspace
SAC	Safety Criteria
SAR	Safety Assessment Report
SBT	Shared Business Trajectory
SecAR	Security Assessment Report
SESAR	Single European Sky ATM Research Programme
SFP	Selective Flight Protection
SID	Standard Instrument Departure
SITA	Société Internationale de Télécommunications Aéronautiques
SJU	SESAR Joint Undertaking (Agency of the European Commission)
SPR	Safety and Performance Requirements
STAM	Short-Term ATFCM Measures

STARS	Surveillance and Tracking Attack Radar System
SWIM	System Wide Information Model
TAF	Terminal Aerodrome Forecast
TBO	Trajectory Based Operations
TS	Technical Specifications
TV	Traffic Volume
UAS	Unmanned Aircraft Systems
UTC	Coordinated Universal Time
UUP	Update Airspace Use Plan
WAFC	World Area Forecast Centre

Table 3: List of acronyms

3 Operational Service and Environment Definition

3.1 SESAR Solution 38: a summary

CR 07008 Update solution PJ.07-W2-38 (PJ.07-W2-38)

SESAR Solution ID	Title
PJ.07-W2-38	Enhanced integration of AU trajectory definition and network management processes

The objective of this key R&D solution is to reduce the impact of ATM planning on Airspace Users' costs of operations, by providing them a better access to ATM resource management and allowing them to better cope with ATM constraints. This shall improve Airspace Users flight planning and network management through improved FOC participation into the ATM network collaborative processes.

This solution analyses the provision of enriched DCB information like Protection Hotspots which NMF can declare to protect an airspace from undesired rerouted flights. Those protection hotspot will follow the same publication rules as the current (resolution) hotspots and have similar attributes. The Protection Hotspot information is provided to the AU, mainly in the context of what-if functions, to be used prior to their decision to change a flight plan. It does not intend to trigger the change of trajectories for flights already planned in the hotspot.

In addition, to support trajectory negotiation processes, the AU can provide to NMF information about really critical flights of the fleet before any DCB measure is allocated and for which DCB delay is particularly costly and should be avoided. The intention is that NMF human operators and systems consider this information before implementing any measure.

The following OIs belongs to the scope of this solution:

OI Step code	OI Step title (CR 06649 Update AUO-0208 (PJ.07-W2-38))	OI Step coverage
AUO-0208	Use of Simple AU Preferences in DCB Processes	
As part of CDM processes, the AU can provide preferences information even before the publication of DCB constraints. This information is considered in the DCB processes to define or refine measures to reduce the impact on the AU costs, when possible. Simple preferences refer more specifically to light information like proactive flight delay criticality indicators that can be considered by NMF human		

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operators and systems - either at regional, sub-regional or local levels - to avoid ATFCM delay (e.g., slot exemption or level capping/re-routing proposal to avoid an ATFCM regulation) for critical flights.

CR name	EN code	Title (EA Project)	Coverage
CR 06641 Create enabler NIMS-72 (PJ.07-W2-38)	NIMS-72	Enhance NM flight planning and DCB functions to integrate the proactive flight criticality data	
CR 06642 Create enabler AOC-ATM-28 (PJ.07-W2-38)	AOC-ATM-28	Enhance AU flight planning systems to integrate the proactive flight criticality data	
CR 06643 Create enabler NIMS-78 (PJ.07-W2-38)	NIMS-78	Enhance local ATFCM system to integrate the proactive flight criticality data.	

OI Step code	OI Step title (CR 06650 Update AUO-0219 (PJ.07-W2-38))	OI Step coverage
AUO-0219	Use of Enriched DCB Information and Enhanced What-Ifs to Improve AU Flight Planning	

Enriched DCB information will be available to improve AUs decision process when planning or re-planning trajectories. Enriched DCB information encompasses DCB constraints/measures information like ATFCM regulations/CTOT/STAM; and additional DCB information such as hotspots. Enriched DCB information is provided either for the trajectory planned by the AU as part of a submitted flight plan or for alternative trajectories considered in the context of advanced what-if. The information can be used in different use-cases: proactive management of fleet delays by AUs, CDM processes triggered by flow managers (e.g., STAM/Cherry picking measures).

Enriched DCB information and advanced what-if functions can be accessible via SWIM services to enable full integration of flight planning and ATFCM information in AU systems and further automation of AU decisions related to flow management constraints.

CR name	EN code	Title (EA Project)	Coverage
	HUM-019	New task to analyse the DCB impact and decide on the next action for the flight plan	
CR 02615 Create NIMS-61 (PJ.07-W2-38)	NIMS-61	Enhance the regional DCB functions to provide the DCB constraint data for a flight trajectory	
CR 02616 Create NIMS-58 (PJ.07-W2-38)	NIMS-58	Enhance the regional DCB functions to provide the enriched DCB data for a flight trajectory	
CR 05431 Update AOC-ATM-24 (PJ.07-W2-38)	AOC-ATM-24	Integration of the DCB constraint data to the flight planning functions	

CR 05432 Create AOC-ATM-26 (PJ.07-W2-38)	AOC-ATM-26	Integration of the enriched DCB constraint data to the flight planning functions	
CR 05438 Create NIMS-77 (PJ.07-W2-38)	NIMS-77	Enhanced local DCB traffic monitoring functions	

Table 4: SESAR Solution 38 Scope and related OI steps/enablers

Id	HL CONOPS Requirement Description	Op Env	Additional Background
S38-HLOR-02	Provision of Enriched DCB information and the use of enhanced What-if services shall support AU flight planning and trajectory optimisation and shall provide benefits in terms of: • AU cost efficiency • Punctuality, Fuel Efficiency & Flight times • Network capacity and predictability through: • Provision of enriched DCB information and what-if services from local and regional DCB actors • Automation of AU flight trajectory optimisation processes and interactions with DCB actors. by : • Better use of the availably capacity inducing a reduction of ATFCM delays • Reduction of flight plan changes and network instability inducing a reduction of operators workload • Reduction of the number of predefined re-routing scenarios impacting fuel efficiency	En-Route; Network; Terminal Airspace;	Route Network and Free Route AU Flight Planning All types of Air Transport subject to DCB Extended TMA
S38-HLOR-03	The DCB decisions of ATFCM/NMF shall enhance the Cost efficiency and Equity of Airspace Users based on their preferences and priorities through: • The sharing of AU preference and priority information between all actors; • Enhanced CDM between AUs and ANSPs - by : • exploitation of the AU preference and priority information provided via Pro-active Flight Delay Criticality Indicators (FDCI), • Improved process (using preferences between AU and NMF to manage cherry-picking measures or regulations)	En-Route; Network; Terminal Airspace;	Route Network and Free Route AU Flight Planning All types of Air Transport subject to DCB Extended TMA

Table 5: High Level CONOPS requirements related to SESAR Solution PJ.07-W2-38

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

OI Step Code	OI Step title	Deviation
AUO-0208	Use of Simple AU Preferences in DCB Processes	None
AUO-0219	Use of Enriched DCB Information and Enhanced What-Ifs to Improve AU Flight Planning	None

3.2 Detailed Operational Environment

3.2.1 Operational Characteristics

This chapter describes the operational characteristics from the current operations but includes as well the future potential impact of the SESAR solution on the current operations processes.

3.2.1.1 Introduction

Currently, the Air Traffic Flow Management system at central (NM) and local level (ATC units through Flow Management office) use historic data, AU schedule information, airport slot information and statistical analysis in order to predict traffic flow and hotspots. Finally, the filed ATC flight plans are taken and used to better predict traffic flow but often at a too late stage to optimise the ATM capacity **especially in medium/high complexity areas**. The results are still inaccurate as the ATC flight plan, as defined in ICAO PANS-ATM Doc. 4444, is a limited representation of the 4D trajectory. As a next step to improve predictability, the FF-ICE FPL will introduce more accuracy in the AU's flight intentions compared to the ICAO flight plan. Therefore, the consideration of FF-ICE or ICAO flight plan usage has also to be taken into account as being different enablers in the framework of the FF-ICE Planning Service.

The exchange of schedule and trajectory information as an iterative process will have a direct effect in the AUs operations and onto the ATFCM scenarios analysed by the NMF representatives. The chapter on the operational characteristics will then permit to understand how the FF-ICE Planning Service will be integrated in this context. Especially, the consideration of airline operational procedures and several criteria that lead to changes in the trajectory generation process shall be considered.

3.2.1.2 FOC Airspace User perspective

In order to define specifically the new rules associated to the FF-ICE Planning Service, it is necessary to remind in this chapter who and which types of operators may use the European airspace and how they are structured. The characteristics of the Airspace Users will be mainly focused on the Flight Operations Centre part. It is the core area in charge of flight planning preparation and flight plans filing, concerning the tasks related to the OSED scope. Moreover, the core FOC structure may be quite different from one airline or business model to another. The third-party service providers that are subcontracted by some operators, play also either partially or fully the FOC role.

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In this document, the characteristics will be described only for the civil Airspace Users. The military ones even if they operate and are subject to flight planning and filing are dealt within the OSED of the Mission Trajectory addressed by PJ.07-W2-40.

- Four types of AUs operations can be identified and are represented in the figure below:

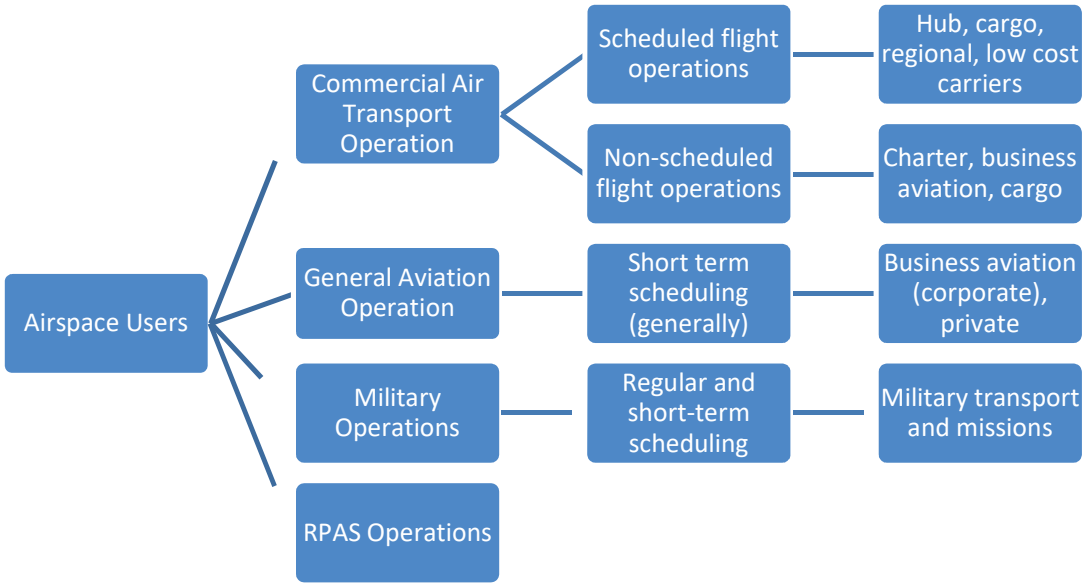

Figure 1: Airspace Users categories

It could be considered that among Commercial Air Transport Operations, scheduled flight operations are mainly concerned by European ATFCM difficulties. However, Non-scheduled flights and General Aviation Operation are also important to be considered as part of the collaborative framework since DCB complexity and variability could be impacted in some cases by those operators that could largely benefit from ATFCM information in return.

A description below gives a little more information on Commercial Air Transport Operations, General Aviation Operations, Aerial work and RPAS:

- Commercial Air Transport Operations means an aircraft operation to transport passengers, cargo or mail for remuneration or other valuable consideration.
- General (private) aviation operation means an aircraft operation other than a commercial air transport operation or an aerial work operation.
- General aviation aerial work means an aircraft operation in which an aircraft is used for specialized services such as agriculture, construction, photography, surveying, observation and patrol, search and rescue, aerial advertisement, etc…

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- Operations under Remotely-Piloted Aircraft Systems. RPAS are a subset of the UAS (Unmanned Aircraft Systems).[1]

3.2.1.2.1 FOC organisational structure and capabilities

The FOC dimension could be identified by its organisational structure and its capabilities. Those two include:

- human resources availability
- different functions integrated into the FOC
- repartition of tasks or roles among the FOC personnel
- robustness and variety of systems used.

Generally, the FOC dimension of an operator depends mainly on its business model, the fleet size, its administrative structure and especially the complexity of operations (which could include regional, domestic or international flights, but also point to point and/or hub)

The figure below shows an example of FOC functional structure of a typical integrated OCC (e.g. major):

[1] **This Solution 38 covers all operations that require Flight Plan filing (including RPAS when filing a FPL).**

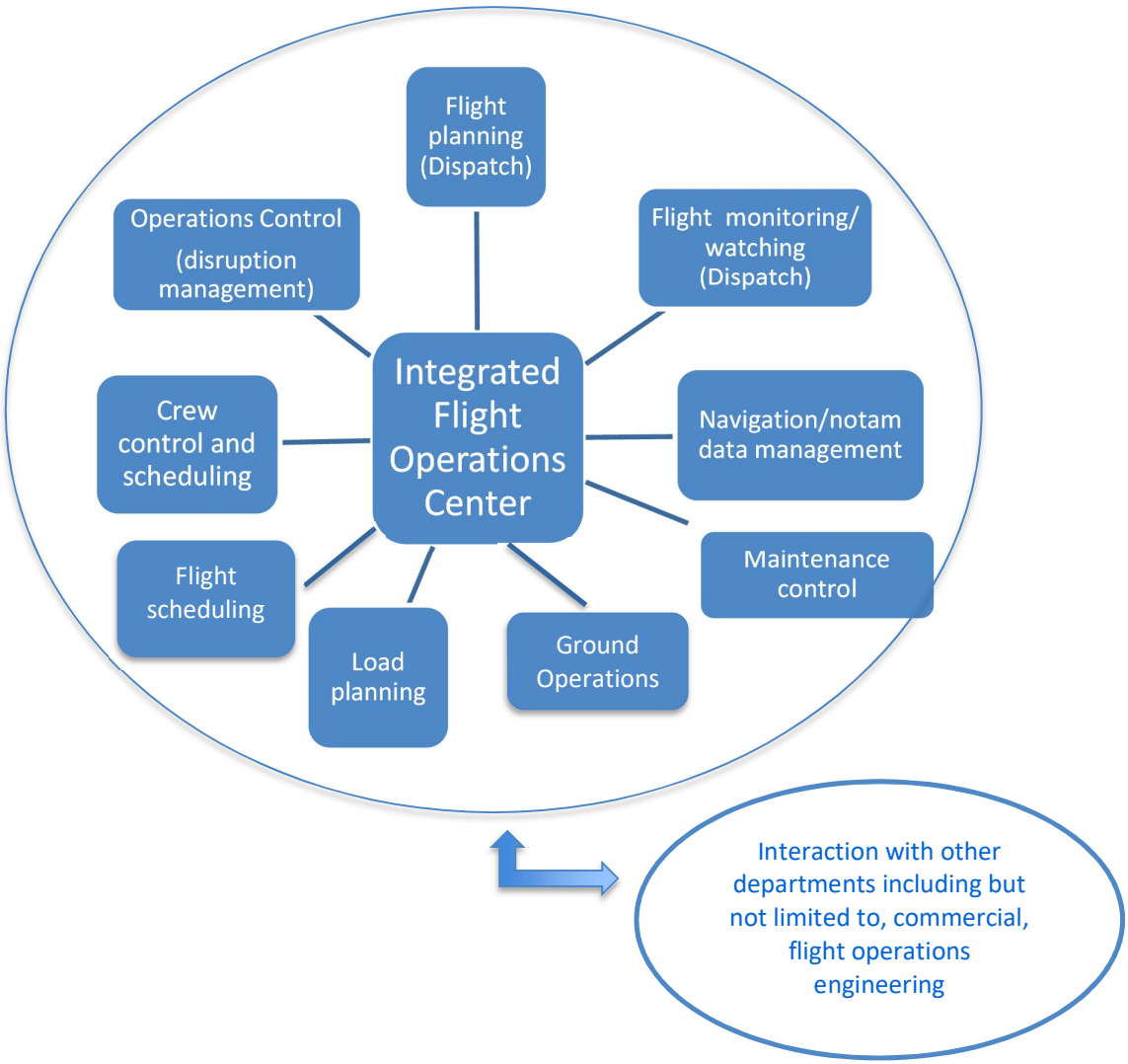

Figure 2: Example of integrated FOC functional structure

Still, other functions could be part of the FOC such as meteorology or ATFM. The ATFM or slot management function, depending on the operator, could be part of the flight dispatch or operations control cell. In some FOC, there is a specific ATM/ATC cell dedicated to all interactions with ATFM and ANSP to solve and monitor the impact of capacity constrained situations on any flight. However, as not being systematic from an operator to another, it can be commonly managed by an operations controller or a flight dispatcher.

The flight planning systems used in this type of structure may easily propose a high degree of automation. Short-haul flights routes calculation may for example be automated and the system may also consider automatically updated weather information (e.g. METAR/TAF) and NOTAMS such as runway closure except for the unreadable NOTAMs which are treated manually.

Here below is represented how a medium/small FOC from regional or charter airline is structured compared to the previous one:

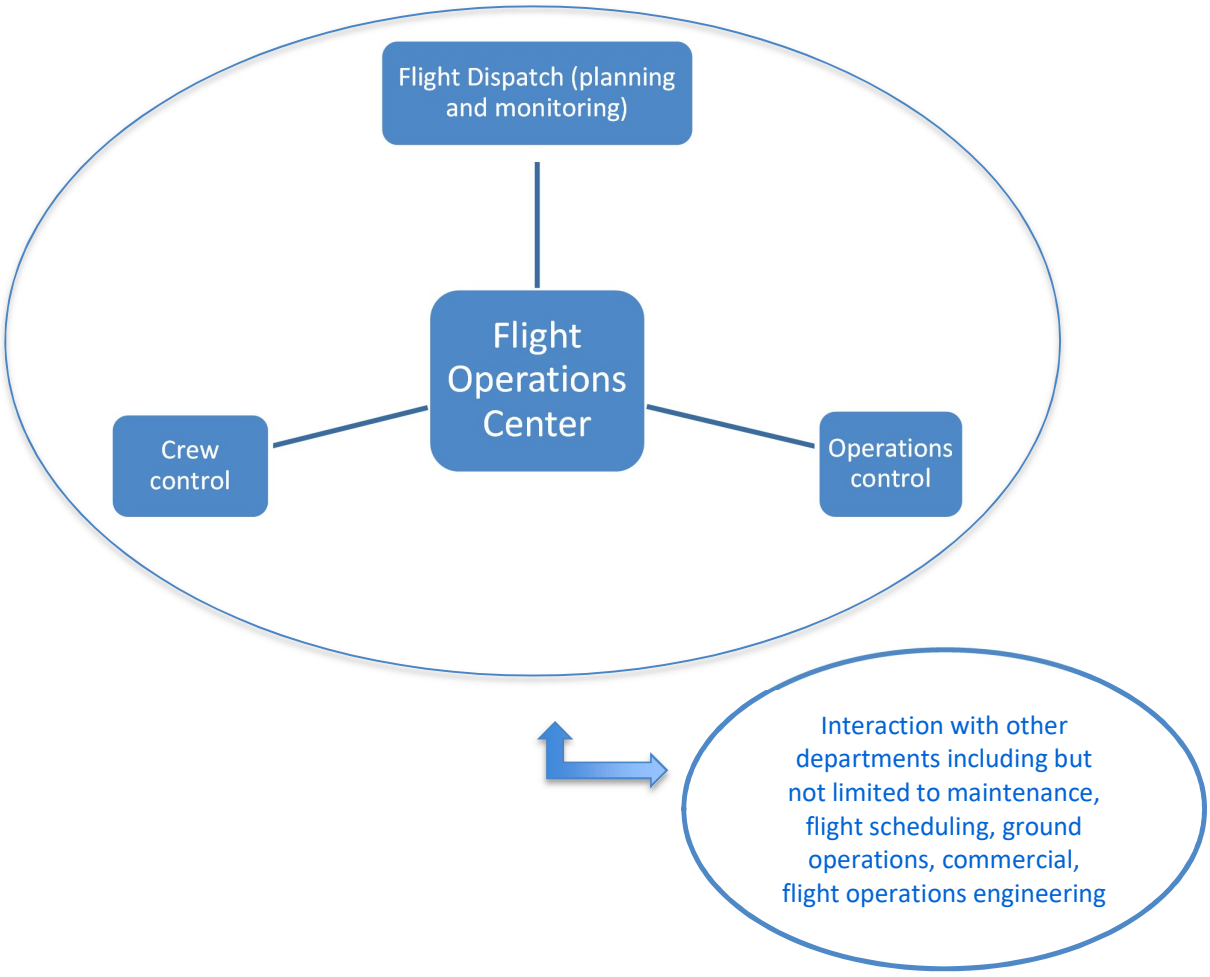

Figure 3: Example of medium/small FOC functional structure

This structure implies that one employee is in charge of all the tasks associated to a functional box. In this case, the flight dispatcher will be in charge of flight planning and monitoring and operations control (slot management, disruption management etc...).

It means that applying the flight planning CDM concept for this type of structure might be more difficult than in the previous example even if it also depends on employee workload and on the supported system provided. However, it might also be possible to correlate the workload to the multiplicity of tasks associated to the personnel.

In this case, the flight dispatcher is entitled to plan flights, to monitor them and also to follow for example with maintenance outside of the OCC the evolution of a technical problem impacting flight operations. In some occasions, the coordination with those “out of FOC” departments can become heavy and generate more complexity on the duty shift.

Finally, the figure below represents a FOC structure of a small airline (e.g small scheduled/charter airliner or business aviation)

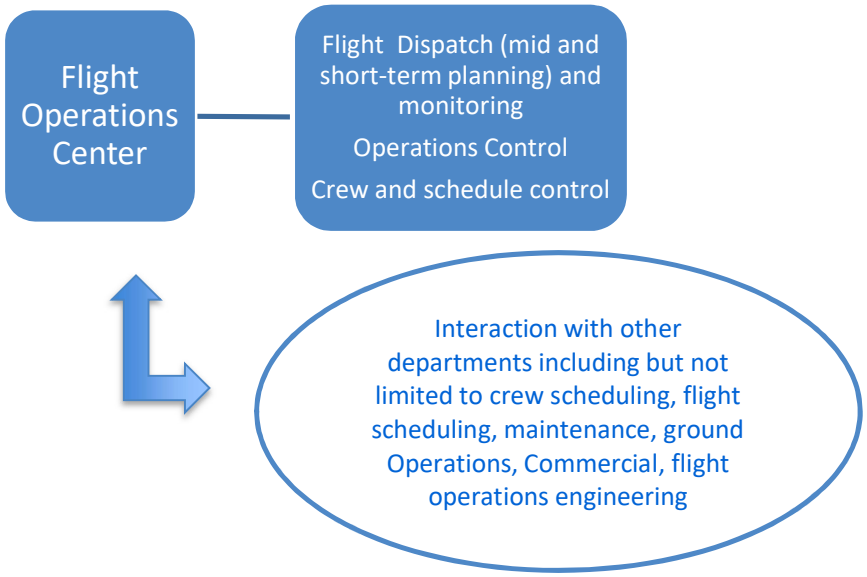

Figure 4: Example of a small FOC functional structure

This structure implies the flight dispatcher to be in charge of flight planning, monitoring, operations control (slot management, disruption management etc...) but even to monitor and act on crew and flight scheduling if the changes impact the day of operations. Integrating a CDM concept would mean that the same dispatcher will have to increase consequently its situational awareness more than in current operations. Iterative flight planning process for this type of operators will have to demonstrate its benefits and incentives for them to participate. Even if the number of flights is certainly much lower than in a major airline, the addition of an iterative process to current multiple tasks management shall therefore be analysed.

Being a small operator does not mean that it cannot be equipped with a robust flight planning system permitting more automation. Level of automation and capabilities will depend on the complexity of operations and the needs of the operator.

Despite the fact that this process is based on trajectory-based operations, operators with a significant number of flights such as major airlines might be more involved in the CDM process with ANSP. One main reason is because trajectory negotiation to solve ATM imbalance help the operator to solve not only one flight but a number of its other flights directly concerned by a potential congested area. In addition to that, there are dedicated resources for ATM and Operations control functions but also automated systems capable or that will be capable of monitoring a CDM process (figure 4).

Nevertheless, it is not to be concluded that only integrated FOC can participate to a CDM process. Explanations about the consequences on different examples of FOC structure and airline models were given above but most importantly, secured human resources are to be allocated for this type of process and supported systems as well.

3.2.1.2.2 Filing process time frame

Following ICAO, the flight plan is recommended to be filed to ANSPs at least one hour before EOBT.

However, in the European case as well as in other regions, filing a flight plan is preferably sent at least 2, 3 hours before EOBT in order to facilitate the flow management performed by NMF.

Nonetheless, the filing time will depend on the internal procedures, the FOC organization of the operator and maybe influenced by the type of flights. The filing timeframe could vary significantly from 30 minutes up to 20 hours before EOBT but the maximum time allowable is **120 hours** before EOBT.

It is then important to identify the areas, the type of flights and mostly the timeframe at which DCB actors need flight plans in advance. There could be for example some specific milestones above which if the demand has not been initiated, the risk of not accommodating the whole forecast demand increases significantly. However, this would not be enough since there are other parameters for trajectory calculation that are triggered at different timeframes and that influence significantly the trajectory calculation. Those parameters will be introduced below.

3.2.1.2.3 Flight planning characteristics

Flight planning constitutes one of the key milestones in the FOC activities and is based on a certain amount of criteria that need to be taken into consideration for a safe and efficient plan as shown in the figure below:

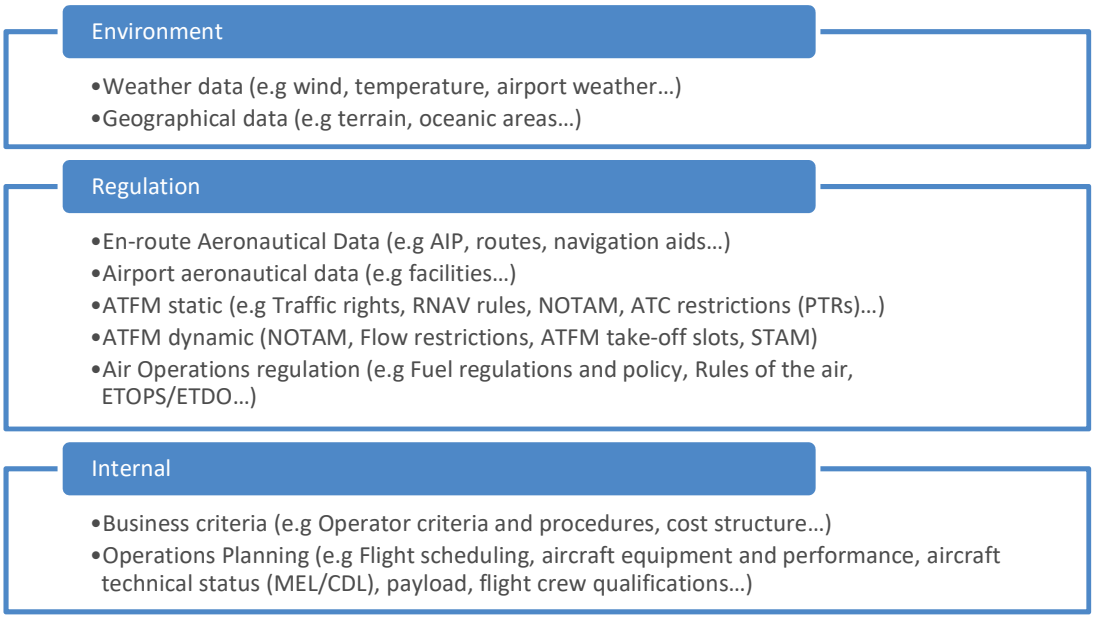

Figure 5: Flight planning characteristics

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Not all parameters need to be described in this chapter but in the context of the solution (flight planning service enhancements), some assumptions will be made in order to concentrate on the aspects that could impact consequently the CDM process definition.

For example, applying a MEL (Minimum Equipment List) item after an aircraft equipment failure may happen every day, at any time and is somehow unforeseeable. This factor can be considered as critical since there could be an operational impact on the trajectory but this will be part of the non-nominal cases that will not put into question the CDM process definition itself.

Regarding the regulation, AIP, Traffic rights or fuel policy used, though it is critical for flight planning, the assumption is that in nominal conditions, the criteria would not change. However, fuel tankering used to carry fuel quantity for at least 2 legs and practised whenever possible by many operators could affect the trajectory computation.

With regard to NOTAMs, a runway closure at departure or arrival airport may impact directly the flight plan calculated but in this context, the criteria that will be considered are the conditional routes availabilities and restricted areas through the AUP/UUP.

Finally, the following parameters could be considered as the most changing in the context of CDM process:

- Certainty of weather forecast
- Airspace availability (FUA restrictions, SID/STAR)

Though the gross weight is critical in flight planning, adding it as a point is useful in order to remind that planning a trajectory early in advance (i.e. D-1) is acceptable in terms of accuracy to the extent that the associated payload is quite stable. Significant changes in payload on the day of operation when the Network is heavily constrained could result in cancellation (mainly due weather). 'Cancellation and consolidation of ' flights can often see radically different climb profiles and cruising levels as well as changes in lateral trajectories when certain CDRs cannot be accessed.

- Certainty/Accuracy of the gross weight

The following point is also to be considered when defining into the CDM process the accuracy and certainty of the data required by DCB that ensures a reliable and effective decision-making.

- Airline disruption management (EOBT volatility as a result of unforeseen events such as aircraft unserviceability, crew shortage or passengers processing delays)

The EOBT volatility or last minute changes even of 10 minutes magnitude could impact traffic counts. This is why it is necessary to not extend too much the preliminary flight plan submission time and keep at the minimum sufficient time for FMPs to analyse the situation. As a consequence, this would limit as much as possible the uncertainty on the predicted demand including the reactionary flight delays.

3.2.1.2.3.1 Airspace availability

The Route Availability Document (RAD) is published through the AIRAC cycle every 28 days and available to Airspace Users for flight planning. Despite the existence of “permanent” ATS routes that are designed into the AIP charts of each state, the European traffic demand requires ANSPs to strictly organise the major traffic flows by defining route restrictions in the RAD in order to maximise capacity.

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The RAD is therefore based primarily on permanent ATS routes and CDR1s and includes route restrictions as published in the national AIPs, LoAs, NOTAMs and AIP Supplements. In addition to the CDR1s, restricted Airspaces (RSAs) also represent a part of the airspace where in most cases military operations or other operations require segregations.

AUP validity covers 24 hour time-period between 06:00 UTC to 06:00 UTC the day after. Since it is published at the later at 15:00 UTC the day before its validity, AUs could already file a flight plan a D-2 if the flight is not arriving beyond 06:00 UTC so that first AUP validity is covered; if they do file the flight plan at that time it will be checked. However, it is to be considered that Updated airspace Use Plans (UUP) could be provided every 30 minutes up to 20:00 UTC every day.

In the case of new opportunities, AUs may file or re-file their flight plans but if there are new restrictions, they could receive Flight suspensions messages (FLS) sent by NM obliging AUs to refile if flight plans are already in the system.

ATFCM daily plan is also published the day before NM operations in the pre-tactical phase at 16:00 UTC or at 17:00 UTC depending on the season. Its validity starts on the tactical phase (D day) at 00:00 UTC and ends at 00:00 UTC.

NOTAMs related to airspace and routes could be considered as additional information but it remains to the State to decide whether a NOTAM or AIS information is required in addition to the AUP.

3.2.1.2.3.2 Weather forecast

To identify some milestones from a flight planning perspective, the timeframe applicable to the use of weather data as well the trajectory computation and optimisation have been taken as main drivers.

Illustrated in the figure below, the upper air wind and temperature data (including humidity) are refreshed by WAFC every 6 hours. The WAFCs global gridded dataset is generated for a range of time steps between T+06 and T+36 inclusive and are available in 3-hourly steps.

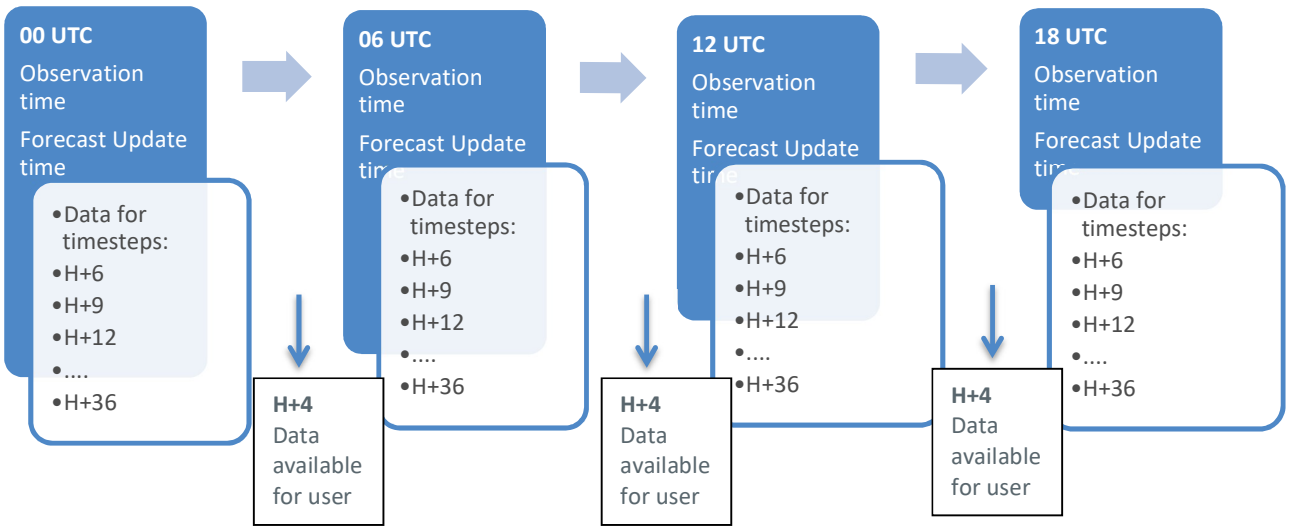

Figure 6: Upper air weather data provision timeline

Even if data forecast is provided for specific validity times, the GRIB data is interpolated between time steps if a flight is planned between two different times. The same timeline is applicable as well to the provision of cumulonimbus, icing and turbulence datasets in the same format.

The weather dataset is provided for the next 36 hours but only 4 hours target after the run time, the dataset is available to the user. Generally, since it takes some time to integrate those data in the flight planning software, it means that forecast data are always available at around T+30 hours max.

In the CDM context, sending flight plans more than 30 hours in advance would therefore not be meaningful on one side and on the other side, trajectory could potentially be changed every 6 hours minimum without considering the additional information provided on CB, turbulence and TAF messages used to define departure and arrival procedures.

Considering that updated weather data is available at 00UTC, 06UTC, 12UTC and 18UTC, a flight departing at 10:00 UTC could be updated at 00:00 UTC and/or planned as well as at 06:00 UTC. In the case of unstable weather such as en-route storms, the risk not to find an agreement on a trajectory at T-5 (05:00 UTC) could exist or at least the confidence on this trajectory would be low if it were agreed.

3.2.1.2.3.3 Traffic characteristics

EUROCONTROL defines short-haul routes as shorter than 1,500 km (810 nm), medium-haul between 1,500 and 4,000 km (810 and 2,160 nm) and long-haul routes as longer than 4,000 km (2,200 nm).

It shall be considered that in the context of a CDM process, there are different types of flights (whether they are short or long-haul flights):

- Departing and arriving into ECAC area (full European)
- Overflying ECAC area

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- Departing in ECAC area and arriving outside ECAC
- Departing outside ECAC and arriving in ECAC area

The full European flights are the simpler ones to be managed into the CDM process since the NM will have a complete view of the trajectory with the associated potential impacts on DCB and routes availability for each ANSP.

For the arriving and overflying flights into the ECAC, it will depend on the duration of the flight since the longer the flight, the shorter the time for a CDM process. For example a 12 hour long-haul flight departing from South America would enter the European airspace 2 hours before arrival in Paris or Madrid depending on its route (taken as an order of magnitude). If dispatch would "freeze" the flight plan 3 hours before EOBT (except if significant weather conditions evolve), it means in this case at H-13 maximum the trajectory would not be modified anymore which is considered in current European operations as far from short term ATFM measures timeframe. In current NM operations where these flights are not subject to ATFM measures, this is not an issue for concern, but for analysis within the framework of NMF assuming its full responsibility as ECAC FF-ICE Planning Service Provider (also for flights overflying ECAC area and departing outside ECAC and arriving in ECAC area).

From a practical concept development perspective, it is important to consider the high/medium complexity areas that generated consequent ATFM delays in Europe in order to assess with clearer evidences the potential benefits of the proposed solution.

3.2.1.2.3.4 Flight planning milestones

From a FOC (flight planning) perspective, a summary of the parameters are described below with the different steps from D-2 up to EOBT that are of interest in the frame of the flight FF-ICE Planning Service. It is important to note that milestones such as payload update, use of updated upper air weather data, crew briefing and filing times strictly depend on the airline organisation and procedures. However, it could be generally considered that room for optimisation is possible whenever updated weather forecast and airspace use plan are published, especially when a flight is planned quite long in advance. Any NOTAM update is not supposed to be foreseeable and part of the UUP if the information relates to CDR or airspace restrictions.

The last point is that despite the schema proposed below, an operator is not prevented from computing and updating a flight plan more in advance than the highlighted milestones but the risk to get a sub-optimal and less predictable trajectory as well as trajectory changes due to UUP and/or ATFCM daily plan exists.

A flight should not be planned earlier than H-30[2] due to non-upper air weather data availability even if the AUP is available and applicable to a flight before H-30.

In principle, the first AUP is issued at 15:00 or 16:00 UTC at D-1 depending on the season for a validity from 06:00 UTC the day after to 06:00 UTC the second day after. Therefore, PFPs whose flights are in

[2] Refer to 3.2.1.2.3.2 section for more explanation on the availability of weather data

the time period 00:00 UTC to 06:00 UTC are not much negotiable except if the UUP process at D-1 allows further influence of the PFP on the UUP. This point is to be studied with the ASM stakeholders.

It could be considered at this stage that in order to influence the ASM and ATFCM daily plan processes, the PFP could be sent at 12 UTC at D-1 to allow few hours of adaptation for ASM/ATCM stakeholders.

The pre-tactical use case should therefore allow AU to plan their flights at 12 UTC at D-1 for all flights in the time period from 00 UTC to 18 UTC in order to cover the weather forecast validity period.

In order to identify more precisely the time periods of flight planning and the corresponding category of flights that could be applied in the flight planning service, a set of rules have been established below.

In order to plan a flight according to the validity of meteorological information, a variable has to be introduced:

FTM (Flight Time for MET validity) = taxi-out + EET + 1h

This variable including the taxi out time plus one hour in case of diversion is created in order to ensure that any flight would be covered by the weather forecast validity.

For each case, depending on flight duration and departure time:

1 - Flights whose FTM is **< 6 hours** can be preliminary planned between **H-30 and H-18**

a) *If FTM is within one of the 6 time periods (00, 06, 12, 18), flights can be preliminary planned between H-30 to H-24*
b) *If FTM is overlapping any of the 6 time periods (00, 06, 12, 18), flights can be preliminary planned between H-24 and H-18*

2 - Flights whose FTM is **between 6 and 12 hours** can be preliminary planned between **H-24 and H-12**

a) *If FTM is within 2 of 6 time periods (00, 06, 12, 18), flights can be preliminary planned between H-24 to H-18*
b) *If FTM is overlapping 3 any of the 6 time periods (00, 06, 12, 18), flights can be preliminary planned between H-18 and H-12*

3 - Flights whose FTM is **> 12 hours** can be preliminary planned between **H-18 and H-6**

a) *If FTM is within 3 of 6 time periods (00, 06, 12, 18), flights can be preliminary planned between H-18 to H-12*
b) *If FTM is overlapping 4 any of the 6 time periods (00, 06, 12, 18), flights can be preliminary planned between H-12 and H-6*

Those rules could be used with the purpose to reorganise the operations duty planning. However, the period at which a flight plan could be pre-filed will depend at which time the ASM/ATFCM stakeholders would recommend to send the PFP in order to influence the related planning processes.

In application of the pre-tactical use case, all flights whose FTM period ends for example at 10:00 UTC the day of operations could be planned from 06:00 UTC at D-1. However, all flights whose FTM period ends at 22:00 UTC means that those flights are plannable only from 18:00 UTC on D-1 which is later than the AUP/ATFCM time publication.

Two figures below show the proposed timeline related to the pre-tactical use case.

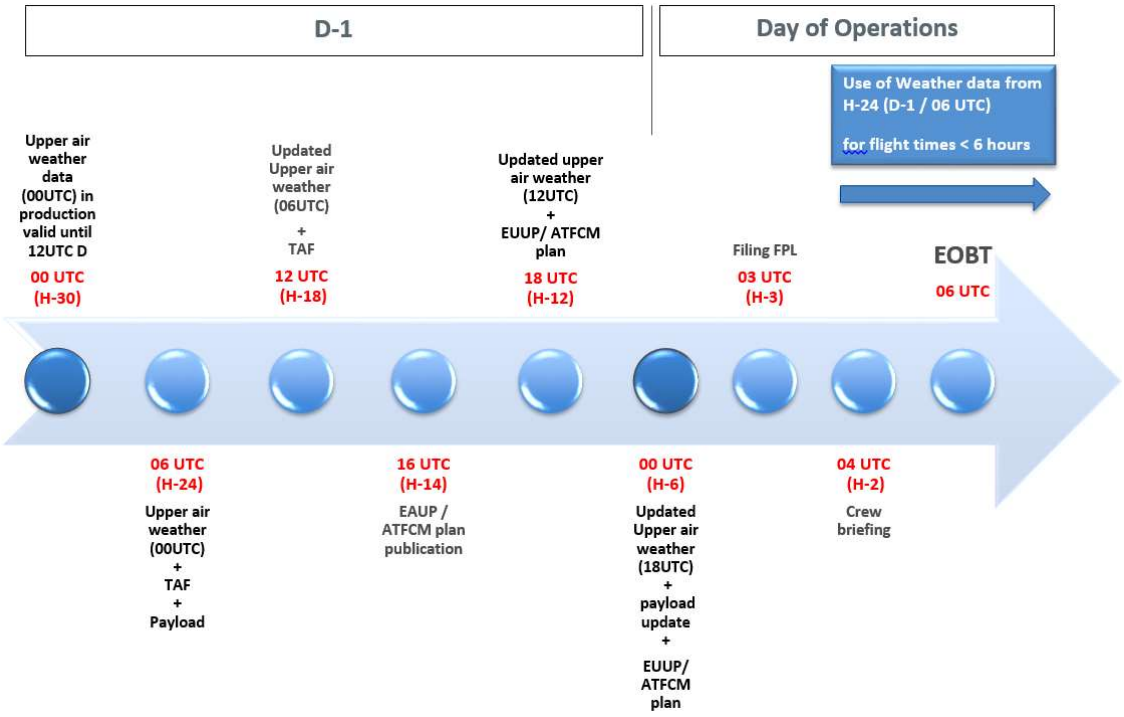

Figure 7: Earliest milestones of some key parameters in flight planning when EOBT is at 06:00 UTC

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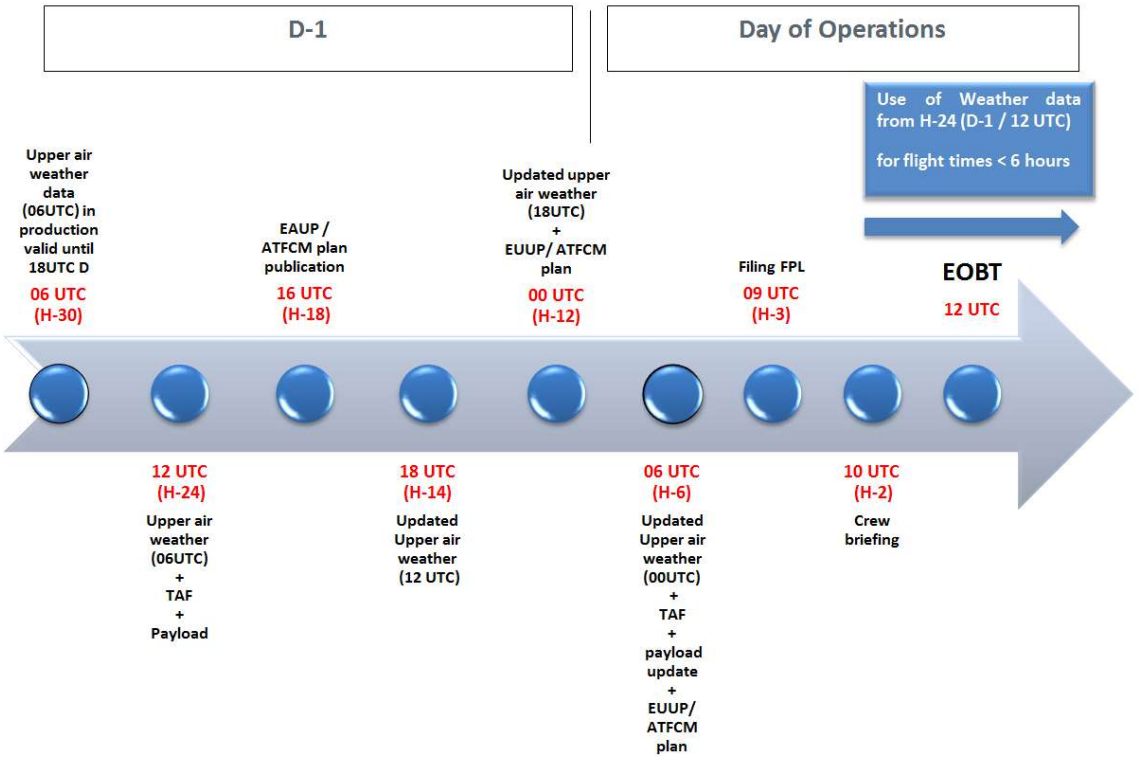

Figure 8: Earliest milestones of some key parameters in flight planning when EOBT is at 12:00 UTC

3.2.1.3 Limitations on Airspace Users side

Iterative flight planning with NM at different stages will have a cost impact for Airspace Users. FOC systems will not only need new automation features to handle these processes, but also additional human resources to supervise and administer the process. To support continuous re-evaluation of flights during the planning phase, server capacities will need to be increased consequently to handle the additional calculation and communication interfaces. The estimated benefits for ATM and for AUs will have to be validated against a potential negative impact on the AUs not participating in the collaborative planning.

Airspace Users being cost-sensitive will neither invest easily into systems nor participate in CDM process, if it does not deliver a quantifiable and credible cost benefit.

Therefore, ATM rules behind iterative flight planning need to support equity and provide incentives so that on one hand it does not reduce flexibility for AUs to optimize trajectories at the latest moment based on most up-to-date information and on the other hand it does not give more advantages to AUs not participating in the CDM process.

3.2.2 Roles and Responsibilities

3.2.2.1 FOC Roles and Responsibilities

The following chapter lists the airspace user roles and responsibilities focused on the FOC part since the solution is mostly impacting the operational actors. The roles are structured into different domains

or functions but as seen in the previous chapter, it depends on the operator if those functions are integrated into the FOC (also known as OCC) or not.

Large Airlines' schedules are created in the scheduling, or network management department handling all changes (time changes, aircraft changes, etc.) until a certain point in time which varies between operators, but could usually be around 72 to 48 hours prior EOBT. After that **Ops Control** takes over the control and handles normal operations as well as irregularities. Ops Control is responsible for initiating, continuing, terminating, delaying, diverting or cancelling a flight. An effective teamwork between flight crew and Ops Control personnel is imperative to find the best solution for every situation. Communication is established by ACARS, telephone, email, SITA, AFTN, radio communication. All those specific tasks are managed in a different way from an operator to another.

The operations of small airlines or small business jet operators might demand combining all roles handled just by a few people as seen in the previous chapter. However, the specific roles and associated actions can be global for all AU.

There are other functions within the OCC like Maintenance Control, Daily Crew Monitoring that are not described in this chapter because they do not interact with the stakeholders (e.g. Network Manager) involved during the trajectory management.

Flight planning/Operations Control

- **OCC manager and duty shift manager**

The OCC manager ensures the smooth continuity of flight operations by supervising the day-to-day running of the operations control. The manager is also in charge of writing, maintaining procedures for the department as well as to provide support to operations and crew controllers during heavy disruptions.

In addition to that, the shift manager assigns flights to staff members and performs short-term personnel planning by ensuring that workload is evenly distributed amongst dispatchers to avoid imbalance.

- **Flight Dispatcher**

The flight dispatcher is responsible for the planning of an individual flight by assessing all boundary conditions (e.g. meteorological conditions, regulations, NOTAMs etc.) that impact the flight execution. The flight dispatcher plans the trajectory of the flight in accordance with all requirements and the business goals for a safe and cost-efficient flight. Furthermore the flight dispatcher provides all briefing information to the flight crew. During flight execution and in absence of in-flight support positions, the flight dispatcher performs flight planning support and inflight briefing to support flight crew decisions.

In the framework of CDM process, the flight dispatcher could be directly linked to the changes of trajectory required in the case of evolving weather and ATFM situation.

The automated short-haul flight routes, could be monitored by the flight dispatcher in case of flight plan rejections, but in other organizations, ATM officers could also take this role in addition of managing irregularities such as slot allocation.

- **Flight Monitoring/Watching Officer**

The flight monitoring officer monitors the progress of the flight and compares it with the planned values. This concerns the monitoring and assessment of all boundary conditions of a flight (e.g. meteorological conditions; regulations, NOTAMs etc.) as well as the deviation between the aircraft and planned trajectory. If required, the flight monitoring officer assists the flight crew by re-planning a route or by providing AIS/weather information.

- **Operations controller**

The operations control officer monitors the whole flight operations at the day of operations and assesses the impact of any deviation within the flight schedule and especially the impact of a flight on other flights. The operations controller is responsible for all coordination, delays, cancellation and reflow of flight operations by maintaining a constant awareness of weather, air traffic control and other factors. The ops controller therefore coordinates with crew and maintenance control as well as with the dispatch office regarding changes that affect the release of a flight (aircraft swap, crew changes, and aircraft maintenance status).

In some organizations, the ops controller might directly deal with slot management by assisting the flight crew and modifying flight plans if necessary.

Flight Planning Service Provider (CFSP)

Service Providers provide a huge variety of services to Airspace Users - from the provision of system support all the way to fully managed dispatch services. In many cases Service Providers act on behalf of the AU for automated flight plan filing, flight operations control, crew management, resolution of operations irregularities, etc. However, operators remain responsible of the flight plans filed to ATC by having checked their compliance with airspace regulation.

3.2.2.2 Network Operations

Please refer to the Roles and Responsibilities described in the SESAR Concept of Operations D2.5 CONOPS 2019 [12]

3.2.2.3 Air Traffic Service Operations

Please refer to the Roles and Responsibilities described in the SESAR Concept of Operations D2.5 CONOPS 2019 [12]

3.2.2.4 Operational Roles and Responsibilities

Different airlines, depending on their business model, allocate in a different way the roles and responsibilities described above. For the use cases described in this document a generic approach encompassing the different AUs has been taken. As such roles and responsibilities can be expressed as follows:

Roles and Responsibilities for OSED from EATMA

Node	Responsibilities
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

Node	Responsibilities
	of this document only those actors directly involved in ATM operations are described. The main types of civil Airspace User Operations are: · 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 maintain a complex organization. This category regroups Cargo, Regional, Network, Charter and Low cost operators. · Business Aviation Operations / Organisation (BA). Another important segment of Airspace Users is Business Aviation, which concerns the operations or use of aircraft by companies for the carriage of passengers or goods as an aid to the conduct of their business. · Military Aviation Operations / (MA). Determined by strategic objectives dealing with National and International security and defence policies and commitments, the operations 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. · 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. 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.
Network Operations	Network Operations fulfils all the activities of the Network Management Function at regional and local level.

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Node	Responsibilities
	The objectives of the ATM Network Management Function (NMF) is to enable the optimum use of airspace and ensure that Airspace Users can operate preferred trajectories while allowing maximum access to airspaces and air navigation services. The NMF integrates and manages all the tasks related to the ATM Network, i.e. the dynamic, integrated management of air traffic and airspace including Air Traffic Services (ATS), Airspace Management (ASM) and Air Traffic Flow and Capacity Management (ATFCM) - safely, economically and efficiently - through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions. For all ATM phases, the NMF is based on Collaborative Decision Making processes; the actors involved are different ones depending on the phases and the activities carried out, but collaborative actions and processes will always drive the result. The Network Management Function is truly performed at all geographical levels (regional, sub-regional, local) with a level of involvement and responsibilities depending on the activities and on the ATM phases. The following roles described in this chapter participate to this function.

Operational interactions per context (NOV-2)		Operating Environment
[NOV-2] Airspace User Simple Preferences		En-Route; Network;
Node	Node instance	Node instance description
Airspace User Operations	Airspace User Operations	A person, organization or enterprise engaged in or offering to engage in an aircraft operation (from ICAO 4444 PANS). An Airspace User can be equipped or not equipped with a Flight Operations Centre (FOC).
Network Operations	Network Operations (Regional and Local NM)	The ATFM Unit concerned with providing the ATFM service for the area that includes the flight's airport of departure (it is an ICAO Relevant eASP). In Europe, the ATFM Service is provided as part of the Network Management Function (NMF), and in particular via the roles of the European Network Manager (NM), Flow Manager (FM), and Local Traffic Manager (LTM).

3.2.3 Applicable standards and regulations

AUO-0219: Protection Hotspots

The protection hotspot topic is not relying on or impacting the current implementation of FF-ICE increment 1 as mentioned in Common Project 1 (CP1) regulation.

However further steps of FF-ICE/1 implementation may include the complete integration of flight planning and flow management information exchanges. In that context, protection hotspot information should be provided by NM in the FF-ICE planning, filing and trial services as part planning/filing response to AU FF-ICE/1 flight plan submission/trial.

AUO-0208: P-FDCI

The pro-active FDCI topic is not relying on or impacting the current implementation of FF-ICE increment 1 as mentioned in Common Project 1 (CP1) regulation.

However further steps of FF-ICE/1 implementation may include the integration of fleet prioritisation information in flight planning/flow management information exchanges.

In that context P-FDCI information should be part of FF-ICE/1 fleet prioritization information to be in flight plan information to be considered both in FF-ICE planning and filing services.

For both OIs, there is no need to standardise at worldwide level. This could be addressed in a European FIXM extension.

3.3 Detailed Operating Method

3.3.1 Previous Operating Method

3.3.1.1 Enriched DCB & Advanced What-If (inc. Protection Hotspot)

The delay management related to ATFM is managed in the FOC by using NOP information and -for some airlines - by using tool such as the What-if reroute (AOWIR), permitting the operator to find alternative routes. The tool enables the operator to identify if there is a regulation impacting the alternative route and provides associated delay in that case, but does not give the existence and severity of other hotspots along the alternative route that could potentially impact the operators and generate more instability in the Network if operators are not aware about congestion information.

The process remains manual and is effort consuming at AU side, since most of the information is split in various systems or screens. The AU flight planning system includes all key operational information and constrains on the flight as well as trajectory optimisation parameters whereas NM systems/HMIs (e.g. NOP portal, CHMI, B2B) gives access to ATFCM information and what-if functions.

ATFCM information is limited to published ATFCM regulations and delays/CTOT. Hotspot information is currently not available.

In addition to ATFCM regulation/delay information, rough congestion level information - OVERLOAD - is provided by the AOWIR service for the what-if trajectory options. However, the information is neither accurate nor reliable enough for AU's decision making or for NM to filter what-if trajectory options to keep only those, which are not risking creating new overloads.

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Availability of the AOWIR service in B2B since 2019, allows a first level integration of ATFCM information in AU systems. However, this integration remains limited, since in most of the cases it is done in a different system from the flight planning system.

At the ANSP side, FMPs face regularly situations when the activation of regulation triggers refiling performed by AU, which then creates new overloads. This refiling may result either in new regulations or cherry picking measures. FMPs do not have specific tools or functions to detect sudden changes in traffic demand due to AU re-routings; the FMPs have no possibility to warn AU about the risk of new DCB problems.

Regarding post-operations, some data are available in NMIR about the use of AOWIR services by AU. However, there is no simple way to extract from NM recorded information more general data on AU re-filings due to ATFCM reasons and their impact on network operations.

3.3.1.2 Proactive Flight Delay Criticality Indicator

In current operations, the main ways for dispatchers to share some criticality information on their flights with NM are:

- To call the helpdesk or local FMP in order to request slot exemption or delay reduction.
- To request a slot swap with a non-critical flight in order to have the delay of the critical flight reduced.
- Since summer 2020, to declare in the eHelpdesk a flight as critical. The limitation about the number of critical flights per AU is: 5% of regulated flights limited to 20 max/day.

Some limitations/issues in current operations:

- Coordination via eHelpdesk (telephone for contingency only) is time/effort consuming for the operators
- Request can be made only when the slot is issued, requiring careful monitoring of ATFCM situation and reactiveness close to flights departure. Not all AUs have the manpower for monitoring and reacting in such cases.

3.3.2 New SESAR Operating Method

3.3.2.1 Introduction

This new operating method describes an extended Planning Service based collaborative process between the Airspace Users and the Network Management Function. The process involves the Airspace User submitting a Flight Plan with Route/Trajectory to the Network Management Function for operational acceptance, as soon as there is a certain degree of confidence to provide the first 4D trajectory information. The Airspace User have also the possibility to include simple preferences for each flight they need to protect.

Within the context of this extended Planning Service based collaborative process, the Network Management Function will also provide enriched DCB information in terms of Hotspots and the AU will compute alternative Route/Trajectories (in the context of what-if functions) or proposed by the Network Management Function, when a Route/Trajectory must change (delayed/rerouted/level capped) to be operationally acceptable by the Network Management Function.

The objectives behind these developments are:

- Minimise impact of flow measures on AU flight costs – Increase flight efficiency
- Better use spare network capacity
- Reduce operators workload through increased automation
- Increase network planning stability in the day of operations

3.3.2.2 Principles

3.3.2.2.1 Enriched DCB information

FF-ICE/1 Services include basic DCB information (i.e. constraints applied to a flight, defined at a higher level of abstraction), while enriched DCB information consists of more specific and complete information, including information on opportunities for the Airspace Users but also risks of activation of constraints in the future.

The integration of flight planning and flow management processes allow Airspace Users to improve and further automate trajectory planning decisions.

When ATFM Regulations - Scenarios or STAM - affect a Flight plan, Network Operations regional sends to the AU the ATFM Regulations, Scenarios or STAM including the relevant DCB trajectory measures (like CTOTs and Target Times, re-routings and level capping).

In addition to these DCB measures information, Network Operations regional includes enriched DCB information in terms of hotspot information and pre-allocated CTOT/TT (CTOT/TT information before officially published) along the submitted Desired Route/Trajectory.

That information sharing will propitiate common situational awareness, which will improve the AU decision making process.

To mitigate DCB negative impact on flights AU can use the trial request service (or AOWIR) to ask Network Operations what-if analysis related to trajectory acceptability, DCB constraints and enriched DCB information to check new routes with their DCB situation before making a decision. This will allow the AU to adopt the most convenient trajectory adapted to the Network DCB situation.

The following diagram summarizes the information exchange:

Figure 9: Enriched DCB information exchanges

3.3.2.2.2 Hotspots

This OSED distinguishes two types of hotspots as part of Enriched DCB information provided to the AUs along a trajectory:

- Hotspot associated to an overloaded traffic volume and for which the FMP plan to apply DCB measures (cherry-picking/STAM measures principally) to solve the overload. This type of hotspot is not new. They were introduced some years ago as part of the STAM concept and are progressively implemented. In the rest of this document, the term "**resolution hotspot**" is used when referring to this specific type of hotspot.[3]

- Hotspot associated to a traffic volume usually close to saturation to protect an airspace from undesired rerouted flights and prevents the application of DCB measures (e.g. ATFCM regulation, cherry picking measures). This is a new kind of hotspot. In the rest of this document, the term **"protection hotspot"** is used when referring to this specific type of hotspot.

Both types of hotpots are published by the Network Manager on LTMs requests. The OSED assumes that the identification and requests for publication of these hotpots remain- at least partially - human based decisions since relying on tasks like complexity analysis which cannot be fully automated at short or medium term.

[3] Note: Resolution hotspot definition and application was developed by PJ09 W1.

3.3.2.2.2.1 Protection Hotspot Principles

As mentioned in the previous paragraph, a protection hotspot is a new type of hotpot the FMP can declare to protect an airspace from undesired rerouted flights. Those protection hotspots will follow the same rules as the current (resolution) hotspots for their publication.

The protection hotspot can be used by NMF for several purposes:

- Avoid an increase of network instability: in particular, the creation of last minute airspace overloads due to AUs re-routings inducing new DCB constraints and further re-rerouting.
- Keep spare capacity in some specific airspace when needed to increase safety and efficiency of tactical DCB flow measures.

The protection hotspot information is provided to the AUs after flight plan filing or in the context of the what-if & what-else functions use. FPLs which had already been filed through the concerned TV before PH declaration are not concerned.

NMF will consider protection hotspots when proposing trajectory options to AUs either in the context of what-if requests or FPL improvements. Trajectory options on-loading a protection hotspots will not be proposed if it is not part of a solution to solve a DCB problem in other TV and acceptable in the protection hotspot TV.

3.3.2.2.2.2 Protection Hotspot activation rules

Protection hotspots usage should be limited to avoid their over-utilisation in particular during heavy network situations. The following rules should apply:

- A protection hotspot should be activated only for traffic volumes for which there is a particular risk of on load due to AU re-routings. This risk can be identified :
  - from knowledge of past recurrent similar network situations
  - From the real-time knowledge of AU re-filings and their impact on TV loads
- When a traffic load on a TV does not require the Protection Hotspot anymore, it can be cancelled.

3.3.2.2.2.3 Protection Hotspot procedures

The main procedures and rules to be applied are:

- Flights planned in the TV before the publication of the protection hotspots are not affected
- AUs are asked to avoid re-filings on loading a protection hotspot. The information will be provided in what-if services (AOWIR, trial request)
- NM shall consider protection hotspots when proposing trajectory options to AU, either in the context of what-if requests or trajectory improvements/opportunities. Trajectory options on-loading protection hotspots will not be proposed.
- Protection hotspots shall be considered in network impact assessment tasks performed by NM when considering ANSPs or AUs requests (e.g. cherry picking measures, slot swaps, force slots)
- If a re-filing on loads a protection hotspot and the reason is to avoid ATFCM measures, the flight will be considered as a protection hotspot **infringer** flight.

Refiling flights on loading protection hotspot because flight suspension (i.e. original FPL no longer valid) or other reason different from avoiding ATFCM measures are not considered as infringer flights.

Flights on loading a protection hotspot because a proposal from NM (RRP) or as result of a DCB measure (i.e.: level capping, MCP, regulation) are not considered infringer flights.

- In case a TV protected by a protection hotspot becomes overloaded and requires the activation of DCB measures, protection hotspot infringers will be penalised in priority through cherry picking measures if this not affects the efficiency of the resolution of the problem (both at local and network levels).
- AOWIR service and RRP from NM shall consider protection hotspots in the network impact assessment before proposing an alternative route.

The last rule above is aimed at increasing impact of protection hotspots information on AU decisions with the following objectives:

- Increase network stability (avoid inefficient re-routings and activation of new regulations)
- Incentivise the publication of protection hotspots by FMPs
- Foster the anticipation of AU re-routing decisions (i.e. do the re-routing before the activation of protection hotspot)

3.3.2.2.3 Simple preferences

Simple Preferences consists of the provision of additional information released by the Airspace User to NMF to indicate the importance of some critical flights to progress on time or other preference as for instance flight level preference. Hence, flow management should preferably assign no delay or limited ATFCM delay to those flights and adapt the measure to AU preference.

FDCI is a parameter provided by the Airspace User to indicate the importance for the flight to progress 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 possible.

Several variants of this concept are nowadays in use at local and network level through the helpdesk.

For critical flights, FDCI can be used by NMF for slot exemption, to reduce the allocated delay or to avoid providing STAM during the cherry-picking selection to create a DCB measure.

The use of this parameter can be monitored, traced and reported allowing to implement rules for use. Transparency between stakeholders on the use and actions related to FDCI will reduce the risk of abuse.

As the AU fleet situation is changing along the day, FDCI can be issued at any time. Two types were identified:

- Proactive FDCI (P-FDCI) (validated during W2, V3 maturity): for critical flights, in advance of any DCB measure allocated to the flight. The intention is that NMF consider this information before implementing any measure.
- Reactive FDCI (R-FDCI) (validated during W1, V3 maturity): issued when a DCB measure is already affecting the flight with the aim that NMF can take any corrective action to reduce the impact.

It is important to highlight the different nature of R-FDCI and P-FDCI:

  - R-FDCI is a formal request to NMF (eHelpdesk) to treat a critical flight
  - P-FDCI is information sharing, with no obligation for NMF to treat a P-FDCI flight.

In case NMF can treat a P-FDCI, no strict rules for the P-FDCI treatments or to decide between two P-FDCI requests, are defined. The operational experts participating to the W2 P-FDCI validation exercises agreed on the below loose principles:

- No strict rules to prioritise P-FDCI to treat. Time of departure and proximity of the SIT 1 milestone as well as the magnitude of delay are the most important criteria to consider.
- An FMP should treat a P-FDCI only if its delay is beyond their maximum acceptable delay.
- The maximum acceptable ATFCM delay or latest CTOT is important information to include in the P-FDCI dataset.

This FDCI concept is related to the FDCI evolution defined in project PJ09.03. The FDCI can be viewed as an instantiation of the simple preference concept in short term implementation objective.

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.
- A third one being the time tolerance (maximum acceptable delay) that will be used by NMF as a help to resolve the problem.

Other information managed by NMF:

- (NMOC eHelpdesk treatment) Status for R-FDCI, to indicate the situation of the flight: Proposed, Accepted, Unable, Under Work, On Hold.

Rules to prevent abusive use of FDCI:

- Maximum number of FDCI request per AU per day.
- Maximum number is weighted considering the number of flights that the airline has in ECAC area.

The OSED V2 (W1) provided a brief description of the general concept to share information between AU and NMF to be implemented at short term (reactive mode) , while PJ09.03 (W1) developed more detailed information on the short term implementation.

The validation results in W1 concluded the reactive FDCI is mature for implementation and no more research activities were envisaged.

The proposal for this W2 focussed on Pro-active FDCI.

Pro-active FDCI is somehow related to Selective Flight Protection (SFP) and further discussion on their relation will be addressed in this W2 with Sol 39, considering that there is overlap on traffic prioritisation but with important differences as: FDCI acts in both En-Route and Airport domains and it is limited to very few flights, while the SFP to be developed in Sol 39 is targeted in Arrival management.

3.3.2.2.3.1 Common principles between reactive and pro-active FDCI

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 - as previously said -.

The Flight Delay Criticality Indicator includes - as also mentioned above - the following information via its FDCI attributes:

- Criticality
- Reason
- Time tolerance

The time tolerance attribute is expressed via:

- Delay (maximum acceptable).

The time tolerance is either provided by the AU as optional P-FDCI attribute, when the specific flight is indicated by the AU as critical; for P-FDCI without such specific time tolerance indication, a default time tolerance will be applied.

This default time tolerance value is also provided by the AU to NM during the strategic phase and applies to any P-FDCI and the whole fleet of the AU, unless overwritten via the optional attribute in the specific P-FDCI declaration.

Feedback from operational experts, after Sol38 W2 P-FDCI validation exercises underlines, that the maximum acceptable ATFCM delay (preferred; easier to handle) is an important information for NMF

to include in the P-FDCI dataset. For deployment it could be considered to make this P-FDCI attribute mandatory.

If the P-FDCI time tolerance attribute, following W2 validation operational expert feedback, would become mandatory (requested by FMPs), the default time tolerance is not needed any longer.

Reasons to use FDCI are for example to avoid a curfew, not to miss an important connection, crew hours, to avoid incurring unnecessary high costs to the AU (airline reputation, VIP flight or high passenger economical compensation).

FDCI can support critical flights impacted either by En-route or airport DCB problems (or both). NMOC, local FMP and AOP can act to solve or improve the situation of a critical flight either in the context of ATFCM regulations or MCP (delay) measures.

An important advantage of providing the FDCI to the NOP or even directly through AU& FMP workplace systems HMI, is the transparency of the process and awareness for all network actors both during operations and in post-operations. 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.

Rules to prevent excessive use of FDCI are:

- Only top critical flights
- Maximum number of FDCI request per AU per period (FDCI quota)

3.3.2.2.3.2 Overall Framework

The following diagram provides an overview of actors and information exchanges concerned by the P-FDCI.

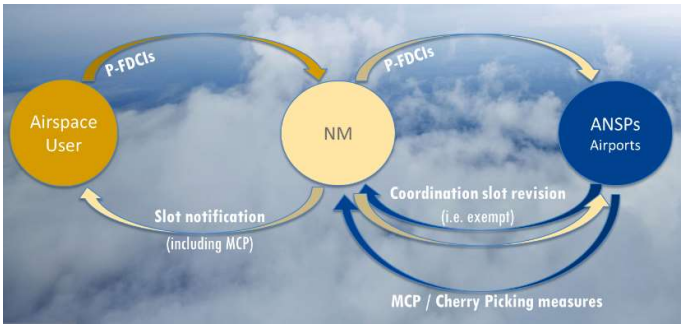

Figure 10: P-FDCI information exchanges

The main operational benefits expected from P-FDCI are the same for R-FDCI.

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3.3.2.2.3.3 Reasons why P-FDCI is needed in addition to R-FDCI

The main specific reasons to address P-FDCI are:

- R-FDCI/critical flights require workload for coordination between AU, NM and FMP close to flight's departure. Not all AUs (and FMPs) have the manpower for that.
- P-FDCI is of particular interest for cherry-picking (MCP) measures to improve the process of selection of candidate flights for measures, since critically information is immediately available to FMP without further need to communicate/co-ordinate with AU.
- Even if the notion of criticality of a flight can be quite dynamic, AU - in particular big airlines - have a recurrent number of critical flights which they can declare ahead of DCB constraints publication.
- P-FDCI information could be used, in some cases, to determine the more relevant DCB measures to apply (e.g. re-routing scenario vs regulation).
- P-FDCI can be combined with other prioritization rules (like in MUAC implementation)
- P-FDCI can provide a simple mean for certain categories of AUs to be involved in future advanced prioritisation processes as defined by UDPP.

3.3.2.2.3.4 Main Assumptions and Principles

Pro-active FDCIs submission and updates by AUs

The assumptions are:

- A P-FDCI can be declared both, either
    - when a flight plan has been or is being submitted to NM, or
    - in advance of the FPL submission, i.e., for critical flights repetitively identified in the weekly, monthly or seasonal schedule.[4]
-
- No possibility to declare a P-FDCI after a certain milestone (e.g. SIT 1)
- Until this milestone, P-FDCI information can be updated

- *4 Sol38 focussed on the P-FDCI declaration after FPL submission only. The possibility to declare flight criticality in advance is already deployed on local level at MUAC. The MUAC implementation allows the provision of priority information a long time ahead of operations (e.g., beginning of the season). This possibility to declare flight criticality in advance of FPL submission could be made available Network wide via to NM.*

- P-FDCI cancellation - at any time , under the condition that it has not been treated yet.
- Main mean to declare P-FDCI for AUs will be through a B2B dedicated ATFCM service or via an NM HMI.
- Automatic submission for “repetitive” P-FDCI would be very useful to AUs. This could represent a significant percentage of the submissions.
- P-DFCI request Under Treatment by NMF are indicated to all operational actors, to avoid uncoordinated multiple actions on the same P-FDCI request
- The NM eHelpdesk interface remains only for the R-FDCI for the Airspace Users.

- *Note: the first assumption differs with MUAC implementation. MUAC implementation allows the provision of priority information a long time ahead of operations (e.g. beginning of the season)*

Pro-active FDCI - quotas per AU

The main assumptions are:

- A P-FDCI quota is required to protect NMF.
- A specific quota for pro-active FDCI will be defined distinct from the quota for reactive FDCIs (critical flights).
- Higher number of flights can be declared as P-FDCI compared to R-FDCI flights since a percentage of P-DCI flight may never be involved in any DCB problem.
- Similar as for the quota R-FDCI (i.e. 5% of regulated flights), the quota for P-FDCI per airline will be defined as a percentage of all flights/per airline & day; i.e. 10 % of flight per day.
- For operators operating a very low number of flights/day; i.e. less than 20, an absolute number of flights per day might be defined as the maximum for P-FDCI declaration; i.e. 1-2 per day.
- In the case a P-FDCI flight turns to R-FDCI mode, it will be counted in the reactive mode quota as well.
- P-FDCI quota shall be calculated dynamically throughout the day
- NM shall apply the quota upon P-FDCI submission

Management of Pro-active FDCIs in flow management (NM regional and local levels)

Both NMOC operators and FMPs have the P-FDCI information and take it into account to:

- Coordinate for slot exemptions or force slots in regulations
- Use P-FDCI information to determine which type of DCB measures (e.g. regulation vs re-routing/level capping measures) should be applied to solve a DCB problem.

In addition, FMPs can use FDCI information – among other criteria - to determine to which flights they will apply MCP delay measures.

As new SESAR operating method, the AU Proactive Flight Delay Criticality Indicator allows the FMP to pick the flights which are less sensible to delay, which in counterpart has a positive effect on the flights that are more sensible to delay, as they are less likely to be affected by the overload situation, which will be either solved or reduced. No specific treatment in CASA (ATFCM slot allocation function) of P-FDCI flights.

In case the P-FDCI is monitored locally: the local FMP/LTM selects the flights to treat and initiate the coordination with NM
In case the P-FDCI is monitored centrally: NM (regional) selects the flights to treat and initiate the coordination with the FMP

The decision if a P-FDCI is monitored and treated locally or centrally does not require any new rule or convention, but is taken as today in operations for other subjects, dependent if the flight in question is impacted only by one local constraint or by several constraints in several FMPs AoIs.

Furthermore, in heavy network situation, FMPs should be more pro-active, to help to avoid NM would have too many P-FDCIs to treat.

In the first case the P-FDCI would be monitored locally by the FMP/LTM and in the second case it would be monitored by NMOC regionally.

In case NM works centrally on a “P-FDCI flight”, this shall be visible to local Network management (FMP) and to the concerned AU.

If the “P-FDCI flight” is treated by local Network management (FMP) this shall be equally visible via system interfaces or messages to regional Network Management (NM) and the concerned AU.

Internal NMF even a “locking” mechanism could be investigated.

This to prevent several actors try in parallel to improve the same P-FDCI flight.

As explained above, the time/delay limit is a general parameter (e.g. 10 minutes). It can be instantiated per flight through the FDCI time tolerance parameter.

As mentioned in the description of the FDCI attributes, one parameter contributing to the processes is the FDCI attribute:

- *Time tolerance*, expressed by a delay value

The second time factor, influencing the FDCI processing and status, are

- *Milestones defined by Network management, mainly linked to slot allocation; i.e. Slot Issue Time 1(SIT1) at EOBT-2H etc.*

The following diagram details the above in terms of roles and responsibilities along the time line:

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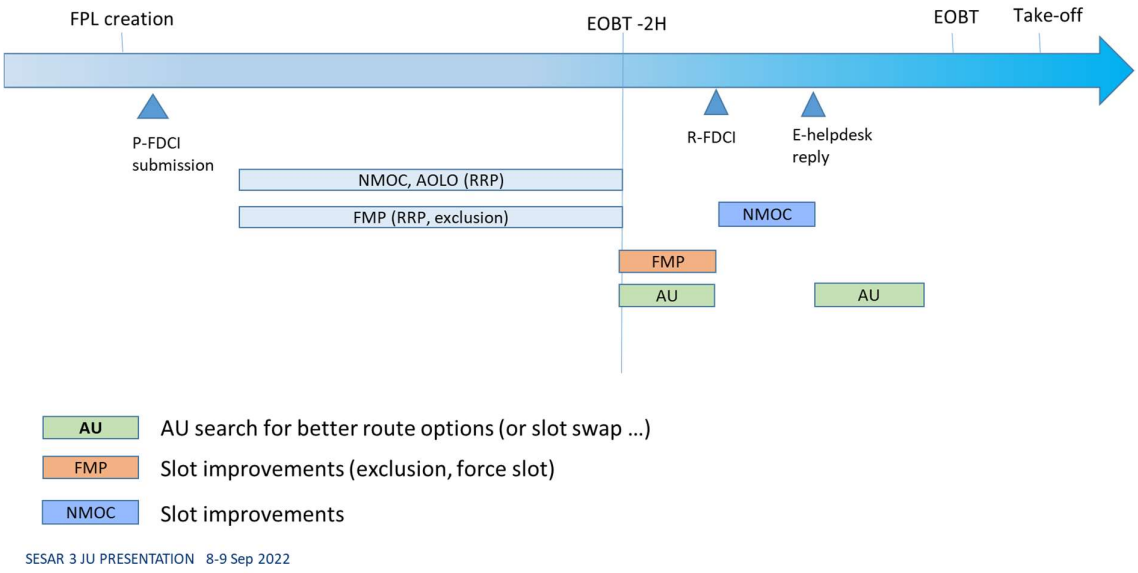

Figure 11: Roles and Responsibilities along the timeline

3.3.2.2.4 Relationship between Pro-active FDCI and UDPP

This section describes the relationship between P-FDCI and UDPP; both concepts considered AU priorities but in slightly different operational context. It was jointly developed together with PJ07 Solution 39 that focus on UDPP.

According to UDPP definition in PJ07 Solution 39, in some situations UDPP and FDCI will cohabitate.

UDPP is making use of P-FDCI in its processes. FDCI is not making use of UDPP information.

The figure below shows the time line for P-FDCI and R-FDCI related to EOBT-2H (SIT1) when typically UDPP regulation starts allocating slots:

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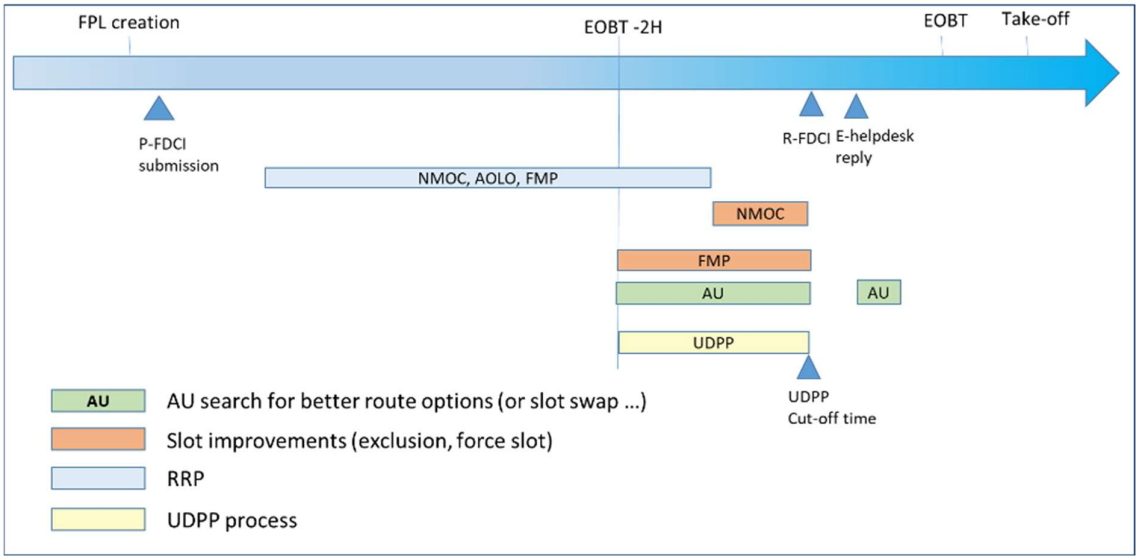

Figure 12: P-FDCI and R-FDCI on timeline

A flight which declared P-FDCI and caught by a UDPP regulation will follow the process:

1. Until SIT1 (typically EOBT-2h) NM and FMP will try to avoid affecting that flight with DCB measures.
2. If the flight is affected by a UDPP regulation and the delay is greater than the P-FDCI tolerance, before declaring R-FDCI, the AU can benefit from UDPP following the AU preferred option:
    a. Follow the usual UDPP process in place as the rest of flights and declare the preferences.
    b. Automatically translate the P-FDCI time tolerance into UDPP margins ("Time Not After") and generate the UDPP preferences. As P-FDCI does not include an equivalent to "Time Not Before" it will be allocated to 0 in this particular option.
3. AU acceptance for UDPP solution.
4. If UDPP do not mitigate the delay, AU can declare R-FDCI through NM helpdesk.

In the above step 2, the option b. has the advantage of reducing the AU workload by introducing the UDPP solution as part of the P-FDCI and UDPP potential automated actions.

P-FDCI can provide a simple mean for certain AUs to be involved in UDPP.

As already mentioned, in case of UDPP regulation, the question of P-FDCI needing to become a R-FDCI will pass through the UDPP process, before eventually need to declare R-FDCI.

In typical situations leading to UDPP, there would be very few opportunities for NM helpdesk to find solutions for R-FDCI flights, then the transit from P-FDCI to UDPP could be one of the best opportunities to mitigate the delay for such flights.

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3.3.2.2.5 Relationship between FDCI and enriched DCB

These topics are introduced in this OSED as two distinct OIs since they can be implemented independently. However when both are implemented, there are some interrelation between the two topics; such interrelation is presented in the next paragraphs.

1) **Management of critical flights in flight planning**

Obviously the criticality of a flight impacts the optimisation (or re-optimisation) process of the trajectory considering DCB situation. In particular for critical flights, the following elements must be considered:

- Current delay level triggering search for a better trajectory with tolerable delay level for critical flights being lower than for others.
- In the trajectory cost evaluation, the cost of ATFCM delay has a higher weight than other cost factors (e.g. fuel)
- The search for trajectory options minimising the risk of future delay will be even more favoured. So for critical flight a particular attention will be put on avoid Protection Hotspots when searching for alternative trajectory options.

It is thus a key requirement that criticality information is known and considered in trajectory optimisation processes. This concerns both the AU trajectory planning process and NMF trajectory proposals. In the context of the progressive automation of CDM processes, this key requirement should be extended to concerned systems.

2) Management of critical flights in Protection hotpots

The rule related to infringers presented in section **Error! Reference source not found.** can be extended as follows considering critical flights.

In case a TV protected by a protection hotspot becomes overloaded and requires the activation of DCB measures then:

- Protection hotspot infringers which have FDCI should try to be excluded from DCB measures.
- Protection hotspot infringers which have no FDCI will be penalised in priority though cherry picking measures if this does not affect the efficiency of the resolution of the problem (both at local and network levels).
- If a regulation is activated, regulation exclusion will be envisaged only for non-infringer critical flights.

3.3.2.2.6 Post Operations Analysis

The Post Ops services focus on, for example, a Daily Basis feedback from the AU to better understand their reactions in case of looking for re-routings.

The target is to improve future operations through this type of feedback.

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To further consolidate the new SESAR Operating Method as proposed in the Solution 38 Concept , it is relevant to have a clear understanding of the post operation information.

This understanding can be obtained through notably post operations analysis using the post ops data that are logged during several months. Through this analysis, the usage of the rerouting services by the AU (through for instance the AOWIR Service) could be better understood. And so adaptations/evolutions can be proposed to obtain the expected benefits.

Post ops analysis could be done on all Flight Plan changes (rerouting, vertical changes) due to ATFCM reasons. This includes:

- All FPL changes performed by AU using AOWIR-like services (including when auto-refiling) to avoid ATFCM delay.
- All FPL changes submitted by AU to avoid ATFCM delay not using any NM DCB what-if service.

Note: FPL cancellation and refiling are considered as FPL change.

Two types of needs can be distinguished:

- “strategic analysis” : statistics over large period of time (i.e. 1 month, 1 year of traffic) to get general trends and parameters. Mainly use in the ATFCM strategic phase
- “fined tuned analysis” : analysis on one day traffic to get fine-tuned information on the impact of re-routings as input to improve pre-tactical and tactical operations.

Beyond the above examples, Solution 38 developed the Post Operational Data requirements for both, P-FDCI and enhanced DCB, which are available in Section 4 SPR-INTEROP Requirements of this OSED.

3.3.2.3 Use Cases

3.3.2.3.1 Use Cases for [NOV-2] AU usage of Enriched DCB

The overview of use cases, operational actors and information exchange needs supporting the AU flight planning with enriched DCB information.

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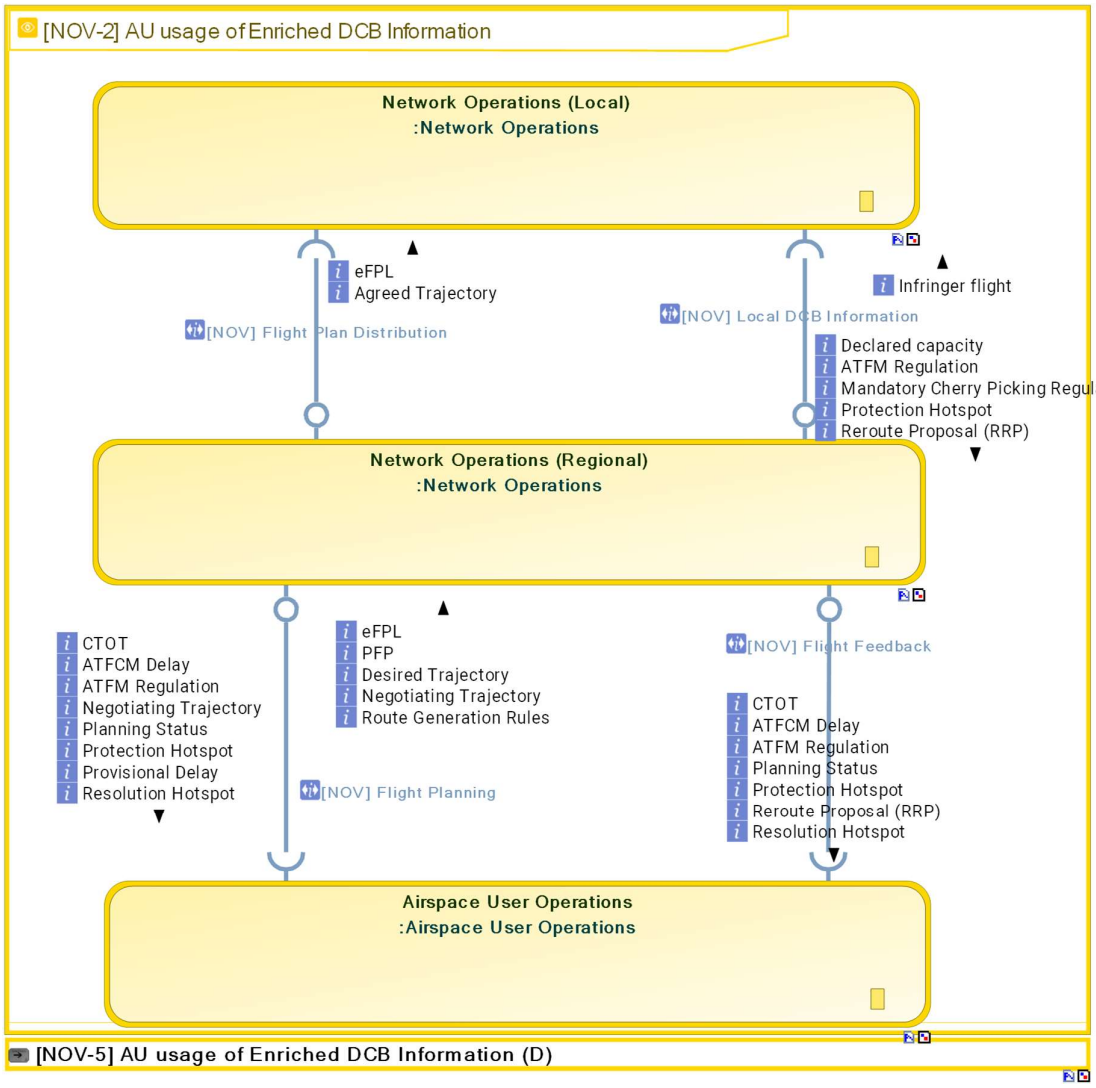

Figure 13: [NOV-2] AU usage of Enriched DCB Information

3.3.2.3.1.1 [NOV-5] AU usage of Enriched DCB Information (D)

This use case describes the AU usage of Enriched DCB information, including Hotspot (Protection & Resolution) and infringing flights, to optimise the trajectory planning.

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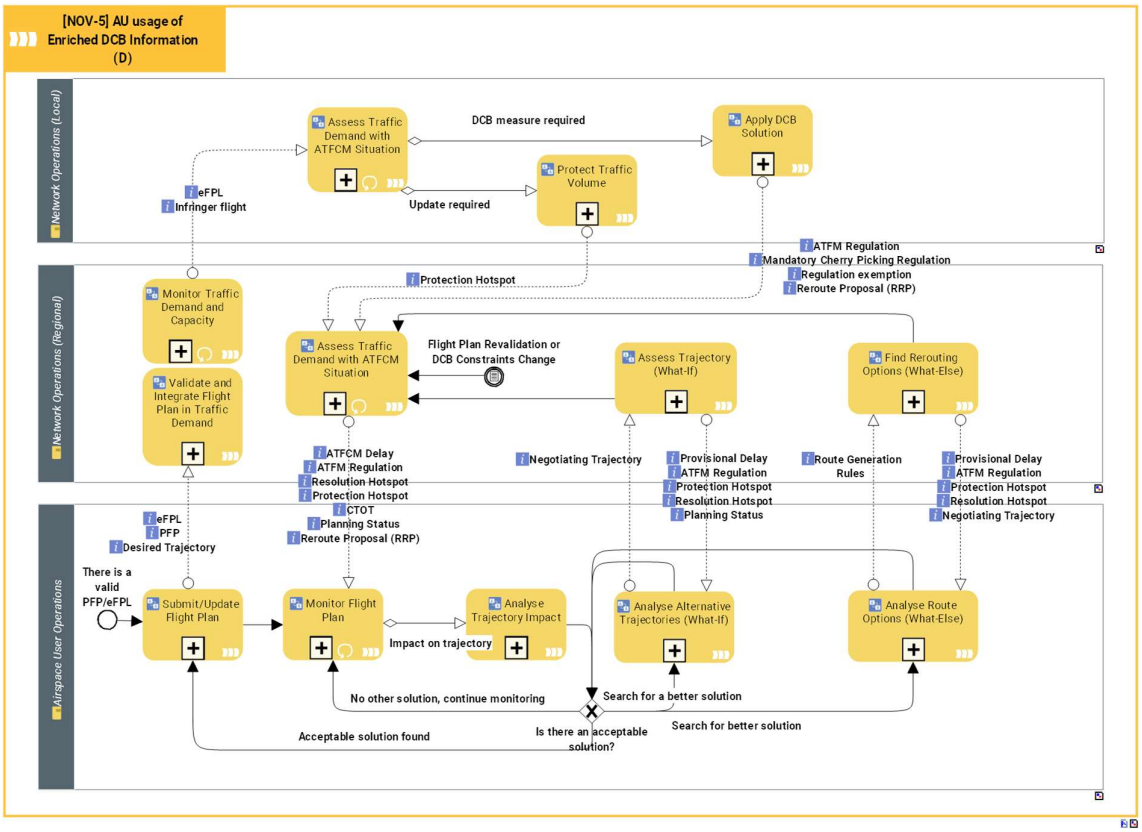

Figure 14: [NOV-5] AU usage of Enriched DCB Information

Activity	Description
Analyse Alternative Trajectories (What-If)	Look for alternative trajectories based on operational route library in order to avoid the DCB measures and ask to analyse the DCB impact on the alternative trajectories. The alternative trajectory might avoid crossing hotspots that could result in double penalization such as re-routing and the increased severity of the hotspot due to new traffic load.
Analyse Route Options (What-Else)	When the DCB measures impact a flight, ask for alternative trajectory options in order to avoid the DCB measures, and analyses the DCB impact of the alternative trajectories. The alternative trajectory will avoid crossing hotspots that could result in double penalization (the rerouting and the increased severity of the hotspot due to new unexpected traffic load).
Analyse Trajectory Impact	Analyse the DCB impact on the trajectory with respect to the AU policies.
Apply DCB Solution	The DCB solution is adjusted if necessary

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Assess Traffic Demand with ATFCM Situation	Assess the impact of the Flight plan in terms of FUA Constraints, Dynamic Airspace Constraints, Delay, ATFCM Regulation, Hotspot, and congested area. Inform the AU with the assessment result.
Assess Traffic Situation	The Controlling ATSU, due to the evolving traffic situation, may elect to cancel the CTA.
Assess Trajectory (What-If)	Validate and provide the DCB impact assessment on the AU provided trajectory.
Find Rerouting Options (What-Else)	Provide rerouting alternatives to AU trajectory with corresponding DCB Impact Assessments.
Monitor Flight Plan	Monitor the flight plan and assess the need to find alternative trajectory due the DCB impact on the flights.
Monitor Traffic Demand and Capacity	Monitor the traffic demand versus airspace capacity continuously and report on the imbalances.
Protect Traffic Volume	Define a protection hotspot on the traffic volume in order to inform the airspace users to avoid the traffic volume for a time period.
Submit/Update Flight Plan	Create a new PFP/eFPL or update a PFP/eFPL, which is already submitted.
Validate and Integrate Flight Plan in Traffic Demand	Validate the flight plan against the flight plan processing rules and mandatory airspace constraints. Distribute and integrate the flight plan in traffic demand when the flight plan is valid. Re-validate the flight plan regularly with respect to the most recent airspace constraints. Update the flight information with the most up-to-date capacity information.

Table 6 :[NOV-5] Activity and Description

Issuer	Info Flow	Addressee	Info Element	Info Entity
Airspace User Operations	Analyse Route Options (What-Else) o--> Find Rerouting Options (What-Else)	Network Operations (Regional)	Route Generation Rules	
Airspace User Operations	Submit/Update Flight Plan o--> Validate and Integrate Flight Plan in Traffic Demand	Network Operations (Regional)	eFPL	
Airspace User Operations	Submit/Update Flight Plan o--> Validate and Integrate Flight Plan in Traffic Demand	Network Operations (Regional)	Desired Trajectory	

Issuer	Info Flow	Addressee	Info Element	Info Entity
Airspace User Operations	Submit/Update Flight Plan o--> Validate and Integrate Flight Plan in Traffic Demand	Network Operations (Regional)	PFP	
Airspace User Operations	Analyse Alternative Trajectories (What-If) o--> Assess Trajectory (What-If)	Network Operations (Regional)	Negotiating Trajectory	Trajectory
Network Operations (Regional)	Assess Trajectory (What-If) o--> Analyse Alternative Trajectories (What-If)	Airspace User Operations	Planning Status	
Network Operations (Regional)	Assess Trajectory (What-If) o--> Analyse Alternative Trajectories (What-If)	Airspace User Operations	Protection Hotspot	
Network Operations (Regional)	Assess Trajectory (What-If) o--> Analyse Alternative Trajectories (What-If)	Airspace User Operations	Resolution Hotspot	
Network Operations (Regional)	Assess Trajectory (What-If) o--> Analyse Alternative Trajectories (What-If)	Airspace User Operations	Provisional Delay	ATFMDelay
Network Operations (Regional)	Assess Trajectory (What-If) o--> Analyse Alternative Trajectories (What-If)	Airspace User Operations	ATFM Regulation	ATFMRegulation
Network Operations (Regional)	Find Rerouting Options (What-Else) o--> Analyse Route Options (What-Else)	Airspace User Operations	Negotiating Trajectory	Trajectory

Issuer	Info Flow	Addressee	Info Element	Info Entity
Network Operations (Regional)	Find Rerouting Options (What-Else) o--> Analyse Route Options (What-Else)	Airspace User Operations	Protection Hotspot	
Network Operations (Regional)	Find Rerouting Options (What-Else) o--> Analyse Route Options (What-Else)	Airspace User Operations	Resolution Hotspot	
Network Operations (Regional)	Find Rerouting Options (What-Else) o--> Analyse Route Options (What-Else)	Airspace User Operations	Provisional Delay	ATFMDelay
Network Operations (Regional)	Find Rerouting Options (What-Else) o--> Analyse Route Options (What-Else)	Airspace User Operations	ATFM Regulation	ATFMRegulation
Network Operations (Local)	Apply DCB Solution o--> Assess Traffic Demand with ATFCM Situation	Network Operations (Regional)	Regulation exemption	
Network Operations (Local)	Apply DCB Solution o--> Assess Traffic Demand with ATFCM Situation	Network Operations (Regional)	Reroute Proposal (RRP)	
Network Operations (Local)	Apply DCB Solution o--> Assess Traffic Demand with ATFCM Situation	Network Operations (Regional)	ATFM Regulation	ATFMRegulation
Network Operations (Local)	Apply DCB Solution o--> Assess Traffic Demand with ATFCM Situation	Network Operations (Regional)	Mandatory Cherry Picking Regulation	
Network Operations (Regional)	Monitor Traffic Demand and Capacity o--> Assess Traffic Demand with ATFCM Situation	Network Operations (Local)	eFPL	

Issuer	Info Flow	Addressee	Info Element	Info Entity
Network Operations (Regional)	Monitor Traffic Demand and Capacity o--> Assess Traffic Demand with ATFCM Situation	Network Operations (Local)	Infringer flight	
Network Operations (Local)	Protect Traffic Volume o--> Assess Traffic Demand with ATFCM Situation	Network Operations (Regional)	Protection Hotspot	
Network Operations (Regional)	Assess Traffic Demand with ATFCM Situation o--> Monitor Flight Plan	Airspace User Operations	Planning Status	
Network Operations (Regional)	Assess Traffic Demand with ATFCM Situation o--> Monitor Flight Plan	Airspace User Operations	Protection Hotspot	
Network Operations (Regional)	Assess Traffic Demand with ATFCM Situation o--> Monitor Flight Plan	Airspace User Operations	Resolution Hotspot	
Network Operations (Regional)	Assess Traffic Demand with ATFCM Situation o--> Monitor Flight Plan	Airspace User Operations	Reroute Proposal (RRP)	
Network Operations (Regional)	Assess Traffic Demand with ATFCM Situation o--> Monitor Flight Plan	Airspace User Operations	ATFCM Delay	ATFMDelay
Network Operations (Regional)	Assess Traffic Demand with ATFCM Situation o--> Monitor Flight Plan	Airspace User Operations	CTOT	CalculatedTakeOffTime
Network Operations (Regional)	Assess Traffic Demand with ATFCM Situation o--> Monitor Flight Plan	Airspace User Operations	ATFM Regulation	ATFMRegulation

Table 7 :[NOV-5] Information element and flow details

Info Element	Description
ATFCM Delay	Departure or en-route delay allocated to a flight by the Network Manager before the departure.
ATFM Regulation	ATFM regulations sequence the traffic entering a protected capacity constrained location (airports, points or airspace within an altitude range) over a time period, by dividing this time period into a number of flight time entries (slots) based on a maximum available capacity and allocating to every flight that requests entry to the location, an available slot, otherwise, if there is no available slot, by shifting the flight entry at the end of the ATFM regulation time period.
CTOT	Descriptionn: CTOT (Calculated Time of Take-Off) is a delayed Take-Off Time, as computed by Network Management in case that a flight is affected by an ATFM regulation, in order to ensure that the flight's 4D trajectory is time shifted so as to enter the ATFM regulated area or airport, at the Target Time on the entry point (TTO) or arrival (TTA) respectively.
Desired Trajectory	The current 4D trajectory that is requested and generated by the airspace user with knowledge of the ATM systems' configuration and published restrictions. [ICAO FF-ICE Manual 0.96] It is the trajectory as filed by the AU to NM. As such, it expresses the trajectory determined by the AU that best meet its needs while complying with the published ATM constraints. It is not the AU preferred trajectory, which ideally would be completely unconstrained in all dimensions as if being alone in the sky. [In the European context]
eFPL	The flight plan as filed with an ATM Service Provider by the pilot or a designated representative, without any subsequent changes (Ref. ATMRPP/2-718 FF-ICE Provisions - 21/10/16)

Infringer flight	If a re-filing flight on loads a protection hotspot, the flight will be considered as a protection hotspot infringer.
Mandatory Cherry Picking Regulation	A Mandatory Cherry Pick regulation (MCP) is used as a measure to solve short peaks (e.g. 1h or 1h 30min) of limited number of flights in congested areas. It consists of selecting flights creating complexity and applying ATFCM measures only to those flights. It may be used in combination with other measures (e.g. scenario) or other options available to the FMP. The identification of the flights to be subject to the Network cherry pick measure shall be carried out by the FMP and the delay for cherry picked flights should not exceed 20 minutes. For predictability reasons, it is recommended to apply MCP to flights close to the congested area and try to minimize the lead-time of the MCP regulation prior the start time of the hotspot.
Negotiating Trajectory	A 4D trajectory proposed by airspace user or eASP as a potential agreed 4D trajectory. Explanation: For trajectory planning purposes, multiple trajectories may be required. However, each participant would be allowed only one negotiating 4D trajectory at a time, which represents their most recent proposal in the negotiation. These trajectories may not necessarily be a gate-to-gate trajectory. These trajectories are intended to be transitory. [ICAO FF-ICE Manual 0.96]
PFP	The flight plan submitted by an operator or a designated representative to conduct collaborative planning of a flight, prior to filing a flight plan for use by ATS units.
Planning Status	The expected operational acceptability and applicable constraints for a submitted Preliminary Flight Plan. Ref: {ATMRPP2 WP 718 FF-ICE Provisions Consolidated, Montreal, Canada 14 to 18 November 2016}
Protection Hotspot	Hotspot associated to a traffic volume usually close to saturation, protects an airspace from undesired rerouted flights and prevents the application of DCB measures (e.g. ATFCM regulation, cherry picking measures).
Provisional Delay	The indicative and non-final ATFCM delay incurred by a flight subject to a CASA regulation before the time at which the slot is issued 2 hours before EOBT. This delay may vary because of, for instance, slot revision, which re-assigns the slots dynamically in function of the changing traffic demand.

Regulation exemption	Excluding a flight from an ATFCM measure.
Reroute Proposal (RRP)	Rerouting Proposal for a specific flight issued by NMF to the Airspace User to solve a demand and capacity problem.
Resolution Hotspot	Hotspot associated to an overloaded traffic volume and for which the FMP plan to apply DCB measures (cherry-picking/STAM measures principally) to solve the overload.
Route Generation Rules	The rules provided by the AU to follow when proposing alternative routes, such as avoiding or going through certain airspaces, routes, points, regulations, hotspots.

Table 8:[NOV-5] Information element and description

3.3.2.3.2 Use Cases for [NOV-2] Proactive FDCI

The overview of use cases, operational actors and information exchange needs supporting the AU flight planning with enriched DCB information.

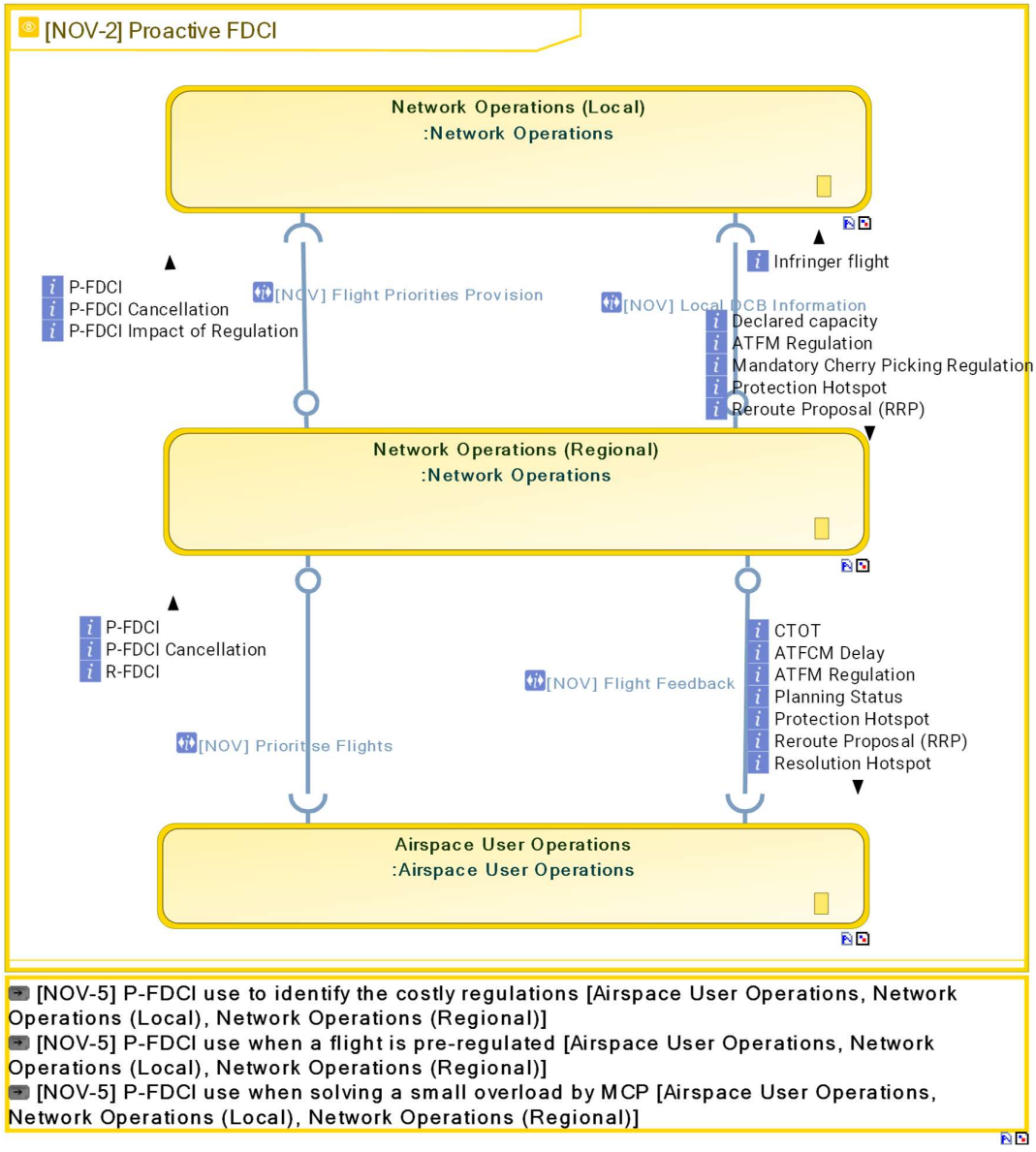

Figure 15: [NOV-2] Proactive P-FDCI

3.3.2.3.2.1 [NOV-5] P-FDCI use to identify the costly regulations

This UC describes the use of P-FDCI by NO (Regional or Local) to identify the costly regulations, which are those with a high number of P-FDCI flights.
Network Operations (Regional) will identify regulations with high number of P-FDCI flights and coordinate with concerned Network Operation (local) actors (or vice versa for locally monitoring FMPs) to coordinate and agree the better mitigation measures.

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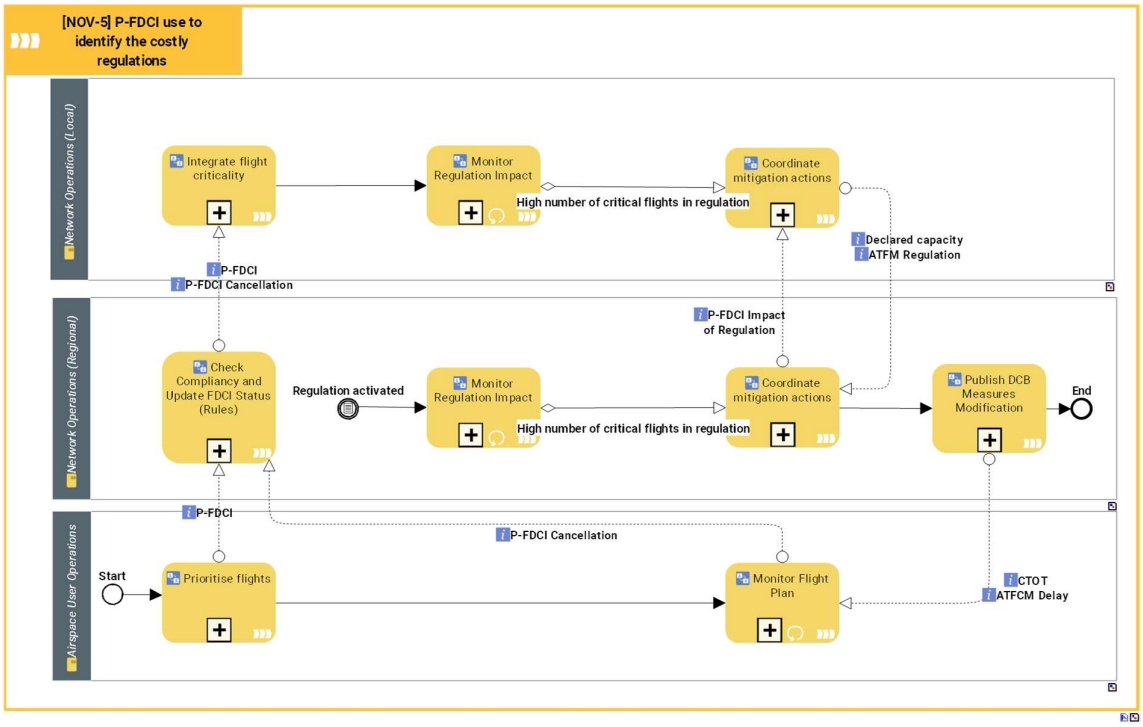

Figure 16: [NOV-5] Proactive P-FDCI to identify costly regulations

Activity	Description
Check Compliancy and Update FDCI Status (Rules)	Check FDCI compliancy against defined rules.
Coordinate mitigation actions	Coordination of mitigations actions between NO (Regional) and NOs (Local) or vice- versa to reduce the impact P-FDCI flights.
Integrate flight criticality	Integrate the P-FDCI in the data set and processes.
Monitor Flight Plan	Monitor the flight plan and assess the need to find alternative trajectory due the DCB impact on the flights.
Monitor Regulation Impact	Once the regulation was activated, monitor the number of P-FDCI flights concerned.
Prioritise flights	Analyse the flight program and determine the priority of those critical flights to be protected.
Publish DCB Measures Modification	Publish the coordinated and agreed DCB measure modifications.

Table 9 :[NOV-5] Activity and Description

Issuer	Info Flow	Addressee	Info Element	Info Entity
Airspace User Operations	Monitor Flight Plan o--> Check Compliancy and Update FDCI Status (Rules)	Network Operations (Regional)	P-FDCI Cancellation	
Network Operations (Regional)	Check Compliancy and Update FDCI Status (Rules) o--> Integrate flight criticality	Network Operations (Local)	P-FDCI	
Network Operations (Regional)	Check Compliancy and Update FDCI Status (Rules) o--> Integrate flight criticality	Network Operations (Local)	P-FDCI Cancellation	
Network Operations (Regional)	Coordinate mitigation actions o--> Coordinate mitigation actions	Network Operations (Local)	P-FDCI Impact of Regulation	
Airspace User Operations	Prioritise flights o--> Check Compliancy and Update FDCI Status (Rules)	Network Operations (Regional)	P-FDCI	
Network Operations (Local)	Coordinate mitigation actions o--> Coordinate mitigation actions	Network Operations (Regional)	Declared capacity	Capacity
Network Operations (Local)	Coordinate mitigation actions o--> Coordinate mitigation actions	Network Operations (Regional)	ATFM Regulation	ATFMRegulation
Network Operations (Regional)	Publish DCB Measures Modification o--> Monitor Flight Plan	Airspace User Operations	ATFCM Delay	ATFMDelay
Network Operations (Regional)	Publish DCB Measures Modification o--> Monitor Flight Plan	Airspace User Operations	CTOT	CalculatedTakeOffTime

Table 10 :[NOV-5] Information element and flow details

3.3.2.3.2.2 [NOV-5] P-FDCI use when a flight is pre-regulated

This UC describes the use of P-FDCI by NO (Regional or Local) for flights that are pre-regulated, i.e. that received a provisional delay.

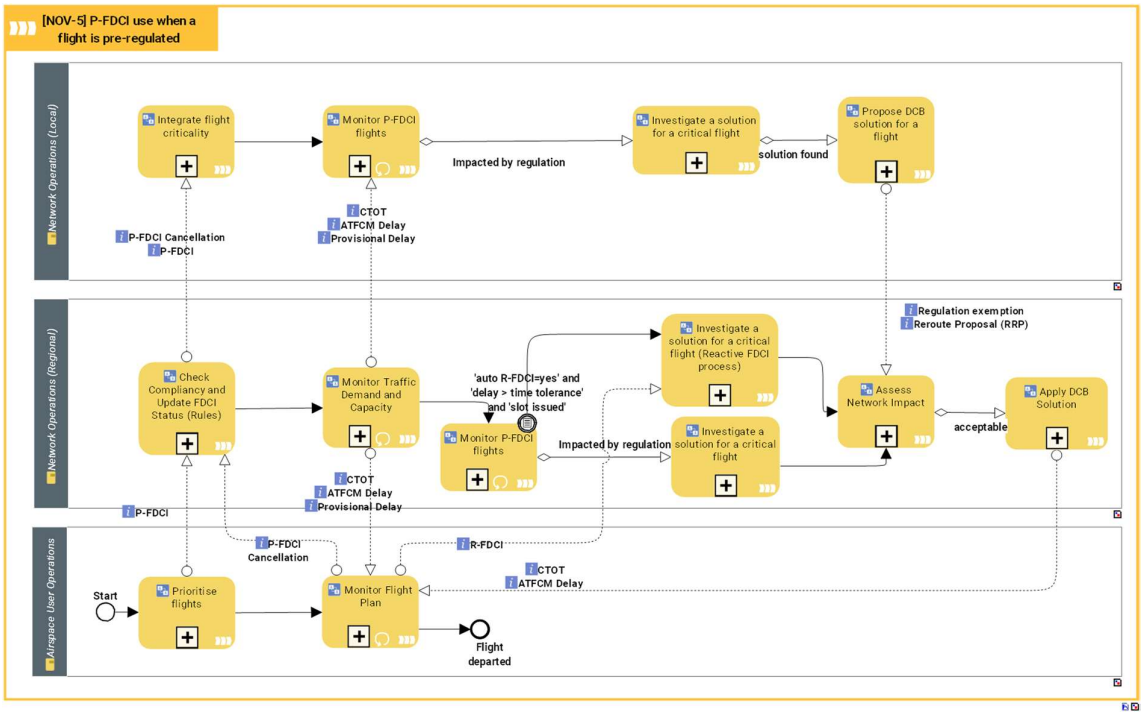

Figure 17: [NOV-5] P-FDCI use when a flight is pre-regulated

Activity	Description
Apply DCB Solution	The DCB solution is adjusted if necessary
Assess Network Impact	Assess the trajectory impact on the network, in terms of traffic load and measures.
Check Compliancy and Update FDCI Status (Rules)	Check FDCI compliancy against defined rules.
Integrate flight criticality	Integrate the P-FDCI in the data set and processes.
Investigate a solution for a critical flight	Investigate a solution for a P-FDCI flight impacted by a regulation.
Investigate a solution for a critical flight (Reactive FDCI process)	Investigate a solution for a R-FDCI flight impacted by a delay greater than the time tolerance defined by the AU.
Monitor Flight Plan	Monitor the flight plan and assess the need to find alternative trajectory due the DCB impact on the flights.
Monitor P-FDCI flights	Monitor the potential delay for P-FDCI flights.

Monitor Traffic Demand and Capacity	Monitor the traffic demand versus airspace capacity continuously and report on the imbalances.
Prepare and coordinate DCB solutions at Network level	[DOD 7.2 modelling] DCB solutions are prepared sufficiently in advance at network level and coordinated with Flow Managers, Local Traffic Managers and Airspace Users.
Prioritise flights	Analyse the flight program and determine the priority of those critical flights to be protected.
Propose DCB solution for a flight	Propose DCB solutions among the following options: Regulation Exemption, Reroute Proposal (RRP).

Table 11 :[NOV-5] Activity and Description

Issuer	Info Flow	Addressee	Info Element	Info Entity
Network Operations (Regional)	Monitor Traffic Demand and Capacity o--> Monitor Flight Plan	Airspace User Operations	ATFCM Delay	ATFMDelay
Network Operations (Regional)	Monitor Traffic Demand and Capacity o--> Monitor Flight Plan	Airspace User Operations	Provisional Delay	ATFMDelay
Network Operations (Regional)	Monitor Traffic Demand and Capacity o--> Monitor Flight Plan	Airspace User Operations	CTOT	CalculatedTakeOffTime
Airspace User Operations	Prioritise flights o--> Check Compliancy and Update FDCI Status (Rules)	Network Operations (Regional)	P-FDCI	
Network Operations (Regional)	Check Compliancy and Update FDCI Status (Rules) o--> Integrate flight criticality	Network Operations (Local)	P-FDCI	
Network Operations (Regional)	Check Compliancy and Update FDCI Status (Rules) o--> Integrate flight criticality	Network Operations (Local)	P-FDCI Cancellation	

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Issuer	Info Flow	Addressee	Info Element	Info Entity
Airspace User Operations	Monitor Flight Plan o--> Check Compliancy and Update FDCI Status (Rules)	Network Operations (Regional)	P-FDCI Cancellation	
Network Operations (Regional)	Apply DCB Solution o--> Monitor Flight Plan	Airspace User Operations	ATFCM Delay	ATFMDelay
Network Operations (Regional)	Apply DCB Solution o--> Monitor Flight Plan	Airspace User Operations	CTOT	CalculatedTakeOffTime
Network Operations (Local)	Propose DCB solution for a flight o--> Assess Network Impact	Network Operations (Regional)	Regulation exemption	
Network Operations (Local)	Propose DCB solution for a flight o--> Assess Network Impact	Network Operations (Regional)	Reroute Proposal (RRP)	
Network Operations (Regional)	Monitor Traffic Demand and Capacity o--> Monitor P-FDCI flights	Network Operations (Local)	ATFCM Delay	ATFMDelay
Network Operations (Regional)	Monitor Traffic Demand and Capacity o--> Monitor P-FDCI flights	Network Operations (Local)	Provisional Delay	ATFMDelay
Network Operations (Regional)	Monitor Traffic Demand and Capacity o--> Monitor P-FDCI flights	Network Operations (Local)	CTOT	CalculatedTakeOffTime
Airspace User Operations	Monitor Flight Plan o--> Investigate a solution for a critical flight (Reactive FDCI process)	Network Operations (Regional)	R-FDCI	

Table 12 :[NOV-5] Information element and flow details

3.3.2.3.2.3 [NOV-5] P-FDCI use when solving a small overload by MCP

This UC describes the use of P-FDCI by NO (Regional or Local) to take a better decision through Mandatory Cherry Picking (MCP) measure.

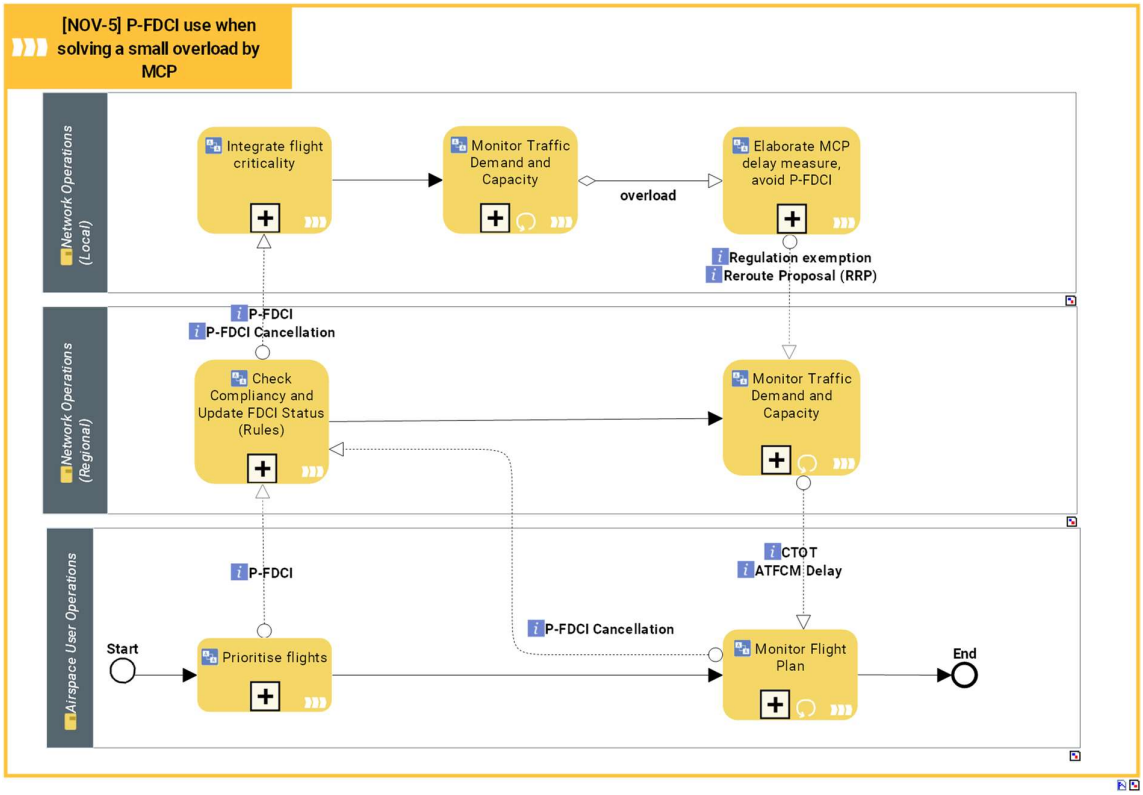

Figure 18: [NOV-5] P-FDCI use when solving a small overload by MCP

Activity	Description
Avoid P-FDCI in the Mandatory Cherry Picking Decision	In case there are several flights of the same AU that are candidates for a Mandatory Cherry Picking, the information provided by the Airspace User can help the LTM to select the flights that are less penalizing for the AU.
Check Compliancy and Update FDCI Status (Rules)	Check FDCI compliancy against defined rules.
Elaborate MCP delay measure, avoid P-FDCI	Elaborate MCP delay measures to solve small overloads trying to avoid the P-FDCI flights.
Integrate flight criticality	Integrate the P-FDCI in the data set and processes.

Monitor Flight Plan	Monitor the flights and assess the need to find alternative trajectory due the DCB impact on the flight plan.
Monitor Traffic Demand and Capacity	Monitor the traffic demand versus airspace capacity continuously and report on the imbalances.
Prioritise flights	Analyse the flight program and determine the priority of those critical flights to be protected.

Table 13: [NOV-5] Activity and Description

Issuer	Info Flow	Addressee	Info Element	Info Entity
Airspace User Operations	Prioritise flights o--> Check Compliancy and Update FDCI Status (Rules)	Network Operations (Regional)	P-FDCI	
Network Operations (Local)	Elaborate MCP delay measure, avoid P-FDCI o--> Monitor Traffic Demand and Capacity	Network Operations (Regional)	Regulation exemption	
Network Operations (Local)	Elaborate MCP delay measure, avoid P-FDCI o--> Monitor Traffic Demand and Capacity	Network Operations (Regional)	Reroute Proposal (RRP)	
Network Operations (Regional)	Monitor Traffic Demand and Capacity o--> Monitor Flight Plan	Airspace User Operations	ATFCM Delay	ATFMDelay
Network Operations (Regional)	Monitor Traffic Demand and Capacity o--> Monitor Flight Plan	Airspace User Operations	CTOT	CalculatedTakeOffTime
Airspace User Operations	Monitor Flight Plan o--> Check Compliancy and Update FDCI Status (Rules)	Network Operations (Regional)	P-FDCI Cancellation	

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Issuer	Info Flow	Addressee	Info Element	Info Entity
Network Operations (Regional)	Check Compliancy and Update FDCI Status (Rules) o--> Integrate flight criticality	Network Operations (Local)	P-FDCI	
Network Operations (Regional)	Check Compliancy and Update FDCI Status (Rules) o--> Integrate flight criticality	Network Operations (Local)	P-FDCI Cancellation	

Table 14: [NOV-5] Information element and flow details

Info Element	Description
ATFCM Delay	Departure or en-route delay allocated to a flight by the Network Manager before the departure.
ATFM Regulation	ATFM regulations sequence the traffic entering a protected capacity constrained location (airports, points or airspace within an altitude range) over a time period, by dividing this time period into a number of flight time entries (slots) based on a maximum available capacity and allocating to every flight that requests entry to the location, an available slot, otherwise, if there is no available slot, by shifting the flight entry at the end of the ATFM regulation time period.
CTOT	Descriptionn: CTOT (Calculated Time of Take-Off) is a delayed Take-Off Time, as computed by Network Management in case that a flight is affected by an ATFM regulation, in order to ensure that the flight's 4D trajectory is time shifted so as to enter the ATFM regulated area or airport, at the Target Time on the entry point (TTO) or arrival (TTA) respectively.
Declared capacity	A measure of the ability of the ATC system or any of its subsystems or operating positions to provide service to aircraft during normal activities. It is expressed as the number of aircraft entering a specified portion of airspace in a given period of time, taking due account of weather, ATC unit

	configuration, staff and equipment available, and any other factors that may affect the workload of the controller responsible for the airspace.
P-FDCI	Issued for really critical flights, with no reported delay yet and before any DCB measure is allocated to the flight. The intention is that NMF consider this information before implementing any measure.
P-FDCI Cancellation	The flight is no longer critical.
P-FDCI Impact of Regulation	The P-FDCI flights impacted by a ATFM regulation
Provisional Delay	The indicative and non-final ATFCM delay incurred by a flight subject to a CASA regulation before the time at which the slot is issued 2 hours before EOBT. This delay may vary because of, for instance, slot revision, which re-assigns the slots dynamically in function of the changing traffic demand.
R-FDCI	Reactive Flight Delay Criticality Indicator: flight criticality submitted to NM, as a reaction to a delay, after SIT1.
Regulation exemption	Excluding a flight from an ATFCM measure.
Reroute Proposal (RRP)	Rerouting Proposal for a specific flight issued by NMF to the Airspace User to solve a demand and capacity problem.

Table 15:[NOV-5] Information element and description

3.3.3 Differences between new and previous Operating Methods

Activities (in EATMA) that are impacted by the SESAR Solution	Current Operating Method	New Operating Method
Define/Update User Preferences	AU call to helpdesk to mitigate DCB measures affecting specific critical flights.	AU defines or updates the flight preferences to help NMF on the decision making when selecting a flight for STAM.
Preliminary Flight Plan Assessment/Re-assessment on Network Impact	AU receive information on the DCB measures affecting their flight and have access to general information on the NOP situation (Declared regulations, etc). AU can use the AOWIR tool to assess	In addition to current operating method NMF send via B2B new enriched DCB information to AU, allowing them to integrate the information into their system to make better decisions regarding

	alternative trajectories based on DCB measures information. Or can directly refile using proposed rerouting from their system.	the possible network situation evolution using between others congestion level indicators, hotspots.

Table 16: Differences between new and previous Operating Method

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4 Safety, Performance and Interoperability Requirements (SPR-INTEROP)

The identifiers of all requirements are assigned in accordance with the following syntax:

<Object type>-<Solution code>-<Document code>-<Category code><Operational Node code>.<Reference number>

e.g.: REQ-07.03-SPRINTEROP-UUNN.0123

The characters between the symbols < and > denote a keyword, and the symbols < and > are not part of the actual identifier. The keywords adhere to the following rules:

- For all requirements the object type is "REQ".
- For all requirements developed by solution PJ.07 Solution 38 the code is “07.38”
- For all SPR-INTEROP/OSED requirements the document code is “SPRINTEROP”
- For all operational requirements the category code is "OP".
- For all safety requirements the category code is "SF".
- For all security requirements the category code is "SC".
- For all human performance requirements the category code is "HP".
- For all information exchange requirements the category code is "IE".
- For all interoperability requirements the category code is "IO".
- For all W1 requirements not addressed in W2 (=deleted), the category code is "DL".
- For all requirements related to the topic “Enriched DCB” the operational node code is "01".
- For all requirements related to the topic “P-FDCI” the operational node code is "02".
- For all requirements related to the combined topic “P-FDCI and Enriched DCB” the operational node code is "03".
- For all requirements related to the topic “PFP&CLI” the operational node code is "04"
- For all requirements the reference number is made of four alphanumeric characters.

Requirement text:

For the formulation of requirements, the rules provided in the SESAR Requirements and Validation Guidelines **Error! Reference source not found.** have been applied. Hence, the requirements contain at least a subject and a statement where the subject is the object under discussion (e.g. operational node), and the statement is a condition, action, intended result or target objective.

The following generic way has been used to write the requirements:

<Object> shall OR should OR may <verb> <Statement>

- Requirements are marked by the use of the verb "shall".
- Recommendations are marked by the use of the verb "should".

- Permissions are marked by the use of the verb "may".

Those requirements considered “MANDATORY”, i.e. that are considered mandatory for the initial deployment package are expressed with the verb “shall” highlighted in bold. Non mandatory requirements (recommendations) can be deployed additionally later, step-by-step, without impacting the core functionality of the two main conceptual topics E-DCB and P-FDCI and are expressed with the verb “should”.

Rationale:

The rationale has been used to provide information such as justification of the allocation or Explanation about the requirement formulation.

Requirements Tracing:

The REQ Trace table contains the links in accordance with SESAR Requirements and V&V Guidelines [to be added in “Reference Documents section].

4.1 Operational Requirements

4.1.1 Operational Enriched DCB requirements

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP01.0001
Title	Provision (initial and/or update) of DCB constraints to the AU.
Requirement	When ATFM Regulations affect a flight plan, Network Operations (Regional) should send (initial and/or updates) to the AU a Planning Status reply with the ATFM Regulations including the relevant DCB trajectory measures (like CTOTs and re-routings and level capping).
Status	<in progress>
Rationale	The sharing of constraints (initial and subsequent updates) will provide common situational awareness, which will improve the AU decision making process and the trajectories negotiation between the AU and Network Operations (Regional). Whenever a DCB constraints impact a Flight Plan, the AU should be informed.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP01.0002
Title	Trajectory negotiation between AU and Network Operations (Regional)
Requirement	The AU according with their criteria **shall** be able to try alternative trajectories or ask for trajectory proposals enhanced with the associated enriched DCB information (protection hotspots).
Status	<validated>
Rationale	A trajectory negotiation between AU and Network Operations (Regional) in some cases will provide a new solution for the AU mitigating the negative effect of the initial proposal meanwhile it will continue providing a solution to the DCB situation. Also in the context of the progressive automation of CDM processes for trajectory replanning considering flow management situation, protection hotspots information sharing should contribute to protect the stability of the Network and FOC operational planning activities and avoid high frequency iterations of flight plans updates.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP01.0003
Title	Provision (initial and/or update) of Enriched DCB information in Planning Status.
Requirement	If a Flight plan with Desired Route/Trajectory is submitted to Network Operations (Regional), Network Operations (Regional) should extend the Planning Status reply to include (initial and subsequent updates) enriched DCB information along the submitted Desired Route/Trajectory.
Status	<in progress >
Rationale	To inform the AU with enriched DCB information along the submitted Desired Route/Trajectory. AU efficient monitoring of enriched DCB information related to flight trajectory is relevant to anticipate AU decision making to mitigate the undesirable effect, improving both the efficiency of the action and the stability and predictability of the Network.
Category	<Operational> <Safety>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP01.0004
Title	Network Operations (Local) Threshold and Alert for unplanned flights
Requirement	NO local should define threshold values for unplanned flights and be alerted when these are reached. The information shall be available in operations and for post operational analysis at NO local and regional level.
Status	<in progress>
Rationale	To support NO local by an automatic alert in the monitoring of unplanned flights. This will also permit to reduce the workload associated to the management of these situations.
Category	<Operational> <Safety>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP01.0005
Title	Declaration of Protection Hotspot
Requirement	Network Operations (Local) **shall** be able to declare Protection Hotspot and provide the information to the Network Operations (Regional).
Status	<validated>
Rationale	To avoid a re-planning of an AU trajectory through a TV close to a saturated one or to create flow management flexibility, the Network Operations (Local) declares the Protection Hotspot and provide the information to the Network Operations (Regional).
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	SOL38
<ALLOCATED_TO>	<Activity>	Protect Traffic Volume
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP01.0006
Title	Identification of Protection Hotspot infringer flights
Requirement	Network Operations **shall** be able to identify flights which have refiled their flights for ATFCM reasons through a Protection Hotspot.
Status	<validated>
Rationale	Those flights are not respecting the Protection Hotspot by refiling their flight plans through it.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	NO

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP01.0007
Title	Infringer FPL reply information to AU
Requirement	Network Operations (Regional) **shall** inform AU in case a FPL is infringing an active Protection Hotspot, when filing, refiling or in case of What-if initiated by the AU.

Status	<validated>
Rationale	An AU could file, re-file a flight plan or doing What-if assessments, without realizing its trajectory passes through an active Protection Hotspot, or during the period between the What-if and the re-filing a Protection Hotspot could have been declared. In both cases the AU needs to be informed about its FPL's trajectory is passing through an active Protection Hotspot.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

REQ]

Identifier	REQ-07.38-SPRINTEROP-OP01.0008
Title	DCB measures firstly applicable to flights infringing Protection Hotspot
Requirement	In case a protected TV becoming overloaded, then if needed, Network Operations (Local) should apply DCB measures (e.g. MCP delay measures) in priority to flights have infringed the protection hotspot after its declaration.
Status	<validated>
Rationale	To penalize those flights not respecting the Protection Hotspot by refiling their flight plans through it.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP01.0009
Title	Awareness of instability for Network Operations (Local) due to refiling flights for ATFCM reasons
Requirement	The Network Operations (Local) should obtain from Network Operations (Regional) the information about refiling flights for ATFCM reasons increasing and/or decreasing the traffic load.
Status	<in progress >
Rationale	The Network Operations (Local) needs to monitor the combination of current traffic load and the unplanned flights that increases and/or decreases the traffic load of the TV.
Category	<Operational> <Human Performance><Safety>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP01.0011
Title	Enriched DCB Post Operational Information
Requirement	The Regional and local Network Operations **shall** provide the following post operational analysis daily: • Protection Hotspot impact on the AU rerouting (infringer) • AU rerouting impact on the traffic load (unplanned) • Protection hotspot impact on the ATFCM regulations, i.e., if the ATFCM regulation is still needed after a protection hotspot • The amount of delay the infringer flights have, i.e., the infringer flights' delays versus non-infringer flights relays in a protection hotspot
Status	<Validated>
Rationale	To measure the protection hotspot impact and use for the Network and Local operations.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	Analyse Trajectory Impact
<ALLOCATED_TO>	<Activity>	Assess Network Impact
<ALLOCATED_TO>	<role>	

4.1.2 Operational P-FDCI requirements

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[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0001
Title	P-FDCI attributes definition by AU
Requirement	AU **shall** be able to define flight criticality using the P-FDCI attributes: - Criticality. - Reason (optional). - Time tolerance. The time tolerance attribute is expressed via one of following two options: • Delay.
	<validated>
Rationale	These P-FDCI attributes will allow Network Operations (Local) and/or Network Operations (Regional) to make decisions, considering better the AU priorities, when applying DCB measures (e.g. MCP).
Category	<Operational> <IER>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0002
Title	P-FDCI submission to NM after flight plan submission
Requirement	AU **shall** be able to submit P-FDCI: after the flight plan submission (single flight or a list of flight) to Network Operations (Regional) and for flights with no slot issued yet. The received P-FDCI information; i.e. creation, update & cancel shall be immediately available as well to all local actors concerned.
Status	<validated>
Rationale	The proactive provision of the criticality of certain flight will help Network Operations (Regional) and/or Network Operations (Local) to make better decisions when applying DCB measures.
Category	<Operational> <Interoperability>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0003
Title	P-FDCI submission to NM before flight plan submission
Requirement	AU **shall** be able to submit P-FDCI before flight plan submission to Network Operations (Regional) in strategic or pre-tactical phase. The received P-FDCI information; i.e. creation, update & cancel shall be immediately available as well to all local actors concerns.
Status	<in progress>
Rationale	Provides AUs the comfortable possibility to indicate at early planning state the criticality for flights which are identified already at that state, for their high risk for criticality issues; i.e. last flight of daily rotation with arrival schedule time close to airport curfew for a period of time. Note: As currently already deployed on a local level in MUAC, but network wide via Network Operations (Regional) for whole IFPZ.
Category	<Operational> <Interoperability><IER>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0004
Title	P-FDCI update & cancel
Requirement	AU **shall** be able to update or cancel their P-FDCI at any time. Any update & cancel of the P-FDCI shall become immediately available to all concerned actors at NO regional and local.
Status	<validated>
Rationale	To provide to AU the flexibility to adapt the criticality information, i.e. cancel criticality or update reason or time tolerance attributes.
Category	<Operational><Interoperability><IER>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0008
Title	P-FDCI & related action available in real-time
Requirement	P-FDCI issued by AUs and related actions by Network Operations (Local and Regional) **shall** be available in real-time.
Status	<in progress>
Rationale	Transparency between stakeholders on the use and actions related to P-FDCI will reduce the risk of abuse.
Category	<Operational><Interoperability><IER>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

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[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0009
Title	P-FDCI Quota per AU defined by Network Operations (Regional)
Requirement	Network Operations (Regional) **shall** limit the maximum number of P-FDCI request per AU & day. The P-FDCI quota is required. It is defined as the % of total number of FPLs submitted (per AU) and shall be calculated dynamically throughout the day. ○ In general, it shall be 10 % for all AUs with a minimum 5 P-FDCI. ○ NM shall apply the quota upon P-FDCI submission. ○ For operators operating a very low number of flights/day; i.e. less than 20, an absolute number of flights per day shall be defined as the maximum for P-FDCI declaration; i.e. 1-2 per day. ○ In the case a P-FDCI flight turns to R-FDCI mode, it will be counted in the reactive mode quota as well.
Status	<validated>
Rationale	The system of “quota” per AU is required to ensure an acceptable level of equity. The maximum number is weighted considering the number of flights/day that the airline has in ECAC area. This limitation aims to guarantee equity among all airspace users and shall assure, that P-FDCI only for a limited number of flights, remain meaningful information for NO in their efforts to protect these really critical flights. Since not all flights with P-FDCI will suffer delay or regulation, the P-FDCI quota could be higher than the R-FDCI quota. (for info: For R-FDCI, the quota deployed in operations is 5% of regulated flight limited to 20 flights.)
Category	<Operational>

[REQ Trace]

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Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0010
Title	P-FDCI quota status to AU
Requirement	Network Operations (Regional) **shall** provide to AU the actual P-FDCI count & quota each time the count changes. Once the quota is reached, the AU can't make further P-FDCI requests.
Status	<validated>
Rationale	To assure awareness about the number of remaining P-FDCI declarations available to the AU.
Category	<Operational> <Human Performance><Interoperability><>IER>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0011
Title	AU internal P-FDCI quota management
Requirement	The AU should be able to define depending on the overall quota sub-quotas for dedicated period of time over the day (e.g. morning, afternoon or night shifts). The sum of the sub-quotas shall not exceed the overall quota defined by NO (regional).
Status	<in progress>
Rationale	To avoid all P-FDCI quota being used in the first shift.
Category	<Operational> <Human Performance>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0012
Title	AU parameter for automatic P-FDCI transition to R-FDCI
Requirement	In the strategic phase the AUs should declare to Network Operations (Regional) some parameters related to the automatic transfer from P-FDCI to R-FDCI (for the whole fleet): • Automatic transfer mode(Y/N), if delay value exceeds P-FDCI time tolerance • AU specific time tolerance as optional P-FDCI attribute, when the targeted flight is indicated by the AU as critical • AU default time tolerance value for its whole fleet
Status	<in progress>
Rationale	After a specific time and/or event, the criticality can't be handled pro-actively anymore, but needs to be treated reactively. The time tolerance is either provided by the AU as P-FDCI (optional) attribute or, for P-FDCI without time tolerance indication, a specific default time tolerance value defined by the AU for its entire fleet, will be applied.
Category	<Operational> <Human Performance><Interoperability><IER>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0013
Title	P-FDCI to R-FDCI automatic transfer warning to AU
Requirement	In case a flight has a provisional TOT(PTOT) before SIT1, the AU should be warned, if a P-FDCI flight is about to become R-FDCI
Status	<in progress>
Rationale	In case the AU has selected the automatic transfer mode, the AU will receive just before SIT 1 (e.g., 5 minutes) a warning, if the flight is about to become R-FDCI (based on PTOT info).
Category	<Operational> <Human Performance><Interoperability><IER>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0014
Title	Automatic P-FDCI transition to R-FDCI
Requirement	When the AU has opted for the automatic transfer mode, the P-FDCI flight **shall** become R-FDCI at SIT1, when an ATFCM slot is issued and the delay is higher than the time tolerance for P-FDCI. From then, the FDCI shall be considered as R-FDCI by the Network Operations (regional); i.e. NMOC helpdesk and will be counted both in P-FDCI and R-FDCI counters. When the AU has not opted for the automatic transfer mode(=N), it will remain in P-FDCI status beyond SIT1.
Status	<validated>
Rationale	After a specific time and/or event, the criticality can't be handled pro-actively anymore, but needs to treated reactively.
Category	<Operational> <Human Performance>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0015
Title	AU cancel of automatic P-FDCI transition to R-FDCI for an individual flight
Requirement	When the AU has agreed to the automatic transfer mode, but would like to avoid that mode for a specific flight, then the AU **shall** have the possibility to cancel this automatic transfer to R-FDCI for this specific flight manually. In this case the P-FDCI is kept beyond SIT1.
Status	<validated>
Rationale	P-FDCI information could still remain relevant after SIT1. This corresponds to flights were AU wants to keep priority indication without that it is dealt with as for R-FDCI by NM Helpdesk and being counted in the R-FDCI quota.
Category	<Operational> <Human Performance><Interoperability><IER>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

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[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0018
Title	Information on the treatment of P-FDCI declared flights.
Requirement	If a P-FDCI declared flight is considered by an actor (Network operations regional or local), all other concerned actors **should** be informed. Concerned actors are AU, Network Operations (Regional) and all Network Operations (local) with the planned trajectory through their AoR.
Status	<in progress>
Rationale	This information is desirable to avoid parallel uncoordinated actions on the same P-FDCI by any of the concerned actors
Category	<Operational><Interoperability><IER>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0018 bis
Title	Sharing of Information on P-FDCI declared flights “under treatment” within NMOC.
Requirement	If a P-FDCI declared flight is “under treatment” by an NMOC actor all other concerned actors within NMOC **shall** be informed.
Status	<in progress>
Rationale	This information is necessary to avoid parallel redundant actions on the same P-FDCI by any of the concerned actors in NMOC.
Category	<Operational><Interoperability><IER>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0019
Title	Network Operations (Regional) activity on P-FDCI flight with high ATFCM delay before SIT 1(PTOT information)
Requirement	Network Operations (Regional) **shall** be able to monitor P-FDCI flights and identify those with high ATFCM delay based on PTOT information before SIT 1. For those identified, Network Operations shall be able to search for acceptable re-routing/level capping options that can avoid the problem and performs network impact assessment.
Status	<validated>
Rationale	Using P-FDCI information, NMOC – and in particular AOLO operators – can better support AUs by proposing proactively re-routings avoiding delay and minimising negative network impact.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0020
Title	Network Operations activity for regulations with high number of P-FDCI flights
Requirement	Network Operations (Regional) **shall** be able to identify regulations with high number of P-FDCI flights and coordinate with concerned Network Operation (local) actors (or vice versa) to discuss mitigation measures.
Status	<validated>
Rationale	For those regulations impacting a high number of P-FDCI flights, it is necessary the interaction among NO (Regional) and concerned NOs (local) to coordinate and agree the better mitigation measures.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0021
Title	P-FDCI consideration by Network Operations (Local)
Requirement	When elaborating MCP measures, Network Operations (Local) **shall** be able to consider P-FDCI information and avoid selecting P-FDCI flights when possible.
Status	<validated>
Rationale	Since the objective is to protect from delays (as much as possible) those P-FDCI flights, NO (Local) will consider them to avoid a delay allocation beyond the associated time tolerance.
Category	<Operational>

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[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

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Identifier	REQ-07.38-SPRINTEROP-OP02.0022
Title	P-FDCI monitoring
Requirement	Network Operations (local) **shall** be able to monitor P-FDCI and chose the best action in case the flight is exposed to only one regulation under its responsibility. If a P-FDCI flight is exposed to several regulations, Network Operations (regional) shall be able to monitor P-FDCI and take action.
Status	<validated>
Rationale	To specify who monitors P-FDCI flight and chose best action in which case. Since there are two monitoring approaches to treat the P-FDCI flights, it is necessary that in any case NM (Regional) performs a surveillance of the actions proposed by NM (Local)
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

*****

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0023
Title	P-FDCI flight data required by NO
Requirement	NO, regional and local, **shall** have the visibility to the P-FDCI flight data, to be able to consider flight criticality in their flight and ATFCM management
Status	<validated>
Rationale	To allow NO to consider P-FDCI in their flight and ATFCM management activities.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP02.0024
Title	Proactive FDCI Post Operational Information
Requirement	The Regional and local Network Operations **shall** provide the following post operational analysis daily: • P-FDCI declaration volume per AU, and Network • P-FDCI to R-FDCI creation volume per type (automatic or manual), per AU, and Network • P-FDCI with automatic R-FDCI creation option volume per AU, and Network • P-FDCI quota usage per AU, and Network • P-FDCI modifications and cancellations per AU, and Network • Critical flights delay progression and reduction per day, and per AU • Positively treated (i.e., delay reduced below the maximum acceptable delay) critical flights and how they are treated, per AU, per ACC, and Network • Not positively treated (i.e., delay stayed above the maximum acceptable delay) critical flights, per AU, per ACC, and Network
Status	<Validated>
Rationale	To monitor the P-FDCI volume, impact on AU and Network Operations, and information stability. To monitor equity aspects.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

4.1.3 Operational requirements for combined P-FDCI and Enriched DCB

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP03.0001
Title	Trajectory negotiation between AU and Network Operations depending on flight criticality
Requirement	NO **shall** be able to consider proactive criticality information in the trajectory optimisation & negotiation process with AUs.
Status	<validated>
Rationale	To improve the efficiency of the trajectory negotiation process
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP03.0002
Title	DCB measures applicable to critical infringer flights
Requirement	NO should try to avoid penalizing infringer flights which have FDCI
Status	<validated>
Rationale	Specific requirement applicable in case AUO-0217 and AUO-0208 are combined. To protect critical flights as much as possible even though they are infringers.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP03.0005
Title	AU customized constraints impact
Requirement	AU should have the possibility to customize impact assessment on their flights according to their specific priorities per influencing parameter -, to consider correctly their individual operational preferences and business model.
Status	<in progress>
Rationale	To allow AUs to perform a customized impact assessment.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-OP03.0006
Title	AU performance & satisfaction
Requirement	AU should have the real-time and post-operational data to assure they can monitor to which extend their operational needs are satisfied.
Status	<in progress>
Rationale	To allow AUs to monitor their performance and to which extend it complies to their performance objectives and to allow them to develop as part of their FOC system a satisfaction indicator.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	AU

4.2 Safety Requirements

There are no requirements exclusively related to “Safety” identified for this section.

Nevertheless, if there were Safety aspects identified in the Operational Requirements, this is shown in the corresponding Category field.

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4.3 Security Requirements

[REQ]

Identifier	REQ-07.38-SPRINTEROP-SC01.0001
Title	FF-ICE information assets protection
Requirement	The “Enriched DCB Information” **shall** be provided and used only by those AU who are known and accepted by the Network Manager.
Status	<in progress>
Rationale	The confidentiality of the information needs to be ensured.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	
<SATISFIES>	<ATMS Requirement>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-SC01.0002
Title	Network Manager ensures regional DCB information assets integrity
Requirement	The “Enriched DCB Information” integrity **shall** be checked and ensured by the Network Manager at regional level.
Status	<in progress>
Rationale	The information provided by the Network Manager has to be trustable and maintain the original level of quality.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier

< ALLOCATED_TO >	<SESAR Solution>	
<SATISFIES>	<ATMS Requirement>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-SC01.0003
Title	AU ensure information assets integrity
Requirement	The “Enriched DCB Information” integrity **shall** be ensured by the AU.
Status	<in progress>
Rationale	The information kept by the AU has to be trustable and maintain the original level of quality.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	
<SATISFIES>	<ATMS Requirement>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-SC01.0004
Title	ANSP ensures local DCB information assets integrity
Requirement	The “Enriched DCB Information” integrity **shall** be checked and ensured by the ANSP at local level.
Status	<in progress>
Rationale	The information provided by the ANSP has to be trustable and maintain the original level of quality.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier

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< ALLOCATED_TO >	<SESAR Solution>	
<SATISFIES>	<ATMS Requirement>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-SC02.0001
Title	P-FDCI information assets protection
Requirement	The P-FDCI **shall** be provided to Network Operations (Regional) from only those AU who are known and accepted by the Network Manager (Regional).
Status	<in progress>
Rationale	The confidentiality of the information needs to be ensured.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	
<SATISFIES>	<ATMS Requirement>	

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[REQ]

Identifier	REQ-07.38-SPRINTEROP-SC02.0002
Title	Network Operations (Regional) and Network Operations (Local) ensure P-FDCI information assets integrity
Requirement	P-FDCI integrity **shall** be checked and ensured by the Network Operations (Regional) and Network Operations (Local).
Status	<in progress>
Rationale	The information managed by the Network Operations (Regional) and Network Operations (Local) has to be trustable and maintain the original level of quality.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	
<SATISFIES>	<ATMS Requirement>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-SC02.0003
Title	AU ensure P-FDCI information assets integrity
Requirement	P-FDCI information assets integrity **shall** be checked and ensured by the AUs.
Status	<in progress>
Rationale	The information managed by the AU has to be trustable and maintain the original level of quality.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	
<SATISFIES>	<ATMS Requirement>	

4.4 Performance Requirements

Note: Performance Framework KPAs are addressed via Validation Objectives in VALP and VALR.

4.5 Interoperability Requirements

Note: Interoperability Requirements are identified by indicating <IO> in the category field of the relevant Operational requirement. IO Requirements will be addressed in more detail in the TS.

4.6 Information Exchange Requirements

Note: Information Exchange Requirements are identified by indicating <IER> in the category field of the relevant Operational requirement. IE Requirements will be addressed in more detail in the TS.

4.7 Deleted Requirements

The first three requirements were identified during SESAR 2020 W1 developments, but they were not addressed by Solution 38 during this W2.

The following requirements were previously identified in the initial SESAR 2020 W2 OSED, but have been deleted as a consequence of the Validation activities.

However, it has been decided to include all of them in this document to leave a trace for future SESAR analysis and developments and avoiding to start again from zero.

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[REQ]

Identifier	REQ-07.38-SPRINTEROP-DL04.0001
Title	PFP Submission Request ahead of time.
Requirement	The AU shall be able to submit a PFP with Route Trajectory to the NMF ahead of time to improve the demand prevision. It can be submitted the day of operation or even earlier.
Status	<deleted>
Rationale	Cluster 1 activities are not maintained in SOL38 W2 due to effort constraints. Improve the demand prevision is one of the relevant elements to optimize network management, to define EAUP and to allocate, when needed, well-adapted DCB measures. **Note for the reader:** Not V2 validated yet.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	Submit/Update PFP
<ALLOCATED_TO>	<role>	AU/Network Operations

[REQ]

Identifier	REQ-07.38-SPRINTEROP-DL04.0002
Title	PFP on D-1 contribution to the daily plan preparation.
Requirement	If a PFP with Desired/Route Trajectory is submitted on D-1 prior to the EAUP/ATFCM Daily Plan Publication, and is not impacted by any Airspace Constraints or is impacted only by Dynamic Airspace Constraints Route Availability Constraints that are capacity related, NMF shall send to the AU a Planning Status reply indicating operational acceptability. PFP shall be taken into account in the daily plan preparation.
Status	<deleted>
Rationale	Cluster 1 activities are not maintained in SOL38 W2 due to effort constraints. To allow a PFP with a Desired/Route Trajectory to be considered in the preparation of the EAUP and ATFCM Daily Plan. Note, if during the EAUP and ATFCM Daily Plan CDM process between NM and the local DCB Units, it is finally decided that the PFP cannot be accommodated as such in the ATM Network, the AU will be informed via a new Planning Status reply that the PFP is no longer operationally acceptable. The idea is, that the applicability of all dynamic Airspace Constraints is re-examined during the EAUP/ATFCM Plan preparation, considering the demand fed by the PFPs. **Note for the reader:** Not V2 validated yet.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	Validate and Integrate flight plan in Traffic Demand
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-DL04.0003
Title	Congestion level indicator information.
Requirement	Network Operations regional shall optionally provide the congestion level indicator to AU for the traffic volumes crossed by the flight plan.
Status	<deleted >
Rationale	Not maintained in SOL38 W2 due to effort constraints. The congestion indicator is a useful parameter for flow management but it is less useful for AU as far as it does not provide the impact on a specific flight. As it is not a main driver for AU decision making it will be optional information. **Note for the reader:** Not V2 validated yet.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-DL04.0004
Title	Network Operation's (Local) choice for P-FDCI monitoring
Requirement	Network Operations (Local) shall indicate in the strategic phase to Network Operations (Regional) their choice to either monitor P-FDCI locally (ANSP/FMP) or centrally (NMOC). If the P-FDCI is monitored locally, the FMP shall propose solution only if the most penalizing regulation is in its AoR.
Status	<deleted>
Rationale	Conceptual proposal rejected by operational experts after validation exercises; existing working arrangements to share local and regional responsibilities are sufficient and will be applied for P-FDCI as well.
Category	<Operational><Interoperability><IER>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-DL04.0005
Title	P-FDCI monitored locally
Requirement	Network Operations (local); i.e. ANSP/FMP or LTM, shall monitor P-FDCI and consider it for the decision which flight to select for flow management action. If the P-FDCI is monitored locally, Network Operations (local) shall propose solution only if the most penalizing regulation is in its AoR. Network Operations (local) shall initiate the coordination with NM before SIT1.
Status	<deleted>
Rationale	Conceptual proposal rejected by operational experts after validation exercises; existing working arrangements to share local and regional responsibilities are sufficient and will be applied for P-FDCI as well.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-DL04.0006
Title	P-FDCI monitored centrally
Requirement	Network Operations (Regional) shall monitor P-FDCIs (designated as managed centrally) and consider it for the decision which flight to select for flow management action and initiate the coordination with NO (Local).
Status	<Deleted>
Rationale	Conceptual proposal rejected by operational experts after validation exercises. Existing working arrangements to share local and regional responsibilities are considered by them as sufficient and will be applied for P-FFDCI as well; not needed;
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-DL04.0007
Title	Manual P-FDCI transition to R-FDCI by AU via iDAP request after SIT1
Requirement	When the AU has disagreed to the automatic transfer mode (=N), the P-FDCI will remain in P-FDCI status.
Status	<deleted>
Rationale	To avoid duplication of same/similar REQs; Conceptual aspect covered by OP02.0014
Category	<Operational> <Human Performance>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

[REQ]

Identifier	REQ-07.38-SPRINTEROP-DL04.0008
Title	P-FDCI counted as well as R-FDCI
Requirement	A P-FDCI flight becoming R-FDCI (so considered by the NM helpdesk) is counted for the P-FDCI and the R-FDCI quota.
Status	<deleted>
Rationale	To avoid duplication of same/similar REQs; Conceptual aspect covered by OP02.0014
Category	<Operational> <Human Performance>

[REQ Trace]

Relationship	Linked Element Type	
<ALLOCATED_TO>	<SESAR Solution>	
<ALLOCATED_TO>	<Activity>	
<ALLOCATED_TO>	<role>	

5 References and Applicable Documents

5.1 Applicable Documents

Content Integration

[1] B.04.01 D138 EATMA Guidance Material, Edition 9.0

[2] EATMA Community pages, https://ost.eurocontrol.int/sites/eatmac/default.aspx

[3] SESAR ATM Lexicon, https://ext.eurocontrol.int/lexicon/index.php/SESAR

Content Development

[4] SESAR 2020 Requirements and Validation Guidelines

Performance Management

[5] PJ19.04: Performance Framework (2019), edition 01.00.01, 30 November 2019

[6] PJ19-W2: Validation Targets - Wave 2, edition 00.00.03, 5th June 2020

Validation

[7] PJ19-W2: Validation Targets - Wave 2, edition 00.00.03, 5th June 2020

[8] PJ19-W1: D2.6 - PJ19: VALS (2019), edition 00.01.00, 31st October 2019

5.2 Reference Documents

[9] Network Manger ATFCM USERS MANUAL Edition 24, Edition validity date 30-06-2020

[10] Procedures for Air Navigation Services Doc 4444

[11] ICAO Doc 9965 Manual on Flight and Flow – Information for a Collaborative Environment (FF-ICE) First Edition 2012

[12] SESAR 2020 Concept of Operations Edition 2019, edition 01.00.00 May 2019

[13]ED-78A GUIDELINES FOR APPROVAL OF THE PROVISION AND USE OF AIR TRAFFIC SERVICES SUPPORTED BY DATA COMMUNICATIONS.[5]

[14]SESAR 2020 W1. Solution PJ07-01 SPR-INTEROP/OSED for V2 Part I Edition 2019

[15]ATMRPP2 WP 718 FF-ICE Provisions Consolidated, Montreal, Canada 14 to 18 November 2016

[16]ATMRPP 3 WP 766 FF-ICE1 Implementation Guidance All, Montreal 10 to 20 October 2017

[17]Cooperative Traffic Management, Short Term ATFCM Measures Operational Concept, edition 1.0, October 2015

[18] FF-ICE Manual Draft Version 0.96 for ATMRPP Review, draft

[19] PFDE Implementation Guidelines Volume 1, Edition 00 01 01 (FF-ICE/1), Aug 2017

[20] FF-ICE1/R1 Extended Release Notes - Release NM 24.0, Edition 1.0, 28 Feb 2020

[21] SESAR Integrated Dictionary, http://www.eurocontrol.int/lexicon

[22] D2.1.012 - PJ.07-W2-38-V3 - Final VALP; Edition 00.01.00; 31 March 2022

[23] D2.1.011 - PJ.07-W2-38-V3 - Final VALR; Edition 00.01.00; 09 December 2022

[24] D2.1.009 - PJ.07-W2-38-V3 - Final TS/IRS; Edition 00.01.00, 09 December 2022

5

Appendix A Cost and Benefit Mechanisms

A.1 Stakeholders identification and Expectations

Stakeholder	Involvement	Why it matters to stakeholder
ANSPs	To implement 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. Expect a reduction in the number of tactical interventions.
Airspace Users	End User.	Expect to obtain evidence of improved service by considering airspace users preferences when selecting optimum/local DCB solutions. Expect to obtain efficiency improvement, as AUs 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, ACCs and AUs.	Effective cooperation between all the stakeholders to optimise Network usage. Appropriate tools and procedures to support collaborative and coordinated Network management activities throughout planning phase.

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	Network monitoring and supervision.	
Industry	To provide tools that fulfils with the operational expectations.	To obtain a clear and consistent set of operational requirements for system development.
SJU	Programme coordinator.	Ensure the concept definition and validation activities comply with the general SJU approach.

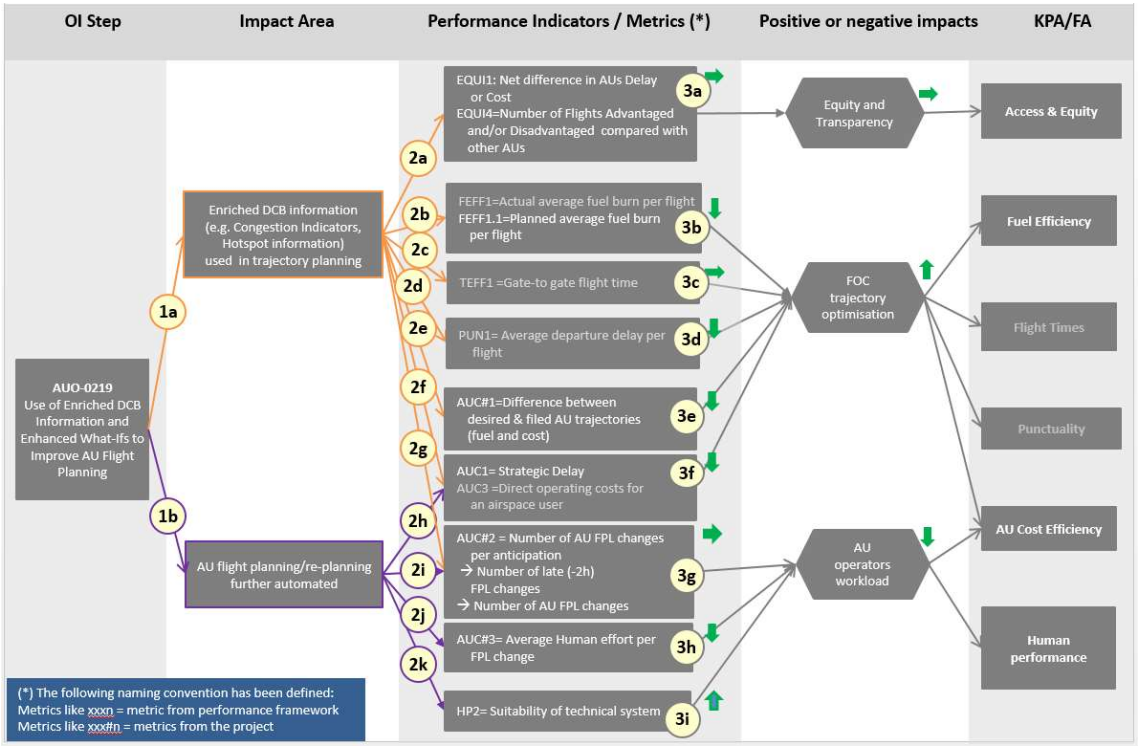
Table 17: Stakeholder's expectations

A.2 Benefits mechanisms

Benefit Impact Mechanism have been described per OI and per stakeholder group.

A.2.1 AUO-0219

Stakeholder AU



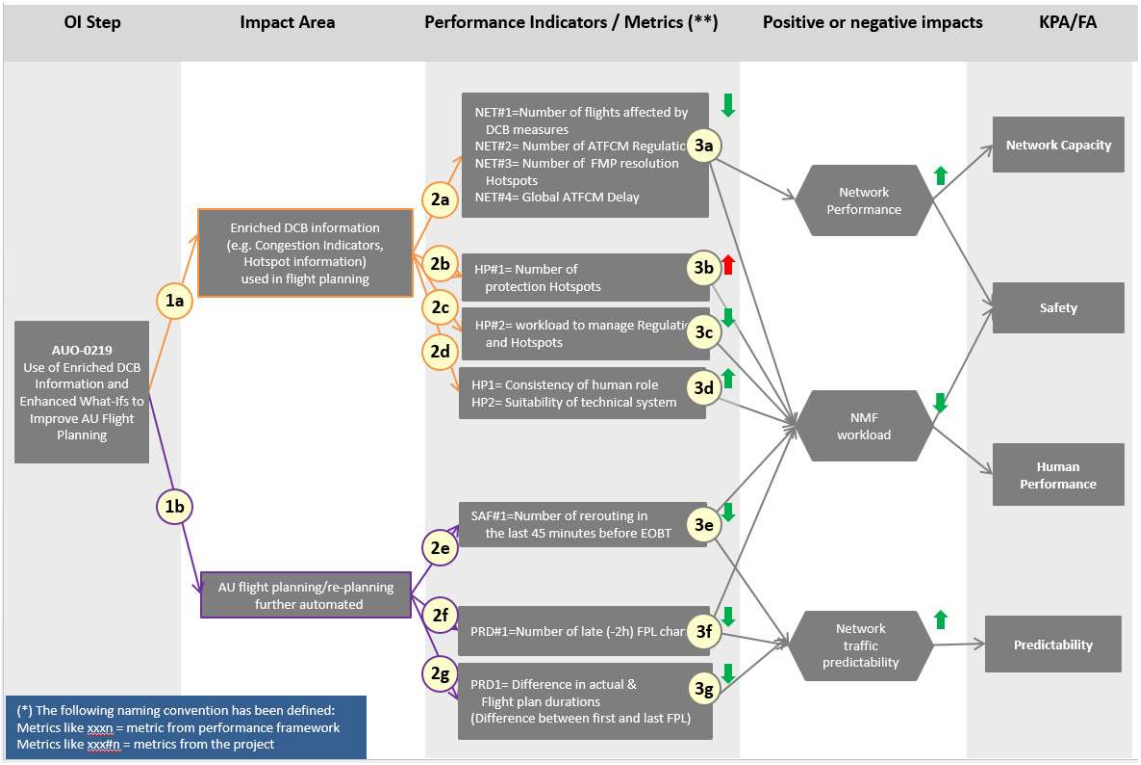
AUO-0219		Stakeholder group: **AUs**
(1a)	Providing accurate and enriched DCB information (e.g. Hotspot Information & Congestion Indicators) to AUs will allow them to better plan/re-plan their Flights.	
(1b)	Standardized information exchanges through B2B services will permit more automation on trajectory planning/re-planning management in a CDM environment.	

(2a)	Trajectory negotiation with the enriched DCB information will enable AU to re-route their flights with an awareness of the evolving situation in surrounding sectors which should reduce their cost/delay and should avoid the need for additional regulations. Therefore, non participants will not get this direct benefit but will benefit from the spinoff due to the better situation on the network because of participant AUs.
(2b)	Taking into account enriched DCB information (e.g. Hotspot Information & Congestion Indicators), AUs will adapt their planned trajectories to mitigate the impact of DCB delay measures and in some cases it could be suboptimal with tendency to increase the fuel burn. On the other hand, some RADs & Scenarios could be avoided and it will impact positively Fuel Efficiency.
(2c)	Taking into account enriched DCB information (e.g. Hotspot Information & Congestion Indicators), AUs will adapt their planned trajectories to mitigate the impact of DCB delay measures and in some cases it could be suboptimal with tendency to increase flight time duration. On the other hand, some RADs & Scenarios could be avoided and it could have a positive impact on flight time duration.
(2d)	Thanks to a better use of the available capacity, there will be a reduction in the departure delay, leading to better departure punctuality.
(2e)	Taking into account enriched DCB information (e.g. Hotspot Information & Congestion Indicators) for situation awareness and decision making will allow AU to better align the filed trajectory to their desired one.
(2f)	Thanks to a better use of the available capacity, there will be a reduction of costs for AUs (strategic delay, direct operating costs).
(2g)	AU trajectory planning taking into account enriched DCB information (e.g. Hotspot Information) will produce planned trajectories closer to the actual execution ones, which will reduce the number of tactical FPL changes.
(2h)	Due to increased automation, more flights optimized (in particular in heavy periods) leading to reduction of strategic delay. Due to automation reduction of operating costs (staff cost for the monitoring of DCB situation and optimization of the fleet flights)
(2i)	In general, Flight planning/re-planning automation could increase the total number of AU Flight Plan changes. But the automation of flight planning/re-planning could anticipate the FPL changes due to DCB constraints. Automation allows to allocate rules to optimize the timeliness for flight plan changes. Therefore, the number of late FPL changes (in the last 2 hours) will be reduced. Hence, the general impact on FPL changes will be neutral.
(2j)	Flight planning/re-planning automation will reduce the average human effort per FPL change.
(2k)	Flight planning/re-planning automation will help AU operators in carrying out their tasks.
(3a)	The participant AUs will directly benefit reducing the cost or delay and the non participants will benefit from the spinoff due to the better situation on the network, therefore this will remain Access and Equity stable.
(3b)	Reducing the average fuel burn per flight will impact positively the FOC trajectory optimisation. It is linked to Fuel Efficiency.

(3c)	As the flight duration will remain stable, no impact is foreseen on Flight Times.
(3d)	Reducing the average departure delay per flight will impact positively the FOC trajectory optimization which is linked to Punctuality.
(3e)	Reducing the difference between their desired & filed trajectories will allow FOC to better optimise their trajectories which is linked to, Fuel Efficiency, Flight Times, Punctuality and AU Cost Efficiency.
(3f)	Reducing the strategic delay and the direct operating costs for AUs will allow more flights to maintain their optimised trajectory, which is linked to, Fuel Efficiency, Flight Times, Punctuality and AU Cost Efficiency.

AUO-0219	Stakeholder group: **AUs**
(3g)	Increased number of automatic FPL changes will contribute beneficially to the further optimisation of the planned trajectory without additional AU operator workload. Fewer late (-2H) FPL changes will reduce AU operators workload since late FPL changes requires coordination with the flight crew. This is linked to AU Cost Efficiency and Human Performance.
(3h)	Reducing the Human effort per Flight Plan change will reduce AU operators workload which is linked to AU Cost Efficiency and Human Performance.
(3i)	Improving task allocation between Human and Machine and supporting Human by technical systems will allow to reduce AU operators workload which is linked to AU Cost Efficiency and Human Performance.

Stakeholder NMF



AUO-0219	Stakeholder group: NMFs
(1a)	Providing accurate and enriched DCB information (e.g. Hotspot Information & Congestion Indicators) to AUs will allow them to better plan their Flights.
(1b)	Standardized information exchanges through B2B services will permit more automation on trajectory planning management in a CDM environment
(2a)	AU trajectory planning taking into account enriched DCB information (e.g. Congestion indicators, Hotspot Information) will allow to better manage network effect and use available capacity and thus minimize the creation of new hotspots and Regulations. Moreover, 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.
(2b)	AU trajectory planning taking into account enriched DCB information (e.g. Congestion indicators, Hotspot Information) will incentivise local DCB actors to identify and publish protection hotspots and support AUs with proposals and alternatives better aligned to their criteria.

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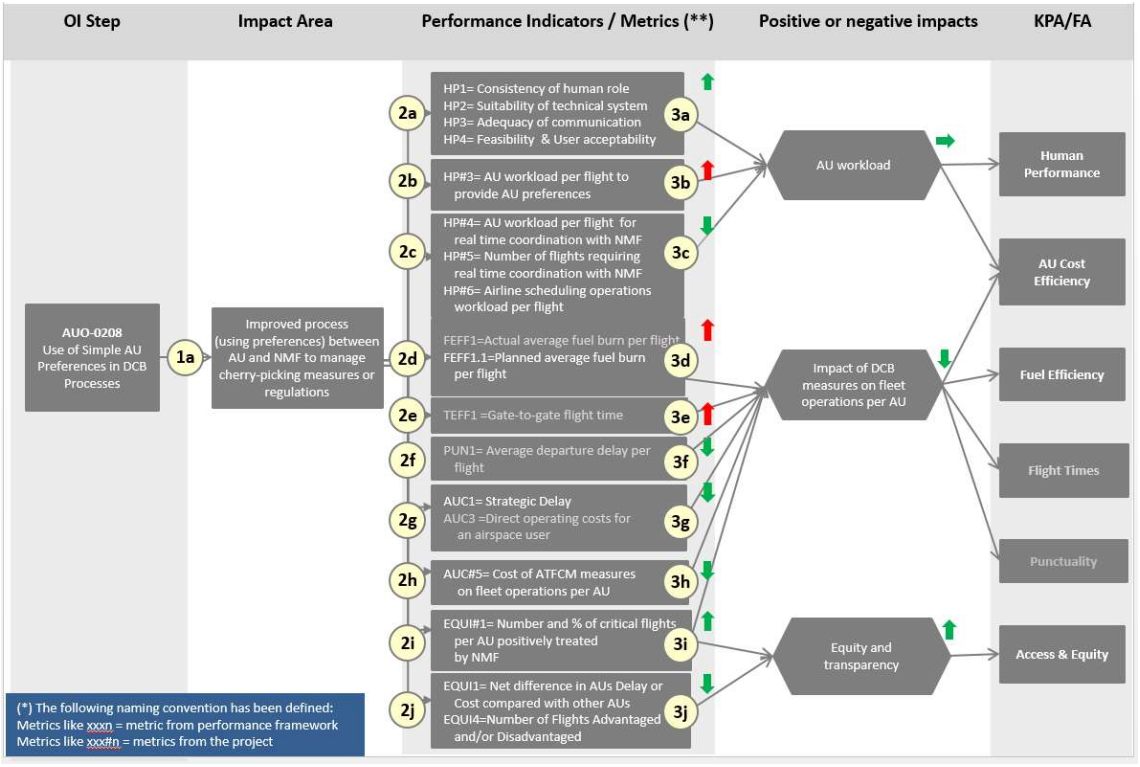
(2c)	AU trajectory planning taking into account enriched DCB information (e.g. Congestion indicators, Hotspot Information) will allow to better manage network effect and minimize the workload to manage hotspots and regulations.
(2d)	AU trajectory planning taking into account enriched DCB information and protection hotspots will allow to improve operating methods.
(2e)	Automation of flight planning/re-planning could anticipate the FPL changes due to DCB constraints. Automation allows to allocate rules to optimize the timeliness for flight plan changes. Therefore, the number of rerouting in the last 45 minutes will be reduced.
(2f)	Automation of flight planning/re-planning could anticipate the FPL changes due to DCB constraints. Automation allows to allocate rules to optimize the timeliness for flight plan changes. Therefore, the number of late FPL changes (in the last 2 hours) will be reduced.
(2g)	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.
(3a)	Less DCB measures, less flights affected by DCB measures and proposed DCB measures more aligned with business needs will improved Network Performance which is linked to Network Capacity and Safety. Fewer number of DCB measures and Hotspots will reduce NMF workload which is linked to Human Performance and Safety.
(3b)	Identification, publication and monitoring of protection hotspots are new tasks that may increase local DCB actors workload if not supported by automation.
(3c)	Reducing the workload to manage Hotspots and Regulations will decrease NMF workload which is linked to Human Performance and Safety.
(3d)	Improving operating methods and adapting technical systems to support humans will reduce NMF workload which is linked to Human Performance and Safety.
(3e)	Fewer rerouting in the last 45 minutes will reduce AU operators workload since late FPL changes requires coordination with the flight crew. This is linked to Human Performance.
(3f)	Fewer tactical FPL changes will increase Network traffic predictability which is linked to Predictability. Fewer tactical FPL changes will also reduce NMF workload which is linked to Human Performance and Safety.
(3g)	Reducing the difference between actual & Flight plan durations will increase traffic predictability which is linked to Predictability.

A.2.2 AUO-0208

Stakeholder AU

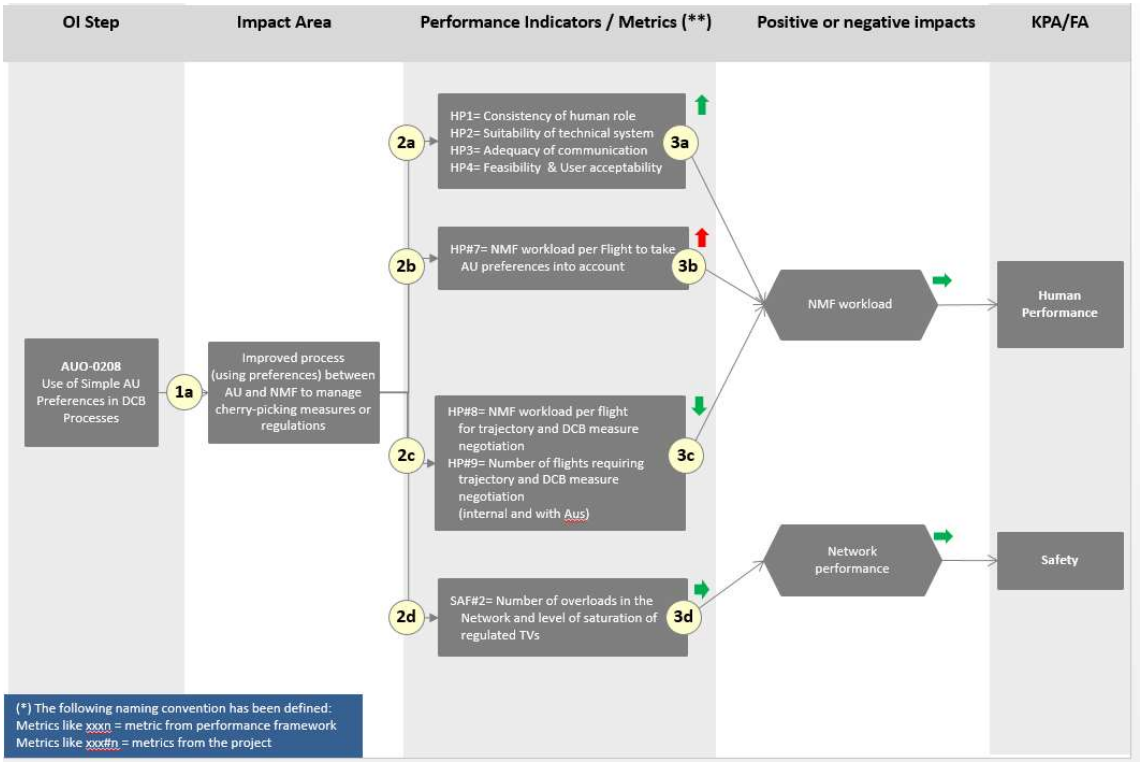


AUO-0208	Stakeholder group: **AUs**
(1a)	Allowing AUs to proactively provide preferences (pro-active FDCI) will improve DCB processes allowing NMF to propose DCB measures and/or negotiate trajectories.
(2a)	Taking into account AU preference information will allow to enhance operating methods and adapt technical systems to support actor task and communication between them.
(2b)	Allowing NMF to use AU preferences to propose DCB measures and/or negotiate trajectories will increase AUs workload as they will have to provide preference information per critical flight.
(2c)	Providing to NMF AU preferences will allow to reduce the number of flights requiring real time coordination between AUs and NMF (done by phone today). Furthermore, Time preferences (in particular) will allow NMF to take decisions that minimise the impact on airline scheduling.

(2d)	Taking into account AU preference information, NMF will propose to AUs to adapt their planned trajectories to mitigate the impact of DCB measures on departure punctuality. In some cases it could be suboptimal with tendency to increase the fuel burn (but for a very limited number of flights).
(2e)	Taking into account AU preference information, NMF will propose to AUs to adapt their planned trajectories to mitigate the impact of DCB measures on departure punctuality. In some cases it could suboptimal with tendency to increase the flight time duration (but for a very limited number of flights).
(2f)	Punctuality will be increased for critical flights and indirectly for all following flights in the rotation due to the reduction or cancellation of ATFCM delay.
(2g)	Strategic delay will be reduced for critical flights thanks to the reduction or cancellation of ATFCM delay.
(2h)	Taking into account AU preference information, NMF will propose to AUs to adapt their planned trajectories to mitigate the impact of DCB measures on critical flights and also on following flights in the rotation. Therefore, it will reduce the cost of ATFCM measure on fleet operations.
(2i)	Clear rules associated to FDCI will ensure transparency and will allow to increase the number of flights positively treated by NMF.
(2j)	Clear rules associated to FDCI will ensure transparency and equity.
(3a)	Using AU preferences in DCB processes to enhance operating methods and improving technical systems to support actors will have a positive impact on Human Performance.
(3b)	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. Minimising the impact on airline scheduling will also reduce AU Workload. This is linked to Human Performance and AU Cost Efficiency.
& (3c)	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. Furthermore, minimising the impact on airline scheduling will also reduce AU Workload. In the future, the AU workload could reduce depending on the level of automation to generate preferences. AU workload is linked to Human Performance and AU Cost Efficiency.
(3d) (3e) (3f)	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 AU Cost Efficiency, Fuel Efficiency, Flight Times and Punctuality.
(3g)	Reducing the strategic delay and the direct operating costs for Aus will allow more flights to maintain their optimised trajectory, which is linked to, Fuel Efficiency, Flight Times, Punctuality and AU Cost Efficiency.
(3h)	The reduction or cancellation of ATFCM delay will have a positive impact on fleet operations per AU. It will increase Punctuality for critical flights and indirectly for all following flights in the rotation. Therefore, it will have a positive impact on AU Cost Efficiency.

(3i)	Increasing the percentage of AU preferences respected when SBT is affected by a DCB measure will improve the FOC trajectory optimization which is linked to Punctuality, Fuel Efficiency, Flight Times and AU Cost Efficiency.
(3j)	Defining clear rules associated to FDCIs will ensure transparency which is linked to Access and Equity.

Stakeholder NMF



AUO-0208	Stakeholder group: NMF
(1a)	Allowing AUs to proactively provide preferences (pro-active FDCI) will improve DCB processes allowing NMF to propose DCB measures and/or negotiate trajectories.
(2a)	Taking into account AU preference information will allow to enhance operating methods and adapt technical systems to support actor task and communication between them.
(2b)	Taking into account AU preferences when proposing DCB measures and/or negotiate trajectories will increase NMF workload as they will have to manage new information.
(2c)	Providing to NMF AU preferences will allow to reduce the number of flights requiring real time coordination between AUs and NMF (done by phone today) and thus it will reduce NMF workload.

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(2d)	Procedures, in particular related to Network impact assessment, will be defined in a way to ensure that the positive treatment of FDCI requests do not increase the number of overloads and the level of saturation of regulated TVs.
(3a)	Better sharing of AU preference information and enhanced technical systems to improve communication between actors will support NFM tasks and decrease NMF workload.
(3b) (3c)	NMF 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. In the future, the AU workload could reduce depending on the level of automation to generate preferences.
(3d)	Global ATFCM delay will remain stable thanks to the definition of procedures to ensure that the positive treatment of FDCI requests do not increase.

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