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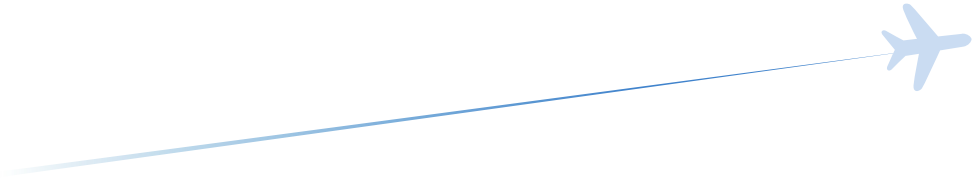

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Founding Members

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4DTM

4D TRAJECTORY MANAGEMENT

This TS/IRS is part of a project that has received funding from the SESAR Joint Undertaking under grant agreement No 734161 under European Union's Horizon 2020 research and innovation programme.

Abstract

The PJ.18-02c solution technical architecture enables the "SBT transition to RBT" operational requirements by defining the validated technical architecture and requirements for

- Distribution and use of 4D trajectory and the flight specific performance profile data for ATC
- Provision of the runway configuration; departure and arrival procedures (SID/STAR); departure taxi time data to the Civil AU Operations Centre via SWIM services
- Use of the runway configuration; departure and arrival procedures (SID/STAR); departure taxi time by the Civil AU Operations Centre

The solution technical architecture also contains the architecture and requirements which are in progress for:

- Provision of ATC Letter Of Agreement (LOA) status update; and Target Time of Arrival data to the Civil AU Operations Centre via SWIM services
- Use of the ATC Letter Of Agreement (LOA); and Target Time of Arrival data by the Civil AU Operations Centre
- Provision of the ATC Letter Of Agreement (LOA) status data from the EN/APP ATC to the Regional ATFCM via SWIM services

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237 # List of Tables

1 Executive Summary

The PJ.18-02c technical architecture describes the enhancements to the EN/APP ACC, Civil AU Operations Centre and Regional ATFCM capability configurations to enable the use cases as described in the PJ.18-02c OSED/INTEROP.

The solution

- Creates new SWIM service interface for TacticalUpdates service to provide the ATC LOA status data from EN/APP ATC to Regional ATFCM and from Regional ATFCM to Civil AU Operations Centre
- Modifies the Regional ATFCM flight data provision SWIM service in order to enrich the flight information provided to the Civil AU operations centre with the arrival/departure and target time data
- Defines the eFPL distribution data content from Regional ATFCM to the EN/APP ACC

The solution modifies the EN/APP ACC, Civil AU Operations Centre and Regional ATFCM capability configurations with the objective of exchanging the data via the SWIM services and using in their domains to obtain a better trajectory quality in their systems.

The 18-02c solution re-uses the SESAR 1 AOP-NOP integration technical architecture.

2 Introduction[1]

2.1 Purpose of the document

This document provides the technical architecture and specifications, covering functional, non-functional, and service requirements related to SESAR Solution 18-02c.

2.2 Scope

This TS/IRS covers functional and non-functional requirements related to SESAR Solution 18-02c in terms of capability configurations, functional blocks, functions, roles, data exchanges and services.

2.3 Intended readership

PJ.18-02c Solution Team

PJ.18-06 Solution Team

PJ.09-03 Solution Team

PJ.19 Project Team

PJ.10 Solution Team

2.4 Background

2.4.1 EFPL Transition to eFPL

The PJ.18-02c technical architecture is building on the SESAR 1 EFPL technical architecture ([3]) as the PJ.18-02c operational requirements is also building on SESAR 1 solution. The EFPL was defined in SESAR

[1] The opinions expressed herein reflect the author's view only. Under no circumstances shall the SESAR Joint Undertaking be responsible for any use that may be made of the information contained herein.

1 in solution #37. The solution #67 also addressed the use of some EFPL data (take-off mass and speed) in ATC system and processes (with the exception of the flight plan distribution) in SESAR 1.

In the meantime, ICAO ATMRPP is defining the eFPL with its data elements in the FF-ICE context (refer to [4]). The FIXM CCB (FIXM Change Control Board) and the working groups are adapting FIXM with the mandate of implementing the FF-ICE requirements. Within the FIXM tasks, there is the development of the FIXM Implementation Guidelines (ref. [6]) task, which includes the definition of FF-ICE services.

From the PJ.18-02c solution perspective, the eFPL is the successor of EFPL. It contains almost all elements of EFPL. The eFPL data definition and the related services are out of the scope of PJ.18-02c solution. However, the PJ.18-02c solution intends to propose enhancements to FF-ICE and FIXM definitions, based on the validation outcomes, pretty much like SESAR 1 did.

We shall also note that both the FF-ICE provisions and the FIXM Implementation Guidelines are draft at the time of the writing of this document.

Therefore, as a principle, the solution architecture uses the FF-ICE draft services, as much as possible; if not available then uses the EFPL services as they are defined in SESAR 1. The solution also follows the evolution of the FF-ICE services until the production of the final edition of this document.

2.4.2 Collaboration with PJ.09-03

The PJ.18-02c technical architecture follows the same principle of collaboration with PJ.09-03 as described in the PJ.18-02c OSED ([2]). The architecture elements are shared between the two solutions.

2.4.3 AOP/NOP integration

The PJ.18-02c solution reuses the architecture of the Regional ATFCM and Airports as defined in SESAR 1 (reference [9]).

2.4.4 PJ.18-02c Scope versus PJ.18-06 Scope

The PJ.18-02c solution is complementing the PJ.18-06 solution in terms of changes to the ACC trajectory prediction functions (ref [8]).

The scope of solutions 18-02c and 18-06a are partially overlapping, since both solutions will cover TP improvements derived from the usage of information in the eFPL. Nevertheless, while 18-06a only focuses on pure TP aspects (and adds the usage of other data sources, such as the EPP), the 18-02c also focuses on the technical means (services) through which the eFPL information will be made

312 available in the system. Additionally, 18-02c will also propose other changes beyond the pure TP
313 aspects (such as ATCO tools and/or HMI) derived from the usage of the eFPL data.

314 2.5 Structure of the document

315 Please see the table of contents.

316 2.6 Glossary of terms

Term	Definition	Source of the definition
eFPL	Filed Flight Plan	Draft FF-ICE Manual ref. [5]
EFPL	Extended Flight Plan as defined in SESAR 1. The EFPL concept is superseded by eFPL which is defined at the global level. Gradually the eFPL concept shall replace the EFPL.	SESAR 1 P07.06.02 OSED
Extended Flight Plan	The Extended Flight Plan consists of • ICAO FPL data: all data to be provided in a filed flight plan as specified in the ICAO Doc 4444, including the Field 15 route information. • 4D Trajectory: is one of the following depending on the service interaction • Filed Trajectory: Present in the EFPL Submission (validate, create or update) request sent by the AU to NM. • Accepted Trajectory: Present in the EFPL Submission (validate, create or retrieve) reply from NM • Flight Specific Performance Data: The FSPD may be provided either as climb and descent performance profile or as the total	SESAR 1 P07.06.02 Technical Specifications (ref [3])

	weight of aircraft as part of the Filed Trajectory, in the EFPL Submission (validate, create or update) request to NM.	
Flight activation	Activation of a flight in the ground system is an event when the flight is close to enter the concern airspace. This event is triggered by either an OLDI message, either a specific event message in an IOP context.	This document

318 **Table 1: Glossary**

319 2.7 Acronyms and Terminology

Term	Definition
ADD	Architecture Description Document
ATC	Air Traffic Control
ATCO	Air Traffic Controller
ATFCM	Air Traffic and Flow Capacity Management
ATM	Air Traffic Management
AU	Airspace User
CC	Capability Configuration
CHG	Change Message (for a Flight Plan)
CTOT	Calculated Take-Off Time
CWP	Controller Working Position
DLA	Delay Message (for a Flight Plan)
EATMA	European ATM Architecture
ECHG	Extended Change Message (for a Flight Plan)

EDLA	Extended Delay Message (for a Flight Plan)
EFPL	Extended Flight Plan
FIXM	Flight Information Exchange Model
FOC	Flight Operations Center
FSPD	Flight Specific Performance Data
IFPS	Initial Flight Planning System
IRS	Interface Requirements Specification
ISRM	Information Services Reference Model
LOA	Letter of Agreement
NAF	NATO Architecture Framework
NM	Network Manager
NSV	NAF System View
OSED	Operational Service and Environment Definition
PTR	Profile Tuning Restriction
RBT	Reference Business Trajectory
SDD	Service Description Document
SBT	Shared Business Trajectory
TBO	Trajectory Based Operations
TOC	Top Of Climb
TOD	Top Of Descent
TTA	Target Time of Arrival
QoS	Quality of Service

SID	Standard Instrument Departure
SDD	Service Description Document
STAR	Standard Instrument Arrival
SESAR	Single European Sky ATM Research Programme
SFPL	System Flight Plan
SJU	SESAR Joint Undertaking (Agency of the European Commission)
SWIM	System Wide Information Model
TRL	Technology Readiness Level
TS	Technical Specification
WSDL	Web Services Definition Language
XSD	XML Schema Definition

320 **Table 2: Acronyms and terminology**

3 SESAR Solution Impacts on Architecture

3.1 Target Solution Architecture

3.1.1 SESAR Solution(s) Overview

PJ.18-02c: eFPL Supporting SBT Transition to RBT

The transition from SBT to RBT is a key aspect of the SESAR Business trajectory concept establishing a strong link between planning and execution. While the full implementation of the business trajectory concept in addressed by solution 18.02a in the context of TBO (Trajectory based operations), 18.02c will address intermediate steps and building blocks taking into account SESAR 1 validation results on the Extended Flight Plan and ICAO FF-ICE increment 1 developments in progress.

3.1.1.1 TRL6 Enablers

EN code	EN description
NIMS-21b	Flight Planning extended with eFPL Distribution service
SWIM-APS-18	eFPL service consumption in ATC

The following enablers have reached TRL6 provided that their scope is limited to departure information from CDM airports:

EN code	EN description
AOC-ATM-23	SID/STAR and RunwayConfigurationPlan information integration in the FOC trajectory
NIMS-54	SID, STAR, TT, and Runway Configuration data applied in Initial Flight Plan Processing
SVC-003	Enhance the existing NMFlightData service to publish and subscribe SID/STAR data
SWIM-APS-17	AOC Consume NMFlightData service FlightListByAO interface via P/S

3.1.1.2 TRL4 Enablers

EN code	EN description
AOC-ATM-11	LOAs Integration in FOC trajectories
ER APP ATC 170	ATC LOA Status Update
NIMS-21a	Initial Flight Planning management enhanced to support 4D for Step 1
NIMS-55	Dynamic ATC LOAs Integration in NM trajectory
SVC-001	Modification of the TacticalUpdates service provided by Regional ATFCM to incorporate PTR status query and updates.
SVC-002	Extend the AirspaceStructure service to cover the PTR status
SWIM-APS-14	AOC AirspaceStructure service Profile Tuning Restriction (PTR) Status interface consumption by the FOC
SWIM-APS-15	TacticalUpdates service Profile Tuning Restriction (PTR) status update provision by the Regional ATFCM
SWIM-APS-16	ATC Letter of Agreement (LOA) Status publication via TacticalUpdates service by ER APP ACC
AOC-ATM-22	TT data integration in the FOC trajectory
ER APP ATC 82	Enhance EN/APP ACC to use eFPL data

Type	Element	EN Code	EN/CR Title	Coverage
		AOC-ATM-11	LOAs Integration in FOC trajectories	
FB	Flight Management (PJ.07-01)			considered
FB	Flight Management (PJ.18-02c)			considered
		AOC-ATM-22	TT data integration in the FOC trajectory	
FB	Flight Management (PJ.07-01)			considered
FB	Flight Management (PJ.18-02c)			considered
		AOC-ATM-23	SID/STAR and RunwayConfigurationPlan information integration in the FOC trajectory	
FB	Data Management (PJ.18-02c)			considered
FB	Flight Management (PJ.07-01)			considered
FB	Flight Management (PJ.18-02c)			considered

		ER APP ATC 170	ATC LOA Status Update	
FB	Operational Supervision ER/APP ATC (PJ.18-02c)			considered
		ER APP ATC 82	Enhance EN/APP ACC to use eFPL data	
FB	Controller Human Machine Interaction Management ER/APP (Consolidation)			considered
FB	Controller Human Machine Interaction Management ER/APP (PJ.18-02c)			considered
FB	Flight Planning - Lifecycle Management - Data Distribution (PJ.18-02c)			considered
FB	Trajectory Prediction and Management (PJ.18-02c)			considered
		NIMS-21a	Initial Flight Planning management enhanced to support 4D for Step 1	
		NIMS-54	SID, STAR, TT, and Runway Configuration data applied in Initial Flight Plan Processing	
		NIMS-55	Dynamic ATC LOAs Integration in NM trajectory	
		SVC-001	Modification of the TacticalUpdates service provided by Regional ATFCM to incorporate PTR status query and updates.	
Serv	TacticalUpdates			considered
		SVC-002	Extend the AirspaceStructure service to cover the PTR status	
Serv	AirspaceStructure			considered
		SVC-003	Enhance the existing NMFlightData service to publish and subscribe SID/STAR data	
Serv	NMFlightDataService (PJ.18-02c)			considered
		SWIM-APS-15	TacticalUpdates service Profile Tuning Restriction (PTR) status update provision by the Regional ATFCM	

FB	Network Operations Plan Management (PJ.18-02c)			considered
		SWIM-APS-16	ATC Letter of Agreement (LOA) Status publication via TacticalUpdates service by ER APP ACC	
FB	Support Functions ER/APP (PJ.18-02c)			considered
		SWIM-APS-17	AOC Consume NMFlightData service FlightListByAO interface via P/S	
FB	Flight Management (PJ.07-01)			considered
FB	Flight Management (PJ.18-02c)			considered
		SWIM-APS-18	eFPL service consumption in ATC	
FB	Flight Planning - Lifecycle Management - Data Distribution (PJ.18-02c)			considered

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338 ### 3.1.1.3 Deviations with respect to the SESAR Solution(s) definition

Enabler	Opt/Req	Deviation
AOC-ATM-11_LOAs Integration in FOC trajectories	Required	None
ER APP ATC 170_ATC LOA Status Update	Required	None
NIMS-21a_Initial Flight Planning management enhanced to support 4D for Step 1	Required	None
NIMS-55_Dynamic ATC LOAs Integration in NM trajectory	Required	None
SVC-001_Modification of the TacticalUpdates service provided by Regional ATFCM to incorporate PTR status query and updates.	Required	None
SVC-002_Extend the AirspaceStructure service to cover the PTR status	Required	None
SWIM-APS-14_AOC AirspaceStructure service Profile Tuning Restriction (PTR) Status interface consumption by the FOC	Required	None
SWIM-APS-15_TacticalUpdates service Profile Tuning Restriction (PTR) status update provision by the Regional ATFCM	Required	None
SWIM-APS-16_ATC Letter of Agreement (LOA) Status publication via TacticalUpdates service by ER APP ACC	Required	None
AOC-ATM-22_TT data integration in the FOC trajectory	Required	None
NIMS-21a_Initial Flight Planning management enhanced to support 4D for Step 1	Required	None
SVC-003_Enhance the existing NMFlightData service to publish and subscribe SID/STAR data	Required	None

ER APP ATC 82_Enhance EN/APP ACC to use eFPL data	Required	None
NIMS-21b_Flight Planning extended with eFPL Distribution service	Required	None
SWIM-APS-18_eFPL service consumption in ATC	Required	None
AOC-ATM-23_SID/STAR and RunwayConfigurationPlan information integration in the FOC trajectory	Required	None
NIMS-54_SID, STAR, TT, and Runway Configuration data applied in Initial Flight Plan Processing	Required	None
SVC-003_Enhance the existing NMFlightData service to publish and subscribe SID/STAR data	Required	None
SWIM-APS-17_AOC Consume NMFlightData service FlightListByAO interface via P/S	Required	None

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340 #### 3.1.1.4 Relevant Use Cases[2]

Operational Use Case	Description
[NOV-5] Distribution of eFPL Data and Use by ATC	This use case deals with the process of using specific data from eFPL in ground trajectory computation and check potential improvement in the conflict detection thanks to more accurate data (trajectory prediction). Improvement in conflict detection and monitoring will allow reducing workload of the ATCOs and therefore increasing capacity. Therefore, it is necessary to determine the relevant eFPL information that will improve computation of the trajectory by the ground system and then improve the accuracy of the conflict detection tools, monitoring tools and other support tools.
[NOV-5] Dynamic AOP/NOP Information in eFPL	The purpose of this use case is to align the trajectories calculated by Airspace User, Network Manager, and Airports in terms of departure taxi times, runway in use configurations, arrival and departure procedures prior to the flight departure.

[2] The grey rows in the tables in this section correspond to the topics/use-cases proposed to be removed from the scope of the solution 18.02c since associated enablers have not achieved TRL 6 maturity. This convention is adopted for all following tables in this document.

[NOV-5] Target Time Use in eFPL (Planning Phase)	The purpose of this use case is to align the trajectories calculated by FOC, Network Manager, and Airports in terms of arrival and departure procedures prior to the flight departure.
[NOV-5] Use of PTRs	This use case deals with the process of distributing the profile tuning restrictions (PTRs) to the different ATM stakeholders and specifically considering them during the 4D trajectory calculation by a Flight Operation Centre. The use case is aiming to support the airspace users at operational level by managing PTRs and providing a FOC trajectory, which is best aligned to the flight profile constraints from ATC and NM. It includes the information exchange between ATC, NM and FOC to respect the actual needs of ATC in reference to actual traffic situation. Besides the published PTRs within the RAD document, this also encompasses the aspects of processing dynamic PTRs.

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System Process	Description
[NSV-4] Distribution of eFPL Data and Use by ATC	This technical use case describes the eFPL data distribution and how it is used in the ATC systems.
[NSV-4] Dynamic AOP/NOP Information and Target Time Use in eFPL (Planning Phase)	This technical use case describes the SID, STAR, Runway Configuration, and Departure Taxi Time, TTA and CTOT data provision/receptions between the Airports, Regional ATFCM, and the FOC; and the functions to align the trajectories of each system.
[NSV-4] Use of PTRs	This technical use case describes the PTR and PTR status data provision/receptions between the ATC, NM, and the FOC; and the functions to align the trajectories of each system.

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3.1.1.5 Applicable standards and regulations

Institutional Enabler	Standard
STD-033 Flight Information Exchange Model v4 incl. ICAO FPL 2012, Extended Flight Plan and Flight Objects elements, in accordance with SESAR FIXM Strategy.	FIXM

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3.1.2 Capability Configurations required for the SESAR Solution

eFPL supporting SBT transition to RBT	

CC	Op Env	Capability	Node	Stakeholder
Airport		Adverse Condition Operations Provision; Air Traffic Flow Management; Airport Capacity Information Provision (incl. Capacity Changes); Airport Operations Management; ATC Team Resource Management; Surface Guidance Provision; Surface Route Management; Trajectory Management; User Driven Prioritisation Process;	Airport Operations; Airport Ops Support; Airport Vehicle; Network Operations;	Civil APT operator; Military APT operator;
APP ACC (PJ.18-02c)		Collaborative Trajectory Planning; SWIM-based Information Dissemination;	Air Traffic Flow and Capacity Management; Airspace Management; Airspace Organisation; En-Route/Approach ATS; Network Operations;	Civil ATS Approach Service Provider; Military ATS Approach Service Provider;
Civil AU Operations Centre (PJ18-02c)		Collaborative Trajectory Planning; SWIM-based Information Dissemination;	Airspace User Ops Support; Flight Deck;	Civil Flight Operations Centre;
Communication Infrastructure (PJ.18-02c)		SWIM-based Information Dissemination;	Network Operations;	Air Navigation Service Provider;

ER ACC (PJ.18-02c)		Collaborative Trajectory Planning; SWIM-based Information Dissemination;	Air Traffic Flow and Capacity Management; Airspace Management; Airspace Organisation; En-Route/Approach ATS; Network Operations;	Air Navigation Service Provider; Civil ATS En-Route Service Provider;
Regional ATFCM (PJ.18-02c)		Collaborative Trajectory Planning; SWIM-based Information Dissemination;	Air Traffic Flow and Capacity Management; Network Operations;	Network Manager;

3.2 Changes imposed by the SESAR Solution on the baseline Architecture

Enabler	Element type	Element name	Impact	Change
AOC-ATM-11	LOAs Integration in FOC trajectories			
	Function	ATM Exchange	Update	
	Function	Monitor Flights	Update	
	Function	Plan Flight and Trajectory	Update	
AOC-ATM-22	TT data integration in the FOC trajectory			
	Function	Monitor Flights	Update	
	Function	Plan Flight and Trajectory	Update	
AOC-ATM-23	SID/STAR and RunwayConfigurationPlan information integration in the FOC trajectory			
	Function	ATM Exchange	Update	
	Function	Monitor Flights	Update	
	Function	Plan Flight and Trajectory	Update	

	Function	Retrieve Data	Introduce	
	Function	Support Flight Deck	Update	
ER APP ATC 170	ATC LOA Status Update			
	Function	Activate/Deactivate PTR	Introduce	
ER APP ATC 82	Enhance EN/APP ACC to use eFPL data			
	Function	Create/Update Planned Trajectory	Update	
	Function	Display trajectory data	Update	
	Function	Generate SFPL	Update	
SVC-001	Modification of the TacticalUpdates service provided by Regional ATFCM to incorporate PTR status query and updates.			
	Service	TacticalUpdates	Update	
SVC-002	Extend the AirspaceStructure service to cover the PTR status			
	Service	AirspaceStructure	Update	
SVC-003	Enhance the existing NMFlightData service to publish and subscribe SID/STAR data			
	Service	NMFlightDataService (PJ.18-02c)	Update	
SWIM-APS-14	AOC AirspaceStructure service Profile Tuning Restriction (PTR) Status interface consumption by the FOC			
	Function	Retrieve Data	Introduce	
SWIM-APS-15	TacticalUpdates service Profile Tuning Restriction (PTR) status update provision by the Regional ATFCM			
	FB	Network Operations Plan Management (PJ.18-02c)	Update	
SWIM-APS-16	ATC Letter of Agreement (LOA) Status publication via TacticalUpdates service by ER APP ACC			
	Function	Send updated PTR status	Introduce	
SWIM-APS-17	AOC Consume NMFlightData service FlightListByAO interface via P/S			
	Function	Monitor Flights	Update	
SWIM-APS-18	eFPL service consumption in ATC			
	Function	Validate eFPL	Introduce	

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4 Technical Specifications

4.1 Functional architecture overview

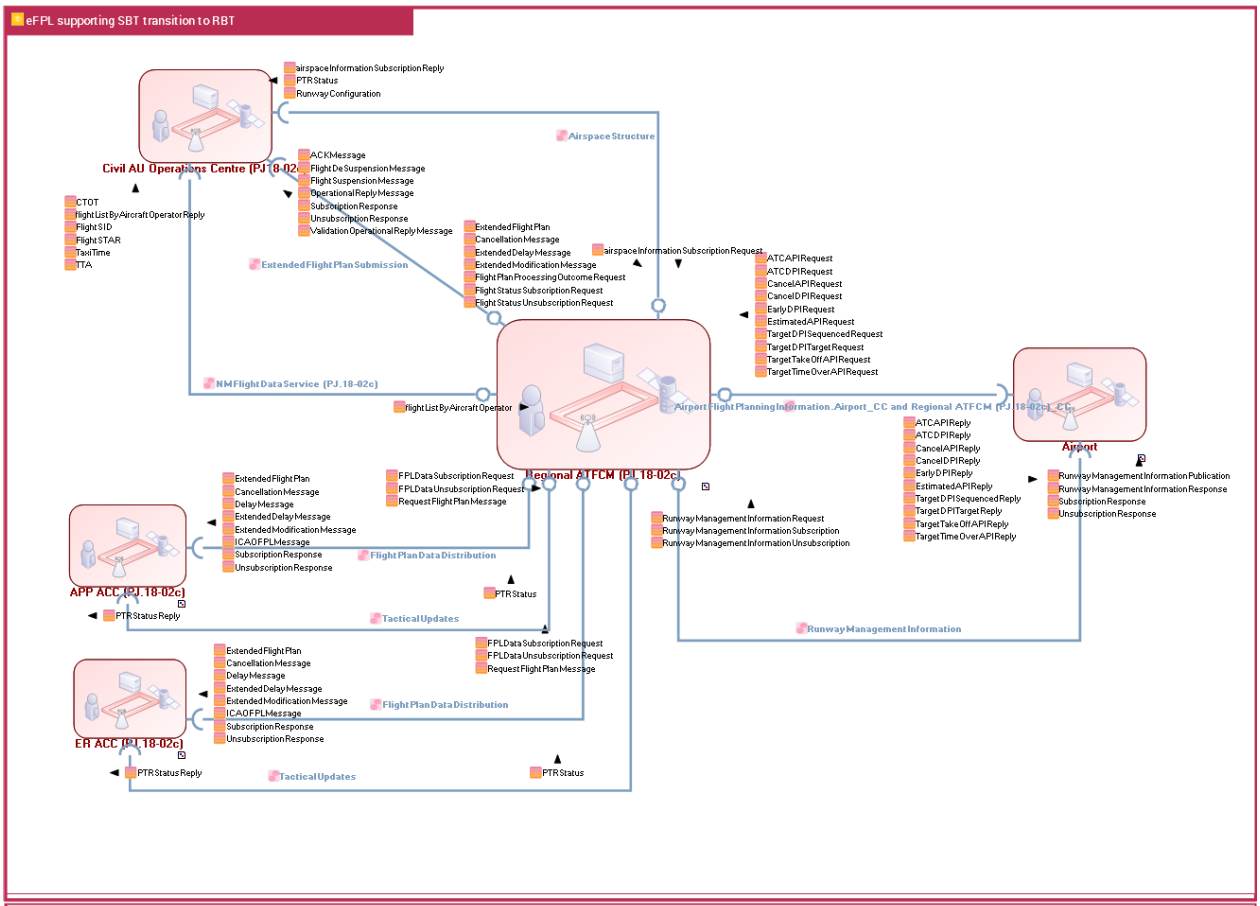
Functions required to perform needed Operational Activities can be allocated to Resources of a different type: Human Role, Infrastructure System or Functional Block.

Role	Functional Block	Function
[NSV-4] Distribution of eFPL Data and Use by ATC		
	Conflict management (PJ.18-02c)	Detect Conflicts;
	Controller Human Machine Interaction Management ER/APP (PJ.18-02c)	Display trajectory data;
	Flight Management (PJ.18-02c)	Plan Flight and Trajectory;
	Flight Planning - Lifecycle Management - Data Distribution (PJ.18-02c)	Generate SFPL; Validate eFPL;
	Monitoring Aids (PJ.18-02c)	Monitor and update flight progress; Monitor flight trajectory deviation and conformance;
	Surveillance (PJ.18-02c)	Compose System Track;
	Traffic Demand Management (PJ.18-02c)	Validate and Integrate eFPL in Traffic Demand;
	Trajectory Prediction and Management (PJ.18-02c)	Create/Update Planned Trajectory; Modify Tactical Trajectory;
[NSV-4] Dynamic SID/STAR Information in eFPL and Target Time Use in eFPL		
	Data Management (PJ.18-02c)	Retrieve Data;
	Demand and Capacity Balancing (PJ.18-02c)	Update Demand;
Flight Dispatcher (PJ.18-02c)		
	Flight Management (PJ.18-02c)	ATM Exchange; Monitor Flights; Plan Flight and Trajectory; Support Flight Deck;

	Traffic Demand Management (PJ.18-02c)	Validate and Integrate eFPL in Traffic Demand;
[NSV-4] Use of PTRs		
	Data Management (PJ.18-02c)	Retrieve Data;
Flight Dispatcher (PJ.18-02c)		
	Flight Management (PJ.18-02c)	ATM Exchange; Monitor Flights; Plan Flight and Trajectory; Support Flight Deck;
	Flight Planning - Lifecycle Management - Data Distribution (PJ.18-02c)	Generate SFPL; Validate eFPL;
	Local Air Traffic Complexity Management (PJ.18-02c)	Analyse sector complexity and workload;
	Operational Supervision ER/APP ATC (PJ.18-02c)	Activate/Deactivate PTR;
	Support Functions ER/APP (PJ.18-02c)	Send updated PTR status;
	Traffic Demand Management (PJ.18-02c)	Validate and Integrate eFPL in Traffic Demand;
	Trajectory Prediction and Management (PJ.18-02c)	Create/Update Planned Trajectory;

4.1.1 Resource Connectivity Model

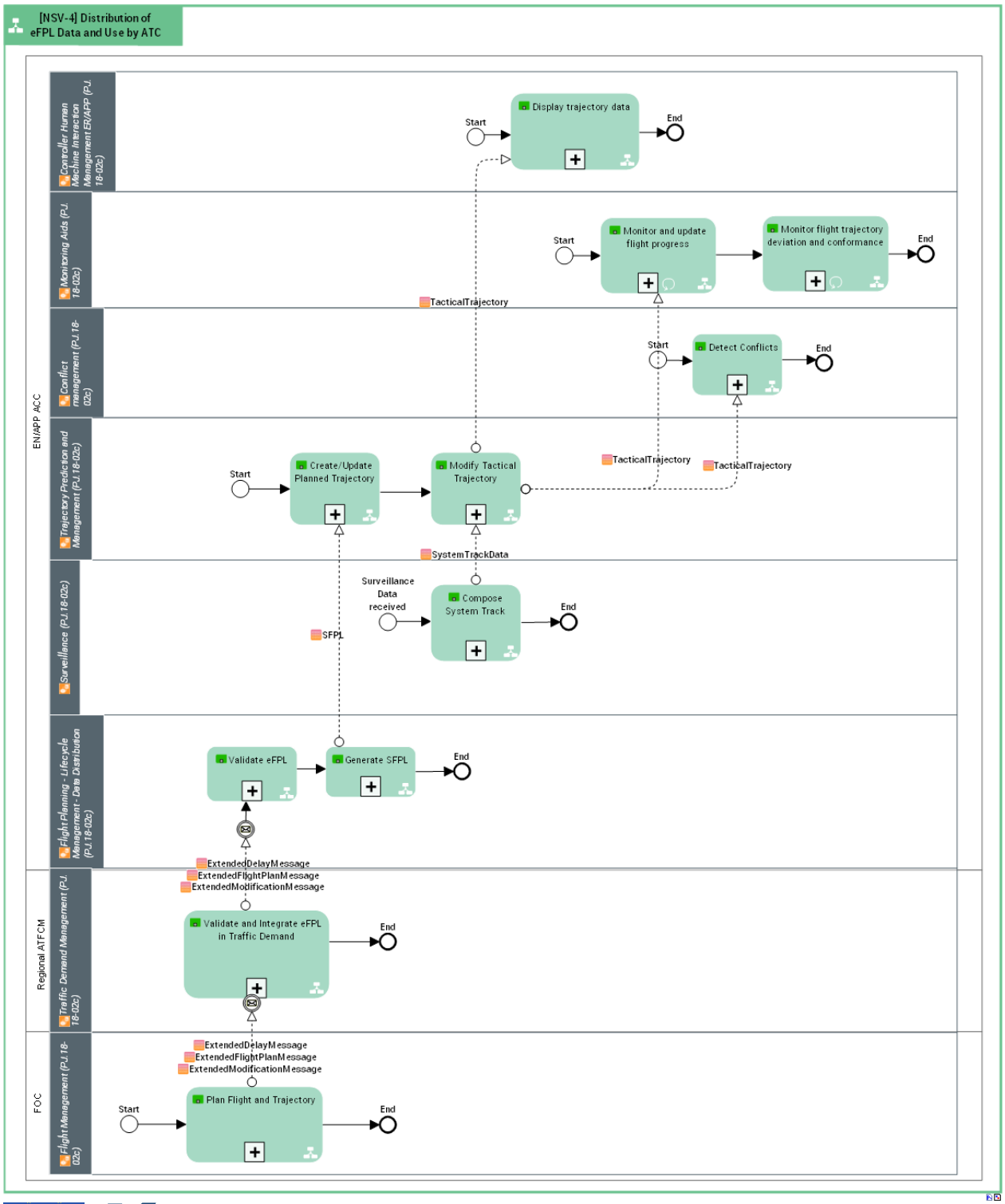
The capability configurations and services required for the eFPL supporting SBT transition to RBT use cases.



4.1.2 Resource Orchestration view

4.1.2.1 [NSV-4] Distribution of eFPL Data and Use by ATC

This technical use case describes the eFPL data distribution and how it is used in the ATC systems.


[NSV-4] Distribution of eFPL Data and Use by ATC
EN/APP ACC
Regional ATFCM
FOC
Controller Human Machine Interaction Management ER/APP (PJ.18-02c)
Monitoring Aids (PJ.18-02c)
Conflict management (PJ.18-02c)
Trajectory Prediction and Management (PJ.18-02c)
Surveillance (PJ.18-02c)
Flight Planning - Lifecycle Management - Data Distribution (PJ.18-02c)
Traffic Demand Management (PJ.18-02c)
Flight Management (PJ.18-02c)
Start
Display trajectory data
End
Monitor and update flight progress
Monitor flight trajectory deviation and conformance
TacticalTrajectory
Detect Conflicts
Create/Update Planned Trajectory
Modify Tactical Trajectory
SystemTrackData
Surveillance Data received
Compose System Track
SFPL
Validate eFPL
Generate SFPL
ExtendedDelayMessage
ExtendedFlightPlanMessage
ExtendedModificationMessage
Validate and Integrate eFPL in Traffic Demand
Plan Flight and Trajectory

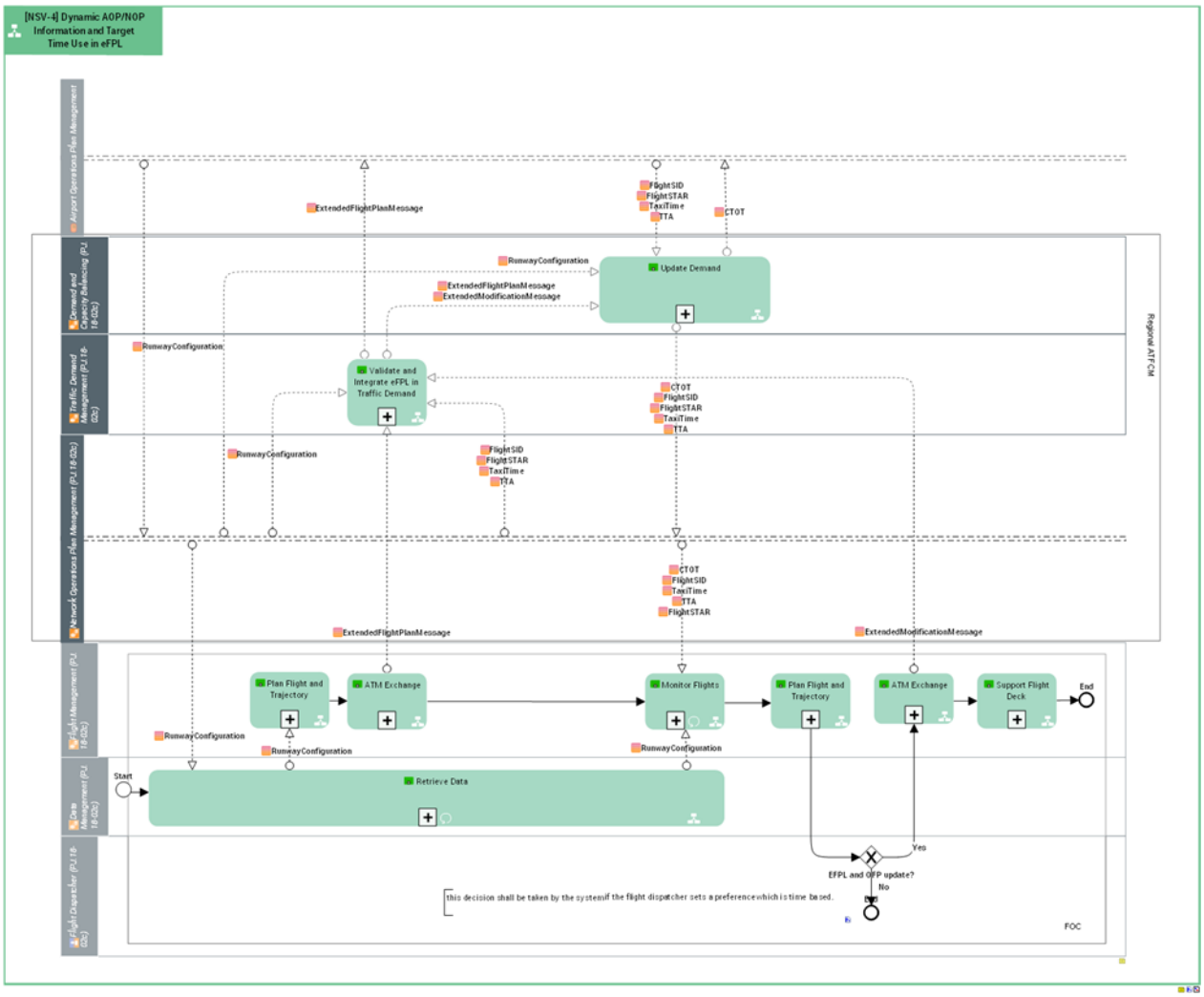
Function[3]	Description
Compose System Track	Calculate the system track for a flight by using the surveillance data.
Create/Update Planned Trajectory	Calculate the planned ATC trajectory from the System Flight Plan (SFPL).
Detect Conflicts	Detect potential trajectory conflicts.
Display trajectory data	Display the flight trajectory data to the ATCO.
Generate SFPL	Create the System Flight Plan (SFPL) based on the input flight plan.
Modify Tactical Trajectory	Update the Tactical Trajectory prediction based on the System Track Data during flight execution.
Monitor and update flight progress	Update the flight progress data with the Tactical Trajectory prediction updates during the flight execution.
Monitor flight trajectory deviation and conformance	Monitor the flight trajectory and its' conformance.
Plan Flight and Trajectory	Prepare the flight and trajectory data for a flight by using the published ATFCM data.
Validate and Integrate eFPL in Traffic Demand	Validate the eFPL according to NM IFPS rules and integrate into the traffic demand when valid. Return the validation result back.

[3] The functions which are not in the scope of this solution are greyed out in this table. They are present to give the full context.

Function[3]	Description
Validate eFPL	Validate the eFPL and extract the data.

4.1.2.2 [NSV-4] Dynamic AOP/NOP Information and Target Time Use in eFPL (Planning Phase)

This technical use case describes the SID, STAR, Runway Configuration, Departure Taxi Time, TTA and CTOT data provision/receptions between the Airports, Regional ATFCM, and the FOC; and the functions to align the trajectories of each system.


[NSV-4] Dynamic AOP/NOP Information and Target Time Use in eFPL
Airport Operations Plan Management
Demand and Capacity Balancing (PJ.18-02c)
Traffic Demand Management (PJ.18-02c)
Network Operations Plan Management (PJ.18-02c)
Flight Management (PJ.18-02c)
Data Management (PJ.18-02c)
Flight Dispatcher (PJ.18-02c)
Regional ATFCM
ExtendedFlightPlanMessage
FlightSID
FlightSTAR
TaxiTime
TTA
CTOT
RunwayConfiguration
Update Demand
ExtendedModificationMessage
Validate and Integrate eFPL in Traffic Demand
Plan Flight and Trajectory
ATM Exchange
Monitor Flights
Support Flight Deck
Start
End
Retrieve Data
Yes
No
EFPL and OFP update?
this decision shall be taken by the systemif the flight dispatcher sets a preferencewhich is time based.
FOC

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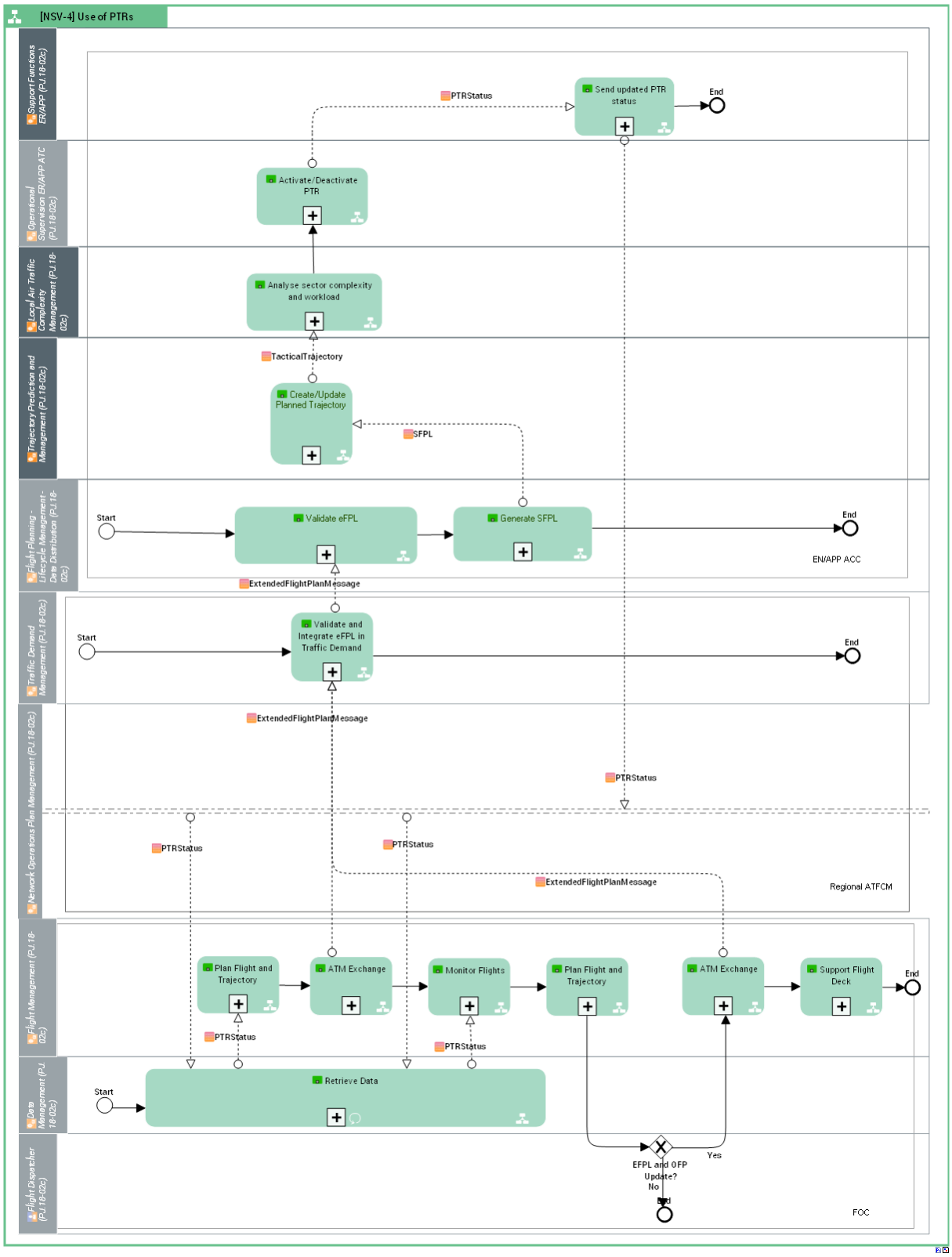
Function[4]	Description
ATM Exchange	Send flight plans to and retrieve corresponding responses from the Regional ATFCM via SWIM web services.
Monitor Flights	Monitor the modification of ATFCM data as well as of flight data for each flight plan submitted to the Regional ATFCM.
Plan Flight and Trajectory	Prepare the flight and trajectory data for a flight by using the published ATFCM data.
Retrieve Data	Monitor and retrieve amongst others the ATFCM data published by the Regional ATFCM.
Support Flight Deck	Prepare the data for the Flight briefing.
Update Demand	Update/re-validate the traffic demand with the flight plan or ATFCM data modifications.
Validate and Integrate eFPL in Traffic Demand	Validate the eFPL according to NM IFPS rules and integrate into the traffic demand when valid. Return the validation result back.

4.1.2.3 [NSV-4] Use of PTRs

This technical use case describes the PTR and PTR status data provision/receptions between the ATC, NM, and the FOC; and the functions to align the trajectories of each system.

[4] The functions which are not in the scope of this solution are greyed out in this table. They are present to give the full context.


[NSV-4] Use of PTRs
Support Functions EN/APP (PJ.18-02c)
Operational Supervision EN/APP ATC (PJ.18-02c)
Local Air Traffic Complexity Management (PJ.18-02c)
Trajectory Prediction and Management (PJ.18-02c)
Flight Planning - Lifecycle Management - Data Distribution (PJ.18-02c)
Traffic Demand Management (PJ.18-02c)
Network Operations Plan Management (PJ.18-02c)
Flight Management (PJ.18-02c)
Data Management (PJ.18-02c)
Flight Dispatcher (PJ.18-02c)
PTRStatus
Send updated PTR status
End
Activate/Deactivate PTR
Analyse sector complexity and workload
TacticalTrajectory
Create/Update Planned Trajectory
SFPL
Start
Validate eFPL
Generate SFPL
End
EN/APP ACC
ExtendedFlightPlanMessage
Start
Validate and Integrate eFPL in Traffic Demand
End
ExtendedFlightPlanMessage
PTRStatus
PTRStatus
PTRStatus
ExtendedFlightPlanMessage
Regional ATFCM
Plan Flight and Trajectory
ATM Exchange
Monitor Flights
Plan Flight and Trajectory
ATM Exchange
Support Flight Deck
End
PTRStatus
PTRStatus
Start
Retrieve Data
Yes
EFPL and OFP Update? No
End
FOC

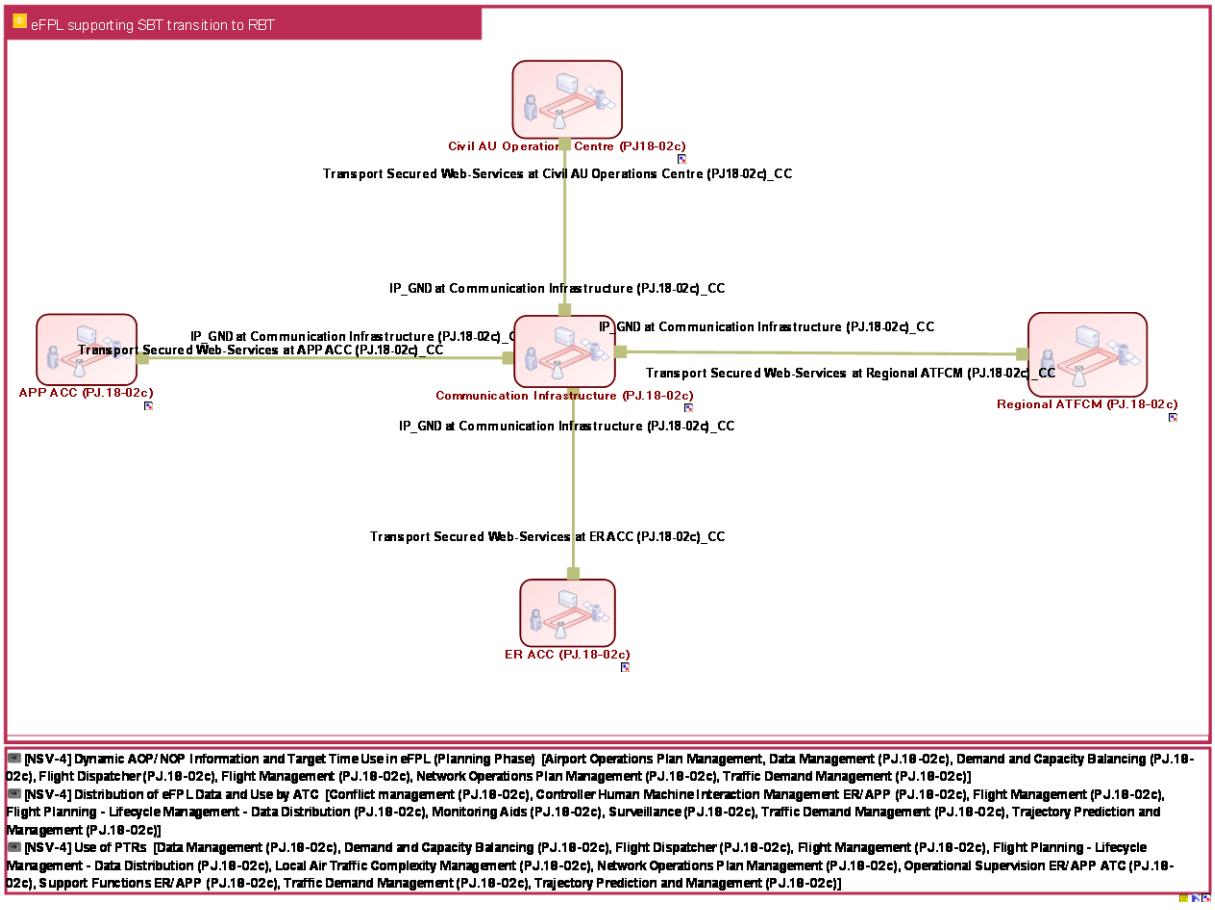
Function[5]	Description
Activate/Deactivate PTR	Modify the PTR status according to the traffic demand situation.
Analyse sector complexity and workload	Analyse the sector complexity and workload via the traffic demand and capacity.
ATM Exchange	Send flight plans to and retrieve corresponding responses from the Regional ATFCM via SWIM web services.
Create/Update Planned Trajectory	Calculate the planned ATC trajectory from the System Flight Plan (SFPL).
Generate SFPL	Create the System Flight Plan (SFPL) based on the input flight plan.
Monitor Flights	Monitor the modification of ATFCM data as well as of flight data for each flight plan submitted to the Regional ATFCM.
Plan Flight and Trajectory	Prepare the flight and trajectory data for a flight by using the published ATFCM data.
Retrieve Data	Monitor and retrieve amongst others the ATFCM data published by the Regional ATFCM.
Send updated PTR status	Send the modified PTR status to Network Manager for use and further publication.
Support Flight Deck	Prepare the data for the Flight briefing.

[5] The functions which are not in the scope of this solution are greyed out in this table. They are present to give the full context.

Function[5]	Description
Validate and Integrate eFPL in Traffic Demand	Validate the eFPL according to NM IFPS rules and integrate into the traffic demand when valid. Return the validation result back.
Validate eFPL	Validate the eFPL and extract the data.

4.1.3 Infrastructure connectivity model

The infrastructure required for the eFPL supporting SBT transition to RBT use cases.



4.1.4 Service View

4.1.4.1 Service Description

Service	Service Description
AirportFlightPlanningInformation	The AirportFlightPlanningInformation service supports the AOP-NOP integration concept by providing the concerned stakeholders with capabilities for exchanging extended DPI and API information in support of network operations planning to enhance predictability.
AirspaceStructureService	The AirspaceStructure NOP/B2B service is intended to provide services related to the management and sharing of Airspace data (e.g. airspaces, routes, aerodromes, etc.) as used by the NM systems. Ref: NM 21.5.0 - NOP/B2B Reference Manuals - AirspaceServices
ExtendedFlightPlanSubmission	The Submission service supports the Airspace User to: - request the validation of an Extended Flight Plan (FPL) message before its submission; - request the submission of Extended FPL/Extended Modification/Extended Delay message; - request the cancellation of an Extended Flight Plan; to the Network Manager and supports the Network Manager to: - send the reply of the validation request (ACK, REJ) to the Airspace User; - send the reply of the submission request (ACK, MAN, REJ) to the Airspace User; - send the status of a specific flight plan to the Airspace User and ATC units. The status may be “Suspended” or “De-suspended”.
FlightPlanDataDistribution	The FlightPlanDataDistribution Service supports the service provider (Network Manager) to: - send a copy of a valid Extended Flight Plan (EFPL) message, Extended Modification (ECHG) message, Extended Delay (EDLA) message to the service consumers concerned by the flight that want to receive extended flight plan messages; - send to all of other service consumers concerned by the flight only a copy of the ICAO Flight Plan included in the EFPL message or a copy of a ‘simple’ modification (CHG) message or a copy of a ‘simple’ delay (DLA) message; - notify to the service consumers the cancellation of a specified flight plan; - send a specific Flight Plan (in Extended or ICAO format) following a specific request from a service consumer.
NMFlightDataService (PJ.18-02c)	The NMFlightData service is used to query and retrieve information on existing flight plans and flights.

RunwayManagementInformation	Service delivers planning information about runway configuration, runway capacities and aggregated runway infrastructure capacities.
TacticalUpdatesService	This service provides a new operation to the TacticalUpdates service (see REF NM 21.5.0 - NOP/B2B Reference Manuals - FlowServices) provided by RegionalATFCM for the ACC to change the status of an existing PTR.

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Interaction	Consumer CC	Consumer System	Provider CC	Provider System
FlightPlanDataDistribution.APP ACC (PJ.18-02c)_CC and Regional ATFCM (PJ.18-02c)_CC	APP ACC (PJ.18-02c)	ATFCM (PJ.18-02c) (EN/APP ACC); En-Route / Approach ATC;	Regional ATFCM (PJ.18-02c)	ATFCM (PJ.18-02c) (Regional ATFCM);
FlightPlanDataDistribution.ER ACC (PJ.18-02c)_CC and Regional ATFCM (PJ.18-02c)_CC	ER ACC (PJ.18-02c)	En-Route / Approach ATC;	Regional ATFCM (PJ.18-02c)	ATFCM (PJ.18-02c) (Regional ATFCM);
TacticalUpdatesService.APP ACC (PJ.18-02c)_CC and Regional ATFCM (PJ.18-02c)_CC	APP ACC (PJ.18-02c)	ATFCM (PJ.18-02c) (EN/APP ACC);	Regional ATFCM (PJ.18-02c)	ATFCM (PJ.18-02c) (Regional ATFCM);
TacticalUpdatesService.ER ACC (PJ.18-02c)_CC and Regional ATFCM (PJ.18-02c)_CC	ER ACC (PJ.18-02c)	ATFCM (PJ.18-02c) (EN/APP ACC);	Regional ATFCM (PJ.18-02c)	ATFCM (PJ.18-02c) (Regional ATFCM);
AirspaceStructureService.Civil AU Operations Centre (PJ18-02c)_CC and Regional ATFCM (PJ.18-02c)_CC	Civil AU Operations Centre (PJ18-02c)	Civil AU Flight Operations Centre (FOC) (PJ.18-02c);	Regional ATFCM (PJ.18-02c)	ATFCM (PJ.18-02c) (Regional ATFCM);
ExtendedFlightPlanSubmission.Civil AU Operations Centre (PJ18-02c)_CC and Regional ATFCM (PJ.18-02c)_CC	Civil AU Operations Centre (PJ18-02c)	Civil AU Flight Operations Centre (FOC) (PJ.18-02c);	Regional ATFCM (PJ.18-02c)	ATFCM (PJ.18-02c) (Regional ATFCM);
AirportFlightPlanningInformation.Airport_CC and Regional ATFCM (PJ.18-02c)_CC	Airport	Airport Airside Operations; Airport Operations Centre;	Regional ATFCM (PJ.18-02c)	ATFCM (PJ.18-02c) (Regional ATFCM);

Interaction	Consumer CC	Consumer System	Provider CC	Provider System
NMFlightDataService (PJ.18-02c).Civil AU Operations Centre (PJ18-02c)_CC and Regional ATFCM (PJ.18-02c)_CC	Civil AU Operations Centre (PJ18-02c)	Civil AU Flight Operations Centre (FOC) (PJ.18-02c);	Regional ATFCM (PJ.18-02c)	ATFCM (PJ.18-02c) (Regional ATFCM);
RunwayManagementInformation.Airport_CC and Regional ATFCM (PJ.18-02c)_CC	Airport	Airport Airside Operations; Airport Operations Centre;	Regional ATFCM (PJ.18-02c)	ATFCM (PJ.18-02c) (Regional ATFCM);

4.1.4.3 Service Realization

4.1.4.3.1 Interaction AirportFlightPlanningInformation.Airport_CC and Regional ATFCM (PJ.18-02c)_CC

Service Interface Definition	
ProvidedAirportFlightPlanningInformation	
Standard	**MEP, Security Configuration, Interface Bindings**
AirportFlightPlanningInformationInterface.Transport Secured Web-Services	MEPs Supported: SRR PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304 REQ-14.01.04-TS-0901.0305 REQ-14.01.04-TS-0901.0325

4.1.4.3.2 Interaction AirspaceStructureService.Civil AU Operations Centre (PJ18-02c)_CC and Regional ATFCM (PJ.18-02c)_CC

Service Interface Definition	
AirspaceStructureConsumer	
Standard	**MEP, Security Configuration, Interface Bindings**
AirspaceDataSubscribe.Transport Secured Web-Services	MEPs Supported: SRR PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304 REQ-14.01.04-TS-0901.0305 REQ-14.01.04-TS-0901.0325

Service Interface Definition	
AirspaceStructurePublisher	
Standard	**MEP, Security Configuration, Interface Bindings**
AirspaceStructurePublish.Transport Secured Web-Services	MEPs Supported: SRR PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304

	REQ-14.01.04-TS-0901.0305 REQ-14.01.04-TS-0901.0325

4.1.4.3.3 Interaction ExtendedFlightPlanSubmission.Civil AU Operations Centre (PJ18-02c)_CC and Regional ATFCM (PJ.18-02c)_CC

Service Interface Definition	
FlightPlanCoordinator	
Standard	**MEP, Security Configuration, Interface Bindings**
FlightPlanCoordinatorInterface.Transport Secured Web-Services	MEPs Supported: SRR PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304 REQ-14.01.04-TS-0901.0305 REQ-14.01.04-TS-0901.0325

Service Interface Definition
FlightStatusConsumer

Service Interface Definition
FlightStatusProvider

4.1.4.3.4 Interaction FlightPlanDataDistribution.APP ACC (PJ.18-02c)_CC and Regional ATFCM (PJ.18-02c)_CC

Service Interface Definition

FlightPlanDataConsumer

Service Interface Definition
FlightPlanDataPublisher

Service Interface Definition	
FlightPlanProvider	
Standard	**MEP, Security Configuration, Interface Bindings**
FlightPlanProviderInterface.Transport Secured Web-Services	MEPs Supported: SRR PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304 REQ-14.01.04-TS-0901.0305 REQ-14.01.04-TS-0901.0325

4.1.4.3.5 Interaction FlightPlanDataDistribution.ER ACC (PJ.18-02c)_CC and Regional ATFCM (PJ.18-02c)_CC

Service Interface Definition
FlightPlanDataConsumer

Service Interface Definition
FlightPlanDataPublisher

Service Interface Definition

FlightPlanProvider	
Standard	**MEP, Security Configuration, Interface Bindings**
FlightPlanProviderInterface.Transport Secured Web-Services	MEPs Supported: SRR PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304 REQ-14.01.04-TS-0901.0305 REQ-14.01.04-TS-0901.0325

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401 #### 4.1.4.3.6 Interaction NMFlightDataService (PJ.18-02c).Civil AU Operations Centre (PJ18-
402 02c)_CC and Regional ATFCM (PJ.18-02c)_CC

Service Interface Definition	
NMFlightDataConsumer	
Standard	**MEP, Security Configuration, Interface Bindings**
ProvidedNMFlightData.Transport Secured Web-Services	MEPs Supported: SRR PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304 REQ-14.01.04-TS-0901.0305

	REQ-14.01.04-TS-0901.0325

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Service Interface Definition
NMFlightDataPublisher

404

405 **4.1.4.3.7 Interaction RunwayManagementInformation.Airport_CC and Regional ATFCM**
406 **(PJ.18-02c)_CC**

Service Interface Definition
RunwayManagementInformationProvider

407

Service Interface Definition	
RunwayManagementInformationPublisher	
Standard	**MEP, Security Configuration, Interface Bindings**
RunwayInformationPubSubInterface.Transport Secured Web-Services	MEPs Supported: SRR PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304 REQ-14.01.04-TS-0901.0305 REQ-14.01.04-TS-0901.0325
RunwayManagementInformationPubSubInterface.DDS over UDP	MEPs Supported: PSPUSH PSPULL Security Configuration: Interface Binding Traceability:

	REQ-14.01.04-TS-0901.0705

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Service Interface Definition	
RunwayManagementInformationSubscriber	
Standard	**MEP, Security Configuration, Interface Bindings**
RunwayInformationPubSubInterface.Transport Secured Web-Services	MEPs Supported: SRR PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304 REQ-14.01.04-TS-0901.0305 REQ-14.01.04-TS-0901.0325
RunwayManagementInformationPubSubInterface.DDS over UDP	MEPs Supported: PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0705

409

410 #### 4.1.4.3.8 Interaction TacticalUpdatesService.APP ACC (PJ.18-02c)_CC and Regional
411 ATFCM (PJ.18-02c)_CC

Service Interface Definition	
TacticalUpdatesPublisher	
Standard	**MEP, Security Configuration, Interface Bindings**
PTRInformationPublisher.Transport Secured Web-Services	MEPs Supported: SRR

	PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304 REQ-14.01.04-TS-0901.0305 REQ-14.01.04-TS-0901.0325

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413 #### 4.1.4.3.9 Interaction TacticalUpdatesService.ER ACC (PJ.18-02c)_CC and Regional ATFCM
414 (PJ.18-02c)_CC

Service Interface Definition	
TacticalUpdatesPublisher	
Standard	**MEP, Security Configuration, Interface Bindings**
PTRInformationPublisher.Transport Secured Web-Services	MEPs Supported: SRR PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304 REQ-14.01.04-TS-0901.0305 REQ-14.01.04-TS-0901.0325

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416 ## 4.2 Functional and non-Functional Requirements

4.2.1 Regional ATFCM Requirements

4.2.1.1 Functional Requirements

[REQ]

Identifier	REQ-18.02c-TS-TDM1.0003
Title	FlightPlanDataDistribution service
Requirement	The Regional ATFCM system shall provide the FlightPlanDataDistribution service.
Status	<validated>
Rationale	The EN/APP ACC needs to receive the eFPL.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0002
< ALLOCATED_TO >	<Enabler>	NIMS-21b
<ALLOCATED_TO>	<Function>	Validate and Integrate eFPL in Traffic Demand

[REQ]

Identifier	REQ-18.02c-TS-TDM1.0004
Title	FPL and eFPL
Requirement	The Regional ATFCM system shall distribute either FPL or eFPL data according to the preference of each ACC.
Status	<validated>
Rationale	During the transition phase, not all Local Network Operations will be able to receive and use the eFPL, therefore the co-existence of ICAO FPL and eFPL needs to be supported.

Category	<Functional>

423 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	REQ-18.02.c.01-SPRINTEROP-TR01.01
< ALLOCATED_TO >	<Enabler>	NIMS-21b
<ALLOCATED_TO>	<Function>	Validate and Integrate eFPL in Traffic Demand

424

425 #### 4.2.1.2 Demand and Capacity Balancing Functional Requirements

426 [REQ]

Identifier	REQ-18.02c-TS-DCB1.0001
Title	NMFlightData Service for AU
Requirement	The Regional ATFCM system shall provide the flightListbyAO interface in NMFlightData service for the Airspace Users via publish/subscribe.
Status	<validated>
Rationale	The Airspace User needs to be notified when there is a decision of SID/STAR/TT, which is applicable to their flight plans, i.e. affects the 4D trajectory; so that all stakeholders are aligned.
Category	<Functional>

427 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0010
< ALLOCATED_TO >	<Enabler>	SVC-003 NIMS-54
<ALLOCATED_TO>	<Functional Block>	Network Operations Plan Management (PJ.18-02c)

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4.2.1.3 Non-functional Requirements

The following requirements are to be validated during deployment phase.

[REQ]

Identifier	REQ-18.02c-TS-QOS1.0001
Title	FlightPlanDataDistribution Quality of Service
Requirement	The Regional ATFCM shall provide the FlightPlanDataDistribution according to the current operational flight data distribution service levels.
Status	<in progress>
Rationale	The QoS of the service shall comply with the current flight data distribution service.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	REQ-18.02.c.01-SPRINTEROP-SE01.01 REQ-18.02.c.01-SPRINTEROP-SE01.03
< ALLOCATED_TO >	<Enabler>	SWIM-APS-18
<ALLOCATED_TO>	<Function>	Validate and Integrate eFPL in Traffic Demand

[REQ]

Identifier	REQ-18.02c-TS-SEC1.0001
Title	Data protection
Requirement	The Regional ATFCM shall provide the FlightPlanDataDistribution service to the identified and authenticated users.
Status	<in progress>
Rationale	The confidentiality of the data needs to be ensured.

Category	<Security>

435

436 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	REQ-18.02.c.01-SPRINTEROP-SE01.01
< ALLOCATED_TO >	<Enabler>	SWIM-APS-18
<ALLOCATED_TO>	<Function>	Validate and Integrate eFPL in Traffic Demand

437 [REQ]

Identifier	REQ-18.02c-TS-SEC1.0002
Title	Data integrity
Requirement	The Regional ATFCM shall provide the FlightPlanDataDistribution via the SWIM Yellow Profile.
Status	<in progress>
Rationale	The confidentiality of the data needs to be ensured.
Category	<Security>

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439 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	REQ-18.02.c.01-SPRINTEROP-SE01.02
< ALLOCATED_TO >	<Enabler>	SWIM-APS-18
<ALLOCATED_TO>	<Function>	Validate and Integrate eFPL in Traffic Demand

440

441 [REQ]

Identifier	REQ-18.02c-TS-SAF1.0001

Title	Assurance Levels
Requirement	The Regional ATFCM shall develop the FlightPlanDataDistribution service with an appropriate Assurance Level (AL).
Status	<in progress>
Rationale	Safety Requirement: NM shall develop the "flight messages checking and distribution" service with an appropriate Assurance Level (AL).
Category	<Security>

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443 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	REQ-18.02.c.01-SPRINTEROP-SE01.02
< ALLOCATED_TO >	<Enabler>	NIMS-21b
<ALLOCATED_TO>	<Function>	Validate and Integrate eFPL in Traffic Demand

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445 4.2.2 APP/ACC and EN/ACC Requirements

446 4.2.2.1 Reception of eFPL data from Regional ATFCM Functional Requirements

447 [REQ]

Identifier	REQ-18.02c-ANS1.0001
Title	Connection to Regional ATFCM and eFPL reception
Requirement	After connection to the B2B NM broker, the En Route / Approach ATC ground system shall receive the eFPL provided by Airspace Users and processed by the Regional ATFCM.
Status	<validated>
Rationale	The protocol used for messages exchange is AMQPS with specific certificate used for the connection to Regional ATFCM. The eFPL are provided using FIXM format.

	The Airspace Users have the capability to plan their flights taking into account a large set of information that are specific data which increase the quality and the precision of the flight data. These data are used to build the Flight Plan in the eFPL standard. These eFPLs follow the usual path from Airspace User to Network Manager and to ATC. For ATC, specific B2B connection is required to transport this information from the Regional ATFCM to the ATC ground system.
Category	<Functional>

448 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0002
< ALLOCATED_TO >	<Enabler>	SWIM-APS-18
<ALLOCATED_TO>	<Function>	Validate eFPL

449 #### 4.2.2.2 Relevant Data extraction for SFPL creation and validation Functional
450 Requirements

451 [REQ]

Identifier	REQ-18.02c- ANS1.0002
Title	eFPL data extraction (En Route / Approach ATC ground system)
Requirement	After reception of the eFPL by the En Route / Approach ATC system, the En Route / Approach ATC system shall extract the following eFPL relevant data to match the flight with the ground system flight plan: - Callsign - ADEP - ADES - EOBT
Status	<validated>
Rationale	The eFPL data have to be extracted by the En Route / Approach ATC system for analysis and to be taken in the flow of information needed by the En Route / Approach ATC system.

Category	<Functional>

452 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0002
< ALLOCATED_TO >	<Enabler>	SWIM-APS-18
<ALLOCATED_TO>	<Function>	Validate eFPL

453 [REQ]

Identifier	REQ-18.02c- ANS1.0003
Title	eFPL additional data extraction
Requirement	In addition to the legacy Flight Plan data, the En Route / Approach ATC system shall extract the aircraft mass on each route point.
Status	<Validated>
Rationale	The En Route / Approach ATC ground trajectory computation should compute trajectories taking into account additional data provided by the eFPL to enrich and build the SFPL. In comparison to standard ICAO Flight Plan format, the eFPL data format includes additional data specific to the concerned flight. These data are candidates to improve the ground system tools such as Trajectory Predictor.
Category	<Functional>

454 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0002
< ALLOCATED_TO >	<Enabler>	SWIM-APS-18
<ALLOCATED_TO>	<Function>	Validate eFPL

455

4.2.2.3 Flight Planning - Lifecycle Management - Data Distribution Functional Requirements

[REQ]

Identifier	REQ-18.02c-ANS1.0004
Title	System Flight plan initialization with eFPL data in ground system.
Requirement	The En Route / Approach ATC ground system and shall integrate with the legacy FPL the extracted eFPL aircraft mass to create the system flight plan.
Status	<validated>
Rationale	In addition to legacy FPL data, additional flight data extracted from the eFPL shall be taken into account in ground Flight Data Processing for trajectory prediction process. From the Flight Plan data received from NM, the En Route / Approach ATC ground system builds a System Flight Plan (SFPL). This System Flight Plan will be enriched with additional data from the eFPL that are not available in the current FPL format.
Category	<Functional><Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0002
< ALLOCATED_TO >	<Enabler>	SWIM-APS-18
<ALLOCATED_TO>	<Function>	Generate SFPL

4.2.2.4 Trajectory Management Functional Requirements

[REQ]

Identifier	REQ-18.02c-ANS1.0007
Title	Use of aircraft Mass in the trajectory computation
Requirement	When available from the eFPL data, the Aircraft Mass on each Route Point extracted from the eFPL shall be used to compute the ground trajectory of the aircraft from its present position.
Status	<validated>
Rationale	One of the major flight items to be considered in the trajectory computation is the aircraft mass, as it has a great influence on performance therefore on predicted trajectory. The aircraft mass is then used in the trajectory prediction tool to determine the mass factor that serve in the Trajectory computation algorithm. During execution phase, the En Route / Approach ATC Ground Trajectory Prediction tool should take into account the Aircraft Mass on each Trajectory Point extracted from the eFPL in order to compute En Route / Approach ATC Ground Trajectory Prediction, therefore aircraft performance shall improve trajectory prediction.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0002
< ALLOCATED_TO >	<Enabler>	SWIM-APS-18
<ALLOCATED_TO>	<Function>	Create/Update Planned Trajectory

4.2.2.5 Non-functional Requirements

The following requirements are to be validated during deployment phase.

[REQ]

Identifier	REQ-18.02c-TS-ANS1.0012
Title	Assurance Levels
Requirement	The ground trajectory prediction tool shall be developed and validated with the correct assurance level (AL)
Status	<in progress>
Rationale	Safety Requirement: The ground trajectory prediction tool shall be developed and validated with the correct assurance level (AL).
Category	<Safety>

467 [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	REQ-18.02.c.01-SPRINTEROP-SE01.02 REQ-18.02.c.01-SPRINTEROP-SE01.03
<ALLOCATED_TO>	<Enabler>	ER APP ATC 82 SWIM-APS-18
<ALLOCATED_TO>	<Function>	Create/Update Planned Trajectory

468 ## 4.2.3 Civil AU Operations Centre Requirements

469 ### 4.2.3.1 Flight Management Functional Requirements

470 [REQ]

Identifier	REQ-18.02c-TS-FM01.0001
Title	Apply the runway configuration
Requirement	The FOC system shall use the published runway configuration in the planning of the trajectory.
Status	<validated>
Rationale	The AU needs to consider the up-to-date runway information in the planning of the trajectory. As the runway influences the result of the creation of an

	optimal trajectory by the AU, the usage of the up-to-date runway supports the creation of a trajectory that does not require an adjustment by other stakeholders and that is closer to the flown trajectory.
Category	<Functional><Safety>

471 [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0004
<ALLOCATED_TO>	<Enabler>	AOC-ATM-23
<ALLOCATED_TO>	<Function>	Retrieve Data
<ALLOCATED_TO>	<Function>	Monitor Flights
<ALLOCATED_TO>	<Function>	Plan Flight and Trajectory

472

473 [REQ]

Identifier	REQ-18.02c-TS-FM01.0002
Title	Retrieve flight data (SID/STAR)
Requirement	The FOC system shall retrieve the flight data from Regional ATFCM and make the included SID/STAR allocation and the TT/CTOT information available to the planning of the trajectory and to the monitoring of the flight.
Status	<validated>
Rationale	The AU needs to have available the SID/STAR allocation and the TT/CTOT information to base the flight planning activities on an up-to-date and complete view of the constraints influencing the trajectory of the flight.
Category	<Functional><Safety>

474 [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0010

<ALLOCATED_TO>	<Enabler>	SWIM-APS-17
<ALLOCATED_TO>	<Function>	Monitor Flights

475

476 [REQ]

Identifier	REQ-18.02c-TS-FM01.0005
Title	Monitor flights for affecting data
Requirement	The FOC system shall monitor the calculated flights for data (SID/STAR, departure runway configuration, and TT/CTOT) affecting them and trigger a recalculation in two possible ways: 1. At pre-defined milestones which are defined by configuration 2. Upon request of the flight dispatcher.
Status	<validated>
Rationale	The AU needs to be aware about the most recent information affecting the trajectory of a flight (PTR, SID/STAR, and TT/CTOT). As this information influences the result of the creation of an optimal trajectory by the AU, the AU will assess the changes at predefined milestones or on demand of the flight dispatcher.
Category	<Functional>

477 [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0004 IER-18-02c-OSED-eFPL.0010
<ALLOCATED_TO>	<Enabler>	AOC-ATM-23
< ALLOCATED_TO >	<Function>	Monitor Flights

478

479 [REQ]

Identifier	REQ-18.02c-TS-FM01.0006

Title	Decision about sending a flight plan update
Requirement	Either the FOC system shall decide if it can send a flight plan update or it shall support the flight dispatcher in this decision – depending on a configuration.
Status	<validated>
Rationale	Although the FOC system might take into consideration the most recent information affecting the trajectory of a flight (PTR, SID/STAR, and TT/CTOT) during the recalculation of the trajectory, the FOC system might not have the possibility to send a flight plan update to the Regional ATFCM. The reason for it is that the AU can send flight plan updates only until a certain point in time prior to the departure of the flight. If this point in time is past then the other stakeholders need to manage the necessary trajectory changes.
Category	<Functional>

480 [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0004 IER-18-02c-OSED-eFPL.0010
<ALLOCATED_TO>	<Enabler>	AOC-ATM-23
< ALLOCATED_TO >	<Functional Block>	Flight Management (PJ.18-02c)
< ALLOCATED_TO >	<Role>	Flight Dispatcher (PJ.18-20c)

481 [REQ]

Identifier	REQ-18.02c-TS-FM01.0003
Title	Apply SID/STAR allocation information
Requirement	The FOC system shall use the most recent planned SID/STAR published by the AOP/NOP in the planning of the trajectory.
Status	<validated>
Rationale	The AU needs to consider the most recent SID/STAR allocation in the planning of the trajectory. As the SID/STAR allocation information influence the result of the creation of an optimal trajectory by the AU, the usage of the

	most recent SID/STAR allocation information supports the creation of a trajectory that does not require an adjustment by other stakeholders and that is closer to the flown trajectory.
Category	<Functional><Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0010
<ALLOCATED_TO>	<Enabler>	AOC-ATM-23
<ALLOCATED_TO>	<Function>	Plan Flight and Trajectory

4.2.3.2 Data Management Functional Requirements

[REQ]

Identifier	REQ-18.02c-TS-DM01.0001
Title	Retrieve runway configuration
Requirement	The FOC system shall retrieve the runway configuration from Regional ATFCM and make it available the planning of the trajectory.
Status	<validated>
Rationale	The AU needs to have available the runway configuration to base the flight planning activities on an up-to-date and complete view of the constraints influencing the trajectory of the flight.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0004
<ALLOCATED_TO>	<Enabler>	AOC-ATM-23

		SWIM-APS-17
<ALLOCATED_TO>	<Function>	Retrieve Data

487

488 #### 4.2.3.3 Non-functional Requirements

489 N/A

5 Implementation Options

N/A

6 Assumptions

N/A

7 References and Applicable Documents

7.1 Applicable Documents

Content Integration

[1] D5.1 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

System Engineering

[1] SESAR 2020 Requirements and Validation Guidelines, Edition 00.01.01

7.2 Reference Documents

[2] SESAR Solution 18-02c SPR-INTEROP/OSED – Part I, Edition 00.01.00, 13 October 2017

[3] D92 Step 1 EFPL in NM Systems Technical Specification, Edition 00.01.01, 30 May 2016

[4] ATMRPP/2-WP/718 AIR TRAFFIC MANAGEMENT REQUIREMENTS AND PERFORMANCE PANEL (ATMRPP), SECOND MEETING, Montreal, Canada, 14 to 18 November 2016, draft working paper

[5] FF-ICE Manual ***Draft*** Version 0.8 for ATMRPP Review, 2017-12-22, draft edition on STELLAR

[6] FIXM Implementation Guidance, draft working version

[7] Step 1 EFPL in NM Systems Technical Specification, Edition 00.01.01, 30 May 2016

[8] D5.2.010, PJ.18-06 TRL6 Initial Technical Specification (TS/IRS), Edition 00.01.02, 29 November 2017

[9] Collaborative NOP OSED Step 1, D45, Edition 00.03.00, 29 September 2015

[10] EUROCONTROL Specification for trajectory prediction Ed 2.0 dated 03 March 2017

Appendix A FlightPlanDataDistribution SDD

A.1 Introduction

This service is defined in SESAR 1 Solution 37. It is used by the PJ.18-02c solution for validation.

A.2 Service Identification

Name of the Service	FlightPlanDataDistribution
Identifier	LYN64d1SLjzX
Version	EATMA Draft
Architect(s)	LAMARQUE Romain (EXT)
Last Modification Date	10/24/2017

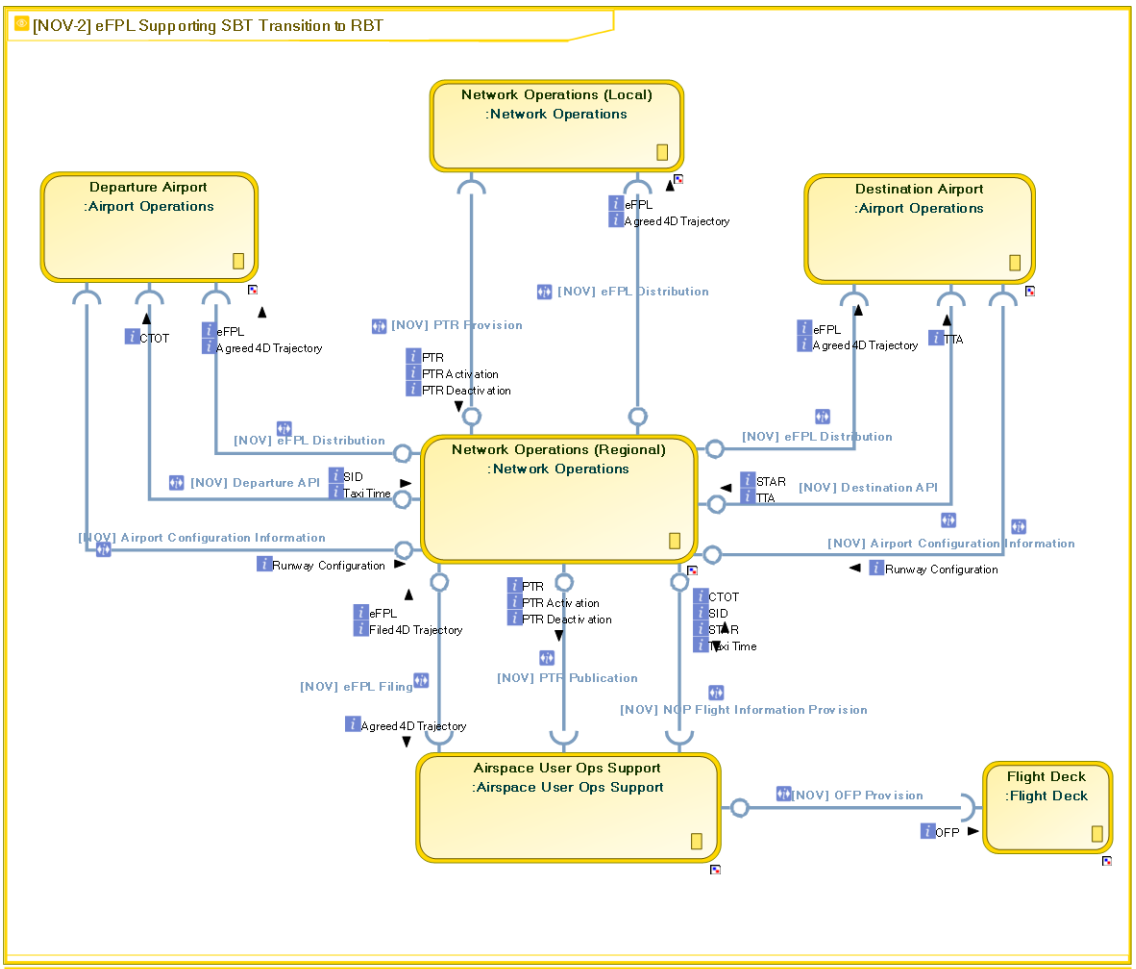
Table 3: FlightPlanDataDistribution Service identification (I)

IOC	
FOC	12/31/2024

Table 2: FlightPlanDataDistribution Service identification (II)

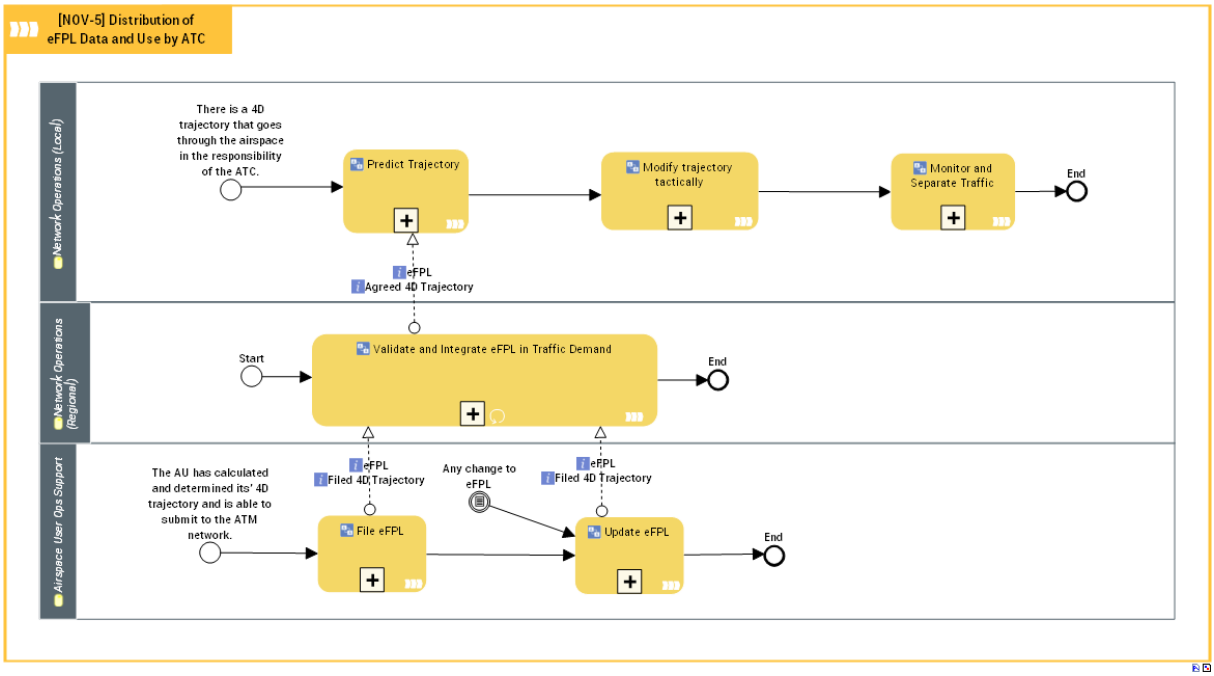
A.3 Operational and Business Context

A.3.1 Operational Context



[NOV-5] Distribution of eFPL Data and Use by ATC [Airspace User Ops Support, Network Operations (Local), Network Operations (Regional)]
[NOV-5] Dynamic AOP/NOP Information in eFPL [Airspace User Ops Support, Departure Airport, Destination Airport, Flight Deck, Network Operations (Regional)]
[NOV-5] Target Time Use in eFPL (Planning Phase) [Airspace User Ops Support, Departure Airport, Destination Airport, Flight Deck, Network Operations (Regional)]
[NOV-5] Use of PTRs [Airspace User Ops Support, Network Operations (Local), Network Operations (Regional)]

523



524

525 A.4 Service Overview

526 A.4.1 Service Taxonomy

Supported Capability	Parent Capability	Level 1 Capability
SWIM-based Information Dissemination		
	Information Infrastructure Management	
		Information Management
Trajectory Information Synchronisation		
	Trajectory Management	
		Service Delivery Management

527 A.4.2 Service Interfaces

528

Service Name	Description

FlightPlanDataDistribution	The FlightPlanDataDistribution Service supports the service provider (Network Manager) to: - send a copy of a valid Extended Flight Plan (EFPL) message, Extended Modification (ECHG) message, Extended Delay (EDLA) message to the service consumers concerned by the flight that want to receive extended flight plan messages; - send to all of other service consumers concerned by the flight only a copy of the ICAO Flight Plan included in the EFPL message or a copy of a 'simple' modification (CHG) message or a copy of a 'simple' delay (DLA) message; - notify to the service consumers the cancellation of a specified flight plan; - send a specific Flight Plan (in Extended or ICAO format) following a specific request from a service consumer.

529

Service Interface Definition	Description
FlightPlanDataConsumer	The FlightPlanDataConsumer service interface definition exposes the operation for the distribution of flight plan data.
FlightPlanDataPublisher	The FlightPlanDataPublisher service interface definition exposes the operations for subscription/unsubscription to/from flight plan data distribution.
FlightPlanProvider	The FlightPlanDataProvider service interface definition exposes the operations to request an extended or ICAO flight plan.

530 ## A.5 Service interface specifications

531 (* indicates that the Data Entity has been created for the needs of this service, but is not yet part of AIRM)

532 ### A.5.1 FlightPlanDataConsumer

533 #### 1. Operation publishFlightPlan

534 No Comment available.

Input	Service Payload	Data Entity
	ExtendedFlightPlanMessage	
	ICAOFPLMessage	

535

Input	Service Payload	Data Entity
	ExtendedFlightPlan	

536

2. Operation publishFlightPlanCancellation

537

538 No Comment available.

Input	Service Payload	Data Entity
	CancellationMessage	

539

3. Operation publishFlightPlanDelay

540

541 No Comment available.

Input	Service Payload	Data Entity
	ExtendedDelayMessage	

542

Input	Service Payload	Data Entity
	DelayMessage	
	ExtendedDelayMessage	

543

4. Operation publishFlightPlanModification

544

545 No Comment available.

Input	Service Payload	Data Entity
	ExtendedModificationMessage	

	ModificationMessage	

Input	Service Payload	Data Entity
	ExtendedModificationMessage	

A.5.2 FlightPlanDataPublisher

1. Operation subscribeToDistribution

No Comment available.

Input	Service Payload	Data Entity
	FPLDataSubscriptionRequest	
Return	**Service Payload**	**Data Entity**
	SubscriptionResponse	

2. Operation unsubscribeFromDistribution

No Comment available.

Input	Service Payload	Data Entity
	FPLDataUnsubscriptionRequest	
Return	**Service Payload**	**Data Entity**
	UnsubscriptionResponse	

A.5.3 FlightPlanProvider

1. Operation requestExtendedFlightPlan

No Comment available.

Input	Service Payload	Data Entity
	RequestFlightPlanMessage	

Return	Service Payload	Data Entity
	ExtendedFlightPlan	
	ExtendedFlightPlanMessage	

558

559

2. Operation requestICAOFlghtPlan

560 No Comment available.

Input	Service Payload	Data Entity
	RequestFlightPlanMessage	
Return	**Service Payload**	**Data Entity**
	ICAOFPLMessage	

561

Appendix B NMFlightDataService (PJ.18-02c) SDD

B.1 Introduction

The NMFlightDataService is a service which is already deployed by the Network Manager. The PJ.18-02c solution modifies the NMFlightDataService by enriching the content.

B.2 Service Identification

Name of the Service	NMFlightDataService (PJ.18-02c)
Identifier	d(mqfFTNQna1
Version	EATMA Draft
Architect(s)	KARAARSLAN Mehtap
Last Modification Date	1/16/2018

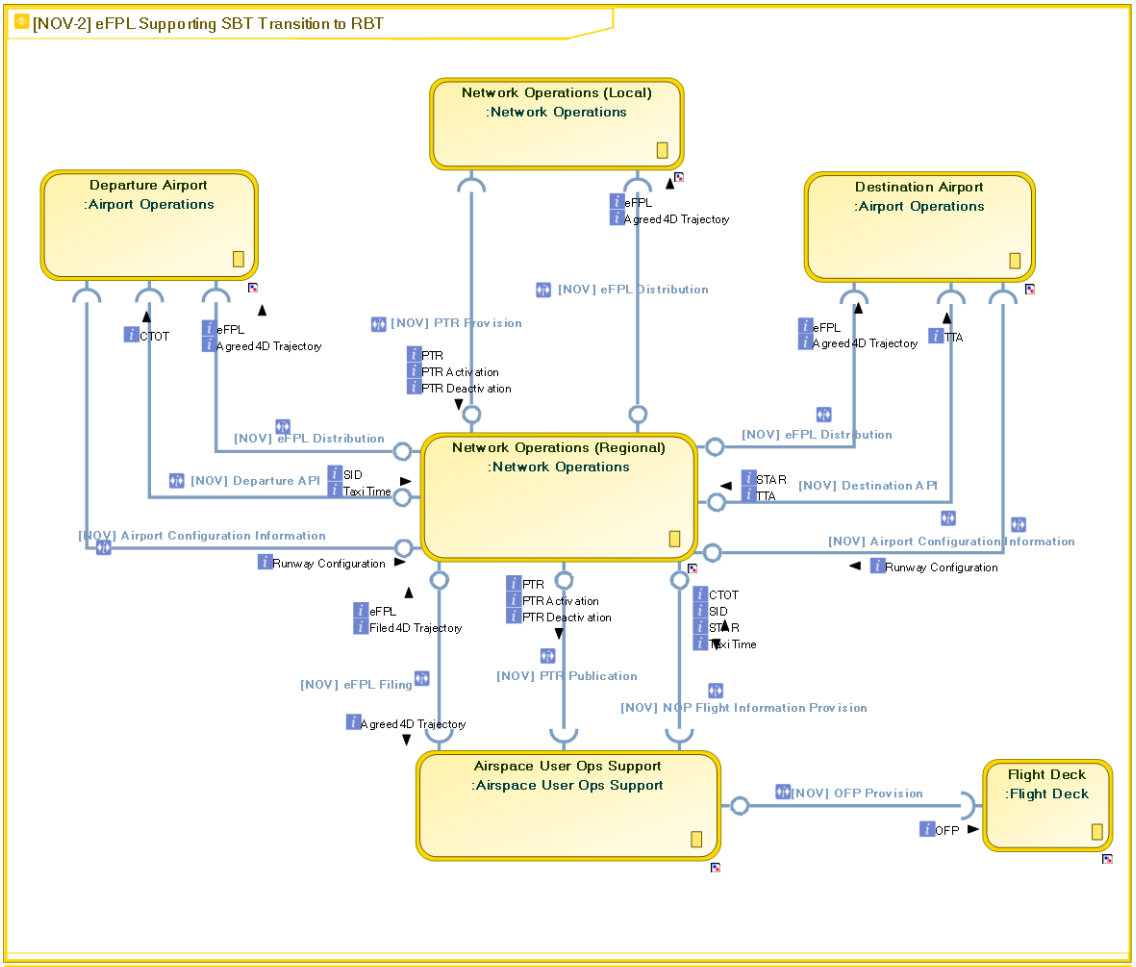
Table 4: NMFlightDataService Service identification (I)

IOC	
FOC	12/31/2029

Table 2: NMFlightDataService Service identification (II)

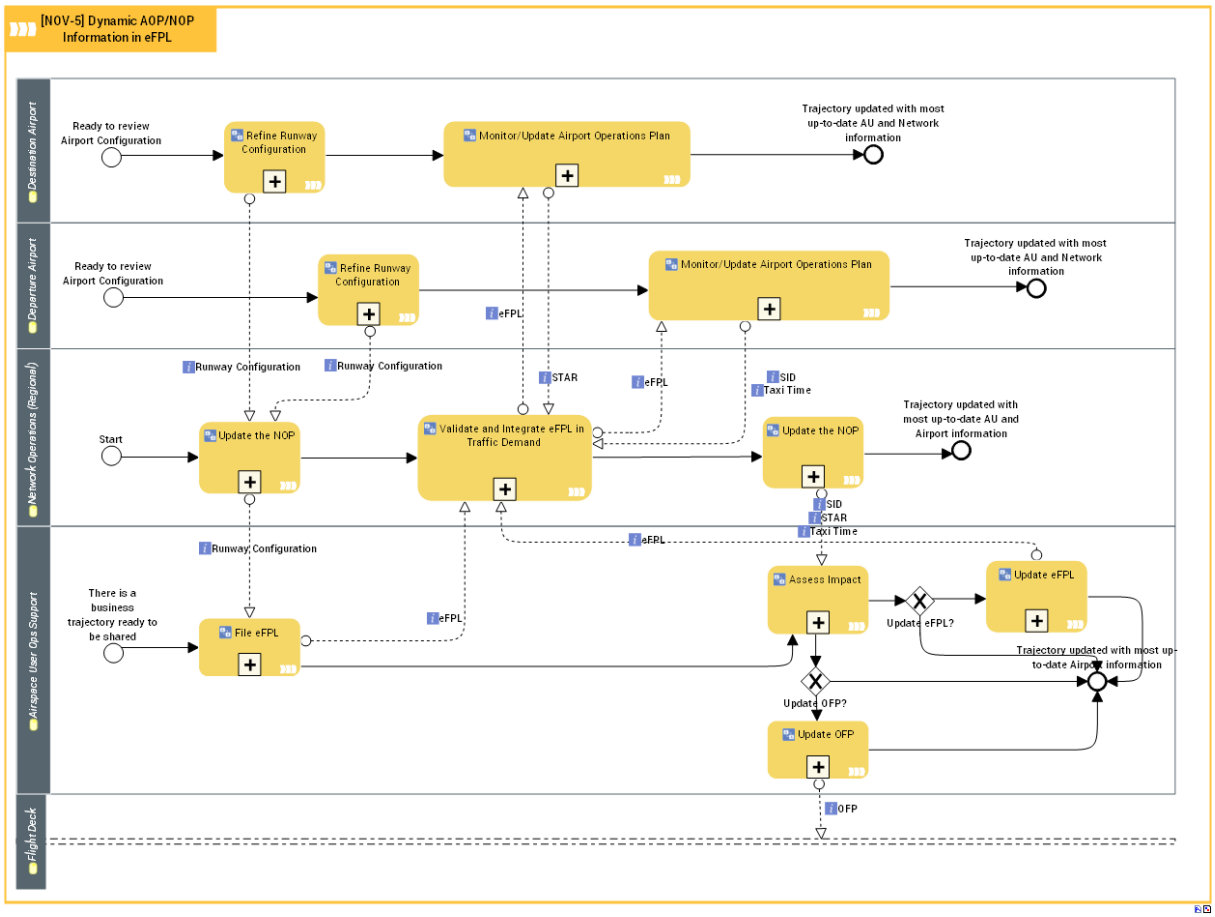
B.3 Operational and Business Context

B.3.1 Operational Context

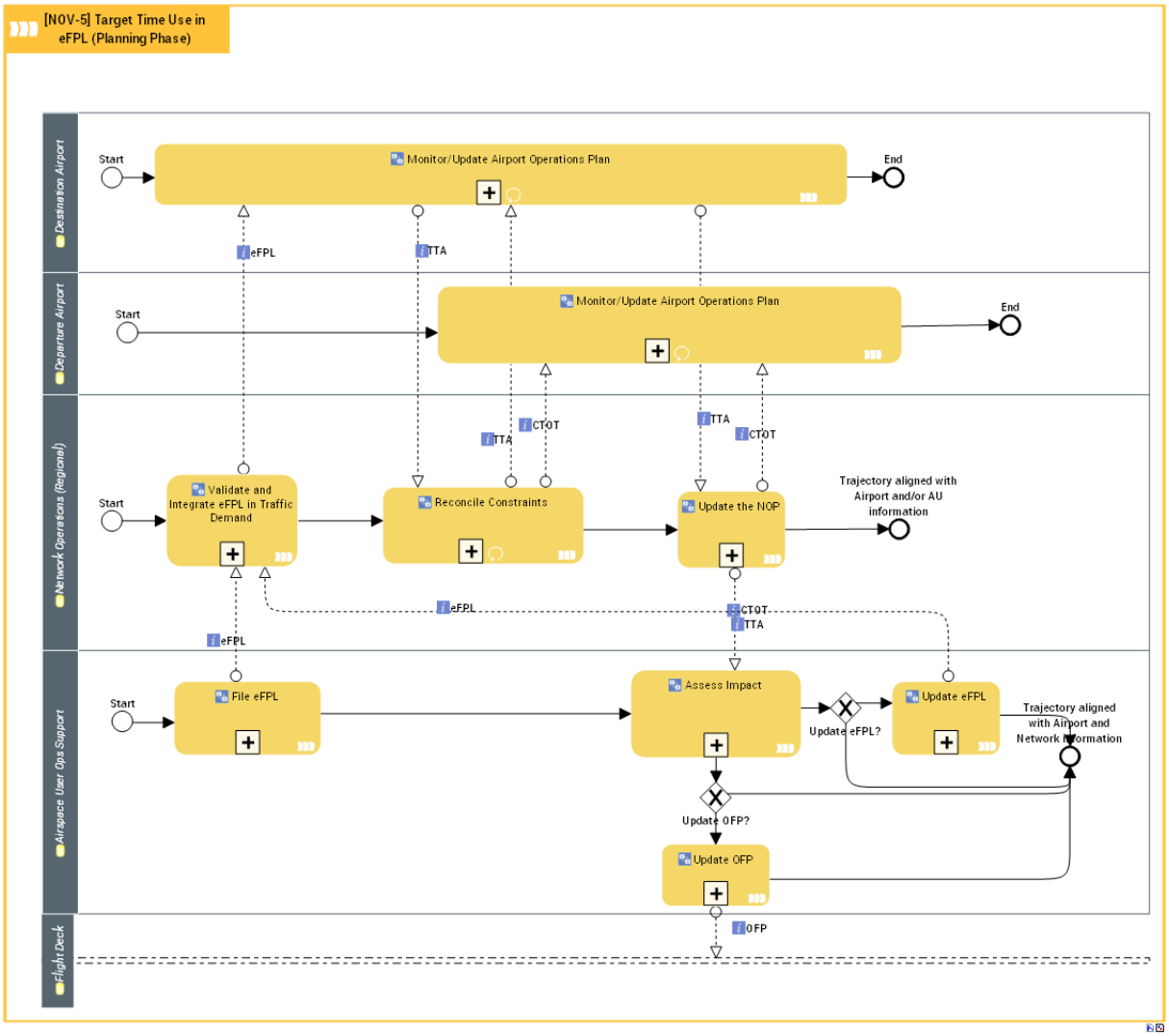


[NOV-5] Distribution of eFPL Data and Use by ATC [Airspace User Ops Support, Network Operations (Local), Network Operations (Regional)]
[NOV-5] Dynamic AOP/NOP Information in eFPL [Airspace User Ops Support, Departure Airport, Destination Airport, Flight Deck, Network Operations (Regional)]
[NOV-5] Target Time Use in eFPL (Planning Phase) [Airspace User Ops Support, Departure Airport, Destination Airport, Flight Deck, Network Operations (Regional)]
[NOV-5] Use of PTRs [Airspace User Ops Support, Network Operations (Local), Network Operations (Regional)]

571


[NOV-5] Dynamic AOP/NOP Information in eFPL
Destination Airport
Ready to review Airport Configuration
Refine Runway Configuration
Monitor/Update Airport Operations Plan
Trajectory updated with most up-to-date AU and Network information
Departure Airport
Ready to review Airport Configuration
Refine Runway Configuration
eFPL
Monitor/Update Airport Operations Plan
Trajectory updated with most up-to-date AU and Network information
Network Operations (Regional)
Runway Configuration
Runway Configuration
STAR
eFPL
SID
Taxi Time
Start
Update the NOP
Validate and Integrate eFPL in Traffic Demand
Update the NOP
Trajectory updated with most up-to-date AU and Airport information
SID
STAR
Taxi Time
eFPL
Airspace User Ops Support
Runway Configuration
Assess Impact
Update eFPL
There is a business trajectory ready to be shared
File eFPL
eFPL
Update eFPL?
Trajectory updated with most up-to-date Airport information
Update OFP?
Update OFP
Flight Deck
OFP

572



573

Supported Activity	Activity Description
Assess Impact	The impact assessment starts with the evaluation if the retrieved information (latest PTR status, dynamic AOP/NOP information, and TTA) requires the creation of a new trajectory. If yes then a new trajectory is calculated taking into account the updated constraints and company rules.

	Afterwards it is evaluated whether it is still possible to update the filed eFPL. Depending on the time the latest PTR status, dynamic AOP/NOP information and TTA is received, it might not be possible to update the eFPL anymore due to operational processes like fuel order (approx. one hour before EOBT). Moreover, it is evaluated whether it is necessary or still possible to update the OFP for the flight crew.
Update the NOP	[DOD 7.2 modelling] The dDCB/DCB solutions descriptions and their intended use are updated and published in the NOP.

574 # B.4 Service Overview

575 ## B.4.1 Service Taxonomy

Supported Capability	Parent Capability	Level 1 Capability
Demand and Capacity Balancing		
	[EATM Capabilities]	

576 ## B.4.2 Service Interfaces

577

Service Name	Description
NMFlightDataService (PJ.18-02c)	The NMFlightData service is used to query and retrieve information on existing flight plans and flights.

578

Service Interface Definition	Description
NMFlightDataConsumer	MEPs Supported: SRR PSPUSH PSPULL

	Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304 REQ-14.01.04-TS-0901.0305 REQ-14.01.04-TS-0901.0325
NMFlightDataPublisher	MEPs Supported: SRR PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304 REQ-14.01.04-TS-0901.0305 REQ-14.01.04-TS-0901.0325

B.5 Service interface specifications

B.5.1 NMFlightDataConsumer

1. Operation queryFlightsByAO

This operation enables the Consumer query a list of flights of a particular Aircraft Operator.

Input	Service Payload	CLDM Data Entity
	flightListByAircraftOperator	
Return	**Service Payload**	**CLDM Data Entity**
	CTOT	
Return	**Service Payload**	**CLDM Data Entity**
	FlightSTAR	
Return	**Service Payload**	**CLDM Data Entity**
	FlightSID	
Return	**Service Payload**	**CLDM Data Entity**
	TaxiTime	
Return	**Service Payload**	**CLDM Data Entity**
	TTA	
Return	**Service Payload**	**CLDM Data Entity**
	flightListByAircraftOperatorReply	

2. Operation queryFlightsByTrafficVolume

Input	Service Payload	CLDM Data Entity
	FlightListByTrafficVolumeRequest	
Return	**Service Payload**	**CLDM Data Entity**
	FlightListByTrafficVolumeReply	

3. Operation queryTrafficCountsByTrafficVolume

Input	Service Payload	CLDM Data Entity
	TrafficCountsByTrafficVolumeRequest	
Return	**Service Payload**	**CLDM Data Entity**
	TrafficCountsByTrafficVolumeReply	

4. Operation retrieveFlight

This operation enables the Consumer retrieve full detail of a flight.

Input	Service Payload	CLDM Data Entity
	FlightRetrievalRequest	
Return	**Service Payload**	**CLDM Data Entity**
	FlightRetrievalReply	

B.5.2 NMFlightDataPublisher

1. Operation publishFlightData

This operation enables the Provider to notify the Consumer with full detail of a flight.

Input	Service Payload	CLDM Data Entity
	TTA	

Input	Service Payload	CLDM Data Entity
	FlightSTAR	

Input	Service Payload	CLDM Data Entity
	FlightSID	

Input	Service Payload	CLDM Data Entity
	flightListByAircraftOperator	

Input	Service Payload	CLDM Data Entity
	CTOT	

2. Operation subscribeToFlightData

This operation enables the Consumer to subscribe to flight related data by choosing the kind of updates required.

Input	Service Payload	CLDM Data Entity
	NMFlightDataSubscriptionRequest	
Return	**Service Payload**	**CLDM Data Entity**
	NMFlightDataSubscriptionReply	

Appendix C AirspaceStructureService SDD

C.1 Introduction

The AirspaceStructureService is a service which is already deployed by the Network Manager. The PJ.18-02c solution modifies the AirspaceStructureService by enriching the content.

This SDD describes only the modifications to the existing service.

C.2 Service Identification

Name of the Service	AirspaceStructureService
Identifier	i5brpXzEQ1VT
Version	EATMA Draft
Architect(s)	KARAARSLAN Mehtap
Last Modification Date	8/29/2019

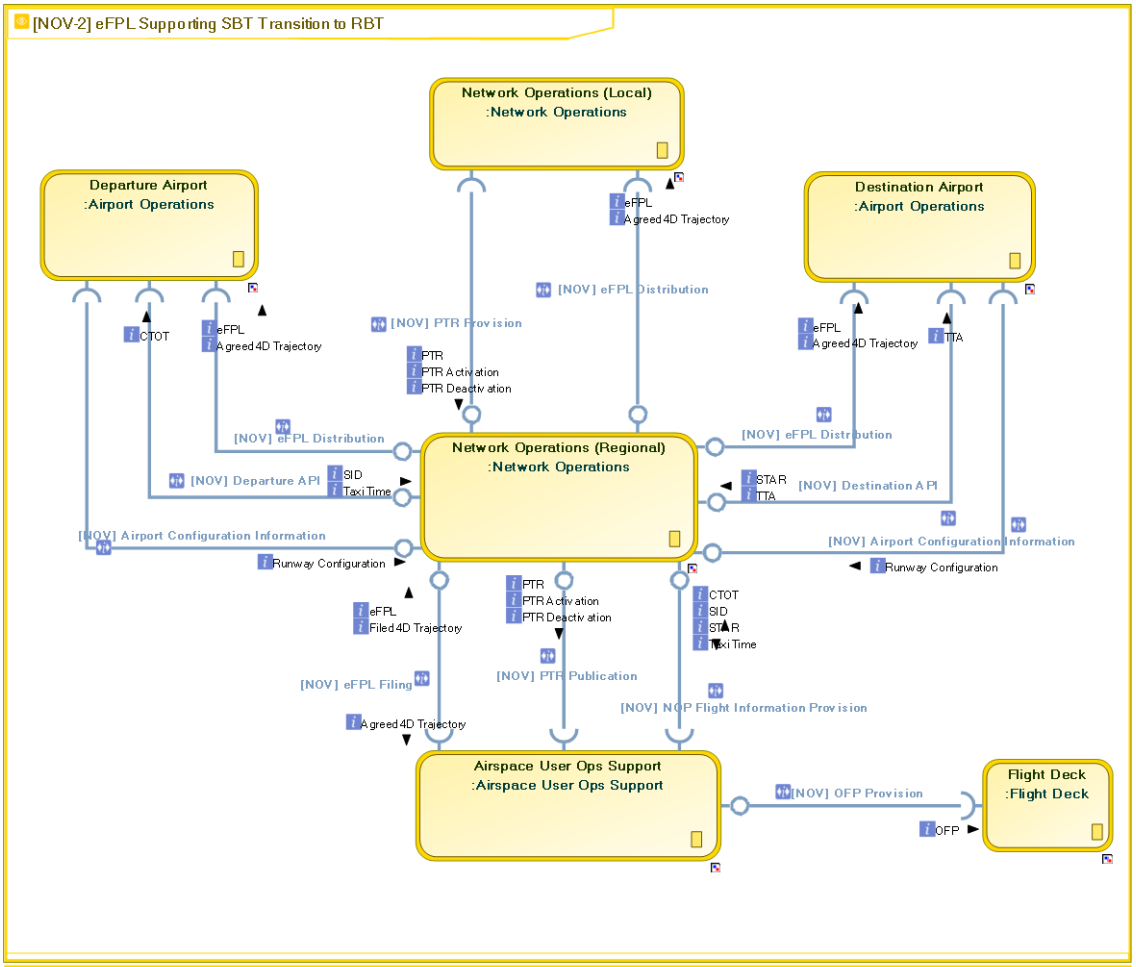
Table 5: AirspaceStructureService Service identification (I)

IOC	
FOC	12/31/2029

Table 2: AirspaceStructureService Service identification (II)

C.3 Operational and Business Context

C.3.1 Operational Context



[NOV-5] Distribution of eFPL Data and Use by ATC [Airspace User Ops Support, Network Operations (Local), Network Operations (Regional)]
[NOV-5] Dynamic AOP/NOP Information in eFPL [Airspace User Ops Support, Departure Airport, Destination Airport, Flight Deck, Network Operations (Regional)]
[NOV-5] Target Time Use in eFPL (Planning Phase) [Airspace User Ops Support, Departure Airport, Destination Airport, Flight Deck, Network Operations (Regional)]
[NOV-5] Use of PTRs [Airspace User Ops Support, Network Operations (Local), Network Operations (Regional)]

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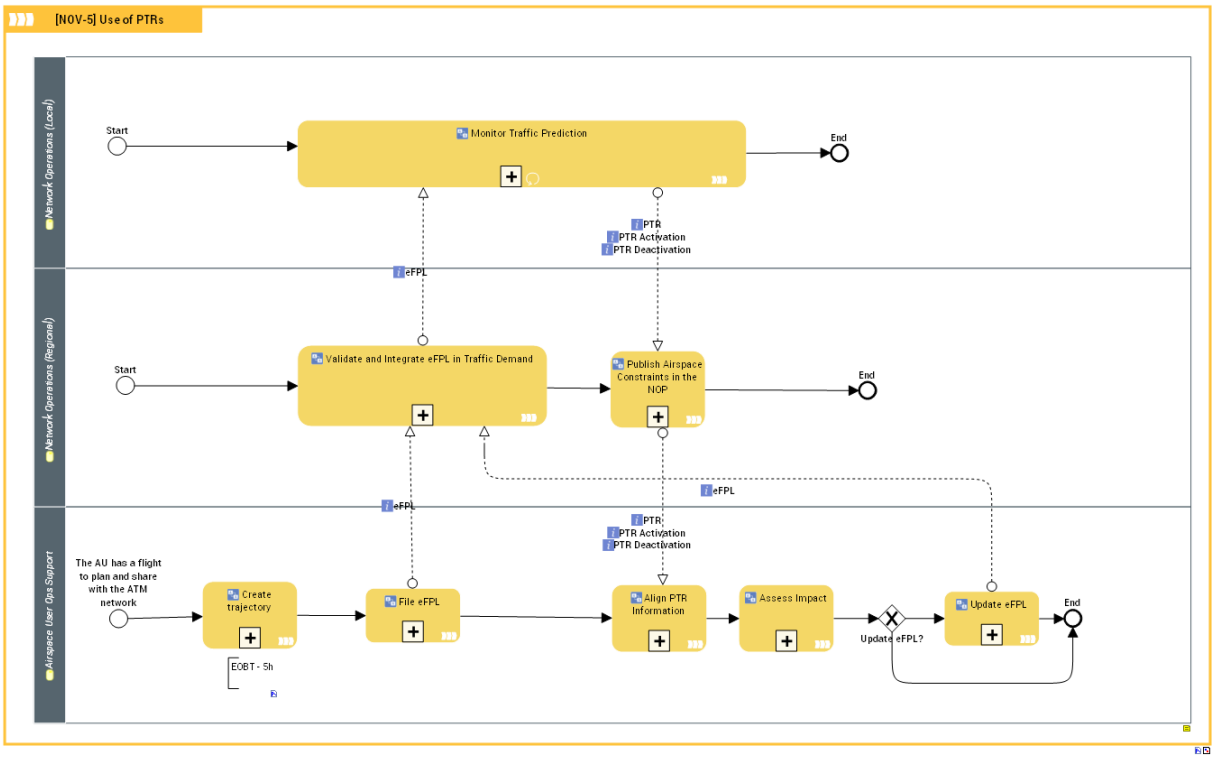


618

Supported Activity	Activity Description
Align PTR Information	Receive the PTR activation and/or deactivation information.
Publish Airspace Constraints in the NOP	Publish the changes to the static and dynamic Airspace Constraints

619 # C.4 Service Overview

620 ## C.4.1 Service Taxonomy

Supported Capability	Parent Capability	Level 1 Capability
Aeronautical and Meteorological Information Management		
	Information Management	
		[EATM Capabilities]

C.4.2 Service Interfaces

Service Name	Description
AirspaceStructureService	The AirspaceStructure NOP/B2B service is intended to provide services related to the management and sharing of Airspace data (e.g. airspaces, routes, aerodromes, etc.) as used by the NM systems. Ref: NM 21.5.0 - NOP/B2B Reference Manuals - AirspaceServices

Service Interface Definition	Description
AirspaceStructureConsumer	Consumer interface to retrieve and subscribe to the updates to the airspace structure data. MEPs Supported: SRR PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304 REQ-14.01.04-TS-0901.0305 REQ-14.01.04-TS-0901.0325
AirspaceStructurePublisher	Publisher interface to disseminate the updates to the airspace structure data.

	MEPs Supported: SRR PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304 REQ-14.01.04-TS-0901.0305 REQ-14.01.04-TS-0901.0325

C.5 Service interface specifications

C.5.1 AirspaceStructureConsumer

1. Operation subscribeToAirspaceData

This operation enables the Consumer to select the data types to subscribe to receive the updates when available.

Input	Service Payload	CLDM Data Entity
	airspaceInformationSubscriptionRequest	
Return	**Service Payload**	**CLDM Data Entity**
	airspaceInformationSubscriptionReply	

C.5.2 AirspaceStructurePublisher

1. Operation distributeAirspaceData

This operation enables the Provider to notify the Consumer with the updates to the data types that are selected during the subscription.

Input	Service Payload	CLDM Data Entity
	RunwayConfiguration	

Input	Service Payload	CLDM Data Entity
	PTRStatus	

Appendix D TacticalUpdatesService SDD

D.1 Introduction

The TacticalUpdatesService is a service which is already deployed by the Network Manager. The PJ.18-02c solution modifies the TacticalUpdatesService by enriching the content.

This SDD describes only the modifications to the existing service.

D.2 Service Identification

Name of the Service	TacticalUpdatesService
Identifier	yUcFvAaJQrpD
Version	EATMA Draft
Architect(s)	KARAARSLAN Mehtap
Last Modification Date	8/29/2019

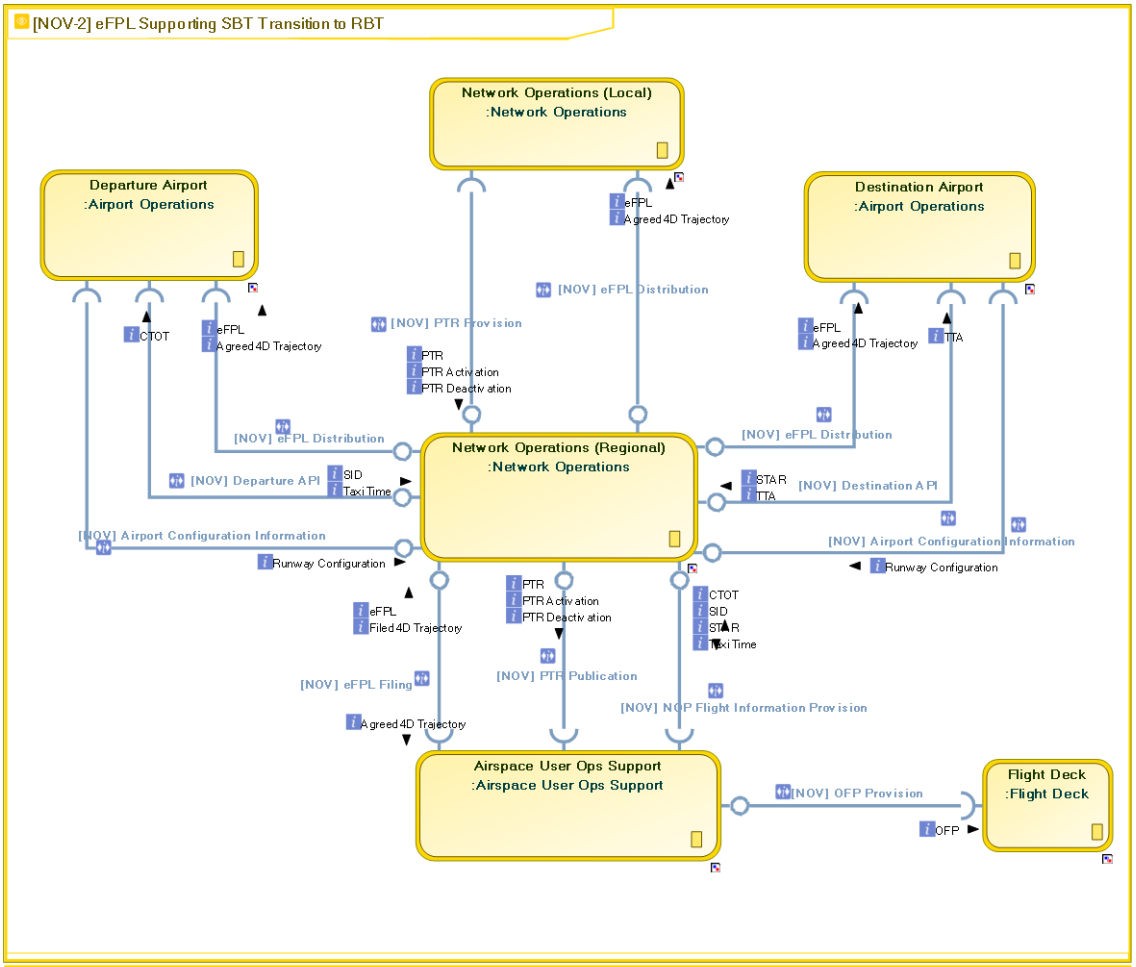
Table 6: TacticalUpdatesService Service identification (I)

IOC	
FOC	12/31/2030

Table 2: TacticalUpdatesService Service identification (II)

D.3 Operational and Business Context

D.3.1 Operational Context



[NOV-5] Distribution of eFPL Data and Use by ATC [Airspace User Ops Support, Network Operations (Local), Network Operations (Regional)]
[NOV-5] Dynamic AOP/NOP Information in eFPL [Airspace User Ops Support, Departure Airport, Destination Airport, Flight Deck, Network Operations (Regional)]
[NOV-5] Target Time Use in eFPL (Planning Phase) [Airspace User Ops Support, Departure Airport, Destination Airport, Flight Deck, Network Operations (Regional)]
[NOV-5] Use of PTRs [Airspace User Ops Support, Network Operations (Local), Network Operations (Regional)]

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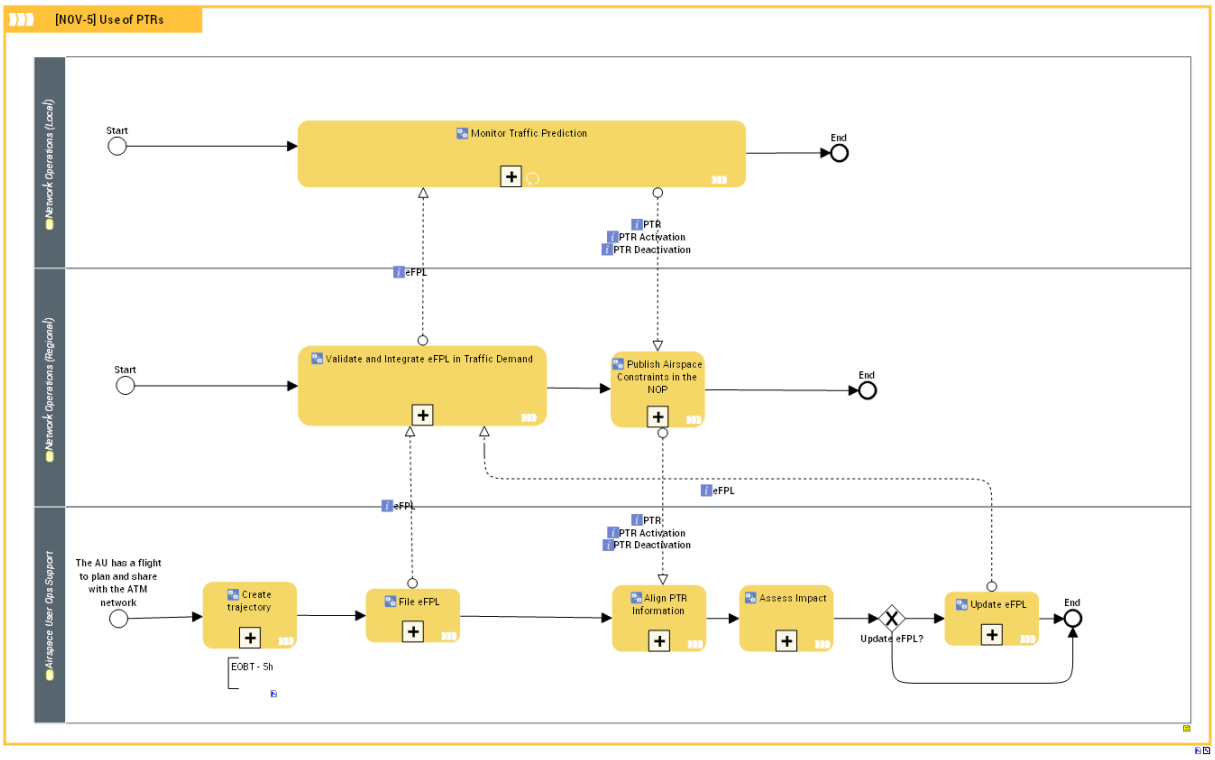

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Supported Activity	Activity Description
Monitor Traffic Prediction	Monitor the traffic predictions based on the eFPLs received from the Network Manager. Periodically analyse the sector load expected in three hours and subsequently activate additional PTRs or deactivate not needed PTRs. Send these additional activations and deactivations to the Network Manager.
Refine Runway Configuration	

648

649 # D.4 Service Overview

650 ## D.4.1 Service Taxonomy

Supported Capability	Parent Capability	Level 1 Capability

Demand and Capacity Balancing		
	[EATM Capabilities]	

651

652 ## D.4.2 Service Interfaces

Service Name	Description
TacticalUpdatesService	This service provides a new operation to the TacticalUpdates service (see REF NM 21.5.0 - NOP/B2B Reference Manuals - FlowServices) provided by RegionalATFCM for the ACC to change the status of an existing PTR.

653

Service Interface Definition	Description
TacticalUpdatesPublisher	Consumer interface to disseminate the updates to the capacity data. MEPs Supported: SRR PSPUSH PSPULL Security Configuration: Interface Binding Traceability: REQ-14.01.04-TS-0901.0790 REQ-14.01.04-TS-0901.0795 REQ-14.01.04-TS-0901.0304 REQ-14.01.04-TS-0901.0305 REQ-14.01.04-TS-0901.0325

654

D.5 Service interface specifications

D.5.1 TacticalUpdatesPublisher

1. Operation updatePTRStatus

This operation enables the Consumer to inform the Provider about a change in the status of a PTR.

Input	Service Payload	CLDM Data Entity
	PTRStatus	
Return	**Service Payload**	**CLDM Data Entity**
	PTRStatusReply	

Appendix E Requirements in Progress

7.2.1 Regional ATFCM Requirements

7.2.1.1 Traffic Demand Management Functional Requirements

[REQ]

Identifier	REQ-18.02c-TS-TDM1.0001
Title	Apply dynamic PTR changes
Requirement	The Regional ATFCM system shall use the most recent PTR status to validate and revalidate the flight plans.
Status	<in progress>
Rationale	All stakeholders need to have an up-to-date view of the planned flights in terms of constraints and decisions.
Category	<Functional><Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0005 IER-18-02c-OSED-eFPL.0007
< ALLOCATED_TO >	<Enabler>	NIMS-55
<ALLOCATED_TO>	<Function>	Validate and Integrate eFPL in Traffic Demand

7.2.1.2 Network Operations Plan Management Functional Requirements

[REQ]

Identifier	REQ-18.02c-TS-NOP1.0001
Title	TacticalUpdates Service
Requirement	The Regional ATFCM system shall provide the TacticalUpdates service for the EN/APP ACC to provide the PTR status data.

Status	<in progress>
Rationale	The EN/APP ACC shall be able to communicate the PTR and PTR status data to the Network Manager to be applied and eventually distributed to the Airspace Users.
Category	<Functional>

669 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0005 IER-18-02c-OSED-eFPL.0007
< ALLOCATED_TO >	<Enabler>	SWIM-APS-15
<ALLOCATED_TO>	<Functional Block>	Network Operations Plan Management (PJ.18-02c)

670

671 [REQ]

Identifier	REQ-18.02c-TS-NOP1.0002
Title	AirspaceStructure Service
Requirement	The Regional ATFCM system shall provide the PTR status data via AirspaceStructure service with publish/subscribe to the Airspace Users.
Status	<in progress>
Rationale	The Airspace User needs to be notified when there is PTR status change, which is applicable to their flight plans, i.e. affect the 4D trajectory; so that all stakeholders are aligned.
Category	<Functional><Safety>

672 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0008
< ALLOCATED_TO >	<Enabler>	SWIM-APS-14

<ALLOCATED_TO>	<Functional Block>	Network Operations Plan Management (PJ.18-02c)

673

674 [REQ]

Identifier	REQ-18.02c-TS-NOP1.0021
Title	AirspaceStructure Service
Requirement	The Regional ATFCM system shall provide the runway configuration data via AirspaceStructure service with publish/subscribe to the Airspace Users.
Status	<in progress>
Rationale	The Airspace User needs to be notified when there is runway configuration data change, which is applicable to their flight plans, i.e. affect the 4D trajectory; so that all stakeholders are aligned.
Category	<Functional>

675 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	
< ALLOCATED_TO >	<Enabler>	SWIM-APS-14
<ALLOCATED_TO>	<Functional Block>	Network Operations Plan Management (PJ.18-02c)
Status	<in progress>	
<ALLOCATED_TO>	<Functional Block>	Network Operations Plan Management (PJ.18-02c)

676

677 ## 7.2.2 APP/ACC and EN/ACC Requirements

678 ### 7.2.2.1 Reception of eFPL data from Regional ATFCM Functional Requirements

679 [REQ]

Identifier	REQ-18.02c- ANS1.0031

Title	eFPL additional data extraction
Requirement	In addition to the legacy Flight Plan data, the En Route / Approach ATC system shall extract the following : • Speed profile • Climb/descend profile
Status	<in progress>
Rationale	The En Route / Approach ATC ground trajectory computation should compute trajectories taking into account additional data provided by the eFPL to enrich and build the SFPL. In comparison to standard ICAO Flight Plan format, the eFPL data format includes additional data specific to the concerned flight. These data are candidates to improve the ground system tools such as Trajectory Predictor. However, in the scope of this solution, which purpose is not to design ground Trajectory Prediction, conflict detection, monitoring aids tools, only the aircraft mass on route points from eFPL will be used in the ground system.
Category	<Functional>

680 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0002
< ALLOCATED_TO >	<Enabler>	ER APP ATC 82
< ALLOCATED_TO >	<Function>	Validate eFPL

681

682 [REQ]

Identifier	REQ-18.02c-ANS1.0051
Title	Trajectory computation accuracy
Requirement	The computed planned trajectory using augmented data extracted from the eFPLs shall be accurate in terms of longitudinal, vertical and lateral errors Note: Accurate implies to be compliant with the EUROCONTROL specification for Trajectory Prediction [10].

Status	<in progress>
Rationale	Safety Requirement: The computed ground planned trajectory using augmented data extracted from the eFPLs shall be accurate in terms of longitudinal, vertical and lateral errors.
Category	<Safety>

683 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0002
< ALLOCATED_TO >	<Enabler>	ER APP ATC 82
<ALLOCATED_TO>	<Function>	Create/Update Planned Trajectory

684

7.2.2.2 SFPL use for Trajectory computation for Flight Planning Functional Requirements

[REQ]

Identifier	REQ-18.02c-ANS1.0005
Title	Trajectory computation for Flight Planning
Requirement	Before the flight activation in the relevant ACC, the En Route / Approach ATC system shall compute flight trajectory using the mass retrieved from the eFPL at each planned Route Point by taking into account the Weight on each Route Point provided within eFPL data instead of the computed weight, in addition to the FPL data elements.
Status	<in progress>
Rationale	At planning phase, in addition to legacy FPL data, in order to enrich the En Route / Approach Ground trajectory, the Trajectory Prediction tool shall compute ground trajectories taking into account relevant additional data extracted from the eFPL. After having built the System Flight Plan Flight Plan (SFPL) enriched with additional data from the eFPL, the En Route / Approach ATC ground system Trajectory Predictor tool shall take into account the SFPL to compute the initial flight trajectory.
Category	<Functional><Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0002
< ALLOCATED_TO >	<Enabler>	ER APP ATC 82
<ALLOCATED_TO>	<Function>	Create/Update Planned Trajectory

7.2.2.3 Conflict Detection Tool Functional Requirements

[REQ]

Identifier	REQ-18.02c-ANS1.0008
Title	eFPL data in Conflict Detection tool
Requirement	In order to improve accuracy of conflict detection tools, the En Route / Approach ATC system shall use the Weight on each Trajectory Point in addition to the FPL data elements to compute the trajectory that serve for conflict detection computation
Status	<in progress>
Rationale	Trajectory prediction data is an essential element for Conflict Detection accuracy, by taking into account elements from the eFPL such as the aircraft mass available in the trajectory prediction used in the conflict detection tools, the uncertainty around predicted conflict should be reduced therefore Controller confidence in conflict detection should be increased.
Category	<Functional><Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0002
< ALLOCATED_TO >	<Enabler>	ER APP ATC 82
< ALLOCATED_TO >	<Function>	Detect Conflicts

7.2.2.4 Controller Human Machine Interaction Management ER/APP Functional Requirements

[REQ]

Identifier	REQ-18.02c-ANS1.0009
Title	Controller human machine interaction management
Requirement	The En-Route / Approach ATC System shall display additional data from eFPL (e.g. Aircraft route, mass values) on the CWP.
Status	<in progress>
Rationale	As eFPL data format includes additional data specific to the concerned flights. These data are candidates to improve the situation awareness of the Controller. Some of the additional data available from eFPL could be of interest for display to the Controller; however, this remains at the discretion of the Controller. The display of information is at the discretion of the ATCO.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0002
< ALLOCATED_TO >	<Enabler>	ER APP ATC 82
< ALLOCATED_TO >	<Function>	Display trajectory data

7.2.2.5 Monitoring Aids Functional Requirements

[REQ]

Identifier	REQ-18.02c-ANS1.0010
Title	Monitoring Aids using additional data from eFPL
Requirement	In order to improve accuracy of Monitoring Aids, the En Route / Approach ATC trajectory Monitoring Aids tools shall use the Weight on each Trajectory

	Point in addition to the FPL data elements to compute the trajectory that serves for monitoring aids computation.
Status	<in progress>
Rationale	Trajectory prediction data is an essential element of monitoring the flight path. Monitoring Aids tool should take benefit by taking into account elements from the eFPL such as the aircraft mass, TOC/TOD.
Category	<Functional><Safety>

701 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0002
< ALLOCATED_TO >	<Enabler>	ER APP ATC 82
< ALLOCATED_TO >	<Function>	Monitor flight trajectory deviation and conformance

702

703 7.2.2.6 PTRs activation/de-activation Functional Requirements

704 [REQ]

Identifier	REQ-18.02c-TS-ANS1.0011
Title	Provide PTR status to Regional ATFCM
Requirement	The ANSP ATFCM system shall inform the Regional ATFCM system of the most recent PTR status in order to validate and revalidate the flight plans.
Status	<in progress>
Rationale	It is important for NM to be aware and the Airspace Users to plan their trajectories with most accurate airspace data including LOAs and specific rules set for regulations. PTRs can be activated/de-activated on short notice taking into account the current and planned local traffic situation. In order to have this information available to the Airspace Users when preparing their Flight Plan, the status of PTRs shall be provided to Regional ATFCM and made available to Airspace Users.

Category	<Functional>

705 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0005 IER-18-02c-OSED-eFPL.0007
< ALLOCATED_TO >	<Enabler>	ER-APP-ATC-170 SWIM-APS-16
< ALLOCATED_TO >	<Function>	Send updated PTR status

706

7.2.3 Civil AU Operations Centre Requirements

7.2.3.1 Flight Management Functional Requirements

[REQ]

Identifier	REQ-18.02c-TS-FM01.0004
Title	Apply the PTR information
Requirement	The FOC system shall use the most recent PTR information in the planning of the trajectory.
Status	<in progress>
Rationale	The AU needs to consider the most recent PTR data and PTR status information in the planning of the trajectory. As the PTR data and PTR status information influence the result of the creation of an optimal trajectory by the AU, the usage of the most recent PTR data and PTR status information supports the creation of a trajectory that does not require an adjustment by other stakeholders and that is closer to the flown trajectory.
Category	<Functional><Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0006 IER-18-02c-OSED-eFPL.0008
<ALLOCATED_TO>	<Enabler>	AOC-ATM-11
< ALLOCATED_TO >	<Function>	Plan Flight and Trajectory

[REQ]

Identifier	REQ-18.02c-TS-FM01.0031
Title	Receive the TT/CTOT information

Requirement	The FOC system shall receive the TT/CTOT information in the planning of the trajectory and make the flight dispatcher aware.
Status	<in progress>
Rationale	The AU needs to be aware of the TT/CTOT information in the planning of the trajectory.
Category	<Functional>

713 [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0016
<ALLOCATED_TO>	<Enabler>	AOC-ATM-22
<ALLOCATED_TO>	<Function>	Monitor Flights

714

715 7.2.3.2 Data Management Functional Requirements

716 [REQ]

Identifier	REQ-18.02c-TS-DM01.0002
Title	Retrieve PTR information
Requirement	The FOC system shall retrieve PTR data and PTR status from Regional ATFCM and make it available the planning of the trajectory and to the monitoring of the flight.
Status	<in progress>
Rationale	The AU needs to have available the PTR data and PTR status information to base the flight planning activities on an up-to-date and complete view of the constraints influencing the trajectory of the flight.
Category	<Functional><Safety>

717 [REQ Trace]

Relationship	Linked Element Type	Identifier

<ALLOCATED_TO>	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0006 IER-18-02c-OSED-eFPL.0008
<ALLOCATED_TO>	<Enabler>	SWIM-APS-14
< ALLOCATED_TO >	<Function>	Retrieve Data

718

Appendix F Deleted Requirements

[REQ]

Identifier	REQ-18.02c-TS-TDM1.0002
Title	Apply SID/STAR allocation
Requirement	The Regional ATFCM system shall use the most up-to-date SID/STAR data given for a flight plan.
Status	<deleted>
Rationale	All stakeholders need to have an up-to-date view of the planned flights in terms of constraints and decisions. The requirements is deleted because it is not mandatory and was not in the scope of the solution. It is internal to NM.
Category	<Functional><Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0010
< ALLOCATED_TO >	<Enabler>	NIMS-54

[REQ]

Identifier	REQ-18.02c-ANS1.0006
Title	Trajectory Management in execution phase
Requirement	As soon as the flight is activated in the ground system, the En Route / Approach ATC system shall compute flight trajectory taking into account the live aircraft data and the SFPL data.
Status	<deleted>
Rationale	During execution phase, the En Route / Approach ATC Ground Trajectory Prediction tool should take into account these relevant additional data extracted from the eFPL in order to enrich the ground trajectory. The En

	Route / Approach ATC Ground Trajectory Prediction tool should be also enriched with live aircraft data. In execution phase, the trajectory computed by the En Route / Approach ATC ground Trajectory Predictor tool is enriched with initial data from the SFPL and live aircraft data. The requirement is deleted because this is a legacy behaviour that does not change.
Category	<Functional>

724 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
<SATISFIES>	<ATMS Requirement>	IER-18-02c-OSED-eFPL.0002
< ALLOCATED_TO >	<Enabler>	ER APP ATC 82

Appendix G PJ.18-02c OSED/INTEROP

Authoring & Approval

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Rejected By - Representatives of beneficiaries involved in the project

Name/Beneficiary	Position/Title	Date

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Document History

Edition	Date	Status	Author	Justification
00.00.01	31/08/2019	Draft	Thomas ESCHENHAGEN, Mehtap KARAARSLAN, Pascal LATRON, Gerard MAVOIAN, Marie-Jo RIBERA	First Edition
00.01.00	13/09/2019	Final	Thomas ESCHENHAGEN, Mehtap KARAARSLAN, Pascal LATRON, Gerard MAVOIAN, Marie-Jo RIBERA	SJU Submission
00.01.01	11/11/2019	Final	Mehtap KARAARSLAN, Gerard MAVOIAN	Updated with SJU comments

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4DTM

4D TRAJECTORY MANAGEMENT

This SPR-INTEROP/OSED is part of a project that has received funding from the SESAR Joint Undertaking under grant agreement No 734161 under European Union's Horizon 2020 research and innovation programme.

G.1 Abstract

The PJ.18-02c technical solution focuses on the validation of the technical requirements supporting the SBT transition to RBT operational concept in particular for the following topics:

- Using 4D trajectory and the flight specific performance profile information for ATC purposes
- Aligning the Airspace User, Network Manager, and Airport's view of the flight trajectory with the most up-to-date information related to runway configuration, departure and arrival procedures, departure taxi time, ATC LoAs
- The consideration of the TTA in the 4D trajectory planned by the Airspace User and included in the filed flight plan

This document includes all use-cases and requirements that were in the scope of the solution at the start of Wave 1. It indicates also which one remains in the scope of the solution at the end of wave 1 considering results of validation.

Table of Contents

The SPR/INTEROP-OSED Template includes the following parts:

- ***SPR/INTEROP-OSED Template – Part I (this volume)***

List of Tables

List of Figures

G.2 Executive Summary

The PJ.18-02c technical solution contributes to the validation of the requirements for SBT transition to RBT operational concept by:

- Using 4D trajectory and the flight specific performance profile information for ATC purposes
- Aligning the Airspace User, Network Manager, and Airport's view of the flight 4D trajectory with the most up-to-date information related to:
  - Runway configurations
  - Departure and arrival procedures
  - Departure taxi times
  - ATC LoAs
- The consideration of the TTA in the 4D trajectory planned by the Airspace User and included in the filed flight plan

The operational and technical environment for the 18-02c solution consists of Network Manager, Airspace User Operations, and ATS Operations.

There is no ATM solution in the SESAR 2020 programme, which addresses these areas of improvements. Therefore, the solution 18-02c, although it is a technological solution, addresses four Operational Improvements. The solution develops operational use cases to validate (only partially as a technological solution) the improvements in scope, in addition to a technical architecture and requirements.

The 18-02c solution as technological solution aims maturity level TRL6 in SESAR 2020 Wave 1. To achieve this maturity, considering validation results, the scope of the solution is proposed to be reduced to two topics:

- Distribution and integration of eFPL data in ATC processes/systems,
- Distribution of AOP/NOP departure information from CDM airports and use in AU flight planning.

However, to get an overall picture of the concept and keep traceability of validation results, the original use-cases and requirements remain in this final version of the document with indication of which ones are in the final scope of the solution at the end of wave 1.

G.3 Introduction[6]

G.4 Purpose of the document

This document provides the requirements specification, covering operational and interface requirements related to SESAR Solution 18-02c.

G.5 Scope

This is the SPR-INTEROP/OSED for Solution PJ.18-02c for V3 phase, produced after the validation exercises EXE-18-02c-TRL6-001_ECRTL and PJ-09-03-02 joint exercise runs are completed; and their validation results analysed and consolidated.

[6] The opinions expressed herein reflect the author's view only. Under no circumstances shall the SESAR Joint Undertaking be responsible for any use that may be made of the information contained herein.

These requirements cover operational and the interoperability aspects to support the SESAR Solution 18-02c.

G.6 Intended readership

PJ.18-02c Solution Team

PJ.09-03 Solution Team

PJ.19 Project Team

PJ.10 Solution Team

G.7 Background

Background information is about three domains of activities:

- SESAR 1 R&D activities;
- ICAO standardisation and in particular the ATMRPP working group in charge of defining FF-ICE concept, provisions and implementation guidelines;
- EUROCONTROL/NM implementation projects addressing future evolutions of flight planning.

The following sections develop further the background information related to these three domains.

7.2.4 SESAR 1 R&D activities

Several SESAR 1 projects have conducted validation activities in relation to the OIs/enablers addressed in this OSED/INTEROP document, more precisely:

- The project P7.6.2 has conducted three validation exercises related to the Extended flight plan: VP311, VP616 and VP713 [23][22]. These exercises have allowed achieving V3 maturity status regarding the use of EFPL information in NM processes and systems and TRL-6 maturity for EFPL submission SWIM services. The results of these exercises have also been key inputs to ICAO ATMRPP standardisation activities related to the eFPL. Additionally, those exercises - VP311 in particular -have provided some initial V2 results related to the contribution of PTRs to improve traffic predictability. The SESAR solution 37 describes the outcome of this project.
- The project P5.5.2 conducted two validation exercises –VP69 and VP300 - on the use of FOC data to improve ATC predictions and processes. The exercises focused on the use of Take-off Mass and speed information as can be provided by the FOC in the EFPL/eFPL[20][21]. The SESAR solution 67 describes the outcome of this project.

- Project P4.5/5.5 conducted an exercise –VP832 - on the use of EFPL data to improve ATC predictions in the Maastricht ACC. The exercise showed in particular the benefit of using flight performance data from EFPL/eFPL to improve ATC traffic predictions in particular in the climbing phase [24]. The SESAR solution 67 describes the outcome of this project.

7.2.5 FF-ICE Increment 1

In the context of ICAO, since 10 years the ATPRPP working group has developed, an FF-ICE concept first and then provisions and implementation guideline documents to support trajectory information exchanges between the Airspace Users and ATM actors. FF-ICE increment 1 – recently renamed as FF-ICE planning – consists in the first step of implementation focusing on flight plan/trajectory information exchanges in the planning phase. Among other aspects, FF-ICE provisions defines the content of the FF-ICE filed flight plan (the eFPL) and the different “trajectory groups” (e.g. filed trajectory, agreed trajectory) exchanged between stakeholders [4].

7.2.6 NM Implementation Projects

At least three NM past or current initiatives have a strong link with this OSED:

- A task force -ATFCM OPERATIONS & DEVELOPMENT SUB-GROUP/31- led by NM for the publication and use of PTRs in planning phase (2013-2014): this task force (involving all main European ASNPs and AUs) allowed to clarify the subset of current PTRs that should be shared with AUs and taken into account by the NM IFPS system when checking flight plans[24]. AUs agreed no general rule regarding the use of PTRs. To support the task force decisions, studies were performed to assess the impact of PTRs on flight plan acceptance rates and traffic predictability.

- A task force led by NM (FPFDE project) addressing FF-ICE increment 1 implementation in the European context. This task force (including some main European ANSPs and AU stakeholders) is in progress and should continue its’ activities until 2020. A strong coordination with SESAR 2020 activities is ensured and two SESAR solutions at least- PJ.18-02c and PJ.07-01 – are expected to provide inputs to the task force.

G.8 Structure of the document

S2020 program defines the PJ.18-02c solution as an enabling solution. However, since the solution does not have operational requirements provided from another solution, it was decided to provide an INTEROP in PJ.18-02c. During the solution development phase, the team identified more elements from the operational architecture context that are required for adequate validation of the solution scope. For example, the operational use cases.

Therefore, this document does not provide all sections as required by the template, but the minimum mandatory to ensure quality validation of the solution scope, more specifically as described below.

Section 3.1 SESAR Solution 18-02c: a summary gives the background and overview of the problem statement and the concepts that this OSED defines.

Section 3.2 Detailed Operational Environment describes the applicable standards.

Section 3.3 Detailed Operating Method describes the operational interactions via the operational services and operational nodes. The activity diagrams describe the operational use cases. There is one activity diagram per use case and four use cases in total.

Section 4 describes the Information Exchange Requirements (IER) and the Interoperability Requirements.

Section 5 contains the applicable and referenced documents.

Appendix A describes the benefit and impact analysis grouped by use cases and stakeholders.

The **Appendix B** and **C** contain the requirements, which are either not validated or deleted.

G.9 Glossary of terms

Term	Definition	Source of the definition
Agreed Trajectory	The current 4D trajectory that is agreed between the airspace user and the ASP after collaboration, or imposition of pre-collaborated rules. *Explanation:* The agreed trajectory is the trajectory that the airspace user agrees to fly. There is only one agreed 4D trajectory for any given flight at any time. As the ATM system has unpredictable or uncontrollable events and to allow flexibility, it is likely that it will be necessary to renegotiate trajectories. The agreed 4D trajectory therefore reflects the most recent instance (that is the current) agreement.	Draft FF-ICE Manual ref. [5]
AIRAC	Aeronautical Information Regulation and Control	EUROCONTROL ATM Lexicon

CTOT	Calculated Take Off Time calculated and published by the Network Manager	Current Operations
eFPL	Filed Flight Plan	Draft FF-ICE Manual ref. [5]
EFPL	Extended Flight Plan as defined in SESAR 1. The EFPL concept is superseded by eFPL which is defined at the global level by ICAO. Gradually the eFPL shall replace the EFPL.	SESAR 1 P07.06.02 OSED
FF-ICE Planning	The Planning Service facilitates 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.	ICAO ATMRPP WP 718, ref. [4]
FF-ICE Filing	The filing is for the Airspace User to submit a request for Air Traffic Services.	ICAO ATMRPP WP 718, ref. [4]
Filed Trajectory	The 4D trajectory present in the filed flight plan data provided by an AU	ICAO ATMRPP WP 718, ref. [4]
OFP	Operational flight plan which the AU operations provide to the pilot.	Current Operations
Initial Reference Business Trajectory (iRBT) and Initial Shared Business Trajectory (iSBT)	The initial SBT is published as the initial RBT at the moment when, due to the proximity of the execution phase, iSBT is sufficiently reliable to become the trajectory the AU agrees to fly and the Airspace Service Providers agree to facilitate. It must be highlighted that the term “initial” is not used in reference to the RBT lifecycle (e.g. first RBT in execution).	Transition CONOPS
Reference Business Trajectory	It is the trajectory that the Airspace User agrees to fly and that the ANSP and Airport agree to facilitate. It is associated to the filed flight plan and includes both air and ground segments. It	Transition CONOPS

	consists of 2D routes (based on published way points and/or pseudo waypoints computed by air or ground tools to build the lateral transitions and vertical profiles); altitude and time constraints where and when required; altitude, time and speed estimates at waypoints, etc.	
Runway	The arrival or departure runway allocated to a flight via the DPI or API.	
Runway Configuration	The runway configuration in use at an airport during a period.	
Shared Business Trajectory	The Shared Business or Mission Trajectory (SBT/SMT) is the trajectory published by the Airspace User that is available for collaborative ATM planning purposes. The refinement of the SBT/SMT is an iterative process. The final form of the SBT/SMT becomes the Reference Business or Mission Trajectory (RBT/RMT) and is part of the filed flight plan.	Transition CONOPS
Soft constraint	ATM published constraint that is not mandatory for the AU to consider when submitting the flight plan (for example some LoAs published as Profile Tuned Restrictions) but can contribute to improve predictability.	SESAR 1 P07.06.02 OSED
Target Time of Arrival (TTA)	An ATM computed arrival time. It is not a constraint but a progressively refined planning time that is used to coordinate between arrival and departure management applications. A TTA consists of a nominal value and tolerance limits around the nominal value.	Transition CONOPS SESAR 1 P07.06.02 OSED

Table 7: Glossary of terms

G.10 List of Acronyms

Acronym	Definition
AIRAC	Aeronautical Information Regulation and Control

ANSP	Air Navigation Service Provider
API	Arrival Planning Information
ATM	Air Traffic Management
AU	Airspace User
CONOPS	Concept of Operations
CTOT	Calculated Take Off Time
DPI	Departure Planning Information
EATMA	European ATM Architecture
eFPL	No acronym definition provided from ICAO
EET	Estimated Elapsed Time
EFPL	Extended Flight Plan
E-ATMS	European Air Traffic Management System
FF-ICE	Flight and Flow Information for a Collaborative Environment
FOC	Flight Operations Centre
FPFDE	Flight Plan and Flight Data Evolution
IAF	Initial Approach Fix
iSBT	Initial Shared Business Trajectory
iRBT	Initial Reference Business Trajectory
ICAO	International Civil Aviation Organisation
INTEROP	Interoperability Requirements
KPA	Key Performance Area
NM	Network Manager
OFP	Operational Flight Plan
OI	Operational Improvement
OSED	Operational Service and Environment Definition
PTR	Profile Tuning Restriction (i.e. soft constraint)

RBT	Reference Business Trajectory
SBT	Shared Business Trajectory
SESAR	Single European Sky ATM Research Programme
SID	Standard Instrument Departure
SMT	Shared Mission Trajectory
STAR	Standard Instrument Arrival
SJU	SESAR Joint Undertaking (Agency of the European Commission)
SPR	Safety and Performance Requirements
SWIM	System Wide Information Model
TT	Target Time
TTA	Target Time of Arrival

Table 8: List of acronyms

G.11 Operational Service and Environment Definition

G.12 SESAR Solution 18-02C: a summary

7.2.7 eFPL supporting SBT/RBT transition - Overview

The transition from SBT to RBT is a key aspect of the SESAR Business trajectory concept establishing a strong link between FF-ICE planning, FF-ICE filing and execution phases. While the full implementation of the business trajectory concept is addressed by solution 18.02a in the context of TBO (Trajectory Based Operations), the 18-02c will address intermediate steps and building blocks taking into account SESAR 1 validation results on the Extended Flight Plan and ICAO FF-ICE increment 1 developments in progress.

In SESAR 1, the Extended Flight Plan (EFPL) concept was defined and validated at V3 level, which was limited to the exchanges between FOC and NM and the use of EFPL information in NM processes. In addition, V2/TRL2-3 validation exercises were conducted addressing the use of EFPL data by ATC but limited to the use in trajectory prediction and considering only a subset of EFPL data elements (see section 7.2.4).

The SESAR Extended Flight Plan has provided strong inputs to the definition of the eFPL, the filed Flight Plan as defined at ICAO level (FF-ICE increment 1). Consequently, in terms of trajectory information

flows and data exchanges, we can consider EFPL and eFPL almost identical. The eFPL includes additional data elements (e.g. the GUFI) as well as new procedures related to the acceptance of the flight plan but the definition/validation of those elements/procedures are out of the scope of SESAR R&D activities.

The eFPL can be viewed as a key enabler supports the agreement process at the end of the FF-ICE planning and FF-ICE filing phases. In this agreement process, as defined in FF-ICE provisions draft working paper [reference [4] ATMRPP/2-WP/718 AIR TRAFFIC MANAGEMENT REQUIREMENTS AND PERFORMANCE PANEL (ATMRPP), SECOND MEETING, Montreal, Canada, 14 to 18 November 2016, draft working paper] two main trajectories are exchanged between the AU (the FOC) and the ATM (NM):

- The Filed Trajectory: this is trajectory as calculated by the FOC and included in the submitted eFPL
- The Agreed Trajectory as calculated by NM: which takes into account the AU filed trajectory but integrates also information from other sources: e.g. allocated SID/STAR from airports, ATC constraints (e.g. LoAs) from ANSPs.

In addition, the eFPL contains trajectory related information like flight specific performance data, which allows ATM to recalculate - when needed - a trajectory closer to the preferred trajectory as would be generated by the FOC.

The following diagram provides a summary of trajectory information exchanges in the context of the FF-ICE planning and FF-ICE filing process.

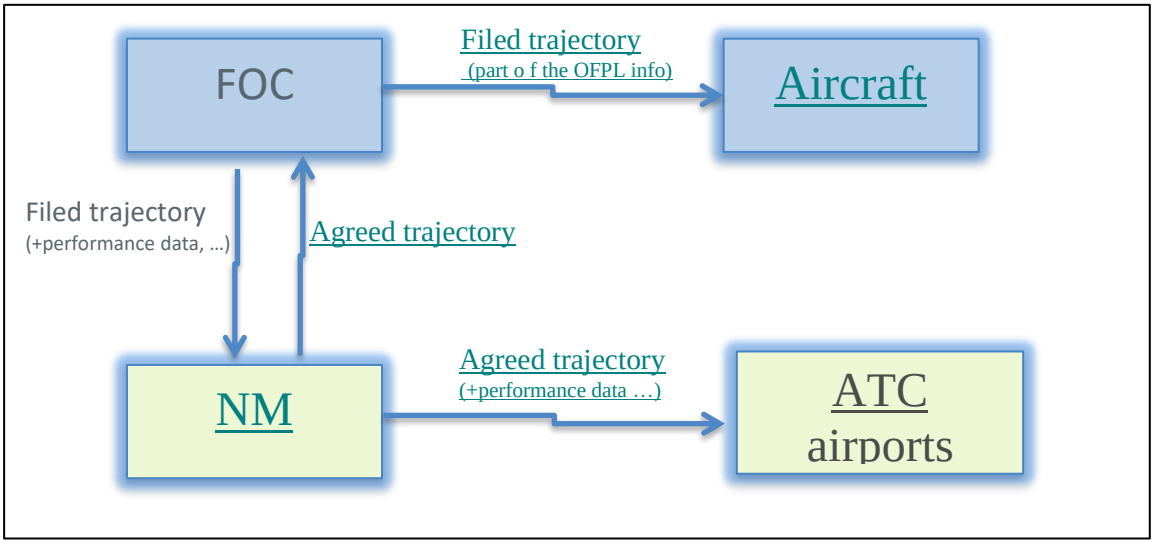


Figure 1: eFPL- Trajectory information flows in FF-ICE planning and FF-ICE filing

SESAR 1 validation on the Extended Flight Plan has allowed deriving the following conclusions related to the information flows presented above:

- Performance data is highly useful information allowing to significantly improving DCB and ATC traffic predictions in particular in climbing phase.
- eFPL trajectory information exchanges allow to increase the alignment between the FOC planned trajectory (filed trajectory) and the NM planned trajectory (agreed trajectory) but still some significant differences remain – in particular in the vertical and time dimensions - for different reasons:
    - The trajectory as planned by the FOC does not consider in general some ATC constraints/procedures like LOAs. Those constraints are in current operations shared by NM but not published as binding constraints to be considered in FF_ICE filing.
    - For a significant proportion of the traffic, the FOC and ATM do not consider the same SIDs and STARs. This is particular critical for the SID since it has potentially an impact on the whole trajectory.

Aligning as much as possible the FOC and NM planned trajectories - and ultimately unifying - is important for many reasons:

- It allows converging to a trajectory that integrates relevant and accurate information from all stakeholders (AU, ATM, and airport). Consequently, aligned/unified trajectories will improve predictability both at AU and ATM sides.

- The misalignment of FOC and NM planned trajectories leads potentially to incorrect decisions and misunderstandings in CDM processes related to flight plan acceptance or flow management (see Figure 3: Example of the impact of PTRs on the vertical profile for an illustration) reducing overall ATM performances and increasing operator's workload.
- Aligning FOC and NM trajectories in FF-ICE planning and FF-ICE filing will indirectly (see Figure 1: eFPL- Trajectory information flows in FF-ICE planning and FF-ICE filing) allow reducing differences between flight crew and ATC actor's views of the trajectory and thus improve air-ground coordination processes, reduce actor's workload and increase safety in execution.

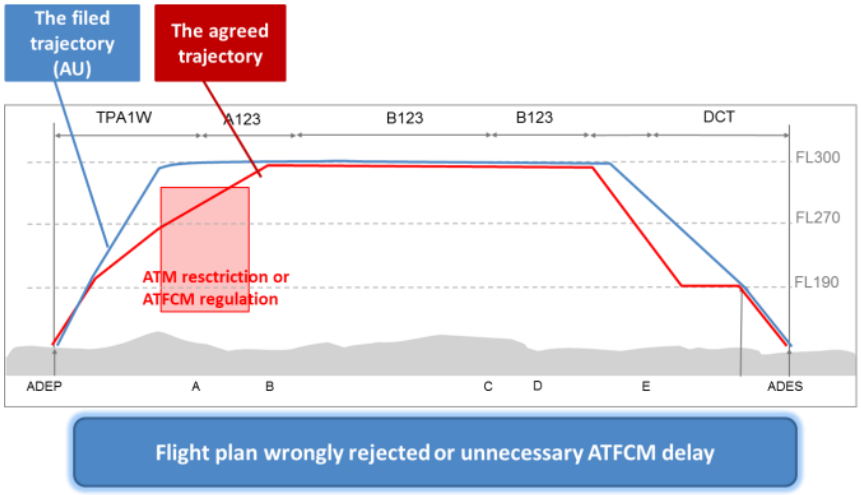


Figure 2: Illustration of trajectory misalignment issue

Considering SESAR 1 findings and current operational shortcomings, the solution addresses four specific evolutions in wave 1 corresponding to four use-cases. The following table lists these evolutions/use-cases as well as their status at the of Wave 1 related to the scope of the solution taking into account validation results.

Topic/use-case	Status at the end of Wave 1
Distribution and use of eFPL Data and Use by ATC	In the final scope of 18.02c
Use of PTRs	Out of the final scope of 18.02c. TRL6 maturity not achieved for associated enablers.
Dynamic AOP/NOP information in eFPL	In the final scope of 18.02c.

Target Time Use in eFPL (planning phase)	Out of the final scope of 18.02c. Validation not conclusive.

Note: elements in grey in the table above corresponds to the topics/use-cases proposed to be removed from the scope of the solution 18.02c since associated enablers have not achieved TRL 6 maturity. This convention is adopted for all following tables in the document.

The following sections give an overview of these four evolutions.

7.2.8 Distribution of eFPL and Use by ATC

First, it must be highlighted that this evolution addresses the use of eFPL information by ATC in execution mainly but based on information provided by the FOC in eFPL in pre-flight phase (FF-ICE filing).

In SESAR 1, several V2 exercises were conducted related to the use of eFPL information by ATC (see section 7.2.4). Those exercises have demonstrated the benefits of using some eFPL data elements like the Take-Off weight, speed information in the trajectory and flight performance data to improve ATC trajectory prediction in support to conflict detection and resolution in particular in the climbing phase.

Those conclusions need to be confirmed yet at TRL 6 maturity level for the system enablers. Moreover, a number of points require further studies and validation:

- Current means/format used for the distribution of ICAO 2012 flight plans (e.g. AFTN, ADEXP) cannot be reused as such for the eFPL. Therefore, existing services must be adapted or new services must be defined; and validated for eFPL distribution to ATC actors.
- Some elements of the 4D trajectory like the Top Of Climb (TOC) or Top Of Descent (TOD) may be useful to display to ATC actors to ease coordination processes with the flight crew and improve ATC quality of service.
- Some information in the 4D trajectory like levels, times at each point may be useful in some cases to improve ATC traffic prediction. Moreover, even the eFPL content is already defined at ICAO level; there is still the possibility to identify additional elements that could be of particular interest for ATC. They could be included as part of FIXM 5.0 or in the context of a European extension. For example, the estimated aircraft weight at each point of the trajectory is not included in the eFPL and FIXM4.0 - and some ANSPs consider this information as potentially useful.
- The management by ATC of mixed traffic - some with ICAO 012 FPLs and some with eFPL - needs to be studied.

7.2.9 Use of PTRs

Note: this topic is removed from the scope of the solution at the end of Wave 1 due to the lack of maturity of associated enablers.

Currently, a number of ATC constraints & procedures (e.g. LOAs) are modelled in NM systems/processes under the denomination of PTRs (Profile Tuned Restrictions) and used in trajectory predictions both in flight plan management and DCB systems (IFPS and ETFMS). These PTRs have the following characteristics:

- ANSPs define and provide the PTRs to NM. The PTRs are activated statically - following the AIRAC cycle publication - in current operations and are declared active in most the cases H24 independently from planned sectors configuration or traffic load.
- They are shared - both paper description & B2B services - but no specific procedures for their use by AUs are defined since PTRs are not published as binding constraints to be considered to get flight plans accepted.
- In theory, the PTRs correspond to level constraints having limited impact on the vertical profile of trajectories. For ATC constraints/procedures having more significant impact e.g. “large” level off, they are supposed to be published as RAD/route constraints to be mandatorily considered in AU flight planning. However, as showed by SESAR 1 validations, the impact of PTRs is far from being negligible and is one of the main causes of the misalignment of AU and NM trajectories (see Figure 3 Example of the impact of PTRs on the vertical profile for an example from SESAR 1 validation).
- In the context of implementation projects, some experiments are in progress (see section 7.2.6) – involving NM and some ANSPs – to study the dynamic management of the activation/deactivation of PTRs depending on planned sectors configurations or traffic loads.
- Previous studies (see sections 7.2.4 & 7.2.6) have shown that the use of PTRs – even managed statically - have a very significant and positive impact on NM traffic predictions accuracy. It is likely that PTRs managed dynamically will intensify this positive impact.

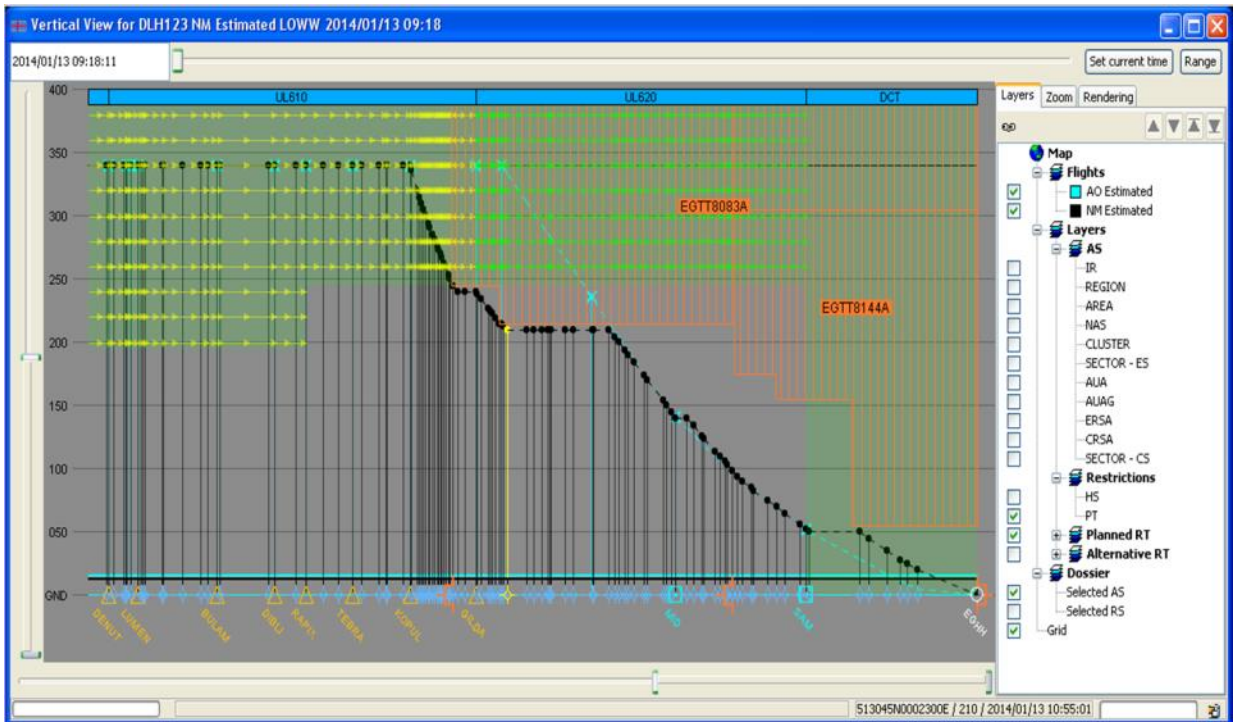


Figure 3: Example of the impact of PTRs on the vertical profile

Considering those elements, the usage of PTRs – whether they are managed statically or dynamically- by AUs in FF-ICE planning and FF-ICE filing is expected to be beneficial for different reasons:

- It will allow AUs to optimise trajectory and plan fuel consumption more accurately by taking better into account planned ATC procedures applied along the trajectory.
- It will allow the AU and NM planned trajectories to be much more aligned with the benefits listed in the previous paragraph.

A number of open points require further investigation/validation:

- The fuel planned by AUs may increase due to the integration of PTRs constraints during FF-ICE planning and FF-ICE filing. This increase may not be always relevant in particular for PTRs managed statically for which a significant proportion of corresponding ATC procedures may not be applied effectively in execution in function of the real time situation.
- The procedures related to the management of dynamic PTRs are still in discussion and in particular the time lead for their activation/de-activation. Some ANSPs promote a very-short

notice activation/de-activation of PTRs (e.g. 30mn to 2 hours) when accurate knowledge of sector configuration and traffic load predictions are available. For so short notice activation/de-activation of PTRs, it will not be possible for the FOC to consider them in FF-ICE planning and FF-ICE filing, since most of the concerned flights are either airborne or close to off-block. The use-case defined in this OSED relies on the assumption that at least some of the dynamic PTRs will be activated/de-activated with sufficient anticipation –at least few hours, preferably in pre-tactical phase – to be considered by FOCs in FF-ICE planning and FF-ICE filing.

- There are ongoing initiatives to allow a more flexible policy on fuel upload requirements (EASA NPA 2016-06 [19]) and may allow last minute updates. They may have an impact on the two use cases on PTRs and AOP/NOP information as well as associated benefits mechanism.

Note: this topic has been put out of the scope of the solution at the end of Wave 1 due to the lack of maturity of associated enablers.

7.2.10Target Time Use in eFPL (Planning Phase)

Note: this topic is removed from the scope of the solution at the end of Wave 1 due to the lack of maturity of associated enablers.

The Target Time management concept as developed in SESAR 1 includes the following features:

- DCB time-based measures (TT) are applied at the point of congestion (and no more at departure runway like in current operations with the CTOT).

- The CTOT is issued in association with the target time but it is mainly to ensure the coordination with departure operations. The CTOT is supposed to be backtrack calculated from the Target time taking into account the estimated flight elapsed time from take-off to the point of congestion.

- For arrival congestion, the reference point at which the TTA is published can depend on airports: it can be for example the first point of the STAR, the IAF or the runway depending on operational needs and procedures.

- The Target Time being applicable at the point of congestion and not at departure, the FOC has the possibility to update the SBT to express his preference on how to meet the TTA and NM should adapt the CTOT in accordance.

Since the target time and the CTOT are linked by the estimated elapse time from take-off to the point of congestion, it is key that:

- The estimated elapsed times are as accurate as possible.
- The estimated elapsed times as calculated by NM and the FOC are aligned to avoid misunderstandings and loss of efficiency.

The solution will address these aspects of target time management with the eFPL:

- The eFPL includes flight elapsed times as calculated by the FOC; and is an important enabler to align FOC and NM estimated elapse times and to improve accuracy of the common prediction.
- The eFPL update procedure can be used by an AU in reaction to the publication of a Target Time to express his trajectory preference to meet the target time. The departure time (CTOT) will be updated in accordance –if needed - by NM to comply with the target time and flight elapse times provided by the AU in the eFPL.

Therefore, in this use case, the solution defines new information flows for AUs to consider the same information as NM.

This topic is strongly linked to DCB operations and procedures, therefore the use-cases and BIM (Benefit & Impact Mechanism) diagrams are developed in close cooperation with solution PJ09.03.

7.2.11Dynamic AOP/NOP Information in eFPL

Some elements of AOP/NOP information are important to consider in AU flight planning in order to better align AU and NM trajectories, improve AU fuel prediction and support target times management.

These elements are:

- The departure taxi time
- The planned departure and arrival runways
- The planned SID and STAR

Note: the allocated SID and STAR information are out of the scope of this topic since the information is only available during the execution phase.

In current operations, NM updates much more dynamically than the FOC this information in the flight trajectory thanks to live updated information received from airports:

- For the departure phase, with the implementation of airport CDM procedures, NM receives from most of the major airports up-to-date information planned departure taxi time, runway

configuration, allocated runway and SIDs in DPI messages. It is taken into account to update DCB trajectories and traffic prediction

- A similar message (API) is in phase of development for arrivals (A-CDM airports) that will allow receiving in the future up-to-date information on runway and STARs

- In addition, NM receives dynamically from main major airports runway configurations in use allowing adapting accordingly SIDs and STARs (in particular depending on runway direction)

Therefore, in this use case, the solution defines new information flows for AUs to consider same information as NM.

The consideration of SID and STAR by the AU has two aspects: safety and fuel. The AU is responsible to create a safe flight plan and to calculate the correct amount of fuel to carry. Both aspects consider SID and STAR. Each change of SID or STAR must result in activities that maintain the safety and that deal with the required amount of fuel during the FF-ICE planning and FF-ICE filing.

The following table details which information the AU should consider from the NOP depending on the reliability of the source.

Type of airport **AOP/NOP Information**	**A-CDM airport** **sending DPI and API information**	**Non A-CDM airport** **sending runway configuration in use information**	**Airport** **not sending dynamic information**
Planned Departure Runway	The AU should consider the planned departure runway information in the NOP coming from A-CDM airports as soon as the first DPI message is sent to NM (EOBT -3H).	The AU should check if its planned departure runway matches with the runway configuration in use.	Not used
Planned SID	The planned SID in the NOP is not considering accurately aircraft performance. Therefore, the AU should include his preferred SID in the flight plan compliant with the planned runway in the NOP.	The AU should plan a SID compliant with one of the runway configuration in use.	Not used

Planned Departure Taxi Time	AU should consider the planned departure taxi time information in the NOP coming from A-CDM airports when the T-DPI message is sent to NM (EOBT -2H).	Not used	Not used
Planned Arrival Runway	AU should consider the planned arrival runway information in the NOP coming from A-CDM airports as soon as the first API message is sent to NM.	The AU should check if its planned arrival runway matches with the runways configuration in use.	Not used
Planned STAR	The planned STAR in the NOP is not considering accurately aircraft performance. Therefore, the AU should include his preferred STAR in the flight plan compliant with the planned runway in the NOP.	The AU should plan a STAR compliant with one of the runway of the configuration in use.	Not used

This topic is strongly linked to DCB operations and procedures, therefore the use-cases and BIM (Benefit & Impact Mechanism) diagrams are developed in close cooperation with solution PJ.09-03.

7.2.12OI Steps Coverage

The PJ19 PMP presents the solution 18-02c as a technological solution, so its scope should be limited to enablers in theory. However, since the enablers tackled by the solution are associated to OIs not addressed in wave 1 by any ATM solution, the solution addresses also OIs to avoid system driven operational evolutions (The PMP reflects this). However, due to its technological nature, the solution will address operational aspects only in a limited way: no - or very limited - safety and human performance assessment, operational performances only partially addressed (i.e. no quantitative assessment of benefits for operational KPAs like capacity, safety, and flight efficiency). That is why the solution is not aiming to achieve full V3 maturity status for the four OIs addressed, while the associated enablers are aiming to achieve TRL6 maturity.

Regarding OI steps AUO-0229 and AUO-0225 (see hereafter), associated use-cases, benefits mechanisms and validation activities are developed in relation with DCB OI addressed by solution 09.03 (DC-0103-B_Collaborative NOP for Step 2). The two solutions agreed to share the scope and responsibilities as:

- The use-cases addressing both AUO and DCB OIs are defined conjointly and included in the 18-02c OSED. The PJ09.03 OSED will add a reference to the PJ.18-02c use-cases.
- The BIMs are developed commonly by the two solutions and included in both PJ.18-02c and PJ09.03 OSEDs respectively for AUO and DCB OIs.
- Validation activities are defined conjointly, PJ.18-02c focusing on objectives/processes/enablers related directly to AUs while PJ09.03 focusing on DCB aspects.

Note: the elements in grey in the following table corresponds to the OIs proposed to be removed from the scope of 18.02c.

OI Step code	OI Step title	OI Step coverage
AUO-0223	Harmonised and improved integration of airspace and ATC constraints/procedures in trajectories calculated by FOCs and NM	Partial The solution is mainly technological so it addresses mainly enablers. Operational feasibility and performance (from AU perspective) is also partially addressed.
This OI contributes to the progressive alignment of the AU and NM calculated 4D trajectories in planning phase. This alignment will be improved by clarifying and harmonizing airspace/route constraints publication and interpretation and agreeing on ATC constraints and procedures (in particular LOAs represented by PTRs in current Network operations) needed to be taken into account to generate the SBT/RBT. This OI addresses ATC constraints published either statically or activated dynamically with sufficient notice to be considered in AU flight planning. This OI is a key step toward the implementation of the SBT concept and will allow improving predictability both at AU and ATM sides as well as enabling fine-tuned trajectory management processes.		
AUO-0225	Enhanced Target time management by the use of eFPL	Partially The solution is mainly technological so it addresses mainly enablers. Operational feasibility and performance (from AU perspective) is also partially addressed.
The use of the eFPL- filed flight plan as defined by FF-ICE increment 1 will allow to align and improve accuracy of prediction of flight elapse times shared between NMF and the AU. Target time management in planning will be improved though a better planning of the departure time to meet the Target time and more flexibility given to the FOC to express his preference.		

AUO-0226	SBT/RBT: Exchange of eFPL with ATC	Partially The solution is mainly technological so it addresses mainly enablers. Operational feasibility is also very partially addressed.
The eFPL (FF-ICE filed plan) information provided by AUs will be distributed to the ATC by NM through Flight Object or possibly other means. The information such as T/O weight, weight profile, 4DT will be used by ATC systems and be a part of the SBT/RBT. ATC will use that to improve the trajectory prediction for all ATC/INAP functions and get more precise view of AU trajectory preference		
AUO-0229	Harmonised and improved integration of AOP/NOP information in trajectories calculated by FOCs and NM	Partially The solution is mainly technological so it addresses mainly enablers. Operational feasibility is also partially addressed.
Alignment of the AU, NMF and airport views of 4D trajectories in planning phase and increase predictability by exchanging dynamic AOP/NOP information – in particular runway in use configurations in use, departure taxi times, planned runways and SIDs/STARs - allowing the FOC to plan and share a more accurate and up-to-date 4D trajectory.		

Table 9: SESAR Solution 18-02c Scope and related OI steps

PJ.18-02c addresses the following CONOPS requirements complementary to PJ.07-01 for all aspects linked to ATC processes and the final agreement on the RBT in the pre-flight phase.

High Level CONOPS Requirement ID	High Level CONOPS Requirement	Reference to relevant CONOPS Sections e.g. Operational Scenario applicable to the SESAR Solution
S07-01-HLOR-01	Trajectory definition processes shall allow civil Airspace User to plan optimised trajectories that best consider their own operational requirements while fulfilling the requirements of the other ATM	B.1.2.3.3. The SBT in the Short Term Planning Phase B.1.2.3.4. Agreeing the RBT B.3.2.2.3. Short Term Planning Phase

	stakeholders expressed with ATM constraints through • involvement of the civil Airspace User throughout all ATM planning activities; • implementing a CDM process assessing what-if scenarios that allows civil Airspace Users to join the DCB optimization process; • allowing civil Airspace Users to re-plan their flight trajectories whenever seen necessary or required by any ATM constraint; • integration of the 4D trajectories provided by the civil AUs in the SBTs; • allowing civil Airspace User the trigger the RBT when the trajectory is mature enough to safely and efficiently operate the flight; and • provision detailed constraint information to civil AUs that is adequate to understand the reason behind the constraint and plan an alternative trajectory which can be provided as new SBT.	B.3.5.2.1 Pre departure

Table 10: Link to CONOPS

7.2.13Deviations with respect to the SESAR Solution(s) definition

OI Step Code	OI Step title	Deviation
AUO-0223	Harmonised and improved integration of airspace and ATC constraints/procedures in trajectories calculated by FOCs and NM	None
AUO-0225	Enhanced Target time management by the use of eFPL	None

AUO-0226	SBT/RBT: Exchange of eFPL with ATC	None
AUO-0229	Harmonised and improved integration of AOP/NOP information in trajectories calculated by FOCs and NM	None

1331

OI Step		OI description
AUO-0223		Harmonised and improved integration of airspace and ATC constraints/procedures in trajectories calculated by FOCs and NM
	EN code	EN description
	AOC-ATM-11	LOAs Integration in FOC trajectories
	ER APP ATC 170	ATC LOA Status Update
	NIMS-21a	Initial Flight Planning management enhanced to support 4D for Step 1
	NIMS-55	Dynamic ATC LOAs Integration in NM trajectory
	SVC-001	Modification of the TacticalUpdates service provided by Regional ATFCM to incorporate PTR status query and updates.
	SVC-002	Extend the AirspaceStructure service to cover the PTR status
	SWIM-APS-14	AOC AirspaceStructure service Profile Tuning Restriction (PTR) Status interface consumption by the FOC
	SWIM-APS-15	TacticalUpdates service Profile Tuning Restriction (PTR) status update provision by the Regional ATFCM
	SWIM-APS-16	ATC Letter of Agreement (LOA) Status publication via TacticalUpdates service by ER APP ACC
AUO-0225		Enhanced Target time management by the use of eFPL
	EN code	EN description
	AOC-ATM-22	TT data integration in the FOC trajectory
	NIMS-21a	Initial Flight Planning management enhanced to support 4D for Step 1
	SVC-003	Enhance the existing NMFlightData service to publish and subscribe SID/STAR data
AUO-0226		SBT/RBT: Exchange of eFPL with ATC
	EN code	EN description
	ER APP ATC 82	Enhance EN/APP ACC to use eFPL data
	NIMS-21b	Flight Planning extended with eFPL Distribution service

	SWIM-APS-18	eFPL service consumption in ATC
AUO-0229		Harmonised and improved integration of AOP/NOP information in trajectories calculated by FOCs and NM
	EN code	EN description
	AOC-ATM-23	SID/STAR and RunwayConfigurationPlan information integration in the FOC trajectory
	NIMS-54	SID, STAR, TT, and Runway Configuration data applied in Initial Flight Plan Processing
	SVC-003	Enhance the existing NMFlightData service to publish and subscribe SID/STAR data
	SWIM-APS-17	AOC Consume NMFlightData service FlightListByAO interface via P/S

Table 11: OI steps and enablers

G.13 Detailed Operational Environment

7.2.14Operational Characteristics

Operational interactions per context (NOV-2)	Operating Environment
[NOV-2] eFPL Supporting SBT Transition to RBT	En-Route; High Complexity; High Complexity; Medium Complexity; Medium Complexity; Network; Terminal Airspace; Very High Complexity; Very High Complexity;
Comment	
N/A	

7.2.15Roles and Responsibilities

Node	Responsibilities
Airport Operations	The Airport Operator is the legal entity responsible for safe operations at the airport. It is responsible for compliance with the conditions of the airport operation laid down by the National and Super-national bodies. This includes the physical condition of the runways, taxiways, aprons and terminal facilities, security at the airport as well as creating and maintaining a good relationship with local / national authorities and neighbouring communities . It also includes assurance that the scale of equipment and facilities provided are adequate for the activities which are expected to take place at that Airport, as well as provision of staff that are competent and where necessary, suitably qualified (licensing of vehicles and companies on airside).
Airspace User Ops Support	Performs all the necessary activities to support AU ops, including the strategic and tactical planning of AU operations, participation to related CDM processes and UDPP, update of AOP with AU information, ground handling. [RELATED ACTORS/ROLES] Flight Schedule Planner, Airline Operations and Control Centre (AOCC), Wing Operations Centre (WOC), etc.
Flight Deck	Performs all the on-board AU operations including flight execution/monitoring according to agreed trajectory, compliance with ATC clearances/instructions, etc. [RELATED ACTORS/ROLES] Flight Crew
Network Operations	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.

7.2.16Technical Characteristics

N/A

7.2.17Applicable standards and regulations

The FF-ICE and Flight Information Exchange Model FIXM is the standard applicable for the exchange of eFPL.

G.14 Detailed Operating Method

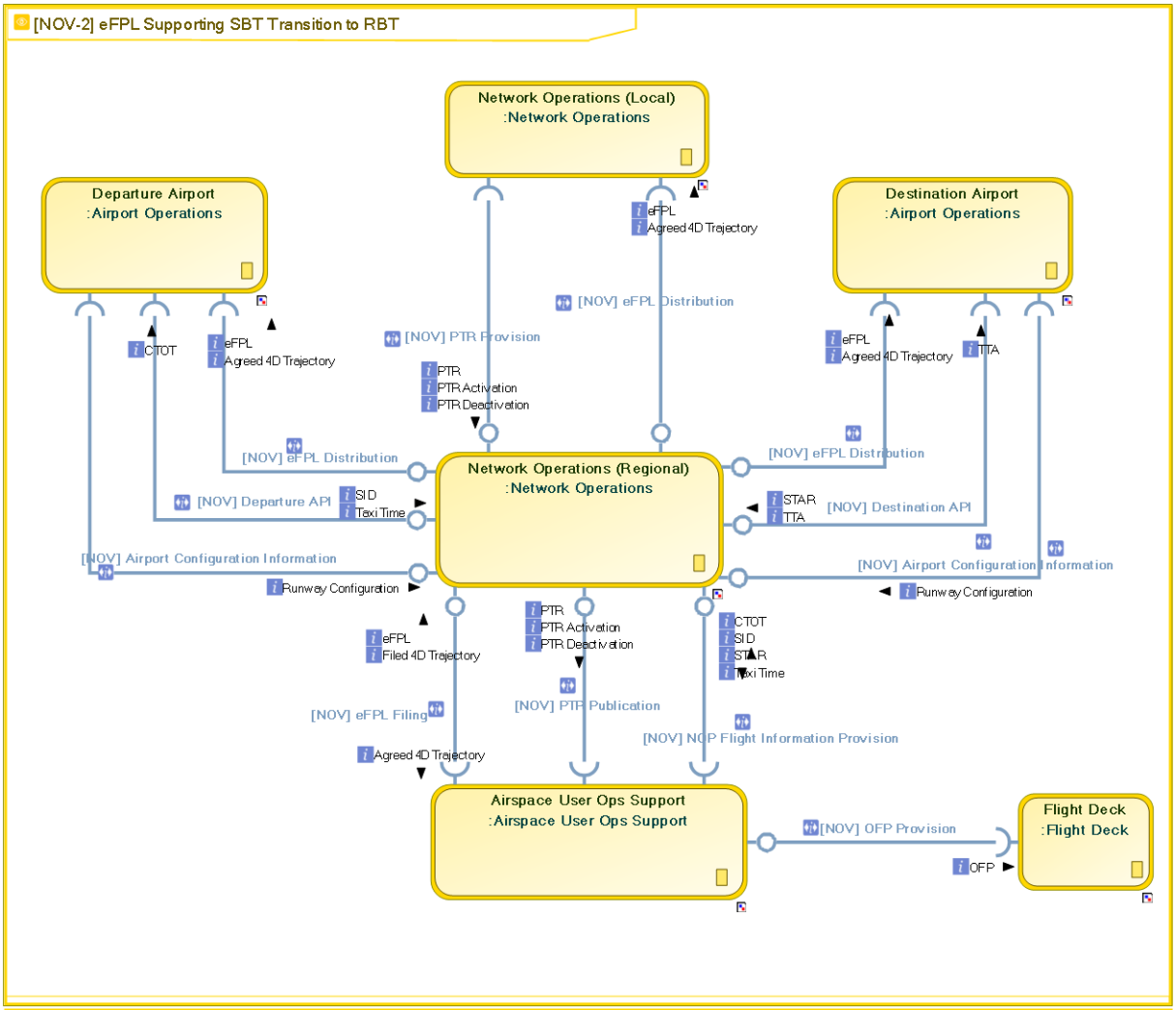
7.2.18Previous Operating Method

N/A

7.2.19New SESAR Operating Method

7.2.19.1 **Use Cases for** [NOV-2] eFPL Supporting SBT Transition to RBT

The information exchanges and the nodes that are defined and used by the PJ.18-02c solution use cases.



[NOV-5] Distribution of eFPL Data and Use by ATC [Airspace User Ops Support, ATS Operations, Network Operations (Local), Network Operations (Regional)]
[NOV-5] Dynamic AOP/NOP Information in eFPL [Airspace User Ops Support, Departure Airport, Destination Airport, Flight Deck, Network Operations (Regional)]
[NOV-5] Target Time Use in eFPL [Airspace User Ops Support, Departure Airport, Destination Airport, Flight Deck, Network Operations (Regional)]
[NOV-5] Use of PTRs [Airspace User Ops Support, Network Operations (Local), Network Operations (Regional)]

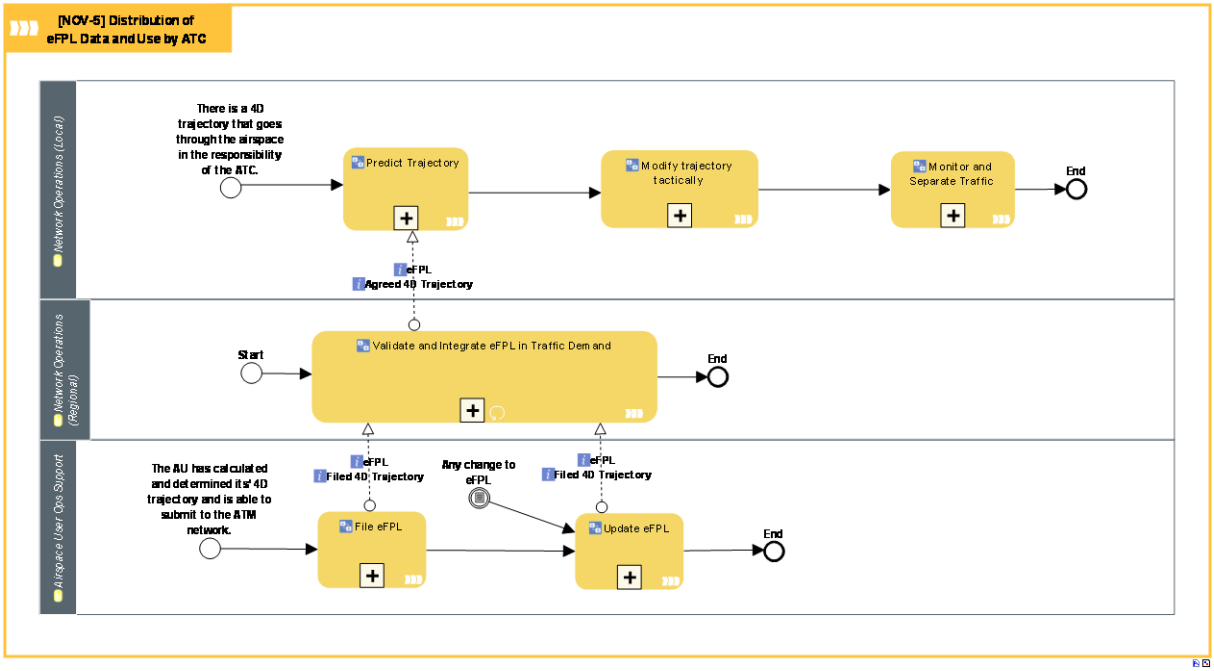
Click on http://webprisme.cfmu.eurocontrol.int/oneportal_working_validation/data/diagrams/4D9E7BC0591D6802 for zooming.

Use case	[NOV-5] Distribution of eFPL Data and Use by ATC
Use case	[NOV-5] Dynamic AOP/NOP Information in eFPL
Use case	[NOV-5] Target Time Use in eFPL (Planning Phase)
Use case	[NOV-5] Use of PTRs

Note: use-cases in grey in the previous table are proposed to be removed from the scope of the solution PJ18.02c as the TR6 maturity is not achieved for the supporting enablers.

7.2.19.1.1 [NOV-5] Distribution of eFPL Data and Use by ATC

This use case deals with the process of using specific data from eFPL in ground trajectory computation and check potential improvement in the conflict detection thanks to more accurate data (trajectory prediction). Improvement in conflict detection and monitoring will allow reducing workload of the ATCOs and therefore increasing capacity. Therefore, it is necessary to determine the relevant eFPL information that will improve computation of the trajectory by the ground system and then improve the accuracy of the conflict detection tools, monitoring tools and other support tools.



Activity	Description
File eFPL	Submit an eFPL using the previously calculated trajectory, that takes into account the known constraints and company rules, to the Network Manager. This eFPL also includes the information detailing the aircraft performance for the flight.
Modify trajectory tactically	Update the trajectory prediction with the incoming surveillance data.

Monitor and Separate Traffic	Based on trajectories computed with the enhanced information (eFPL) conflict detection tools compute potential conflicts encounters and these encounters are displayed to the ATCO Controller Working Position (CWP) for validity check.
Predict Trajectory	Extract relevant information from the eFPL and compute ground trajectories using the Trajectory Predictor tool. The ground trajectory is enhanced with the use of specific information extracted from the eFPL (Aircraft mass on points, speed profile, Top Of Climb, Top Of Descent, vertical profile, speed, and time over navigation points). Initial trajectory computation is performed with a/c data extracted from the eFPL. Real-time trajectory computation is using a/c data extracted from the eFPL and a/c data received via Mode-S/ADS-B.
Update eFPL	Submit an update to the eFPL using the previously calculated trajectory, that takes into account the updated constraints and company rules, to the Network Manager. This update may also include the information detailing the aircraft performance for the flight.
Validate and Integrate eFPL in Traffic Demand	Validate the submitted eFPL against the flight plan processing rules, mandatory airspace constraints. Distribute and integrate the eFPL in traffic demand when the flight plan is valid. Re-validate the eFPL regularly with respect to the most recent airspace constraints. Update the flight information with the most up-to-date capacity information.

1364

Issuer	Info Exchange	Addressee	Info Element	Info Entity
Airspace User Ops Support	File eFPL o--> Validate and Integrate eFPL in Traffic Demand	Network Operations (Regional)	eFPL	
Airspace User Ops Support	File eFPL o--> Validate and Integrate eFPL in Traffic Demand	Network Operations (Regional)	Filed 4D Trajectory	Trajectory

Issuer	Info Exchange	Addressee	Info Element	Info Entity
Airspace User Ops Support	Update eFPL o--> Validate and Integrate eFPL in Traffic Demand	Network Operations (Regional)	eFPL	
Airspace User Ops Support	Update eFPL o--> Validate and Integrate eFPL in Traffic Demand	Network Operations (Regional)	Filed 4D Trajectory	Trajectory
Network Operations (Regional)	Validate and Integrate eFPL in Traffic Demand o--> Predict Trajectory	Network Operations (Local)	eFPL	
Network Operations (Regional)	Validate and Integrate eFPL in Traffic Demand o--> Predict Trajectory	Network Operations (Local)	Agreed 4D Trajectory	Trajectory

1365

1366 7.2.19.1.2 **[NOV-5] Dynamic AOP/NOP Information in eFPL**

1367 The purpose of this use case is to align the trajectories calculated by Airspace User, Network
1368 Manager, and Airports in terms of departure taxi times, runway in use configurations, arrival
1369 and departure procedures prior to the flight departure.

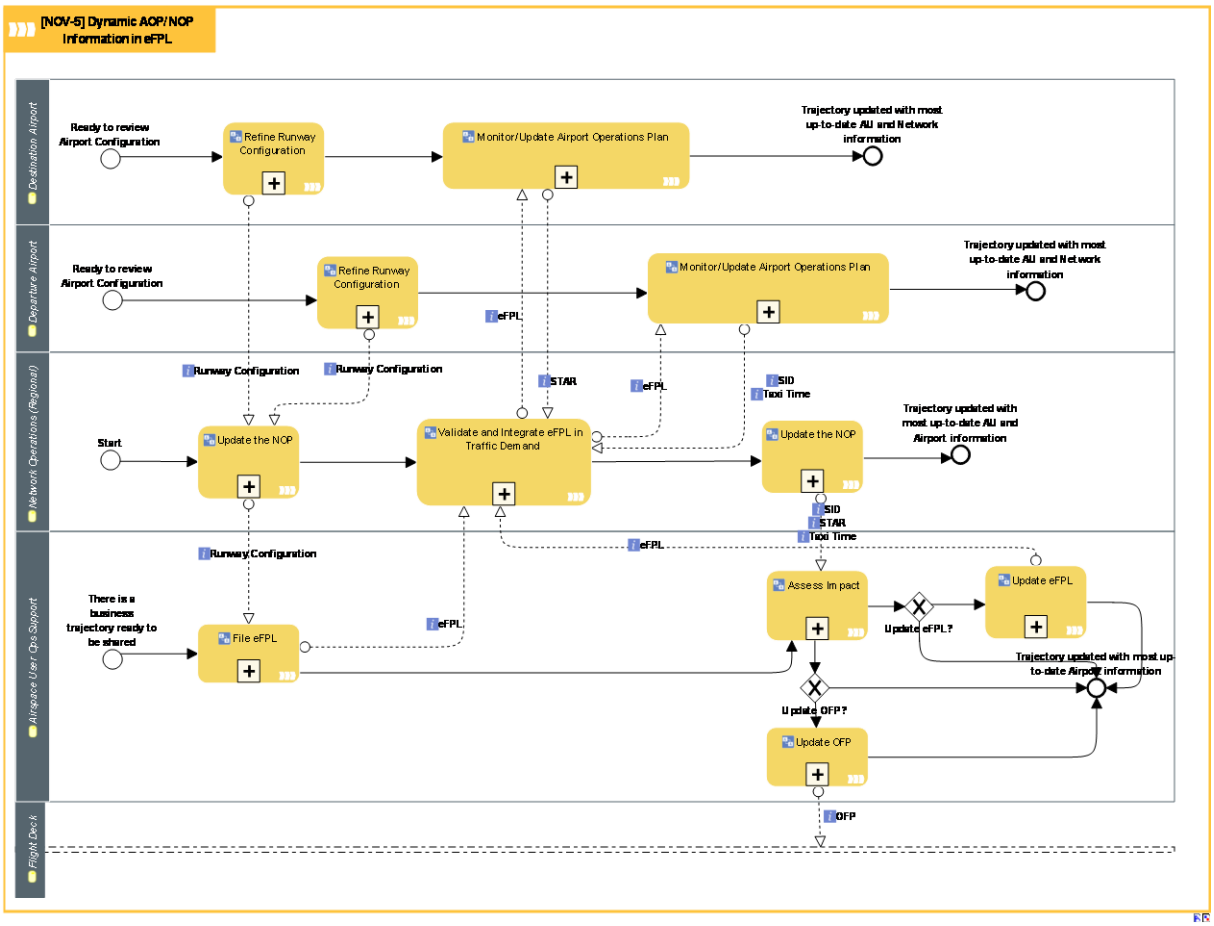


Diagram Id: 4D9E726C591D60E0

The following table illustrates the use case scope as defined by several projects.

Flight Deck	PJ.18-02c
Airspace User Ops Support	PJ.18-02c
Network Operations (Regional)	PJ.09-03
Departure Airport	PJ.04-01
Destination Airport	PJ.04-01

Activity	Description
Assess Impact	The impact assessment starts with the evaluation if the retrieved information (latest PTR status, dynamic AOP/NOP information, and TTA) requires the creation of a new trajectory. If yes then a new trajectory is calculated taking into account the updated constraints and company rules. Afterwards it is evaluated whether it is still possible to update the filed eFPL. Depending on the time the latest PTR status, dynamic AOP/NOP information and TTA is received, it might not be possible to update the eFPL anymore due to operational processes like fuel order (approx. one hour before EOBT). Moreover, it is evaluated whether it is necessary or still possible to update the OFP for the flight crew.
File eFPL	Submit an eFPL using the previously calculated trajectory, that takes into account the known constraints and company rules, to the Network Manager. This eFPL also includes the information detailing the aircraft performance for the flight.
Monitor/Update Airport Operations Plan	
Refine Runway Configuration	
Update eFPL	Submit an update to the eFPL using the previously calculated trajectory, that takes into account the updated constraints and company rules, to the Network Manager. This update may also include the information detailing the aircraft performance for the flight.
Update OFP	Update the OFP and provide it to the Flight Deck.
Update the NOP	[DOD 7.2 modelling] The dDCB/DCB solutions descriptions and their intended use are updated and published in the NOP.
Validate and Integrate eFPL in Traffic Demand	Validate the submitted eFPL against the flight plan processing rules, mandatory airspace constraints. Distribute and integrate the eFPL in traffic demand when the flight plan is valid. Re-validate the eFPL regularly with respect to the most recent airspace constraints. Update the flight information with the most up-to-date capacity information.

1374

Issuer	Info Exchange	Addressee	Info Element	Info Entity
Airspace User Ops Support	Update OFP o--> Flight Deck	Flight Deck	OFP	
Network Operations (Regional)	Validate and Integrate eFPL in Traffic Demand o--> Monitor/Update Airport Operations Plan	Destination Airport	eFPL	
Destination Airport	Monitor/Update Airport Operations Plan o--> Validate and Integrate eFPL in Traffic Demand	Network Operations (Regional)	STAR	
Departure Airport	Monitor/Update Airport Operations Plan o--> Validate and Integrate eFPL in Traffic Demand	Network Operations (Regional)	SID	
Departure Airport	Monitor/Update Airport Operations Plan o--> Validate and Integrate eFPL in Traffic Demand	Network Operations (Regional)	Taxi Time	
Network Operations (Regional)	Validate and Integrate eFPL in Traffic Demand o--> Monitor/Update Airport Operations Plan	Departure Airport	eFPL	
Destination Airport	Refine Runway Configuration o--> Update the NOP	Network Operations (Regional)	Runway Configuration	
Departure Airport	Refine Runway Configuration o--> Update the NOP	Network Operations (Regional)	Runway Configuration	
Network Operations (Regional)	Update the NOP o--> Assess Impact	Airspace User Ops Support	SID	
Network Operations (Regional)	Update the NOP o--> Assess Impact	Airspace User Ops Support	Taxi Time	

Issuer	Info Exchange	Addressee	Info Element	Info Entity
Network Operations (Regional)	Update the NOP o--> Assess Impact	Airspace User Ops Support	STAR	
Airspace User Ops Support	Update eFPL o--> Validate and Integrate eFPL in Traffic Demand	Network Operations (Regional)	eFPL	
Network Operations (Regional)	Update the NOP o--> File eFPL	Airspace User Ops Support	Runway Configuration	
Airspace User Ops Support	File eFPL o--> Validate and Integrate eFPL in Traffic Demand	Network Operations (Regional)	eFPL	

7.2.19.1.3 [NOV-5] Target Time Use in eFPL (Planning Phase)

Note: this use-case is proposed to be removed from the scope of the solution.

The purpose of this use case is to align the trajectories calculated by FOC, Network Manager, and Airports in terms of arrival and departure procedures prior to the flight departure.

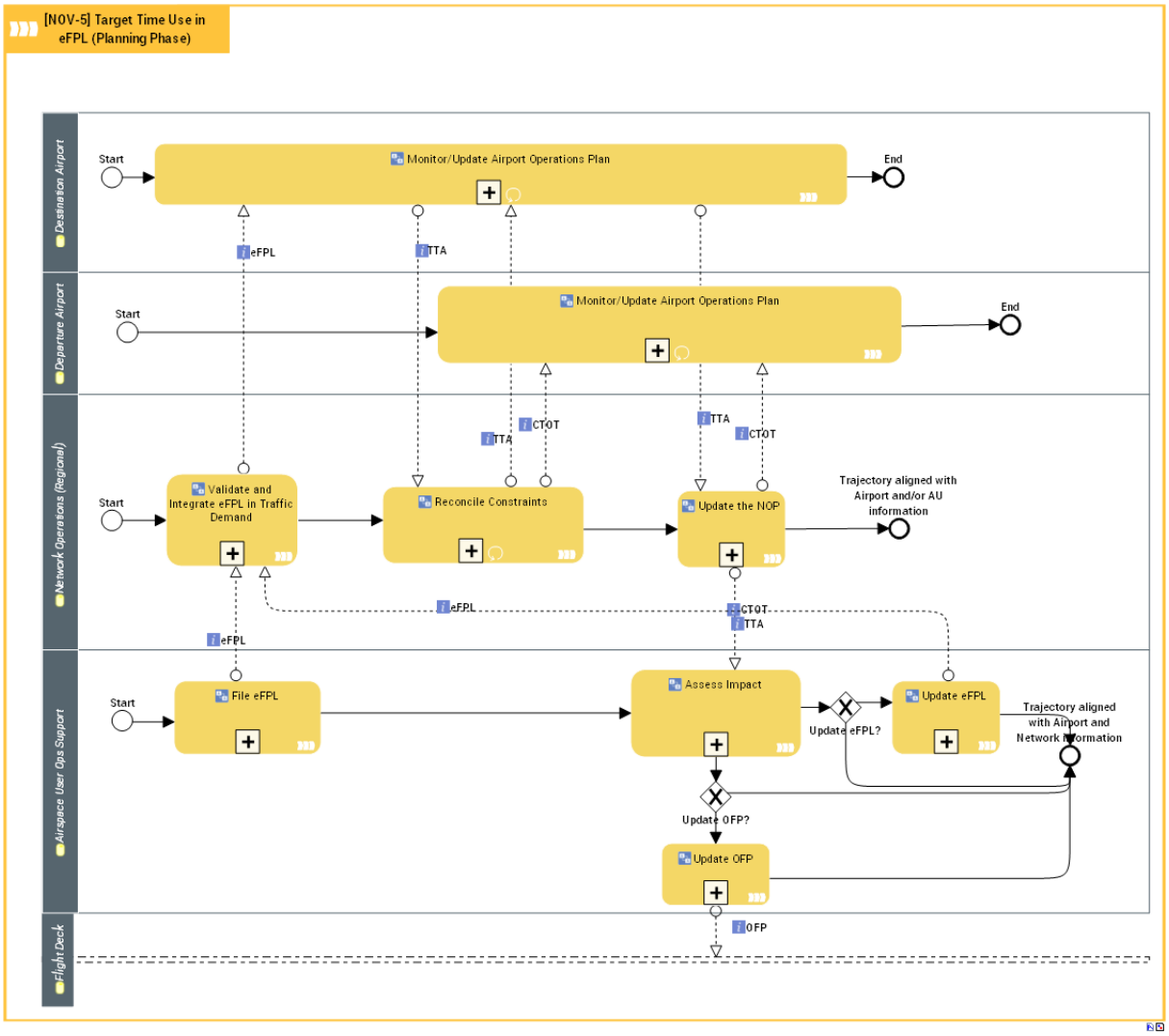


Diagram Id: AF8BDD67597567EF

The following table illustrates the use case scope as defined by several projects.

Flight Deck	PJ.18-02c
Airspace User Ops Support	PJ.18-02c
Network Operations (Regional)	PJ.09-03

Departure Airport	PJ.04-01
Destination Airport	PJ.04-01

1383

Activity	Description
Assess Impact	The impact assessment starts with the evaluation if the retrieved information (latest PTR status, dynamic AOP/NOP information, and TTA) requires the creation of a new trajectory. If yes then a new trajectory is calculated taking into account the updated constraints and company rules. Afterwards it is evaluated whether it is still possible to update the filed eFPL. Depending on the time the latest PTR status, dynamic AOP/NOP information and TTA is received, it might not be possible to update the eFPL anymore due to operational processes like fuel order (approx. one hour before EOBT). Moreover, it is evaluated whether it is necessary or still possible to update the OFP for the flight crew.
File eFPL	Submit an eFPL using the previously calculated trajectory, that takes into account the known constraints and company rules, to the Network Manager. This eFPL also includes the information detailing the aircraft performance for the flight.
Monitor/Update Airport Operations Plan	
Reconcile Constraints	This function collects the planned DCB constraints from local NMF actors and provide the Network Consolidated Constraints (NCC) aiming at reconciling the interfering local constraints.
Update eFPL	Submit an update to the eFPL using the previously calculated trajectory, that takes into account the updated constraints and company rules, to the Network Manager. This update may also include the information detailing the aircraft performance for the flight.
Update OFP	Update the OFP and provide it to the Flight Deck.
Update the NOP	[DOD 7.2 modelling] The dDCB/DCB solutions descriptions and their intended use are updated and published in the NOP.
Validate and Integrate eFPL in Traffic Demand	Validate the submitted eFPL against the flight plan processing rules, mandatory airspace constraints.

	Distribute and integrate the eFPL in traffic demand when the flight plan is valid. Re-validate the eFPL regularly with respect to the most recent airspace constraints. Update the flight information with the most up-to-date capacity information.

1384

Issuer	Info Exchange	Addressee	Info Element	Info Entity
Network Operations (Regional)	Validate and Integrate eFPL in Traffic Demand o--> Monitor/Update Airport Operations Plan	Destination Airport	eFPL	
Network Operations (Regional)	Update the NOP o--> Assess Impact	Airspace User Ops Support	TTA	TargetTimeOfArrival
Network Operations (Regional)	Update the NOP o--> Assess Impact	Airspace User Ops Support	CTOT	CalculatedTakeOffTime
Network Operations (Regional)	Reconcile Constraints o--> Monitor/Update Airport Operations Plan	Destination Airport	TTA	TargetTimeOfArrival
Destination Airport	Monitor/Update Airport Operations Plan o--> Reconcile Constraints	Network Operations (Regional)	TTA	TargetTimeOfArrival
Network Operations (Regional)	Reconcile Constraints o--> Monitor/Update Airport Operations Plan	Departure Airport	CTOT	CalculatedTakeOffTime

Issuer	Info Exchange	Addressee	Info Element	Info Entity
Airspace User Ops Support	Update OFP o--> Flight Deck	Flight Deck	OFP	OperationalFlightPlan
Network Operations (Regional)	Update the NOP o--> Monitor/Update Airport Operations Plan	Departure Airport	CTOT	CalculatedTakeOffTime
Destination Airport	Monitor/Update Airport Operations Plan o--> Update the NOP	Network Operations (Regional)	TTA	TargetTimeOfArrival
Airspace User Ops Support	File eFPL o--> Validate and Integrate eFPL in Traffic Demand	Network Operations (Regional)	eFPL	
Airspace User Ops Support	Update eFPL o--> Validate and Integrate eFPL in Traffic Demand	Network Operations (Regional)	eFPL	

7.2.19.1.4 [NOV-5] Use of PTRs

Note: this use-case is proposed to be removed from the scope of the solution.

This use case deals with the process of distributing the profile tuning restrictions (PTRs) to the different ATM stakeholders and specifically considering them during the 4D trajectory calculation by a Flight Operation Centre. The use case is aiming to support the airspace users at operational level by managing PTRs and providing a FOC trajectory, which is best aligned to the flight profile constraints from ATC and NM. It includes the information exchange between ATC, NM and FOC to respect the actual needs of ATC in reference to actual traffic situation. Besides the published PTRs within the RAD document, this also encompasses the aspects of processing dynamic PTRs.

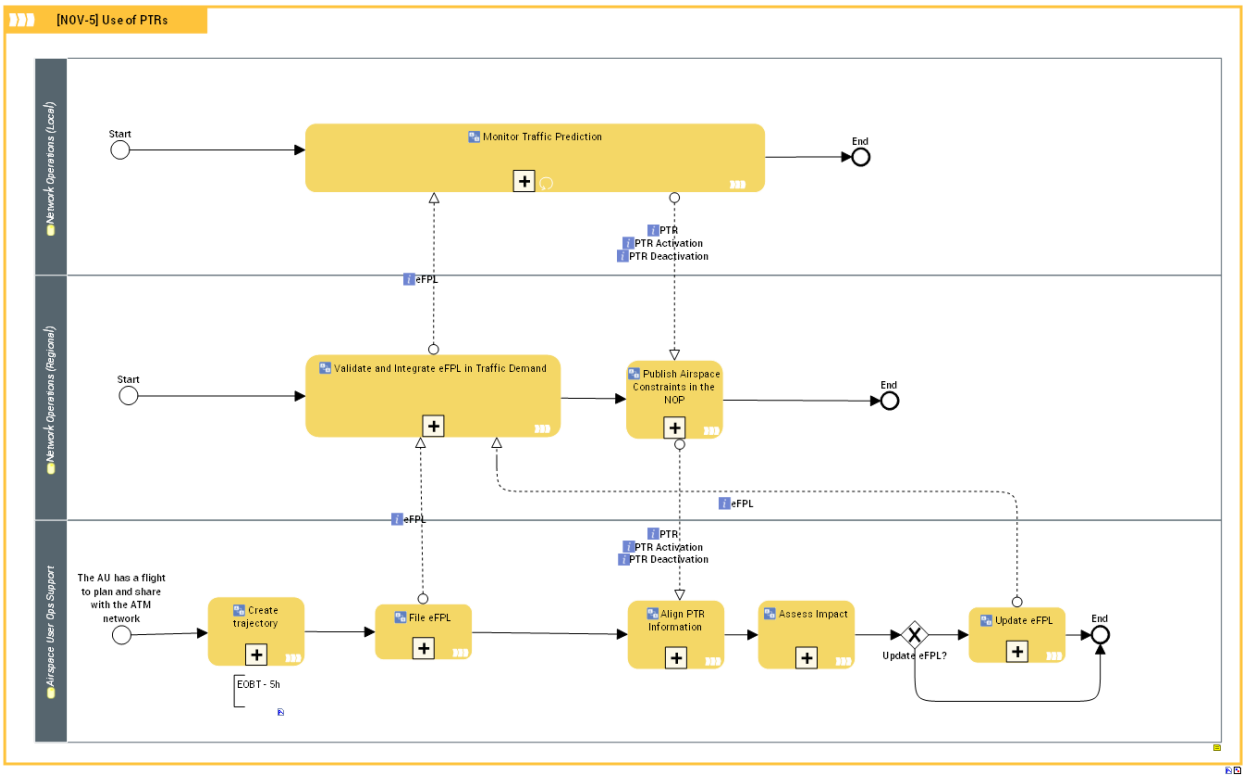


Diagram Id: 66E1777859C20C58

Activity	Description
Align PTR Information	Receive the PTR activation and/or deactivation information.
Assess Impact	The impact assessment starts with the evaluation if the retrieved information (latest PTR status, dynamic AOP/NOP information, and TTA) requires the creation of a new trajectory. If yes then a new trajectory is calculated taking into account the updated constraints and company rules. Afterwards it is evaluated whether it is still possible to update the filed eFPL. Depending on the time the latest PTR status, dynamic AOP/NOP information and TTA is received, it might not be possible to update the eFPL anymore due to operational processes like fuel order (approx. one hour before EOBT). Moreover, it is evaluated whether it is necessary or still possible to update the OFP for the flight crew.

Create trajectory	Calculate a trajectory taking into account the latest published PTRs as well as all known constraints.
File eFPL	Submit an eFPL using the previously calculated trajectory, that takes into account the known constraints and company rules, to the Network Manager. This eFPL also includes the information detailing the aircraft performance for the flight.
Monitor Traffic Prediction	Monitor the traffic predictions based on the eFPLs received from the Network Manager. Periodically analyse the sector load expected in three hours and subsequently activate additional PTRs or deactivate not needed PTRs. Send these additional activations and deactivations to the Network Manager.
Publish Airspace Constraints in the NOP	Publish the changes to the static and dynamic Airspace Constraints
Update eFPL	Submit an update to the eFPL using the previously calculated trajectory, that takes into account the updated constraints and company rules, to the Network Manager. This update may also include the information detailing the aircraft performance for the flight.
Validate and Integrate eFPL in Traffic Demand	Validate the submitted eFPL against the flight plan processing rules, mandatory airspace constraints. Distribute and integrate the eFPL in traffic demand when the flight plan is valid. Re-validate the eFPL regularly with respect to the most recent airspace constraints. Update the flight information with the most up-to-date capacity information.

1398

Issuer	Info Exchange	Addressee	Info Element	Info Entity
Network Operations (Local)	Monitor Traffic Prediction o--> Publish Airspace Constraints in the NOP	Network Operations (Regional)	PTR Deactivation	FlightRestriction
Network Operations (Local)	Monitor Traffic Prediction o--> Publish Airspace Constraints in the NOP	Network Operations (Regional)	PTR Activation	FlightRestriction

Issuer	Info Exchange	Addressee	Info Element	Info Entity
Network Operations (Local)	Monitor Traffic Prediction o--> Publish Airspace Constraints in the NOP	Network Operations (Regional)	PTR	FlightRestriction
Network Operations (Regional)	Publish Airspace Constraints in the NOP o--> Align PTR Information	Airspace User Ops Support	PTR Deactivation	FlightRestriction
Network Operations (Regional)	Publish Airspace Constraints in the NOP o--> Align PTR Information	Airspace User Ops Support	PTR Activation	FlightRestriction
Network Operations (Regional)	Publish Airspace Constraints in the NOP o--> Align PTR Information	Airspace User Ops Support	PTR	FlightRestriction
Airspace User Ops Support	File eFPL o--> Validate and Integrate eFPL in Traffic Demand	Network Operations (Regional)	eFPL	
Airspace User Ops Support	Update eFPL o--> Validate and Integrate eFPL in Traffic Demand	Network Operations (Regional)	eFPL	
Network Operations (Regional)	Validate and Integrate eFPL in Traffic Demand o--> Monitor Traffic Prediction	Network Operations (Local)	eFPL	

7.2.20Differences between New and Previous Operating Methods

N/A

G.15 Interoperability Requirements (INTEROP)

G.16 Information Exchange Requirements

[REQ]

Identifier	IER-18-02c-OSED-eFPL.0002
Title	eFPL to ATC
Requirement	NM shall enable the ATC to subscribe to and receive the eFPL for their area of responsibility via services based on SWIM standard to improve the trajectory prediction.
Status	<Validated>
Rationale	The most up-to-date information shall be available to the AU. The information exchanges have to be realised with the SWIM standards in order to enable timely and rich content propagation of the available information so that all stakeholders have access to the most up-to-date information.
Category	<IER>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
< ALLOCATED_TO >	<Information Flow>	Validate and Integrate eFPL in Traffic Demand o--> Predict Trajectory

1408 [REQ]

Identifier	IER-18-02c-OSED-eFPL.0004
Title	Runway Configuration information to the AU
Requirement	The Network Manager shall enable the AU to receive and use the most up-to-date Runway Configuration information via services based on SWIM standard.
Status	<Validated>
Rationale	The most up-to-date information shall be available to the AU. The information exchanges have to be realised with the SWIM standards in order to enable timely and rich content propagation of the available information so that all stakeholders have access to the most up-to-date information.
Category	<IER>

1409 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
< ALLOCATED_TO >	<Information Flow>	Update the NOP o--> File eFPL

1410 [REQ]

Identifier	IER-18-02c-OSED-eFPL.0010
Title	SID Information to the AU
Requirement	The Network Manager shall enable the AU to receive and use the most up-to-date SID information via services based on SWIM standard.
Status	<Validated>
Rationale	The AU will use the most recent SID information to improve the trajectory prediction.
Category	<IER>

1411 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
< ALLOCATED_TO >	<Information Flow>	Update the NOP o--> Assess Impact

1412

G.17 FPL to eFPL Transition Requirements

[REQ]

Identifier	REQ-18.02.c.01-SPRINTEROP-TR01.01
Title	The Regional Network Operations ensure ICAO FPL and eFPL information distribution
Requirement	The Regional Network Operations shall distribute the flight plan information according to the Local Network Operations capability in terms of ICAO FPL or eFPL.
Status	<Validated>
Rationale	During the transition phase, not all Local Network Operations will be able to receive and use the eFPL, therefore the co-existence of ICAO FPL and eFPL needs to be supported.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
< ALLOCATED_TO >	<Activity>	Validate and Integrate eFPL in Traffic Demand

G.18 Security Requirements

The requirements in this section are to be validated during the industrialisation.

[REQ]

Identifier	REQ-18.02.c.01-SPRINTEROP-SE01.01
Title	Information assets protection
Requirement	The Regional Network Operations shall provide information to the users whom it has identified and agreed prior to information provision.
Status	<in progress>
Rationale	The confidentiality of the information needs to be ensured.
Category	<Security>

1420

1421 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
< ALLOCATED_TO >	<Information Flow>	Validate and Integrate eFPL in Traffic Demand o--> Predict Trajectory
< ALLOCATED_TO >	<Activity>	Validate and Integrate eFPL in Traffic Demand

1422

1423 [REQ]

Identifier	REQ-18.02.c.01-SPRINTEROP-SE01.02
Title	Regional Network Operations ensures information assets integrity
Requirement	The Regional Network Operations shall check and ensure the information integrity.
Status	<in progress>
Rationale	The information provided by the Regional Network Operations has to be trustable and maintain the original level of quality.
Category	<Security><Safety>

1424

1425 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
< ALLOCATED_TO >	<Information Flow>	Validate and Integrate eFPL in Traffic Demand o--> Predict Trajectory
< ALLOCATED_TO >	<Activity>	Validate and Integrate eFPL in Traffic Demand

1426

[REQ]

Identifier	REQ-18.02.c.01-SPRINTEROP-SE01.03
Title	Regional Network Operations ensures information availability
Requirement	The Regional Network Operations shall ensure that information is available to as it is in current operations.
Status	<in progress>
Rationale	The information provided by the Regional Network Operations has to be available.
Category	<Security><Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
< ALLOCATED_TO >	<Information Flow>	Validate and Integrate eFPL in Traffic Demand o--> Predict Trajectory
< ALLOCATED_TO >	<Activity>	Validate and Integrate eFPL in Traffic Demand

G.19 References and Applicable Documents

G.19.1 Applicable Documents

Content Integration

[11]D5.1 EATMA Guidance Material, Edition 9.0

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

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

Content Development

[14]D19.2.1 SESAR 2020 Concept of Operations Edition 2017, Edition 01.00.00

Performance Management

[15]16.06.06 D26 Guidelines for Producing Benefit and Impact Mechanisms, Edition 03.00.01

[16]SESAR 2020 Requirements and Validation Guidelines, Edition 00.01.01

G.19.2 Reference Documents

[17]ATMRPP/2-WP/718 AIR TRAFFIC MANAGEMENT REQUIREMENTS AND PERFORMANCE PANEL (ATMRPP), SECOND MEETING, Montreal, Canada, 14 to 18 November 2016, draft working paper

[18] FF-ICE Manual ***Draft*** Version 0.8 for ATMRPP Review, 2017-12-22, draft edition on STELLAR

[19] Notice of Proposed Amendment 2016-06 (A), Fuel planning and management, European Aviation Safety Agency, July 2016

[20] SESAR P05.05.02 D03 Validation Results for Enhanced TP using AOC data, December 2011

[21] SESAR P05.05.02 D04 Final Project Report on the concept and benefits for improving TP using AOC data, August 2012

[22] SESAR P07.06.02 D55 Step 1 EFPL Validation Report, October 2016

[23] SESAR P07.06.02 D05 Step 1 Business Trajectory Validation Report for 2013-2014 exercises

[24] SESAR P05.05.01 D843 Internal Validation Exercise Reports VP832 (5.5.1 Deliverable – 4.5 Contribution), Edition 01.00.00, 02/09/2016

[25]INFORMATION PAPER 04: PTRs ISSUE STATUS UPDATE, ATFCM OPERATIONS & DEVELOPMENT SUB-GROUP/31, June 2014

G.20 Cost and Benefit Mechanisms

G.21 Stakeholders Identification and Expectations

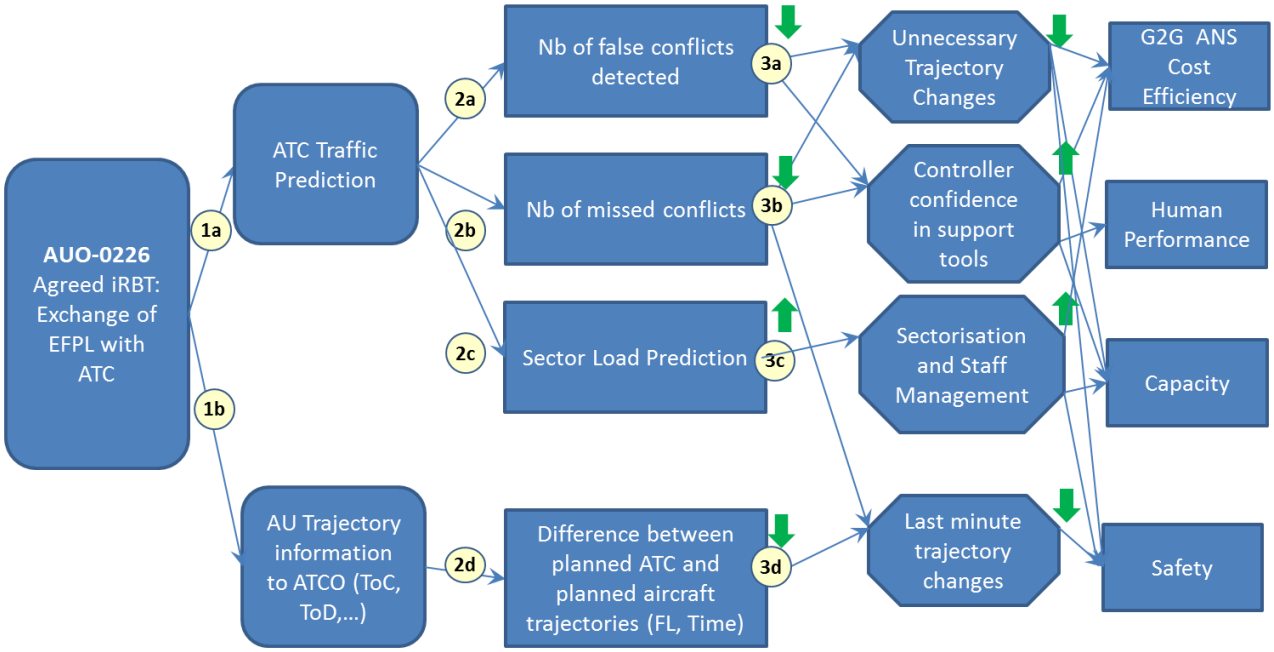
N/A

G.22 Benefits Mechanisms

G.22.1 Distribution of eFPL Data and Use by ATC

Stakeholder Group: ATC

OI Step	Impact Area	Performance Indicators / Metrics	Positive or negative impacts	KPA/FA

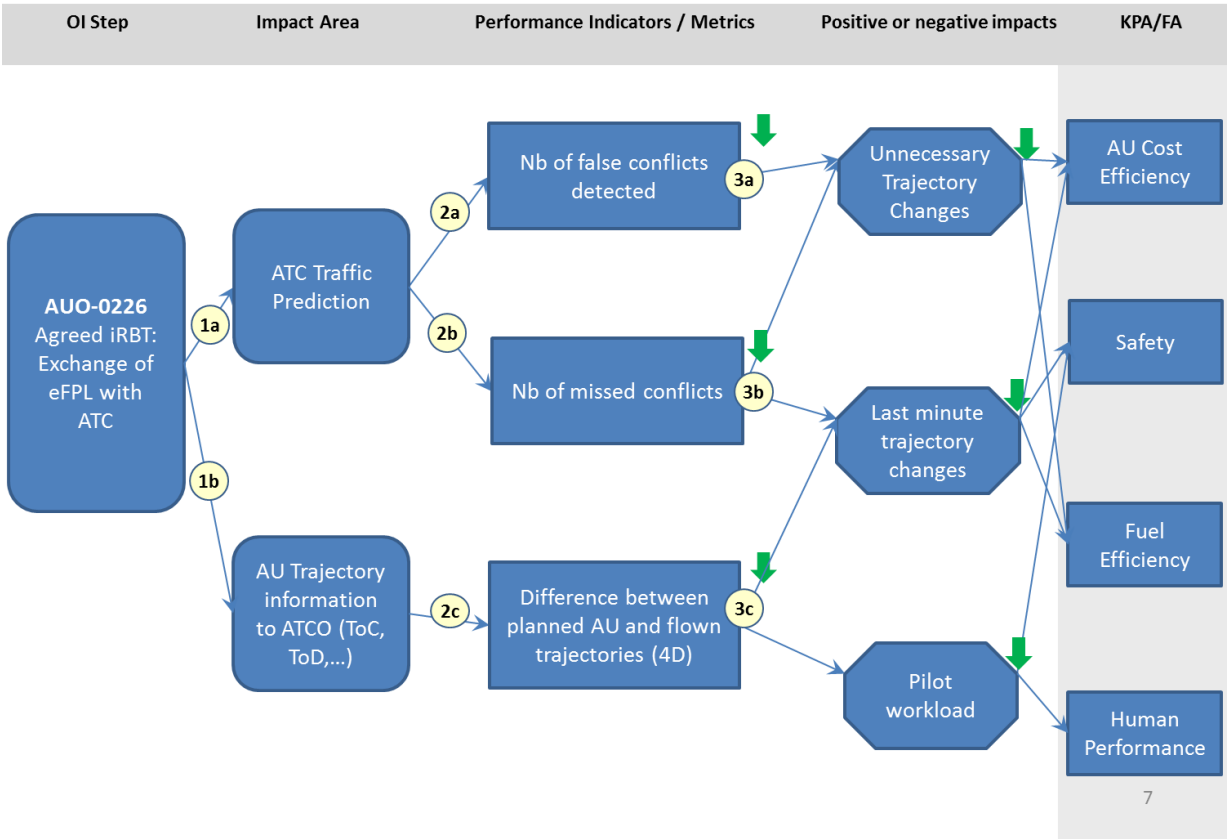


1467
1468

AUO-0226: SBT/RBT: Exchange of eFPL with ATC	
(1a)	Distributing eFPL information to ATC will allow ATC to increase the accuracy of their traffic prediction due to more precise data on planned trajectory (4D trajectory and more accurate performance data).
(1b)	Display of some relevant eFPL data such as TOC, TOD will allow to increase the situation awareness of the ATCO and permit anticipation of actions
(2a)	Improving ATC prediction will result identifying the conflicts more accurately and therefore will reduce the number of false conflicts detected.
(2b)	Improving ATC prediction will result identifying the conflicts more accurately and therefore will reduce missed conflicts.
(2c)	Improving ATC prediction will allow to better assessing the expected sector load.
(2d)	Additional information on AU trajectory enables to reduce discrepancies between air and ground trajectory prediction.

(3a)	Fewer detection of false conflicts will reduce the number of unnecessary trajectory changes made by the controller and will improve its confidence in support tools ((Trajectory Management, Conflict detection, monitoring aids). This will reduce controller workload which is linked to Human Performance, Cost Efficiency (controller productivity), Capacity and Safety.
(3b)	Fewer missed conflicts will reduce the number of unnecessary trajectory changes made by the controller and will improve its confidence in support tools (Trajectory Management, Conflict detection, monitoring aids). It will also reduce the number of last minutes and inefficient changes made by the controller. This will reduce controller workload which is linked to Human Performance, Cost Efficiency (controller productivity), Capacity and Safety.
(3c)	Better sector load anticipation will allow optimizing the sectorisation management (split/combination of sectors) and staff management.
(3d)	Discrepancy between planned ATC and planned aircraft trajectories will be reduced, therefore limiting last minute trajectory changes.

Stakeholder Group: AU



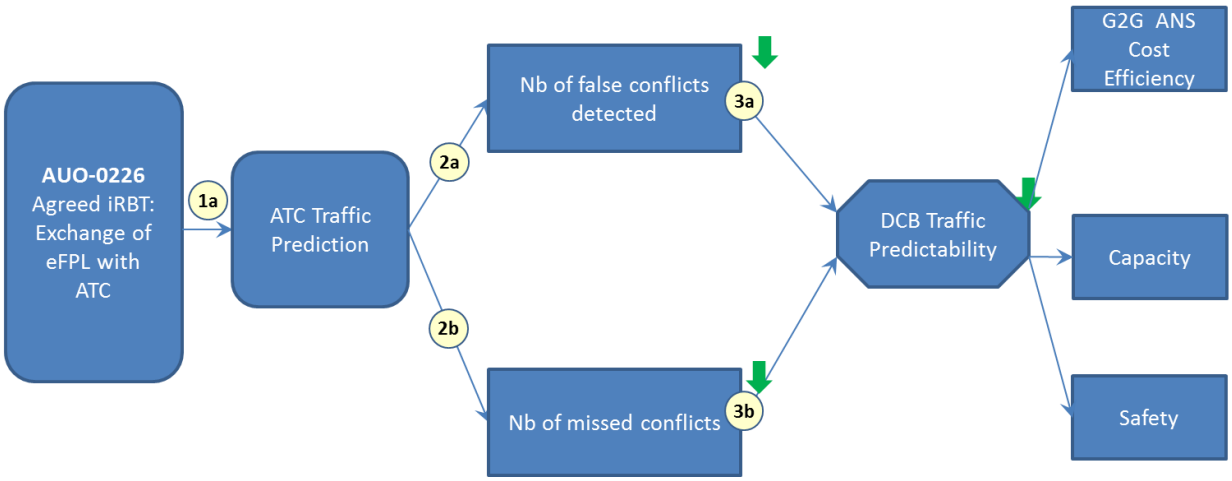
1473

AUO-0226: SBT/RBT: Exchange of eFPL with ATC	
(1a)	Distributing eFPL information to ATC will allow ATC to increase the accuracy of their traffic prediction thanks to more precise data on planned trajectory (4D trajectory and performance data).
(1b)	Distributing eFPL information to ATC will permit ATCO to have better knowledge of airline intentions thanks to a more accurate profile and additional elements such as TOC or TOD
(2a)	Improving ATC prediction will result identifying the conflicts more accurately and therefore will reduce the number of false conflicts detected.
(2b)	Improving ATC prediction will result identifying the conflicts more accurately and therefore will reduce missed conflicts.
(2c)	The knowledge of more accurate AU trajectory information by ATCO will increase the possibilities for AU to get clearance on their planned trajectory and therefore helping to reduce the difference between the planned and flown 4D trajectory
(3a)	Less detection of false conflicts will reduce the number of unnecessary trajectory changes made by the controller. This will therefore improve the AU fuel efficiency and the overall AU cost efficiency.
(3b)	By reducing the number of missed conflicts, the number of last minute trajectory changes are also reduced implying a positive impact on the safety. Deviations to the planned optimized trajectory are reduced; and AU cost and fuel efficiency is increased.
(3c)	The improvement of trajectory prediction will allow ATCO to reduce deviations to the planned trajectory and reduce in consequence pilot workload, as fewer actions will have to be managed. This is linked to Safety and human Performance.

1474

1475 Stakeholder Group: NM

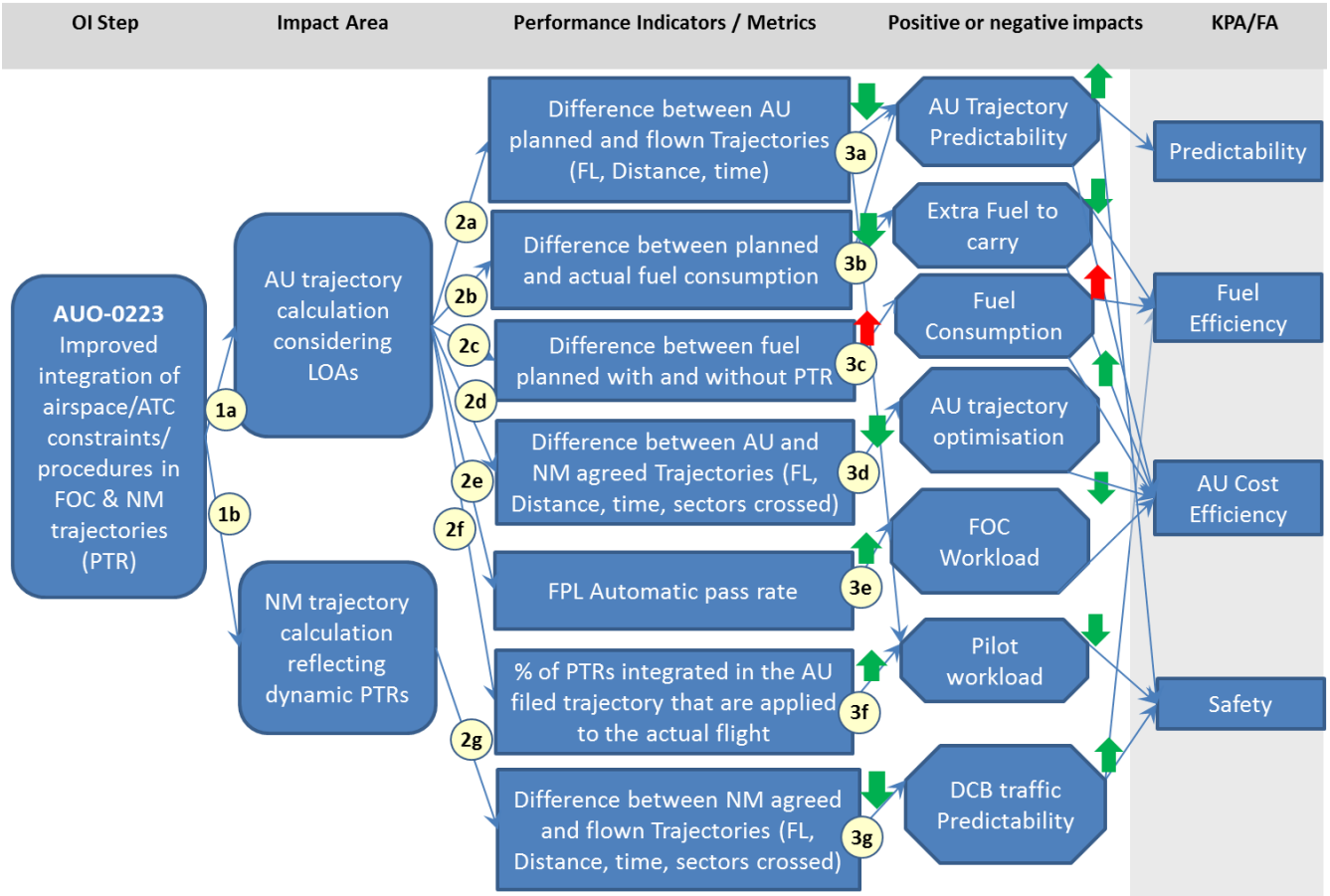
OI Step	Impact Area	Performance Indicators / Metrics	Positive or negative impacts	KPA/FA



Distribution to ATC	Stakeholder group: NM
AUO-0226: SBT/RBT: Exchange of eFPL with ATC	
(1a)	Distributing eFPL information to ATC will allow ATC to increase the accuracy of their traffic prediction due to more precise data on planned trajectory (4D trajectory and more accurate performance data).
(2a)	Improving ATC prediction will result identifying the conflicts more accurately and therefore will reduce the number of false conflicts detected.
(2b)	Improving ATC prediction will result identifying the conflicts more accurately and therefore will reduce missed conflicts.
(3a)	Less detection of false conflicts will reduce the number of unnecessary trajectory changes made by the controller. As a result, aircraft will follow more often the original planned trajectory, which will improve DCB traffic prediction.
(3b)	When conflicts are detected earlier, they can be solved with smaller trajectory modifications. As a result, aircraft will be stay closer to the original planned trajectory, which will improve DCB traffic prediction.

G.22.2 Use of PTRs

1481 Stakeholder Group: AU



1482

1483

PTRs	Stakeholder group: AUs
AUO-0223: Harmonised and improved integration of airspace and ATC constraints/procedures in trajectories calculated by FOCs and NM	
(1a)	The integration of airspace/ATC constraints/procedures by the AUs will allow the FOC to consider the LoAs in the trajectory calculation process
(1b)	The integration of airspace/ATC constraints/procedures by the NM will allow NM to consider the dynamic PTRs into its initial flight planning processing system.
(2a)	The consideration of LoAs in the AU trajectory will permit to reduce the difference between the planned and the flown trajectory since the planned trajectory profile will be more aligned with ATC clearances associated to LoAs

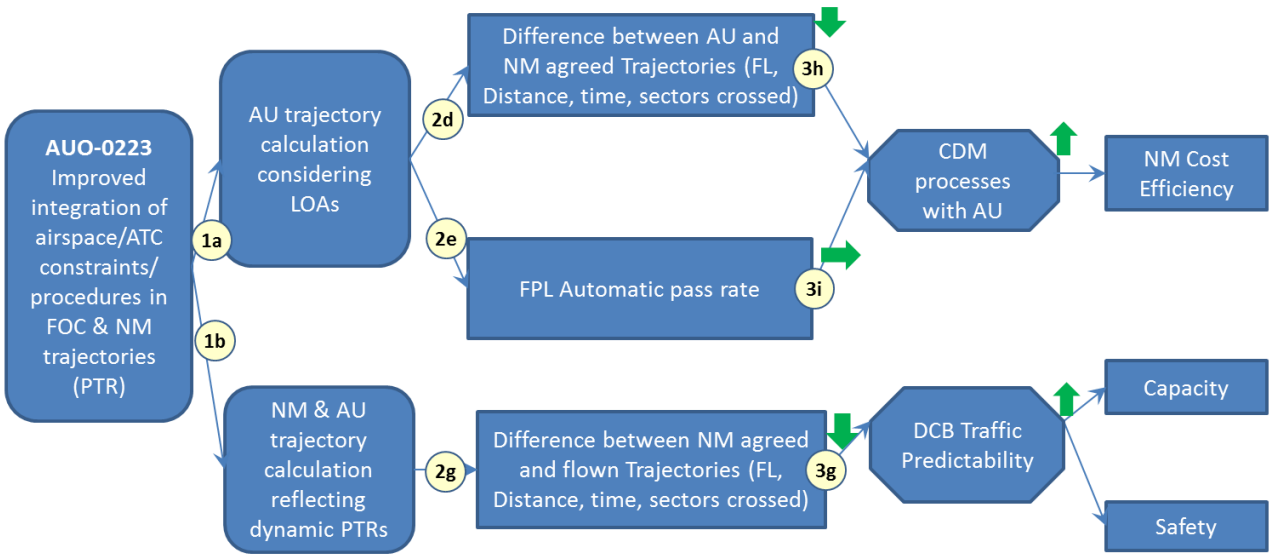
(2b)	By considering the LOAS into the profile, the planned trajectory will be closer to the flown trajectory and consequently the actual fuel consumption will be closer to the planned fuel consumption.
(2c)	The trajectory profiles being constrained by the PTRS implies that fuel consumption will be higher with PTRs than without PTRs.
(2d)	Consideration of PTRs by the AU will permit to improve the alignment of the agreed trajectories with NM since NM takes already into account the PTRs.
(2e)	By considering the PTRS, the AUs will see a reduction of rejected flight plans that are due indirectly by the PTRs. In consequence, the FPL automatic pass rate increases.
(2f)	If the AUs take into account the LOAs in its trajectory calculation, the percentage of PTRs applied to the actual flight will increase.
(2g)	The consideration of dynamic PTRs by NM will permit to reduce the difference between the NM agreed and flown trajectories since dynamic PTRs are applied to the actual flights.
(3a)	By reducing the difference between the AU planned and flown trajectories, the AU trajectory predictability is directly improved with a positive impact on the predictability, AU cost efficiency and safety. The improvement of the AU cost efficiency is positive because more accurate are the predictions, more efficiently AUs can control the operations and anticipate recovery of operational irregularities.
(3b)	When considering the PTRs the trajectories are less deviated, the planned fuel consumption is closer to the actual fuel consumption and in consequence, flight plans will be closer to the reality. Therefore, flight crews will reduce the extra fuel to carry associated to ATC uncertainties implying a positive impact on the fuel efficiency and on the AU cost efficiency.
(3c)	Considering PTRs, planned fuel consumption increases compared to trajectories without PTRs, there is a negative impact on fuel, and AU cost efficiency.
(3d)	The improved alignment between AU and NM agreed trajectories will allow the AU to optimise trajectories implying a positive impact on AU cost efficiency but also on interoperability between FOC and NM systems.
(3e)	Improving the automatic pass rate will permit the FOC to reduce its workload dealing with less manual interventions on flight plans rejection and resulting in a positive impact on human performance and AU cost efficiency.
(3f)	The percentage of PTRS that are applied to a flight increase with the consideration of PTRs in the trajectory calculation implying a reduced difference between the planned and the actual trajectory and resulting in a reduction of the pilot workload. This implies directly a positive safety impact.
(3g)	The reduction of difference between the NM agreed and flown trajectories will result in an increased overall network predictability implying a positive impact on safety but also on fuel efficiency. In fact, the improvement of network predictability will bring a better network stability

	and will help to reduce the difference between the actual trajectories and the planned trajectories.

1484

1485 Stakeholder Group: NMF (NM & FMP)

OI Step	Impact Area	Performance Indicators / Metrics	Positive or negative impacts	KPA/FA



1486

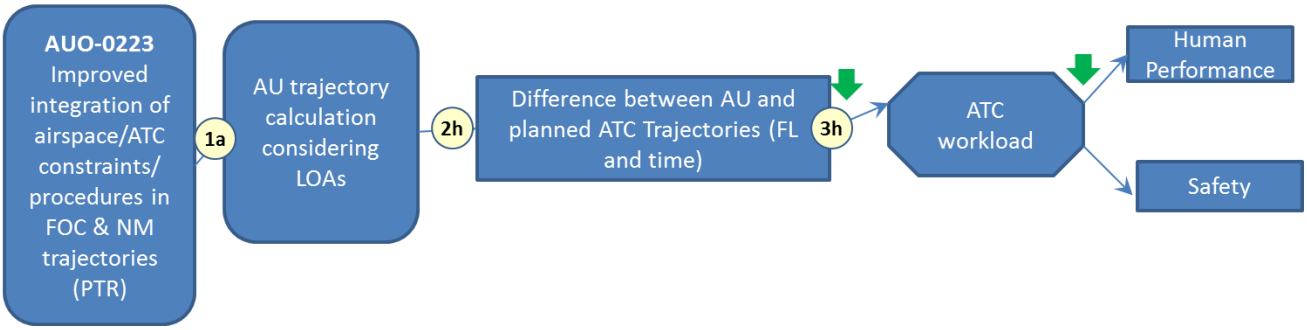
1487

PTRs	Stakeholder group: NM
AUO-0223: Harmonised and improved integration of airspace and ATC constraints/procedures in trajectories calculated by FOCs and NM	
(1a)	The AU takes into account PTRs/LOAs published to calculate its planned trajectory (filed trajectory) that is included in the eFPL.
(1b)	Both AU and NM take into account in trajectory/traffic prediction PTRs activated/deactivated dynamically by ANSPs according to the network plan.
(2d)	Since the AU already integrates PTRs in the filed trajectory the difference between the AU trajectory and the NM trajectory will be reduced.
(2e)	Although the AU trajectory will integrate PTRs, this will not modify the automatic pass rate.

(2g)	Dynamic PTRs reflect LOAs better so that they are likely to be applied in execution. As a result, the NM planned trajectory considering dynamic PTRs will be closer to the flown trajectory.
(3h)	Since that actors have a more consistent and shared view a the trajectory this will improve CDM processes both in flight plan flow management contexts
(3i)	The higher the automatic FPL pass-rates the more CDM processes will be.
(3g)	Obvious link.

Stakeholder Group: ATC

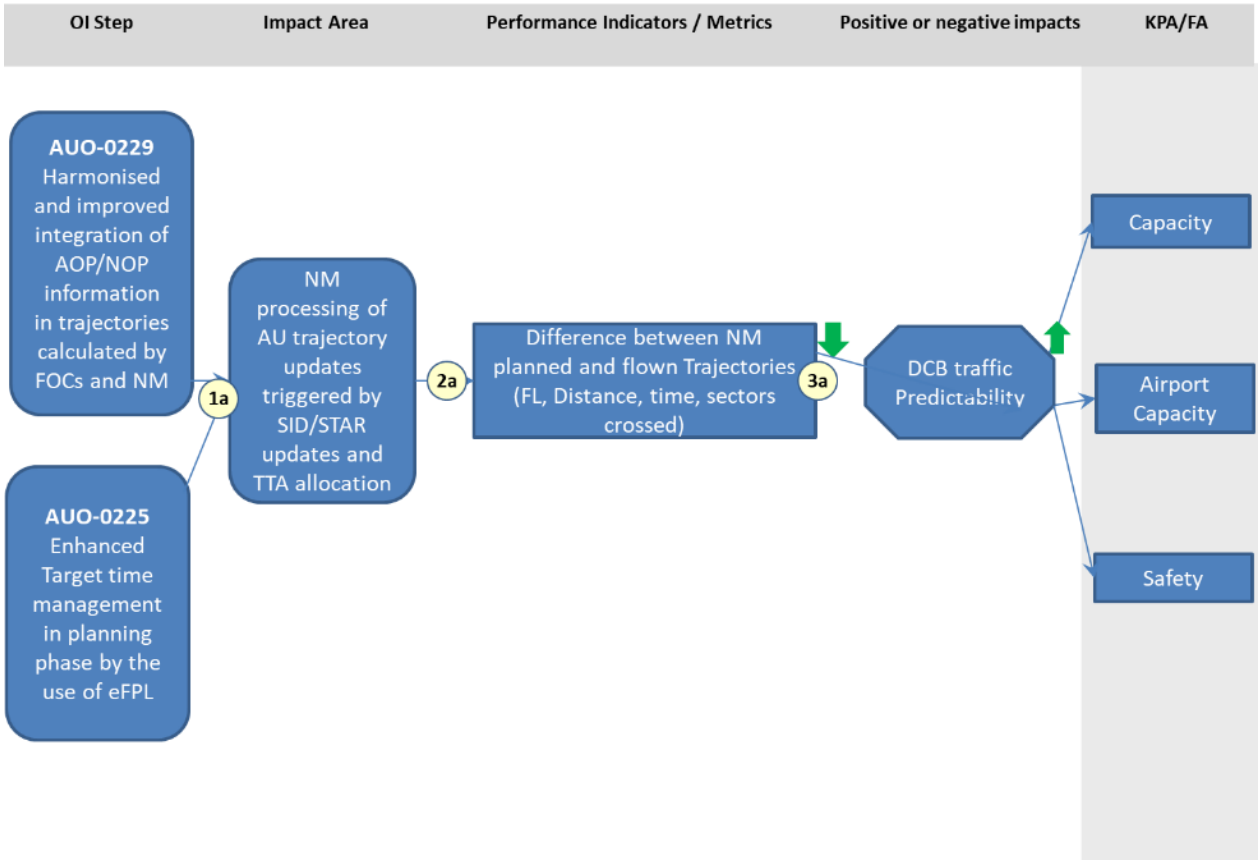
OI Step	Impact Area	Performance Indicators / Metrics	Positive or negative impacts	KPA/FA



PTRs	Stakeholder group: ATC
AUO-0223: Harmonised and improved integration of airspace and ATC constraints/procedures in trajectories calculated by FOCs and NM	
(1a)	Integration of airspace/ATC constraints/procedures will allow optimising AU trajectory computation.
(2h)	The integration of airspace/ATC constraints/procedures in the trajectory computed by FOC will allow reducing the discrepancy between the aircraft and the ground expected trajectories.
(3h)	As aircraft trajectory will take into account airspace/ATC constraints, the ATCO workload will be reduced by the shared knowledge of the aircraft intent and ground trajectory constraints.

G.22.3 Dynamic SID/STAR Information and Target Time Use in eFPL (Planning Phase)

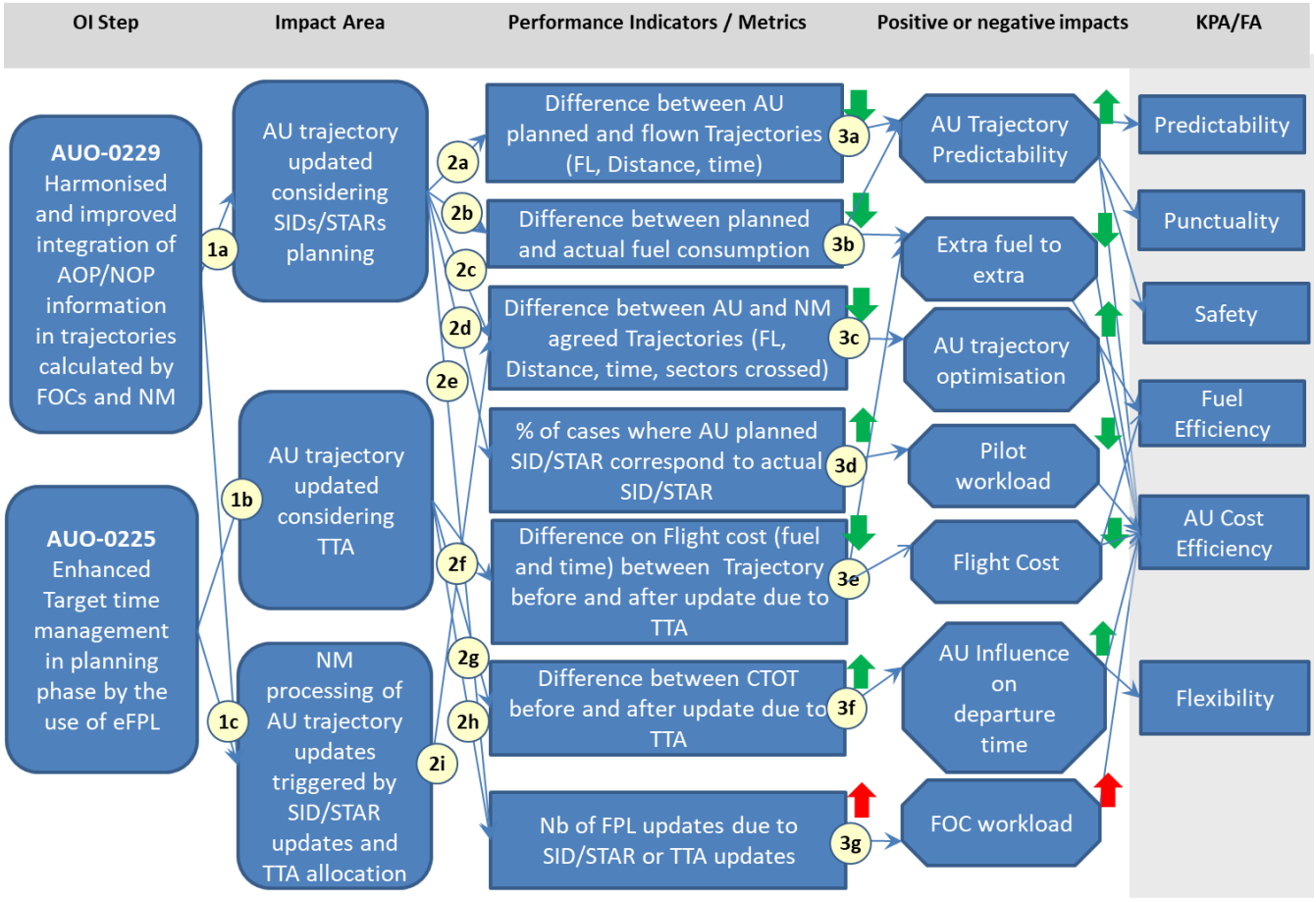
Stakeholder Group: ATC/Airport



SIDs/STARs & TTAs	Stakeholder group: ATC/Airports
AUO-0229: Harmonised and improved integration of AOP/NOP information in trajectories calculated by FOCs and NM **AUO-0225:** Enhanced Target time management by the use of eFPL	
(1a)	Taking into account the new eFPL information coming from AUs which integrates SIDs/STARs & TTA information, NM will recalculate the Trajectory accordingly.
(2a)	The processing by NM of AU updated trajectories triggered by SID/STAR will result in better TTA allocation. More accurate SID/STAR and TTA will permit the NM and the AU to reduce the difference between their trajectories.

(3a)	The reduction of difference between the NM planned and flown trajectories will result in an increased predictability implying a positive impact on safety and allowing a better use of the available airport capacity.

Stakeholder Group: AU



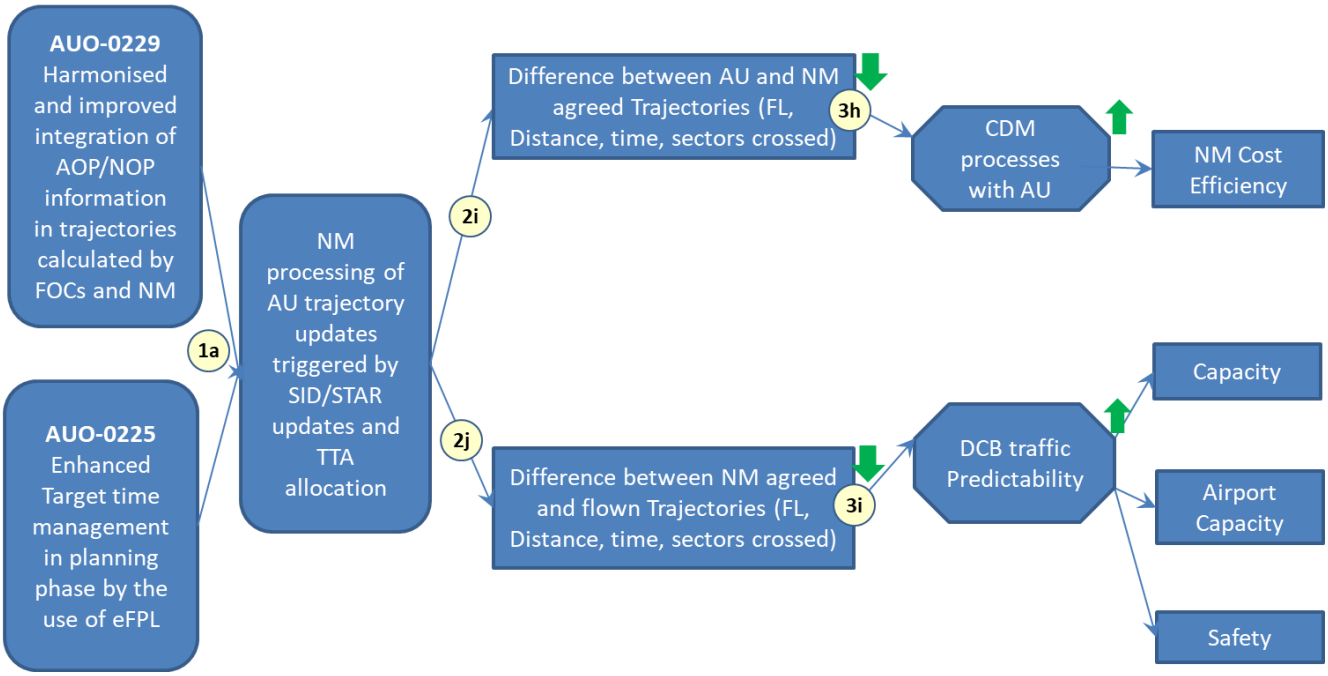
SIDs/STARs & TTAs	Stakeholder group: AUs
AUO-0229: Harmonised and improved integration of AOP/NOP information in trajectories calculated by FOCs and NM **AUO-0225:** Enhanced Target time management by the use of eFPL	
(1a)	Receiving SIDs/STARs planning information from Airports, AUs will update their trajectory taking into account more accurate information.

(1b)	By receiving Target Times, the AU will have the possibility to refile an eFPL by changing some parameters (e.g. adapting the speed …).
(1c)	Taking into account the new eFPL information coming from AUs which integrates SIDs/STARs & TTA information, NM will recalculate the Trajectory accordingly.
(2a)	The consideration of updated SID/STAR in the AU trajectory will permit to reduce the difference between the planned and the flown trajectory since the planned trajectory profile will be in line with the departure and arrival procedures clearances.
(2b)	By considering updated SID/STARs into the profile, the planned trajectory will be closer to the flown trajectory and consequently the actual fuel consumption will be closer to the planned fuel consumption.
(2c)	Consideration of SID/STARS planning by the AU will permit to improve the alignment of the agreed trajectories with NM since NM will also receive updated SID/STAR planning.
(2d)	If the AUs take into account the SID/STAR planning in its trajectory calculation, the percentage of SID/STAR applied to the actual flight will automatically increase.
(2e)	By including up to date planning information SID/STAR, the trajectories will be more accurate but the number of FPL changes will increase.
(2f)	Fight cost is not reduced, it could be increased. What is reduced is the disruption cost associated to a potential reduced delay with departure time adaptation or no holding at arrival thanks to TTA consideration.
(2g)	Considering TTA into the trajectory will permit the AU to adapt the departure time depending on its need instead of getting applied an imposed CTOT. There will be depending on the optimized trajectory a certain difference between the imposed CTOT and the influenced CTOT.
(2h)	By including up to date planning information TTA, the trajectories will be better reflecting the constraints but the number of FPL changes will increase.
(2i)	The processing by NM of AU updated trajectories triggered by SID/STAR and TTA allocation will permit the NM and the AU to reduce the difference between their trajectories .
(3a)	By reducing the difference between the AU planned and flown trajectories, the AU trajectory predictability is directly improved with a positive impact on the predictability, AU cost efficiency and safety. The improvement of the AU cost efficiency is positive because more accurate are the predictions, more efficiently AUs can control the operations and anticipate recovery of operational irregularities.
(3b)	When considering updated SID/STAR information the trajectories are less deviated, the planned fuel consumption is closer to the actual fuel consumption and in consequence, flight plans will be closer to the reality. Therefore, flight crews will reduce the extra fuel to carry associated to ATC uncertainties implying a positive impact on the fuel efficiency and on the AU cost efficiency.

(3c)	The improved alignment between AU and NM agreed trajectories will allow the AU to optimise trajectories implying a positive impact on AU cost efficiency.
(3d)	The percentage of SID/STARs that are applied to a flight increase by considering them in the trajectory calculation implying a reduced difference between the planned and the actual trajectory and resulting in a reduction of the pilot workload. This implies directly a positive safety impact.
(3e)	Flight cost not necessarily reduced except if we compare the CTOT+TTA application and the TTA alone application
(3f)	By considering the TTA, the AU will be able to recalculate its trajectory and deduce the most suited departure time to match the TTA with an optimized trajectory. This will permit the AU to influence the departure time by sharing the preferred target time of departure to the ATM stakeholder.
(3g)	Updating the flight plans with TTA input will imply a possible FOC workload increase depending on the level of automation given to the AU and the operational procedure associated to the flight plan update.

Stakeholder Group: NM

OI Step	Impact Area	Performance Indicators / Metrics	Positive or negative impacts	KPA/FA



SIDs/STARs & TTAs		Stakeholder group: NM
AUO-0229: Harmonised and improved integration of AOP/NOP information in trajectories calculated by FOCs and NM **AUO-0225:** Enhanced Target time management by the use of eFPL		
(1a)	NM will determine the plan trajectory taking as input the filed trajectory coming from AUs which integrates up-to-date SIDs/STARs & TTA information	
(2i)	Since the AU already integrates up-to-date SID/STAR information in the filed trajectory the difference between the AU trajectory and the NM trajectory will be reduced	
(2j)	Taking into account more accurate eFPL information from AUs will allow NM to improve their prediction and reduce the difference between NM planned trajectory and flown trajectory.	
(3h)	Since that actors have a more consistent and shared view a the trajectory this will improve CDM processes both in flight plan flow management contexts	
(3i)	Obvious	

G.23 Costs Mechanisms

N/A

G.24 Requirements In Progress

The requirements in this section are out of the scope of the final solution.

[REQ]

Identifier	IER-18-02c-OSED-eFPL.0005
Title	PTR information to the NM
Requirement	The ATC shall inform the NM about the most up-to-date PTR information via services based on SWIM standard.
Status	In progress
Rationale	The ATC will provide the most up-to-date PTR's to NM to be used for profile calculation and dissemination to the AUs.
Category	<IER>

[REQ Trace]

Relationship	Linked Element Type	Identifier

< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
< ALLOCATED_TO >	<Information Flow>	Monitor Traffic Prediction o--> Update the NOP

1514

1515 [REQ]

Identifier	IER-18-02c-OSED-eFPL.0006
Title	PTR information to the AU
Requirement	The Network Manager shall enable the AU to receive and use the most up-to-date PTR information via services based on SWIM standard.
Status	In progress
Rationale	The FOC will use the PTR's to consider these restrictions to provide a 4D trajectory best aligned with the ATC requirements for the flight profile.
Category	<IER>

1516 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
< ALLOCATED_TO >	<Information Flow>	Update the NOP o--> Align PTR Information

1517

1518 [REQ]

Identifier	IER-18-02c-OSED-eFPL.0007
Title	PTR Activation and Deactivation Information to the NM
Requirement	The ATC shall inform the NM about the most up-to-date PTR status via services based on SWIM standard.
Status	In progress
Rationale	The real-time use of activated or deactivate PTR'S will be used by NM to consider these restrictions to provide a 4D trajectory best aligned with the dynamic ATC requirements for the flight.
Category	<IER>

1519 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
< ALLOCATED_TO >	<Information Flow>	Monitor Traffic Prediction o--> Update the NOP

1520

1521 [REQ]

Identifier	IER-18-02c-OSED-eFPL.0008
Title	PTR Activation and Deactivation Information to the AU
Requirement	The Network Manager shall enable the AU to receive and use the most up-to-date PTR status information via services based on SWIM standard.
Status	In progress
Rationale	The real-time use of activated or deactivate PTR'S will be used by the FOC to consider these restrictions to provide a 4D trajectory best aligned with the dynamic ATC requirements for the flight profile and optimise accordingly the individual flight efficiency.
Category	<IER>

1522 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
< ALLOCATED_TO >	<Information Flow>	Update the NOP o--> Align PTR Information

1523

1524 [REQ]

Identifier	IER-18-02c-OSED-eFPL.0011
Title	STAR Information to the AU
Requirement	The Network Manager shall enable the AU to receive and use the most up-to-date STAR information via services based on SWIM standard.
Status	In progress
Rationale	The AU will use the most recent STAR information to improve the trajectory prediction.
Category	<IER>

1525 [REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
< ALLOCATED_TO >	<Information Flow>	Update the NOP o--> Assess Impact

1526

1527 [REQ]

Identifier	IER-18-02c-OSED-eFPL.00122
Title	CTOT Information to the AU
Requirement	The Network Manager shall enable the AU to receive and use the most up-to-date STAR information via services based on SWIM standard.
Status	In progress

Rationale	The AU will use the most recent CTOT information to improve the trajectory prediction.
Category	<IER>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
< ALLOCATED_TO >	<Information Flow>	Update the NOP o--> Assess Impact

[REQ]

Identifier	IER-18-02c-OSED-eFPL.00133
Title	TT Information to the AU
Requirement	The Network Manager shall enable the AU to receive and use the most up-to-date Target Time information via services based on SWIM standard.
Status	In progress
Rationale	The AU will use the most recent TT information to improve the trajectory prediction.
Category	<IER>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.18-02c
< ALLOCATED_TO >	<Information Flow>	Update the NOP o--> Assess Impact

G.25 Deleted Requirements

[REQ]

Identifier	REQ-18.02.c.01-SPRINTEROP-UU01.02
Title	SWIM Enabled Information Exchanges
Requirement	All stakeholders shall use the SWIM yellow profile for the information exchanges.
Status	<Deleted>
Rationale	The information exchanges have to be realised with the SWIM standards in order to enable timely and rich content propagation of the available information so that all stakeholders have access to the most up-to-date information. All the other updated IERs cover this requirement. Therefore, this requirement is not needed anymore.
Category	<Interoperability>

[REQ Trace]

Linked Element Type	Identifier
<SESAR Solution>	PJ.18-02c
<Information Exchange>	IER-18-02c-OSED-eFPL.0001 IER-18-02c-OSED-eFPL.0002 IER-18-02c-OSED-eFPL.0003 IER-18-02c-OSED-eFPL.0004 IER-18-02c-OSED-eFPL.0005 IER-18-02c-OSED-eFPL.0006 IER-18-02c-OSED-eFPL.0007 IER-18-02c-OSED-eFPL.0008 IER-18-02c-OSED-eFPL.0009 IER-18-02c-OSED-eFPL.0010 IER-18-02c-OSED-eFPL.0011 IER-18-02c-OSED-eFPL.0012 IER-18-02c-OSED-eFPL.0013 IER-18-02c-OSED-eFPL.0016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