



SESAR Solution PJ.10-01a SPR-INTEROP/OSED for V2-V3 - Part I

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PROSA

HIGH PRODUCTIVITY CONTROLLER TEAM ORGANISATION

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Abstract

Note to the reader: This release of the OSED includes inputs from both V2 and V3 activities and aims at being the final release that will be part of the final Datapack.

PJ.10-01a Solution¹ is further investigating the concept of operation and the associated system support required for operating in new team structure such as Multi- Sector Planning (MSP).

The key objective of PJ.10-01a Solution is to further develop the Role, Responsibilities and Tools associated with this new Controller Team Organisation (MSP) in En-Route and eTMA airspace by maximising the benefits of controller tools.

This OSED addresses the overall aspect of the Multi-Sector Planner (MSP) concept. Interaction between the Executive Controllers and the Multi-Sector Planner within the Multi-Sector area is addressed in two different operational environments (OE):

- The OE En-Route is assessed at V2 level
- The OE eTMA is assessed at V3 level

The SPR/INTEROP-OSED includes the following parts:

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

¹ In order to separate eTMA and En-Route Operational Environments scopes, the solution 10-01a has been split into two solutions :

- 10-01a1 : PJ.10-01a1 High Productivity Controller Team Organisation in eTMA
- 10-01a2 : PJ.10-01a2 High Productivity Controller Team Organisation in En Route



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

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1 Executive Summary

The Solution PJ.10-01a Operational Services and Environment Description (OSED) details the operational concept for the Operational Improvements (OI) *CM-0303 "Sector Team Operations Adapted to new Responsibilities in En Route, 1 Planning to several Tactical Controllers team structure"* and *CM-0304b "Sector Team Operations Adapted to new Responsibilities in eTMA, 1 Planning to several Tactical Controllers team structure"*. The OSED is a top-down refinement of the concept of operations developed in the frame of the PJ19 [4]. It also contains additional information that should be consolidated back into the higher-level SESAR concepts using a "bottom up" approach.

The organisation of the controller teams is important, in conjunction with other advanced concepts and controller tools, to support the safe management of the anticipated growth in traffic and provide ATM in the most efficient manner.

In En-Route, Solution PJ.10-01a referred as solution PJ.10-01a2 further investigates introducing more flexibility within the controller team structure in En Route airspace, concerning Multi Sector Planning (MSP), where a PC is responsible for a number of sectors, each with its own EC. Changes to the controller team structure may also lead to airspace changes, promoting a more flexible division of airspace and changes to reflect traffic flows and regions of complexity. Solution PJ.10-01a aims to refine **at V2 level** the concept and the necessary support tools which will allow flexibility in controller team structures to suit various traffic levels and complexities **in En Route airspace**.

In extended TMA, Solution PJ.10-01a referred as solution PJ.10-01a1 will take benefit of the Multi Sector Planning (MSP) already in operation in some TMAs (e.g. : Stockholm TMA, Copenhagen TMA, Munich TMA...). However, this will be complemented by introducing the Multi Sector Planning concept in lower En Route airspace considered as extended TMA (eTMA). Solution PJ.10-01a investigates introducing more flexibility within the controller team structure in eTMA airspace, in particular in high complexity environment, primarily concerning Multi Sector Planning (MSP), where a PC is responsible for a number of sectors, each with its own EC. Changes to the controller team structure may also lead to airspace changes, promoting a more flexible division of airspace and changes to reflect traffic flows and regions of complexity. Solution PJ.10-01a aims to refine **at V3 level** the concept and the necessary support tools which will allow flexibility in controller team structures to suit various traffic levels and complexities **in eTMA airspace**.

2 Introduction

2.1 Purpose of the document

This document provides the requirements specification, covering functional, non-functional and interface requirements related to SESAR Solution PJ.10-01a.

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

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

- Part I (core part) of this document provides the Safety and Performance Requirements (SPR) and Interoperability Requirements (INTEROP), related to SESAR Solution PJ.10-01a, that have been validated during validation activities at a V2 and V3 level.
They are presented in the context of the Operational Service and Environment Definition (OSED), which describes the environment, assumptions, etc. that are applicable to the SPR and INTEROP requirements.
These requirements cover safety, performance, operational aspects as well as the interoperability aspects related to a specific technology to support the SESAR Solution PJ.10-01a.
The core part of the document is completed by appendices including:
 - The Benefit and cost Mechanisms, showing how the SESAR Solution elements contribute (positively or negatively) to the delivery of performance benefits and the costs.
- Parts II, IV and V provide the series of assessments that justify the SPR and INTEROP requirements:
 - Part II: The Safety Assessment Report describes the results of the safety assessment work for the SESAR Solution. Due to regulatory obligations, a Safety Assessment is required for any proposed change to the system;
 - Part IV: The Human Performance Assessment Report describes the results of the Human Performance assessment work for the SESAR Solution PJ.10-01a;
 - Part V: the Performance Assessment Report (PAR) that consolidates the performance results obtained in different validation activities.

2.2 Scope

This is the SPR-INTEROP/OSED for Solution PJ.10-01a for **V2** phase for the **En Route** part and **V3** phase for the **eTMA** part

This SPR-INTEROP/OSED addresses the overall aspect of the **Multi-Sector Planner (MSP) concept**. Interaction between the Executive Controllers and the Multi-Sector Planner within the Multi-Sector is addressed. The purpose of this document is to define Roles, Responsibilities and Tools associated with different Controller Team Organisations in Extended TMA and En-Route airspace.

2.3 Intended readership

The intended audience for the document is:

- Other SESAR Solutions as depicted in [2] :
 - PJ.10-01b: Flight Centred ATC
 - PJ.10-01c: Collaborative Control
 - PJ.10-02a: Improved Performance In The Provision Of Separation
 - PJ.10-02b: Advanced Separation Management
 - PJ.10-05: IFR RPAS Integration
 - PJ.10-06: Generic' (non-geographical) Controller Validations
 - PJ.16-04: Workstation, Controller productivity
- Transverse and federating projects;
 - PJ19.02: ATM Operation
 - PJ19.03: System & Services
 - PJ19.04: Performance Management
- Stakeholders.

2.4 Background

The document benefits from work performed in the scope of projects 04.07.08, 05.07.03 and 05.07.02 in SESAR 1, as well as already deployed concepts in various ANSPs.

The solution will also take into account previous SESAR activities, Sector Team Operations Adapted to New Responsibilities in En-Route, 1 Planning Controller to 2 Tactical Controllers team structure has been addressed and validated at V3 level with geographical sectors. However, the concept in high complexity sectors in particular in eTMA (considered as lower En Route sectors) and making transition to TMA was not considered as sufficiently mature and requires complementary validation and also the implementation of some Multi Sector Planning concept performed by some ANSPs. The experience of COOPANS/LFV, COOPANS/NAVIAIR and DFS having put in operation Multi Sector Planning concept in TMA will be considered as baseline for the solution.

Taking in consideration this experience, a re-assessment of the solution has been necessary at the beginning of the project to update the concerned OIs and enablers and define an appropriate objective for the solution in order to bring benefit and added value to the SESAR concept.

This SPR-INTEROP/OSED document addresses the overall aspect of the Multi-Sector Planner within this new frame.

2.5 Structure of the document

The present volume is the Part I of the SESAR Solution PJ.10-01a SPR-INTEROP/OSED document. It is structured as follows:

Section 1 is the Executive Summary.

Section 2 is an introductory section that has two other side goals:

- To briefly introduce the background R&D Projects whose results have been considered in this document;
- To introduce all terms that are used in the document and in the requirements.

Section 3 describes in a plain and easy to understand language the environment, assumptions, etc. that are applicable to the SPR and INTEROP requirements. It also provides with the impact of the SESAR Solution PJ.10-01a on Operating Methods.

Section 4 lists the SPR and INTEROP requirements, which are covering safety, performance, operational aspects as well as the interoperability aspects related to a specific technology to support the SESAR Solution PJ.10-01a.

Section 5 is the recipient for all applicable and reference documents.

Appendix A contains the Benefit and cost Mechanisms, showing how the SESAR Solution elements contribute (positively or negatively) to the delivery of performance benefits and the costs.

2.6 Glossary of terms

Term	Definition	Source of the definition
AIR-REPORT	A report from an aircraft in flight prepared in conformity with requirements for position, and operational and/or meteorological reporting.	ICAO Annex
Coordination	An agreed course of action for an aircraft that is made between two distinct PCs (or ECs)	Solution #27
Conflict Potential Conflict Predicted Conflict	Any situation involving aircraft and hazards in which the applicable separation minima may be compromised. Note: These terms are in general widespread usage and within the context of this glossary are synonymous. They	Solution #27

	relate to potential infringements of separation minima. More specifically they are used in the context of ATCO activities where actions are performed in order to anticipate and resolve conflicts (potential/predicted) for separation management purposes. This is in contrast to the situations detected and processed by CD&R tools where the terminology used is 'encounters', which relates to the applicable Separation of Interest used by the tool-set, rather than Separation Minima. Conflicts are a subset of Encounters	
[Entry/Exit] Coordination Trajectory	A Trajectory that is derived from the Planned Sequence Trajectory. It follows the lateral profile of the Planned Sequence Trajectory² but maintains a specific coordination level relevant to the boundary between two sectors. It represents the expected behaviour of the aircraft according to the entry/exit co-ordination conditions. Entry = A Trajectory that is built at levels associated with the sector entry coordination for the flight. Exit = A Trajectory that is built at levels associated with the sector exit coordination for the flight. Note: The Coordination Trajectory: Supports both lateral and vertical boundary co-ordinations; Can have the origin and end truncated (e.g. at sector boundaries); Is necessary for predicting encounters with flights that are co-ordinated with the sector but not yet in communication with that sector. Because it is only needed for boundary crossing conditions it can have a relatively short prediction horizon; typically up to the point where the flight is assumed by the sector concerned.	Solution PJ.10-01a

² It may be possible for the lateral profile of Coordination Trajectories to be altered from that of the Planning Trajectory to take into account relevant Coordination Constraints applied at the boundary between two sectors.

[Tactical/Planning] Deviation Trajectory	The Deviation Trajectory provides the predicted profile of the aircraft based on the observed behaviour, extrapolated from the particular deviation from the current clearance (or deviation from coordination constraint for Planning Deviation Trajectories). Note: Deviation Trajectories are necessary for situations where non-compliance with a flight's expected tactical or coordinated behaviour is observed, with respect to an applicable tolerance threshold. Deviation Trajectories support Tactical/Planner ATC operations when the flight has deviated from its predicted behaviour. The Tactical Deviation Trajectory is useful for a short prediction horizon (e.g. 3-5 minutes). A Planning Deviation Trajectory follows the cleared route of the flight, irrespective of any coordination constraints (as the flight has been observed to be deviating from these constraints). During periods where a Deviation Trajectory is necessary it may also be used by TC/PC CD&R Aid.	Solution #27
En Route airspace	airspace volume corresponding to an ACC	Eurocontrol Lexicon
Encounter	A situation where an aircraft is predicted to be within the applicable separation of interest with respect to another aircraft, or a designated volume of airspace, classified respectively as "aircraft-to-aircraft" and "aircraft-to-airspace" encounters. Notes: Encounters are related to the various detection tools and may work to different look-ahead time horizons with different separation criteria, using different trajectories. Different tool configurations can therefore be expected to yield different encounters. Some Encounters are also Conflicts The Separation of Interest thresholds are considered with respect to any applicable uncertainty volumes around the predicted aircraft position(s).	Solution 27

Entry Boundary	The boundary where an aircraft will enter a defined volume of airspace, whether it be of a multi-sector or an executive-sector.	Solution #27 ICAO Doc 9689
Executive-Sector	For the purpose of this document 'Executive-Sector' will refer to the volume of airspace that is the responsibility of a single EC and may compromise one or more airspace sectors.	Solution #27
Exit Boundary	The boundary where an aircraft will exit a defined volume of airspace, whether it be of a multi-sector or an executive-sector.	Solution #27
Extended TMA (eTMA)	A general term used to describe airspace in which approach control service or airport traffic control and lower en route sectors traffic control service is provided. The notion of extended TMA has been introduced with extension of the use of ATC tools (e.g. extended AMAN) in sectors above TMA	Solution PJ.10-01a definition
Hazard	The objects or elements that an aircraft can be separated from. Note: In TMA, these can be: other aircraft, airspace with adverse weather conditions, or airspace with incompatible airspace activity.	Solution #27
Internal Boundary	The boundary between the executive-sectors within a multi-sector	Solution #27
Lateral Separation	Separation expressed in terms of horizontal distance or angle of convergence/divergence between tracks	Solution #27
Medium Term Conflict Detection (MTCD)	MTCD is a planning tool that will assist the ATCO in identifying situations in which a conflict may occur, providing the controller enough time to assess the severity of the situation, and, if necessary, to resolve the conflict in a deliberate fashion.	Solution #27
Minimum Lateral Separation	The lateral separation threshold above which the separation minima are fulfilled Note: Different thresholds may be applied for tactical and planning purposes. Note: Different thresholds are applied in different MTCD volumes and may be applied for different separation modes (e.g. heading-v-heading, RNP-v-RNP)	ICAO

Minimum Vertical Separation	The vertical separation threshold above which the separation minima are fulfilled	ICAO
Multi-Sector	A term that describes the volume of airspace for which a MSP is responsible and comprises of two or more Executive-Sectors	Solution #27
Multi Sector Area	A term that describes the area for which a MSP is responsible.	Solution PJ.10-01a Definition
Open loop Instruction/Clearance	An ATC clearance or instruction where a full trajectory extrapolation beyond the point or segment(s) affected is not possible using the normal prediction process, i.e. without special measures to assert a closure condition (e.g. time limit on headings and most probable point of return to original routing). Open loop instructions/clearances can be cancelled by a Closed-loop instruction/clearance. Note: Most tactical instructions/clearances take this form; they include heading (including track offset), level, and speed restrictions and exceptionally could also cover rates of climb or descent.	Solution PJ.10-01a Definition
Planning Encounter	A specific instance of an Encounter which is predicted using any of the planning related trajectories and the Planning Separation	Solution #27
Planning Profile	The vertical profile defined by the entry-internal-exit boundary levels along the expected track of the aircraft.	Solution #27
Planned Sequence Trajectory	A Trajectory that is derived from the Planned Trajectory and It follows the vertical and lateral profile of the Planned Trajectory, truncated in time to an adaptable parameter (e.g. 25 minutes). Uncertainty is added (although the lateral uncertainty may be zero). Note: The Planned Sequence Trajectory is used for the determination of co-ordination levels and the sector penetration sequence. It is used for both manual coordination and integrated coordination purposes and may be used by the CD&R Aid (with the Planning Separation) for traversals of the sector	Solution #27

	concerned (CD&R for entry and exit to the sector are covered by the Coordination Trajectory).	
Planned Trajectory	The Planned Trajectory represents the stable medium to long term behaviour of the aircraft but may be inaccurate over the short term where tactical instructions that will be issued to achieve the longer term plan are not yet known. It takes into account the planned route and requested vertical profile, strategic ATC constraints, Closed Loop Instructions/Clearances, co-ordination conditions and the current state of the aircraft. Assumptions may be made to close Open Loop Instructions/Clearances issued by TCs. It is calculated within the planning look-ahead timeframe, starting from the Area of Interest of the unit concerned, or the aircraft's current position (whichever is later). It is constrained during all phases of flight by boundary crossing targets (e.g. standing agreements between the Units concerned). Note: The Planned Trajectory supports the ATC planning operations. It is used primarily to support data distribution within the system and in the determination of the top of descent point. As such, uncertainty does not need to be calculated for this trajectory. It is also used as the starting point for derivation of more specific local ATC trajectories.	Solution #27
Separation Minima	The minimum displacements between an aircraft and a Hazard which maintain the risk of collision at an acceptable level of safety. Note: ICAO Doc 9689 describes the methodology to be used for the determination of Separation Minima.	Solution #27
Standing Agreement	An agreement between distinct airspace sectors where an aircraft will be transferred under the same conditions (e.g. a particular level, heading and/or speed) without the need for individual coordination. This saves time and workload for the Planning controller.	Solution #27
Standard Instrument Departure (SID)	A standard ATS route identified in an instrument departure procedure by which aircraft should proceed from take-off phase to the En-Route phase.	Solution #27
Subject Flight	A flight that has been explicitly selected by the Controller concerned.	Solution PJ.10-01a definition

Tactical Encounter	A specific instance of an Encounter which is predicted using any of the tactical related trajectories or the Entry Coordination Trajectories, and the Tactical Separation.	Solution #27
Tentative Trajectory	Tentative trajectories are created from another trajectory that is in operational use (Tactical, Planning or otherwise). They reflect tentative what-if flight data selected by the controller. If these conditions are then committed the Tentative trajectory and the associated data will be used to establish the new operational trajectory. If the conditions are discarded then it will also be discarded. Note: Tentative trajectories support What-If probing and are created during this process.	Solution #27
TMA	A general term used to A control area normally established at the confluence of ATS routes in the vicinity of one or more major aerodromes.	ICAO Eurocontrol Lexicon
Tactical Trajectory	The Tactical Trajectory is calculated within a short look-ahead time (e.g. up to 20 minutes) during tactical ATC operations. It therefore reflects an accurate view of the predicted flight evolution, starting from the current flight position (generally, as reported by surveillance), with low uncertainty and high precision. It is kept up to date with all clearances, including tactical instructions. During any open tactical manoeuvres it will also be reflecting those temporary conditions. It is usually determined with a fast update rate (e.g. 5 seconds) and with an optimised Uncertainty calculation; to maximise response and minimise the incidence of false alarms. Note: The Tactical Trajectory supports the tactical ATC operations when the flight is predicted to follow its cleared behaviour (or its coordinated behaviour)	Solution #27
Trajectory	1- A set of reconstructed 4-dimensional points (geographic position + altitude + time) defining the path of an aircraft through space. The points are calculated by using mathematical splice functions. 2- Time sequence of state vectors of an Object simulated or reconstituted from Multi-Radar data by some filtering technique, using all information available including the data after the moment of particular interest.	Eurocontrol Lexicon

	3- A generic sequence of 4D points that describe the profile of a flight.	
User Preferred Route	A preferred route that is provided by an Airspace User during the flight planning and agreement phase. In Step 1 it may take advantage from Free Route Airspace (FRA) for optimum routings. Note: A User Preferred Route may include published as well as non-published points defined in latitude/longitude or point bearing/distance. Such waypoints are inserted in the FMS for trajectory computation.	Solution #27
Vertical Separation	Separation expressed in units of vertical distance	Solution #27
What-else Probing	A process where several Speculative Trajectories and associated data arising from What-If Probing are assessed for the impact on the occurrence of predicted Encounters. The Speculative Trajectories utilise flight data other than that currently committed or tentatively selected (during What-If Probing operations) by the controller.	Solution #27
What-if Probing	A process where a private copy of a Trajectory that is in operational use and associated data is taken and used as a Tentative Trajectory to check the impact of changes to the flight data on the occurrence of predicted Encounters, without affecting the corresponding data for the actual flight. Note: On completion the what-if data and the Tentative Trajectory may be discarded or used to implement an update to the actual flight data and to construct the necessary clearance.	Solution #27
Baseline Scenario	Common point of reference to be used by multiple validation exercises in order to perform measurements relative to a common, well-known and consistent origin.	Eurocontrol Lexicon
Reference Scenario	Scenario including traffic and operational environment and without the SESAR operational improvements that are the subject of the validation, matched in time with the solution scenario .	Eurocontrol Lexicon
Solution Scenario	Scenario including traffic and operational environment and SESAR operational improvements that is the subject of the validation.	Eurocontrol Lexicon

Table 1: Glossary of terms

2.7 List of Acronyms

Acronym	Definition
AMAN	Arrival Manager
ANSP	Air Navigation Service Provider
AOR	Area of Responsibility
ARN	Air traffic services Route Network
ATC	Air Traffic Control
ATCO	Air Traffic COntroller
ATM	Air Traffic Management
ATS	Air Traffic Service
ATSU	Air Traffic Service Unit
CD/R	Conflict Detection and Resolution tools
CDT	Conflict Detection Tools
CNS	Communication Navigation and Surveillance
CONOPS	Concept of Operations
CMON	Conformance MONitoring
CPDLC	Controller-Pilot DataLink Communication
CR	Change Request
DCB	Demand Capacity Balancing
EAP	Extended ATC Planner
EATMA	European ATM Architecture
E-ATMS	European Air Traffic Management System
ECAC	European civil Aviation Conference

EC	Executive controller ³
eTMA	Extended Terminal Manoeuvring Area
FDPS	Flight Data Processing System
FRA	Free Route Airspace
HPAR	Human Performance Assessment Report
IAF	Intermediate Arrival Fix
IFL	Intermediate Flight Level
INAP	Integrated Network Management and (Extended) ATC Planning
INTEROP	Interoperability Requirements
KPA	Key Performance Area
MONA	MONitoring Aids
MSA	Muti Sector Area
MSP	Multi-Sector Planner
MTCD	Medium Term Conflict detection
OI	Operational Improvement
OSED	Operational Service and Environment Definition
PC	Planning controller
PAR	Performance Assessment Report
QoS	Quality of Service
RBT	Reference Business Trajectory
RDPS	Radar Data Processing System
RMT	Reference Mission Trajectory
RVSM	Reduced Vertical Separation Minima
SAC	Safety Criteria
SAR	Safety Assessment Report
SESAR	Single European Sky ATM Research Programme
SID	Standard Instrument Departure

³ Note that in this document ATCOs role defined as "Executive Controller - EC" refers also to generic term "Tactical Controller - TC"



SJU	SESAR Joint Undertaking (Agency of the European Commission)
SPR	Safety and Performance Requirements
STAR	STandard Arrival Route
SWIM	SyStem Wide Information Model
TMA	Terminal Manoeuvring Area
TC	Tactical Controller
TS	Technical Specification

Table 2: List of acronyms

3 Operational Service and Environment Definition

This section details the operational concept aspects described in the CONOPS [5] maintained by PJ.19

In the SESAR 2020 operational environment, advanced tools and operating methods influence the task allocation between Controllers (Extended ATC Planner, MSP, PC and EC), thus team structure and communication are affected.

The traditional Planner-Executive (1PC-1EC) two-person ATC sector team will be modified with the introduction of a new Planning role : the Multi-Sector Planner (MSP) where the Planning Controller is responsible for the airspace that is under the executive control of two or more independent Executive Controllers (1P-nE).

The Multi Sector Planning Controller will provide support to several Executive Controllers operating in different AORs, including ensuring suitable coordination agreements between these sectors and assisting in managing the workload of the Executive Controllers. These roles will be applied in both En Route sectors and in the extended TMA (eTMA).

By implementing new operating procedures in eTMA and En Route sectors that have been combined into Multi-Sector Planner teams, coordination will be adapted to the Multi Sector Area. In addition, constraints will only be applied when there are particular separation problems or traffic demands. The Multi-Sector Planner will set overall profile targets to allow airspace to be used more efficiently. Then, in order to achieve these profiles, Executive Controllers in the Multi-Sector Planner's area of interest will collaborate and may issue clearances into, and even operate traffic within others' AoR without prior coordination.

The Extended ATC Planner is an INAP function mainly acting as DCB activity. Depending on the ACC configuration, EAP is acting as a Local Traffic Manager for the ACC at planning level as MSP is acting, in the execution phase, as a Planner Controller on a Multi Sector Area which is a combination of the area of two sectors.

3.1 SESAR Solution PJ.10-01a: a summary

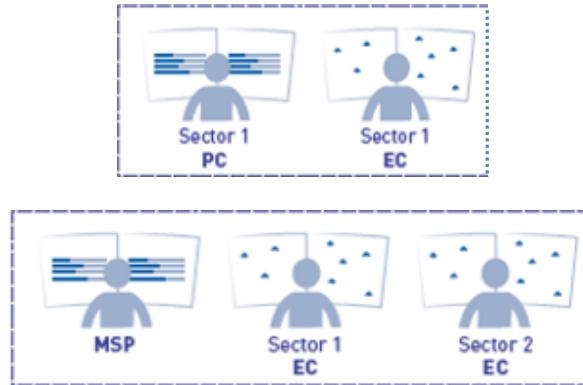


Figure 1: From PC-EC team to MSP-ECs team

High Productivity Controller Team Organisation sees the extension of sector team operations beyond team structures of one planning ATCO and two or more executive ATCOs both in En-Route and eTMA in order to optimise flight profiles, minimise delays and improve ANSP cost efficiencies while taking into account intrinsic uncertainty in the trajectory.

The Multi Sector Planning concept provides new opportunities for the utilisation of the operational staff, including new responsibilities sharing for the Executive and (Multi Sector) Planning Controllers within the team, coupled with advanced controller support tools.

SESAR Solution ID	SESAR Solution Title	OI Steps ID ref. (coming from EATMA)	OI Steps Title (coming from EATMA)	OI Step Coverage
PJ.10-01a ⁴	High Productivity Controller Team Organisation	CM-0303	Sector Team Operations Adapted to New Responsibilities in En Route, one Planning to several Tactical Controllers team structure	Fully
		CM-0304b ⁵	Sector Team Operations Adapted to New Responsibilities in eTMA, one Planning to several Tactical Controllers team structure	Fully

Table 3: SESAR Solution PJ.10-01a Scope and related OI steps

High CONOPS Requirement ID	Level	High Level CONOPS Requirement	Reference to relevant CONOPS Sections e.g. Operational Scenario applicable to the SESAR Solution
S10-01a-HLOR-01		The High Productivity Controller Team Organisation, based on one Planning Controller (Multi-Sector Planner) to several Executive Controllers, shall provide efficient and safe distribution of responsibility for	Operational Requirements PJ10 (section 4.12)

⁴ In the scope of the rescoping of the solution 10-01a, solution has been split into two solutions, to separate V2 and V3 parts

- 10-01a1 : PJ.10-01a1 High Productivity Controller Team Organisation in eTMA
- 10-01a2 : PJ.10-01a2 High Productivity Controller Team Organisation in En Route

(Change Requests are on going)

⁵ The OI CM-0304 has been split into two OIs CM-0304a and CM-0304b to differentiate TMA and eTMA environment (Change Requests are on going)

	traffic and separation management across the team, in order to provide efficient flight profiles through the airspace sectors under control and ensure an efficient distribution of tactical workload between the Executive Controllers.	High Level Operational Scenario (section 3): Execution phase: • Sector Team Organisation
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Table 4: Link to CONOPS

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

The SESAR PJ10.01a solution defined in this document is aligned with DS 19.

As already mentioned the experience of COOPANS/LFV, COOPANS/NAVIAIR and DFS having put in operation Multi Sector Planning concept in TMA is be considered as baseline for the solution. Within these above mentioned TMAs, the Multi Sector Planner is acting when the traffic level and complexity allows.

Therefore, OSED activities in solution PJ.10-01a have been initiated with COOPANS/LFV, COOPANS/NAVIAIR and DFS experience. This has allow to structure the Operational Concept for eTMA and En Route with beneficial inputs from their operational experience and it allowed to elaborate the concept directly in an optimal way.

In order to separate **eTMA** and **En-Route** operational environments scopes, series of Change Request have been initiated in the DS20. They concern mainly:

- the split of the solution into two solutions :
 - 10-01a1 : PJ.10-01a1 High Productivity Controller Team Organisation in **eTMA** (CM-0304b)
 - 10-01a2 : PJ.10-01a2 High Productivity Controller Team Organisation in **En Route** (CM-0303)
- The split of the OI CM-0304 :
 - CM-0304a : Sector Team Operations Adapted to New Responsibilities in the **TMA**, 1 Planning to two Tactical Controllers team structure
 - CM-0304b : Sector Team Operations Adapted to New Responsibilities in the **eTMA**, 1 Planning to two Tactical Controllers team structure

Concerning CM-0304a, MSP is already in operation in some TMA and therefore this OI can be considered already in deployment phase.

3.2 Detailed Operational Environment

This section will detail firstly some general characteristics of an En Route, eTMA Operational Environments within Europe, both current and envisaged for the future.

3.2.1 Operational Characteristics

3.2.1.1 Airspace Characteristics

During the timeframe of SESAR 2020 the future European airspace organisation will initially be based on current ICAO ATS airspace classifications, regulations and applicable rules, including Visual Flight Rules (VFR) and Instrument Flight Rules (IFR).

Classifications and rules will be adopted consistently by all states, thus ensuring uniformity of their application and a simplification of airspace organization throughout the whole ECAC region.

This will provide a progress towards an airspace continuum where the only distinction is between two airspace classes (i.e. Managed and Unmanaged Airspace).

Airspace use will be optimised through dynamic demand and capacity management, queue management, flexible military airspace structures, free, direct and fixed routing and a reduced number of airspace categories. The objective is to have an airspace organisation that:

- Is as transparent and simple as possible with regard to user perception;
- Permits unambiguous rules for ATS service provision;
- Allows simple documentation of the requirements for aspects such as flight planning, airspace reservations, communication actions and minimum equipage.

A general description of the airspace characteristics is provided by the European Route Network Improvement Plan (ERNIP), Part 1 (refer [39]).

The airspace addressed in PJ.10-01a is High and Medium density/complexity extended TMA and En-Route operational environment.

3.2.1.1.1 Airspace Structure

The airspace considered in this solution is a managed airspace, where a separation service is provided by ATM services providers.

In such airspace, the role of the separator may in some cases be delegated to the pilot. However, this capability is out of the document's scope.

The vertical scope considered by SESAR Solution PJ.10-01a extends from FL110 to FL660 wherever traffic is controlled. This comprises upper airspace as well as lower airspace area (e.g. Extended TMA (<FL245)).

Currently the airspace is divided into separate areas of responsibility (Sectors). The sectors may be grouped together when traffic and operational complexity are low enough and they will be de-grouped when traffic increases. This is operated by the Operational Supervisor based on specific operational criteria.

3.2.1.2 Airspace Configuration

The airspace structure investigated in this solution is consisting of geographical sectors adjacent to each other.

3.2.1.2.1 Route Configuration/Network

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Within eTMA, the ATS routes of the ARN will be applied based upon Basic Area Navigation (RNAV). Sector boundaries are currently fixed (laterally and vertically).

3.2.1.2.2 Free-Route Airspace

The Free-Route airspace concept (FRA) is addressed by SESAR Solutions PJ.06-01 and PJ.06-02

The Free-Routing Airspace is a managed airspace, where aircraft separation is provided via an ATSU control service, and which allows airspace users to plan their preferred business trajectories without the need to adhere to the predefined published routes.

PJ.10-01a will consider the Free Route Airspace for the En-Route part of the solution.

Above FL 305, the airways network is not available anymore; airspace users shall plan a direct route between entry and exit points taking into account the availability of restricted areas and the preferred route. Free Route is available also for arrival and/or departing flights to/from defined points, above FL 305, after/before which the flights will use the current ATS network to complete a published landing procedure in case of arriving traffic, or to join Free Route Airspace in case of traffic departing.

3.2.1.3 Separation Minima

In En-Route, current vertical separation minima will be applied including Reduced Vertical Separation Minima (RVSM) between FL290 and FL410. Lateral and Longitudinal separation will be as per current local ANSP regulations and agreements with adjacent ANSPs.

In eTMA Airspace, the Radar Separation Minima (RSM) also remains the same as today.

These separation standards should be taken into account by the advanced tools provided to the MSP and Executive Controllers for detection of encounters.

3.2.1.4 Traffic characteristics

The traffic characteristics are a complex airspace with many flights in climb and descend phases and conflicting trajectories. IFR traffic.

Traffic characteristics will vary by airspace type:

- Upper airspace e.g. above FL245: levelled flights and descending/climbing aircraft especially in complex areas;
- Lower airspace e.g. under FL245: A mix of levelled and descending/climbing aircraft depending on the sector. A higher proportion of aircraft that take off from - or arrive to - airports within the area of interest.

In the most-likely scenario, there will be 11.6 million IFR movements in Europe by 2023, 14% more than in 2016 [38]

3.2.2 Roles and Responsibilities

Roles and activities service from EATMA



Purpose of the solution is to study new sector team arrangements that will be used, with new procedures and responsibilities. These new roles organisation will be supported by improved support tools. As well as the traditional Planner-Executive (1PC-1EC) two-person ATC sector team, sectors will operate with the distinct role of Multi-Sector Planner (MSP) where the Planning Controller is responsible for the airspace that is under the executive control of two or more independent Executive Controllers (1PC-nECs).⁶

Roles that are affected to the solution are Planning and Executive Controllers (refer to SESAR 2020 Concept Of Operations [4]).

By implementing new operating procedures in TMA, Extended TMA and En-Route sectors, that have been combined into Multi-Sector Planner teams, coordination will not be required at all sector boundaries.

The Planning Controller will provide support to several Executive Controllers operating in different AORs, ensuring suitable coordination agreements between these sectors and assisting in managing the workload of the Executive Controllers. These roles will be applied in both En Route sectors and in the eTMA. Some responsibilities currently assumed by the Planning Controller will move to the Executive Controller and vice-versa in a Modern ATC system.

This enables the Planning Controller to take responsibility for remaining planning tasks supporting more than one Executive Controller. The ATM system support will increase Situational Awareness for both PC (in this case the MSP) and EC.

Advanced standard agreements will further decrease the need of co-ordination tasks and thereby reduce overall workload.

The change of roles of EC and PC are described more detailed in section 3.2.2 New SESAR detailed operating method.

⁶ 1PC-nECs has been addressed in En-Route validation exercise. In eTMA, the MSP concept was focused on 1PC-2ECs

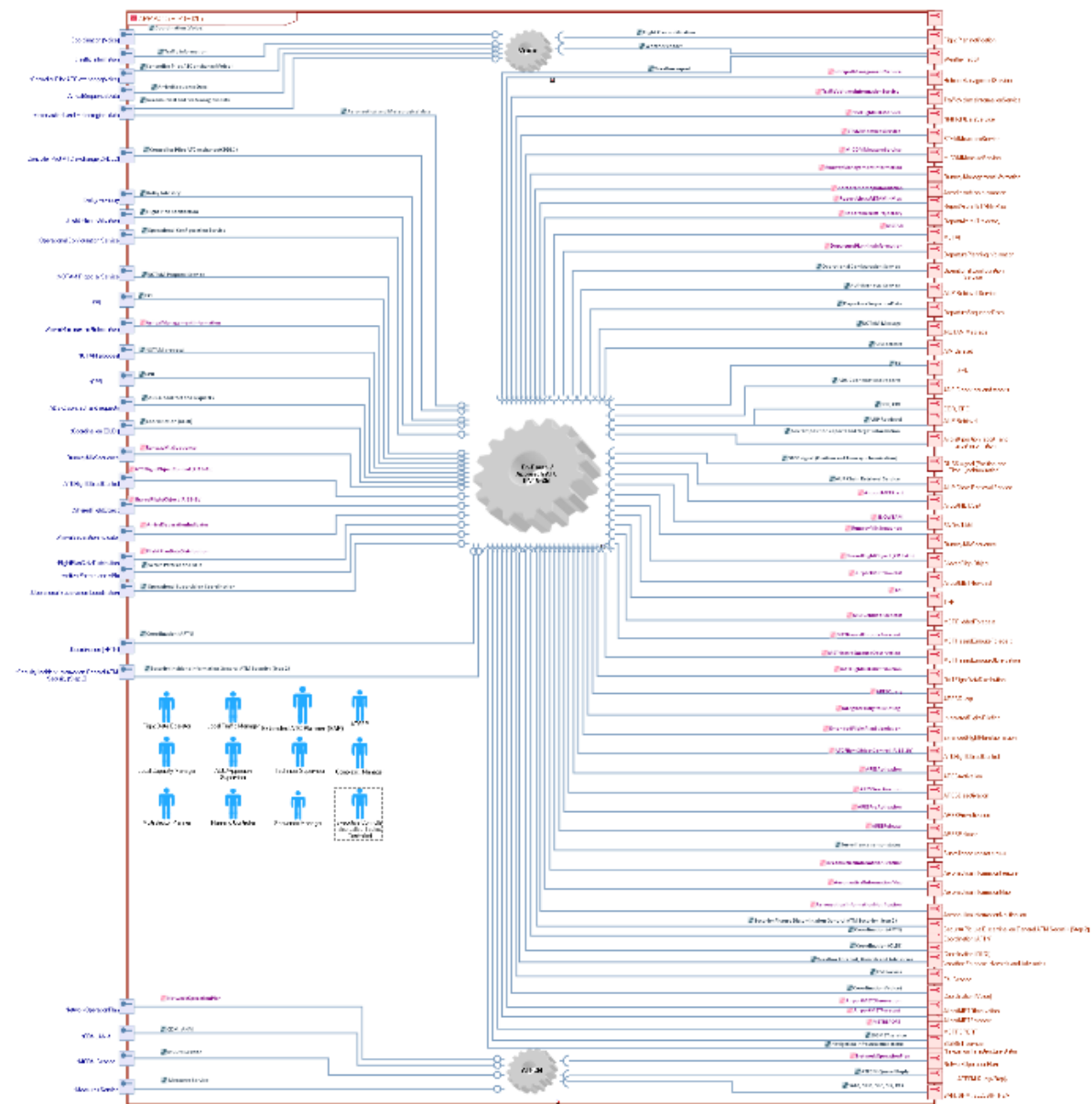


Figure 2: Team organisation EATMA model

3.2.3 Technical Characteristics

This section describes the fundamental technical characteristics that are part of the context where the set of requirements included in section 4 have been consolidated.

The operational environment under study for this solution assumes a baseline of key technology solutions to be in place to provide support to controller team.



A modern Trajectory Based ATC system with a System Co-ordination functionality (SYSCO) which allows electronic interaction with the system and information sharing via configurable CWP HMI is a key factor, as well as tools for trajectory prediction, trajectory conformance monitoring, conflict detection and resolution

Both the Executive and Planning Controller shall be supported by a suite of support tools (ER APP ATC 96) providing information on potential conflicts between aircraft. This conflict information shall be derived through the comparison of predicted trajectories for aircraft in a Conflict Detection Tool engine. The support tools shall also provide conformance monitoring information.

It is assumed that the system under use by the Executive and Planning Controllers also provides facility for current operational methods of coordination, including MSP.

It is anticipated that the development of new technology solutions in the form of tools support to Multi Sector Planning activity could be necessary following the maturation of the concept. Where this is the case, the requirement will be clearly defined within the impacted procedures which may give rise to the need for additional or modified tools support.

Functional Blocks ACC Capability Configuration in Targeted Operating Environment	
ATFCM	Local Air Traffic Flow and Capacity Management systems
ATC	RDPS, FDPS, CD/RT, MONA, CMON, ATC-ATC and A/C-ATC communications, local Air Traffic Complexity Management ...
Coordination & Transfer (C&T)	System supported electronic coordination will be of prime importance in Free Routing Airspace as coordination actions will be made more difficult by high variability of trajectories and the lack of mandatory coordination points.
Monitoring Aids (MONA)	The MONA help controllers to reduce the workload associated with traffic monitoring tasks by providing warnings if aircraft deviate from a clearance or plan and reminders of instructions to be issued and providing conformance monitoring triggering trajectory re-calculation essential for the Conflict Detection Tools. MONA provides also additional warnings such as Change of Frequency... ⁷
Safety Nets (SNET)	Ground-based safety nets will be of prime importance in Free Routing Airspace as the last ATC barriers against collision / airspace infringement hazards. • <u>Short-Term Conflict Alert (STCA)</u> is a ground-based safety net intended to assist the controller in preventing collision between aircraft by generating, in a timely manner, an alert of a potential or actual infringement of separation minima. The purpose of STCA is to detect and alert “operationally relevant conflict” involving at least one “eligible aircraft” with “sufficient warning time” for the controller to intervene and the aircraft to execute an appropriate manoeuvre. STCA parameters setting might require being adapted in order to better fit this purpose in Free Route environment. • <u>Area Proximity Warning (APW)</u> is a ground-based safety net intended to warn the controller about unauthorized penetration of an airspace volume by generating, in a timely manner, an alert of a potential or actual infringement of the required spacing to that airspace volume, which require attention/action. APW is intended to function in the short term, if applicable providing warning times of up to 2 minutes, and to contribute in a significant way to the prevention of accidents arising from unauthorized penetration of an airspace volume, e.g. active ARES.

⁷ CMON is a subset of MONA

Conflict Management (CONF)	To be able to handle traffic in a safe and efficient manner in high complexity environment, ATCO are going to need a tool set to detect and solve conflicts. These tools could be embedded into Control Working Position (CWP) for a better and faster usage by ATCOs. At least, the following tools will be considered: • <u>4D graphical trajectory presentation</u>. Horizontal trajectory and vertical profile will be displayed onto the CWP (together or in different panels). The presentation of estimated time over “interest” point is necessary (e.g. AoR cross borders, AoI cross borders, fix points). • <u>Conflict Detection Tools (CDT)</u>. Conflicts detection algorithms will have to consider characteristics of airspace (eTMA and En Route). • <u>PC-Aid Tool (CDT) for (Multi Sector) Planning Control</u>: ATCOs need support to negotiate conflict-free coordination conditions, including mid-term detection of conflicts for traffic entering / leaving or within their ATC sectors of interest. So this is an important tool for the (Multi Sector) Planning Controller, but it can also be used by the Executive Controller. • <u>TC-Aid Tool (CDT) for Executive Control</u>. ATCOs also need to know every conflict detected as consequence of executive actions (i.e. headings, DCTs or route modifications, CFL, etc.), performed over assumed flights, against the rest of the flight inside an adapted time interval (time configured by user). This is a necessary tool for Executive controllers. • <u>Separation tool (SEP-tool)</u>. To visualize the minimal horizontal distance between two selected aircraft. • <u>What-if and/or What-else tools</u>. Every time an ATCO issues a clearance or gives an executive instruction to a flight, a potential conflict could be raised (or several), so What-if tools is necessary to detect possible conflicts induced by ATCO and What-else is a useful support tool to determine conflict-free clearances or instructions. In the same way, all actions over the flight plan route could raise conflicts (also called “risks”) against other flights in a long time range, so What-if what-else tools are important for ATCOs to plan possible changes over the flights. Both tools can be used by TC and/or MSP.
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Table 5: En Route and eTMA Systems in Targeted Operating Environment

Below is a brief overview of the tools envisaged to support EC and MSP in En Route and in extended TMA.

It has to be noted that most of the support tools described above are part of the baseline, however, they needed adaptation in the context of MSP and have been validated or highlighted in the frame of 10-01a validations. Some support tools like What-else functions are still in the process of validation and not yet in operation.

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3.2.3.1 Voice Communication Air-Ground

While the ATM Target Concept is oriented toward data exchanges between aircraft and ATM ground systems, voice will remain an essential means of communication. It will be used for separation notably for time critical clearances and especially in high density environments.

Beyond 2020, voice will remain the primary means of communications, only in certain circumstances. The role of voice communications will essentially be a safety back-up means of communication; however voice will remain an essential means for pilots to get information and to obtain confirmation of the ATC instructions. When more complex instructions or transmissions of long and complex non-routine messages are needed, voice communications will help ATCOs and flight deck crew to better understand each other.

The Multi Sector Planner will be confronted with the listening of 2 or more radio frequencies. The activities and operating methods of the MSP will reduce the need to listen to the frequency. However different techniques could be envisaged to improve situational awareness.

At this stage, some techniques using voice recognition, automatic display on demand of the radio dialogue with a specific aircraft, advanced gonio detection are still under investigation and not yet fully mature but after further validation of these techniques, they could be implemented with MSP concept to ensure adequate situation awareness.

However, the use of CPDLC will increase significantly in the coming years therefore reducing the frequency listening time.

3.2.3.2 Conflict Detection Tools and What-if function

Conflict Detection Tools (CDT) provide automated assistance to MSP, and/or PCs as well as ECs. They can be used at a strategic or executive level.

The requirements for a CDT cover one or several of the following functions:

- a) The detection and display to the controller of probable loss of the required separation between two or more aircraft;
- b) The detection and display to the controller of aircraft-to-aircraft encounters where, although the required separation will be achieved, each aircraft is predicted to be occupying airspace that may be used by the other, e.g. in the case of pilot request for an alternative level or when resolving a conflict involving one of the aircraft.

In order to reach these operational requirements, CDT assists the controller in conflict identification and planning tasks by:

- Providing automated early detection of potential conflicts at different time horizons;
- Identifying aircraft constraining the resolution of a conflict or occupying a flight level requested by another aircraft.

As well as CDT highlighting to the MSP any aircraft that pose a coordination issue, the potential to highlight any “traffic” (contextual flights) to a subject aircraft will support the MSP in enhancing their situational awareness of the traffic situation. This tool highlights any potentially interacting flights

which are of planning interest to the sector due to their anticipated profiles, which can therefore assist the MSP in mitigating the EC workload by planning out the most suitable XFL for an aircraft – they represent potential executive problems that the EC will need to resolve within the sector.

A set of derived trajectories probed by CDT may provide the PC with a picture of the predicted potential problems both at likely exit levels, but also throughout the sector between entry and exit points and levels allowing an improved judgement of the potential executive workload which might occur as a result of setting particular coordination targets.

What-if and probing permit to check the impact of changes to the flight data on the occurrence of predicted Encounters. Therefore the process is based on a private copy of a Trajectory that is in operational use and associated data which are taken and used as a Tentative Trajectory in order to check the impact of changes to the flight data on the occurrence of predicted Encounters, without affecting the corresponding data for the actual flight.

Note: On completion the what-if data and the Tentative Trajectory may be discarded or used to implement an update to the actual flight data and to construct the necessary clearance.

3.2.3.3 Monitoring Aids (MONA)

Monitoring aids help the controllers to reduce the workload associated with traffic monitoring tasks by:

- Providing warnings if aircraft deviate from a clearance or plan and reminders of instructions to be issued;
- Providing conformance monitoring triggering trajectory re-calculation essential for the CDT.

A MONA alert may indicate:

- A deviation from an ATC clearance (Lateral, Vertical),
- A controller clearance input error (The ATC Clearance is respected by the flight but the clearance monitored by the system is not good),
- A deviation from the predicted lateral/vertical/4D profile which is not as a result of either the aircraft not complying with the clearance or the controller mis-entering the clearance but which may impact on the predicted traffic situation and erode the separation that was expected (e.g. due to poor prediction of the winds),
- A planned action to be made (communication transfer, etc...).

3.2.3.4 System Supported Coordination (SYSCO)

System supported co-ordination (SYSCO) is the provision of system support capability and the development of procedures to automatically electronically co-ordinate and transfer flights in sectors of an ATS unit or between adjacent ATS units, based on a shared set of flight data.

The SYSCO concept was intended to address all coordination scenarios that were likely to occur within the "ECAC core area".



Permits controllers to conduct screen to screen co-ordination between adjacent ATSU's /sectors reducing workload associated with co-ordination task.

Enables controllers to conduct co-ordination dialogue and transfer flights between ATSUs.

Facilitates early resolution of conflicts through inter ATSU/sector co-ordination.

3.2.3.5 AMAN

The Arrival Manager (AMAN) objective is to manage the flow of arriving aircraft in a way that makes best use of the available Air Traffic Management (ATM) resources, such as runways and airspace. To achieve this goal, AMAN sequences arrivals and generates advice for all controllers involved, if required in a multi-runway configuration environment.

Extended TMA sectors are expected to contribute to the arrival sequencing towards the TMA simultaneously with potentially conflicting sequencing constraints. The system integrates information from arrival management systems operating out to extended range with local traffic/sector information and balances the needs of each

This leads to a reduction of time spent in holding stacks in the destination TMA.

Air Traffic Control (ATC) services in the TMA using AMAN operations will coordinate with Air Traffic Services (ATS) units responsible for adjacent en-route sectors.

The existing techniques to manage the AMAN constraints, in particular Time to Lose or Gain and Speed Advice may be used to implement this functionality

3.2.4 Applicable standards and regulations

There is no specific topic in the field of the regulatory framework to be considered within the SESAR Solution PJ.10-01a, beyond the applicable regulations currently existing.

There is no specific topic in the field of the standardization framework to be considered within the SESAR Solution PJ.10-01a, beyond the applicable standards currently existing

3.3 Detailed Operating Method

3.3.1 Previous Operating Method

In current operations in the majority of ACC environments (En-Route and eTMA airspace) the controller team consists of two main actors; the Executive Controller (EC) and the Planning Controller (PC). Each team is responsible for looking after a distinct volume of airspace. The aim of this sector team is two-fold:

- To ensure aircraft enter a defined sector of airspace separated from other aircraft which are transiting through the sector, and to ensure that the aircraft exits the sector at a flight level that is separated from other aircraft that are entering and leaving the same sector. This is done

by allocating an exit flight level appropriate and achievable for each flight (essentially the Planning Controller responsibility).

- Once the aircraft is in jurisdiction with (i.e. under the control of) an airspace sector, to ensure the aircraft attains the desired exit flight level, or transits the airspace if already at cruising level, in the most safe, efficient and expeditious manner as is possible (Executive Controller responsibility).

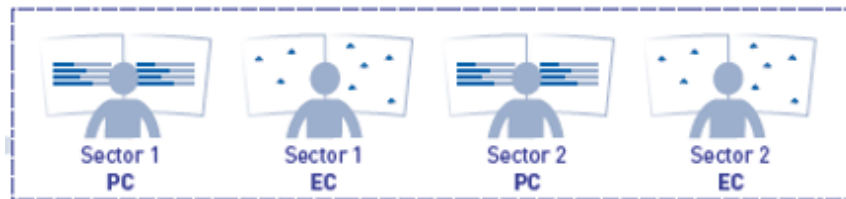


Figure 3: Current Sector Staffing Configuration (Split)

Today an operational solution for MSP- Multi-Sector Planner in TMA, is relevant for some ATS units. It is enabled by a modern Trajectory Based ATC system with a System Co-ordination functionality (SYSCO) which allows electronic interaction with the system and information sharing via configurable Controller Working Positions (CWP) HMIs. This enables both EC and PC to have the same information visible at the CWP.

Monitoring aids (MONA) assists the EC to monitor and follow up the traffic evolution. Furthermore, advanced standing agreements between sectors and other ATS units is in place to limit the need for co-ordination between sectors.

An AMAN system supports the planning task for arrival management.

In some places this configuration is used, to a limited extent, even though not all of the modern tools are available.

It seems that most of the previous MSP roles are focused on planning the inbound flows and support with coordination and workload balancing for this service. (Often this role is called an approach coordinator). In the SESAR1 solution#05 a role of a Sequence Manager was established. This role could be seen as part of an MSP role with the focus on monitoring arrival flow sequence along more than one sector and support communication of changes in the planned sequence.

This initial MSP role is not yet in operation in the En Route environment.

3.3.1.1 Planning Controller

The Planning Controller receive information for an aircraft that is planned to enter his/her sector by the previous sector sending a coordination (standard or non-standard) for the aircraft. The Planning Controller responsibility is to assess that transfer conditions are acceptable.

The Planning Controller is provided with various sources of information to assist them in their planning tasks. Firstly, a source of flight data in electronic form (electronic strips, flight labels, list). The Planning Controller uses the flight data and some Controller Support Tools to gain information about a flight, to detect conflicts and to plan ahead and make decisions on how best to plan the traffic in his/her sector.



The Planning Controller use another main source of information which is the air situation display, assisting him/her in developing their air situational awareness. The radar display is also used to propose conflict solving and prepare situation to the Executive Controller.

Some area control systems do have additional support tools for the Planning Controller in terms of a trajectory prediction (TP) and Conflict Detection (CDT) which allows the detection of potential interactions and conflicts between flights in planning phase. CDT compares the trajectories created by the TP to determine how close two flights will come within or one another and if the closest point of approach falls below defined minima (e.g. 15 Nm).

The Planning Controller can also be assisted with "What-if" and "What-else" functions which permit to test potential solution to improve planning.

The Planning Controller is in charge of ensuring coordination with adjacent sectors/centres. He can be assisted with electronic coordination means which allow coordination information sharing via the Controller Working Position.

In addition to coordinating aircraft into and out of the sector safely, the Planning Controller has numerous other tasks, of which telephone calls are a significant one. The Planning Controller must make and receive telephone calls to and from adjacent sectors/centres. Telephone calls can be made and received for various reasons; for example, to amend an aircraft's entry or exit coordination, or if the Executive Controller wishes to modify aircraft profiles of flights that are in communication with, but not yet in jurisdiction as the aircraft has not yet entered the sector boundary.

The Planning Controller must also wherever possible, monitor the R/T frequency of the Executive controller. This is primarily for safety reasons in the event of incorrect read backs or emergency scenarios. It is also useful for the Planner in gaining a suitable level of situational awareness, or for picking up various requests that the pilots may have. This can save the Executive controller having to repeat the request to the Planner, or having to act upon it him/herself.

The Planning Controller endorse also the role of "second pair of eyes" ensuring the overall situation awareness within the controller team.

3.3.1.2 Executive Controller

The responsibility of the Executive Controller is to manage a safe, orderly and expeditious flow of air traffic throughout their area of jurisdiction. The Executive Controller maintains radio contact with the aircraft and will issue instructions to the pilots via the R/T (some of these are eligible for transmission by CPDLC in).

Like the Planning Controller, the Executive Controller is provided with various sources of information to assist them in their executive tasks. Firstly, a source of flight data in electronic form (electronic strips, flight labels, lists). The Executive Controller uses the flight data and some Controller Support Tools to gain information about a flight, to detect conflicts and to plan ahead and make decisions on how best to solve any conflicts and expedite traffic. Another main source of information available to the Executive Controller is the air situation display, which greatly assists the Executive Controller in developing their situational awareness. The Executive Controller uses the air situation display to identify aircraft (from the Mode A/Mode S), the aircraft position, and the actual aircraft altitude (from Mode C readings). In some operational units the air situation display is also configurable for the

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Executive Controller to access other aircraft information, such as selected heading, speeds through Mode S airborne downlinked parameters. The radar display is also used to make decisions on conflict solving and allows the Executive to monitor aircraft profiles to ensure that their executive decision and actions are ensuring and maintain the required separation between aircraft.

Some area control systems do have additional support tools for the Executive Controller in terms of a trajectory prediction (TP) and Conflict Detection (CDT) which allows the detection of potential interactions and conflicts between flights. CDT compares the trajectories created by the ground TP to determine how close two flights will come in a certain period of time and if the closest point of approach falls below defined minima (e.g. 10 Nm). Additionally some Controller Support Tools such as Conformance monitoring allows alerts to be shown to the Executive Controller when the flight is not complying with the issued clearances entered into the ground system or deviating from its trajectory.

As mentioned in section 3.3.1.1 the Executive Controller is supported by the Planning Controller. The Executive Controller can make any requests to the Planning Controller for tasks such as coordination amendments or asking an adjacent sector permission to issue instructions to aircraft that they are in communication with but not yet in their area of jurisdiction. If the Executive Controller feels it is within their capabilities they will instigate making and answering telephone calls, particularly if they can see that the Planning Controller is involved in another task.

There are certain airspace sectors in which a significant amount of coordination is effected Executive Controller to Executive Controller, in particular when a sector has a vertical divisional boundary. In these cases is it important that the two Executive Controllers sit adjacent to one another, with their individual planners sat on the other side to them. The executives can then easily lean over and point at each other's situation displays at individual aircraft and discuss specific coordinations.

3.3.2 New SESAR Operating Method

In the New SESAR operating method the role of the Multi-Sector Planner, the MSP is assumed to serve not only the TMA but also sectors in the eTMA and En-Route. In these cases more options of configurations of sectors could be available. See below.

Enhanced new controller support tools will assist ATC in aircraft trajectory conformance monitoring and traffic flow optimisation, as well as in preventing, detecting and resolving conflicts in En-Route, Extended Terminal Area and Terminal Area Operations

Team tasks and performance are changed with the introduction of automated technologies, as well as adapted structure and composition of teams. Team roles are re-defined, and interaction and communication patterns are altered. Communication mechanisms are developed that favour the exchange and sharing of operational needs

It assumes a modern Trajectory Based ATC system with a System Co-ordination functionality (SYSCO) which allows electronic interaction between operators (ATCOs) and information sharing via configurable CWP HMIs. This enables both EC and PC to have the same information visible at the CWP.

Monitoring aids (MONA) assists the EC to monitor and follow up the traffic evolution and AMAN tools will assist in planning of the arrival sequence extended into En-Route. CDT tools ease an efficient and conflict free planning in the eTMA, and new advanced Tactical tools, TCT, will support the ATCOs in Conflict Detection and Resolution both in extended TMA and En Route. Furthermore, advanced standing agreements between sectors and other ATS units will be in place to limit the need for co-ordination between sectors

The circumstances when MSP can be used and when 1 PC/1EC should be used, has to be defined locally at the ATSU and differ in En Route and in eTMA.

PC workload consists mainly of monitoring tasks, workload balancing for ECs and flow-managing.

Initially, the traffic load and traffic complexity allow to have two or more sectors combined. The combined sectors are managed by a pair of one PC and one EC.

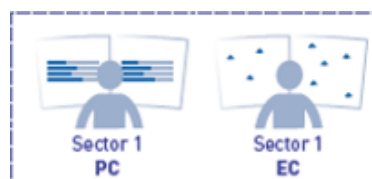


Figure 4: PC/EC Staffing Configuration on combined sectors⁸

⁸ Sector 1 and Sector 2 combined means that the AOR of Sector 2 has been attributed to the Sector 1. Therefore Sector 1 AOR is composed of Sector 1 initial AOR and Sector 2 AOR.

When traffic load and/or traffic complexity increase, it may become necessary to maintain an acceptable sector workload by splitting the combined sectors into two sectors. However, thanks to new operating methods introduced with the MSP, instead of going to the usual configuration one PC/ one EC per sector, the MSP configuration is set. One MSP acting as PC for both sectors.

Therefore the operating method is that one PC can provide support to two ECs. This implies that the sector is busy enough to warrant two separate ECs, however the workload is acceptable for 1 PC.

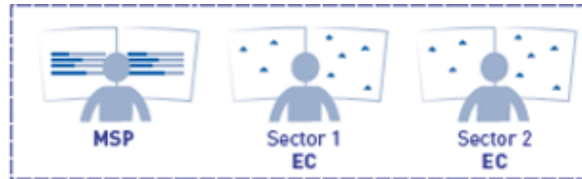


Figure 5: MSP Staffing Configuration –Sector 2 is grouped on Sector 1.

When traffic load and/or traffic complexity increase up to a limit that become no more acceptable for one MSP to manage safely both sector planning activities, then the conventional configuration having one PC / one EC per sector is put in place and roles and responsibilities become as usual PC/EC sector configuration.

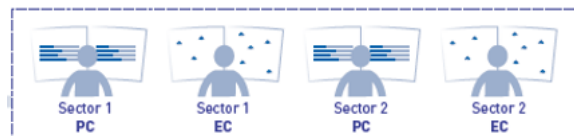


Figure 6: PC/EC Staffing Configuration per sector. Sector 1 has been de-grouped in Sector 1 and Sector 2

This can be summarise by the following diagram:

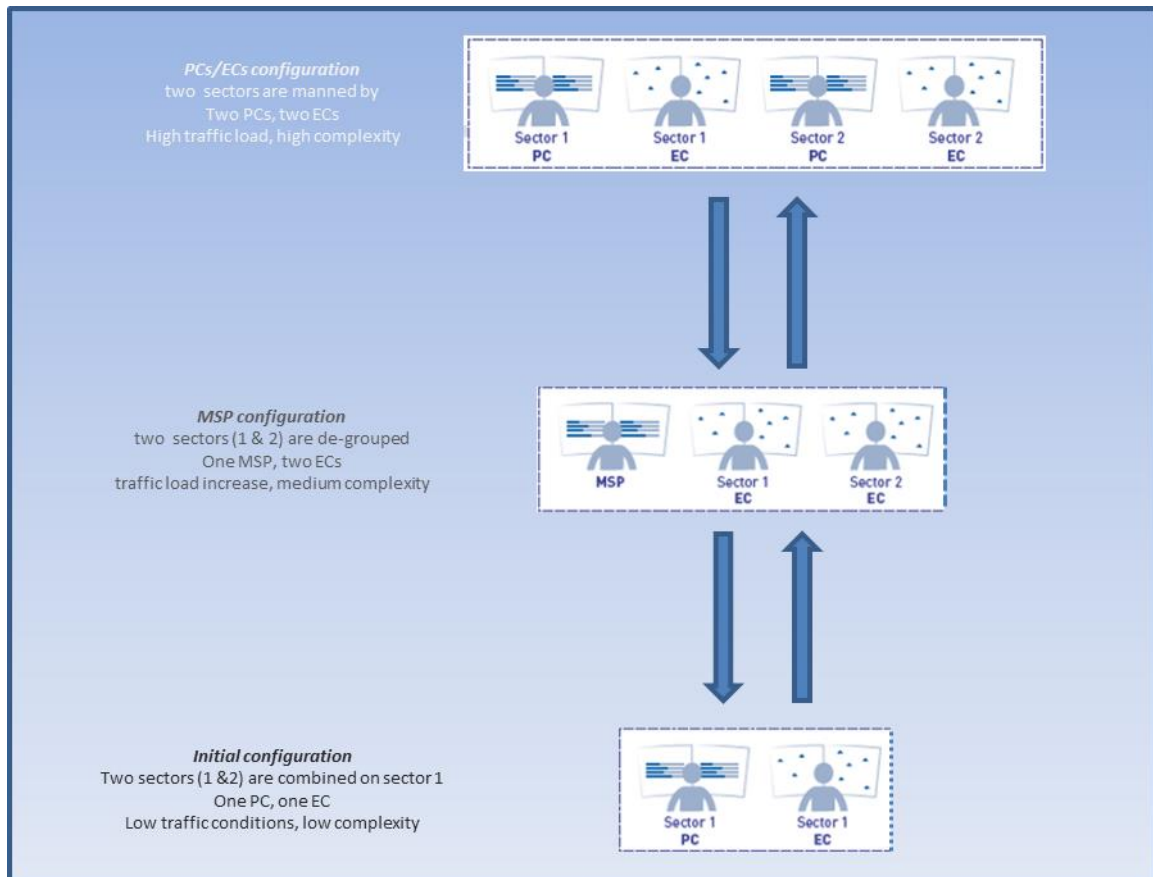


Figure 7: Staffing Configuration steps

Following on from the above scenario, the PC may also feasibly support more than two ECs, from three up to 'n' ECs.

The number of ECs, depend on the traffic volume and complexity of each sector and on the number of explicit coordination tasks that the PC would need to perform in a specific configuration. However, the configuration of MSP with more than two ECs has not been proven operationally feasible as a result from the En-Route validation exercise (refer to PJ10 PROSA - D1.1.050 - Final VALR (eTMA V3 & En-Route V2) [40])

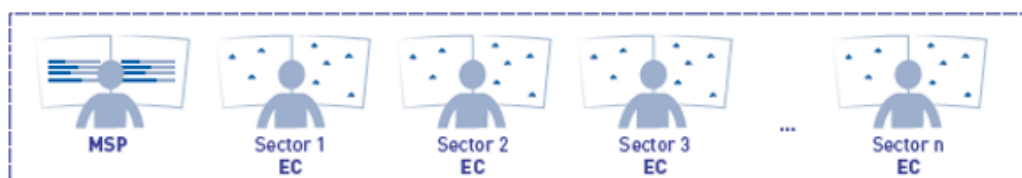


Figure 8: MSP Supporting 'n' ECs

Therefore, as the traffic levels rise and fall throughout the day, the sector configurations could follow a flow. The flow chart below is far from representative of the complex relationship between workload and traffic level, however it is intended to be a schematic view.

The transition from an MSP configuration with more than two sectors will always be performed step by step de-grouping sector per sector.

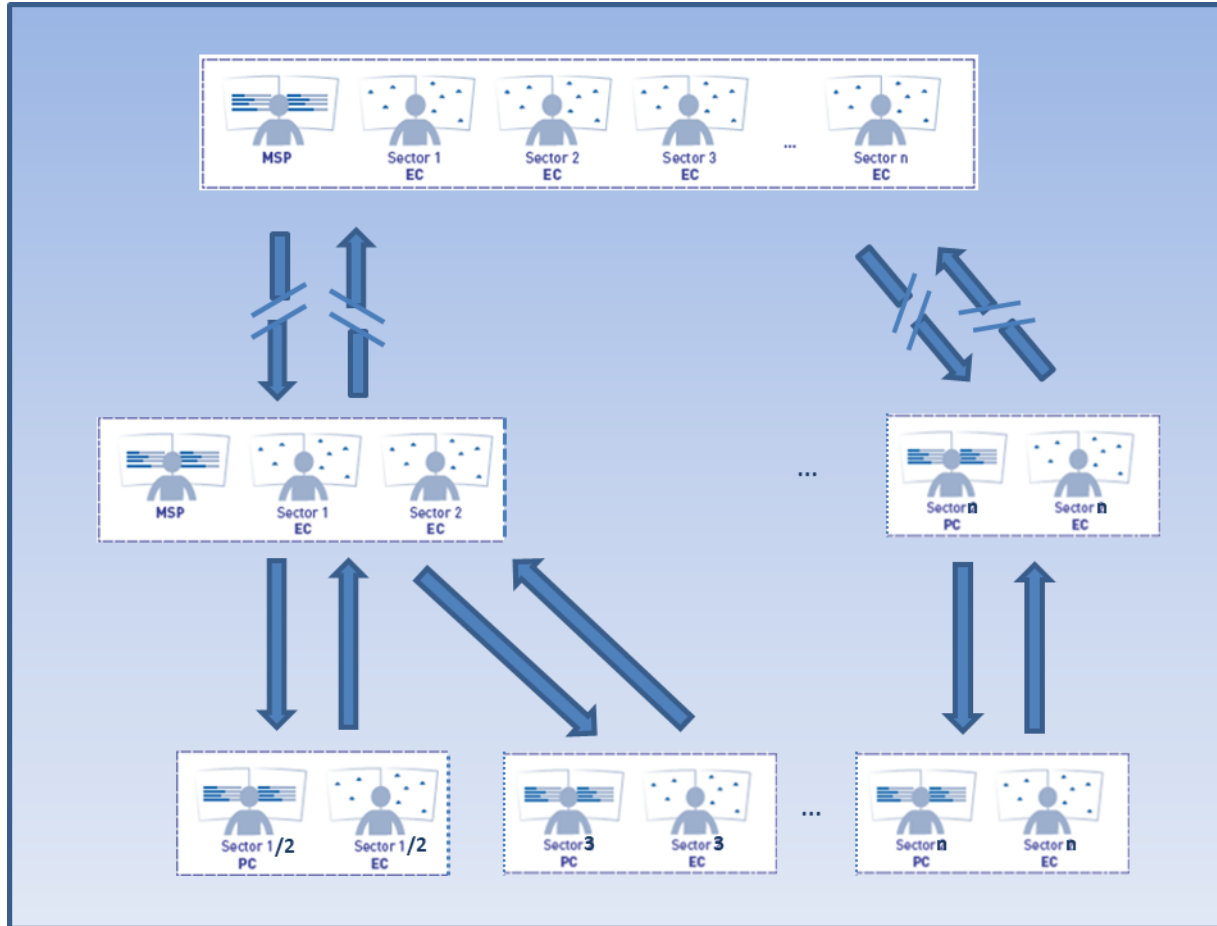


Figure 9: Sector Staffing Configuration Flow Diagram

In addition to the above staffing configurations it can be envisaged to have several Multi Sector Areas in a same ACC. Configuration of these MSA will be managed separately and independently. However, these possible configurations will drastically depend on traffic load and complexity level, therefore limited configuration in high complex environment.

An example is in an extended TMA configuration, 1 or more MSP might serve TMA sectors and 1 or more MSP the adjacent eTMA sectors. Another example is when one MSP serves an inbound flow where several ECs follow one flow from En-Route inbound to TMA via eTMA.

- 2 x MSP teams i.e.: 1 MSP to 2 EC and 1 MSP to 2 EC.:

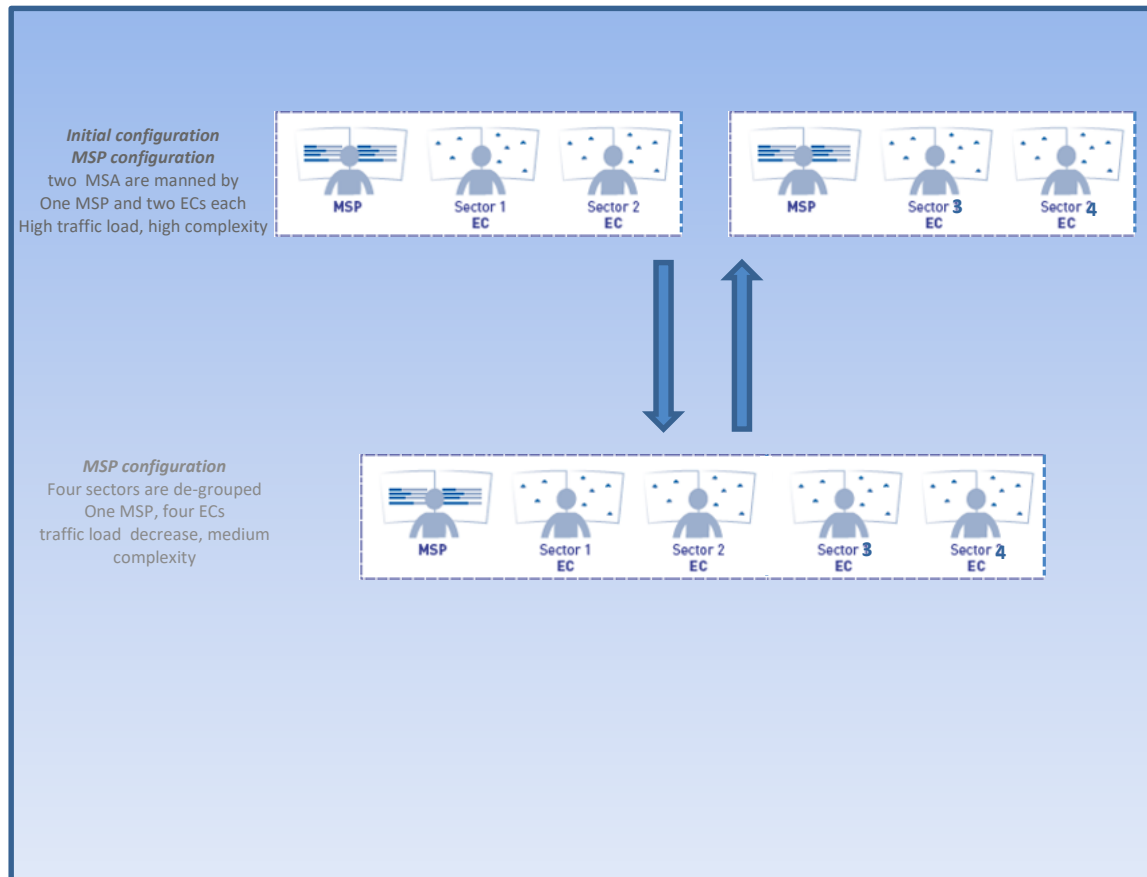


Figure 10: 2 x MSP Teams from one 'Super' MSP

3.3.2.1 Change of Roles and New roles

3.3.2.1.1 Executive Controller (also called Tactical Controller)

Executive Controller maintains main responsibilities described in CONOPS and EATMA.

Additional tasks will be possible to handle in a modern ATC-system. Executive updates to flightplan is inserted into ATC system and monitored by Conformance Monitoring tool which enables EC to focus on other tasks instead of monitoring. Coordination tasks is facilitated electronically which releases/free capacity for EC enabling an overtake of most coordination tasks. The free capacity of the EC can also be used in planning ahead by the use of CDTs.

In a MSP environment, EC has the responsibility to monitor that standing agreements are followed. He/she has help from monitoring aids that gives warning if i.e. level standing agreement is not followed. If the standing agreement is not suitable, EC requests a new entry or exit condition electronically or asks PC to do the task. In certain circumstances an EC can become Single Person Operator and take all the responsibilities of the PC to its role, this will not be addressed in this solution. EC has the overall responsibility to provide separation between aircrafts in her area of responsibility. EC expedites an orderly flow into airfields with the help of AMAN tool in eTMA and XMAN tool in En Route.

The Executive Controller main responsibilities are⁹:

- *Identify conflict risks between aircraft (with the support of ConflictDetection tools).*
- *Provide separation between controlled flights.*
- *Provide sequencing between controlled flights (with the support of extended AMAN tools for En Route sectors)*
- *Provide flight information to all known flights.*
- *Co-ordinate entry and exit conditions (with the support of SYSCO functions and standard agreements).*
- *Resolve boundary problems by re-coordination.*
- *Provide information on observed but unknown flights that may constitute traffic for known aircraft.*
- *Monitor flights regarding adherence to flight plan/RBT/RMT.*
- *Monitor the air situation picture.*
- *Communicate with pilots by means of R/T or data link.*
- *Monitor information on airspace status, e.g. activation/ deactivation of segregated/reserved airspace.*
- *Input data into the flight data processing system regarding tactical route modification, modification of flight level etc... using advance input capabilities through advanced HMI (flight label, list..).*
- *Monitor the weather conditions.*
- *Relay to pilots SIGMETs that may affect the route of a flight.*
- *Re-route flights to avoid non-nominal or hazardous weather areas.*
- *Monitor aircraft equipment status according to information provided by the system.*
- *Co-ordinate with Planning Controller or Multi-Sector Planner (inter-sector co-ordination) and adjacent centre/sector Executive Controllers.*
- *Coordinate if needed with the Planning Controller or Multi-Sector Planner about planned conflict solution strategies.*
- *Coordinate the implementation of system support tools derived conflict solutions with the Planning Controller or Multi-Sector Planner. Only when needed/non-expected actions as most actions are visible directly in the system*
- *Handle flight-information.*
- *Apply appropriate separation to all controlled flights departing his area of jurisdiction.*
- *Transfer control of aircraft to the appropriate Executive Controller when clear of traffic within his area of jurisdiction.*
- *Assign specified headings, speeds and levels suitable for the planned approach.*
- *Inform pilots about the intended approach procedures and determine (if not done by arrival management systems) the approach sequence.*
- *Issue approach and, if necessary, holding instructions.*
- *Issue approach clearance.*

⁹ *In italic are the tasks that are not changed in MSP configuration*

- *He provides Alerting Service (ALRS) to all known flights according to the following three different phases (INCERFA, ALERFA, DETRESFA)*

Depending on the sector team organization (SPO), or where Collaborative Control or Flight Centric ATC operate, the following responsibilities currently assumed by the Planning Controller may partly move to the Executive Controller. However the solution PJ.10-01a will concentrate on MSP configuration.

3.3.2.1.2 ATC Multi Sector Planning Controller Role

The PC role is a monitoring role enabling the MSP to support more than one EC. The PC is responsible for strategic common decisions e.g. RWY changes, DCB issues, workload balancing between EC both in En Route and eTMA environments.

The Planning Controller will provide support to several Executive Controllers (or Executives) operating in different sectors, including ensuring suitable coordination agreements between these sectors and assisting in managing the workload of the Executive Controllers. PC is responsible for updating and managing AMAN flow (eTMA). Moreover PC coordinates nonstandard dep/arr flights (eTMA), monitors EC traffic situation continuously and acts on EC requests.

MSP (one Planning Controller providing support to several Executive Controllers) will be mainly responsible to coordinate the internal boundaries between all of the sectors within the multi-sector team, as well as coordinating each aircraft in and out of the multi sector area, regardless of whether a flight is traversing one or all of the multi sector area sectors.

The main responsibilities for Multi Sector Planner are:

- Co-ordinate entry and exit conditions at internal and external MSA boundaries.
- Prepare the passage of aircraft through the MSA by checking the risks (encounters) that may occur related with coordinated entry/exit conditions at MSA external boundaries.
- Verify the compatibility of overflying aircraft with other traffic entering or already inside the MSA and take action if necessary, coordinating with adjacent sectors (Planner) or with MSA Executive controller.
- Co-ordinate re-routing options with adjacent control areas/sectors and with MSA Executive controllers if necessary.
- Monitor internal and external constraints, complexity and workload (with a look-ahead time of 30 minutes or more).
- Mitigate traffic complexity and if necessary balance workload between Executive controllers, by applying constraints e.g. level capping, target times, levels or speeds, etc.

The Multi Sector Planner keeps also responsibilities of Planning Controller which are to¹⁰:

- Co-ordinate entry and exit conditions on EC request using SYSCO.
- Resolve boundary problems by re-coordination on EC request using SYSCO.

¹⁰ *In italic are the tasks that are not changed with the MSP role*



- Provide with tools support early conflict detection and resolution (depending on the Conflict Detection and Resolution tools horizon) if this early resolution brings operational benefit (either on the ground side or the airborne side)
- *Check flight-plans/RBT/RMTs for possible conflicts and complexity issues within its area of responsibility.*
- Plan conflict-free flight path through his/her area of responsibility and in so far as practicable, plan taking into account if the aircraft is also subjected to other network constraints in order to facilitate the execution of the RBT/RMT.
- Coordinate with the ATC Sector Executive Controller about planned conflict solution strategies.
- Implement solution strategies by communicating trajectory changes to the aircraft on delegation from ATC Sector Executive role (use of CPDLC).
- Monitor flights regarding adherence to flight plan/RBT/RMT.
- *Monitor the air situation picture.*
- *In coordination with the ATC Supervisory or Local Traffic Management roles determine the need for additional Executive Controller(s) in the case where forecast overload situations are developing.*
- *Input trajectory changes into the Flight Data Processing System when delegated by the Executive Controller using advance input capabilities through advanced HMI (flight label, list..).*
- *Co-ordinate with adjacent control areas/sectors for the delegation of airspace or aircraft.*
- Coordinate with several Executive Controllers within its area of responsibility about planned conflict solution strategies based on system derived solution proposals. Only when needed/non-expected actions as most actions are visible directly in the system.

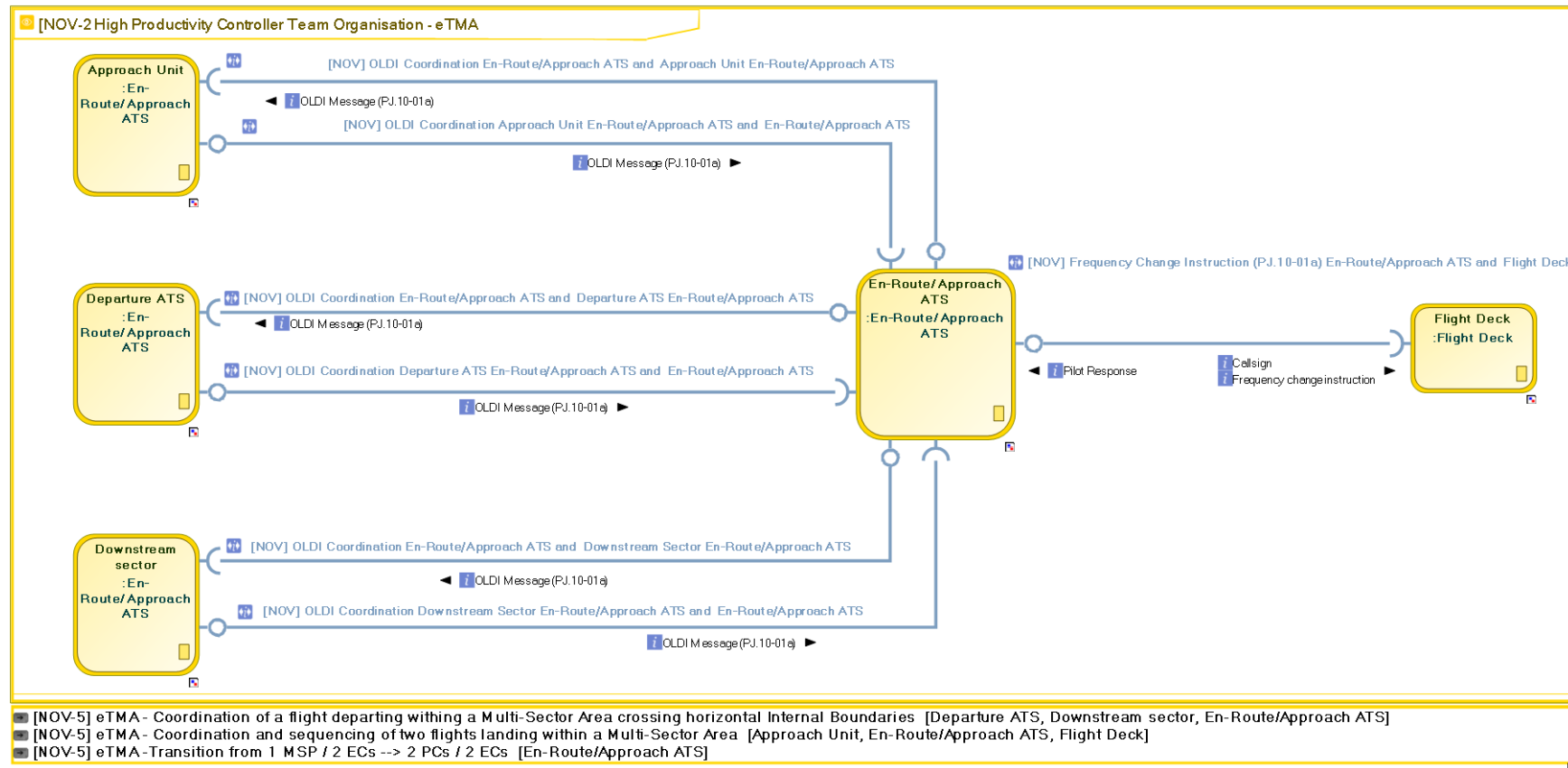


Figure 11: [NOV-2 High Productivity Controller Team Organisation - eTMA]

3.3.3 Use Cases

3.3.3.1 En Route Use cases (V2 maturity target)

The OI CM-0303 is addressing specifically the En Route environment for MSP

3.3.3.1.1 Use Case #1 - En Route - Coordination of a flight through a Multi-Sector area for strategic resolution of potential traffic conflicts¹¹

Use Case Environment

1. Sectors S1 (en-route, FL 305/UNL), S2 (en-route, FL 305/UNL), S3 (en-route, FL 305/UNL).
2. Free route environment.
3. All sectors are part of the Multi Sector Area (MSA).
4. The route will proceed northbound along the MSA until MSA exit point.
5. When the MSP request for re-routing of an aircraft outside MSA is denied, MSP needs to assess the re-routing of an aircraft inside the MSA to solve the conflict.
6. The controller's team of the MSA is formed by an MSP supporting all the sectors of the MSA and three executive controllers each one in its sector.

Assumptions

It is assumed:

- Some tools (e.g. PC-Aid Tools with what-if, electronic coordination function via HMI) will be available to the PC/MSP and the EC.
- The use of a combination of “conventional” coordination methods (i.e. call from planner to planner) and innovative silent coordination methods between MSP and one of his/her Executive Controller within the MSA (i.e. electronic coordination from planner to executive and vice versa, directly via HMI).
- Internal MSA boundaries are not subject to a Standing Agreement.

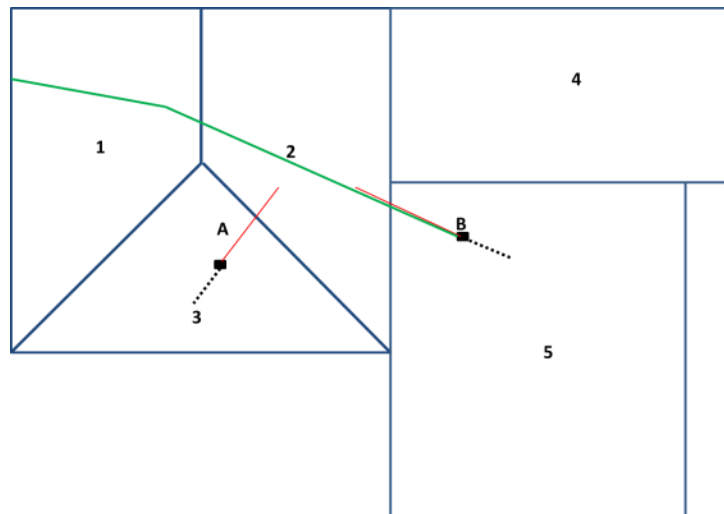
Pre-conditions

¹¹ This Use Case has been tested in the En-Route validation exercise but cannot be considered fully validated as in the tested operational environment, traffic volume and complexity, the concept has been considered not feasible.

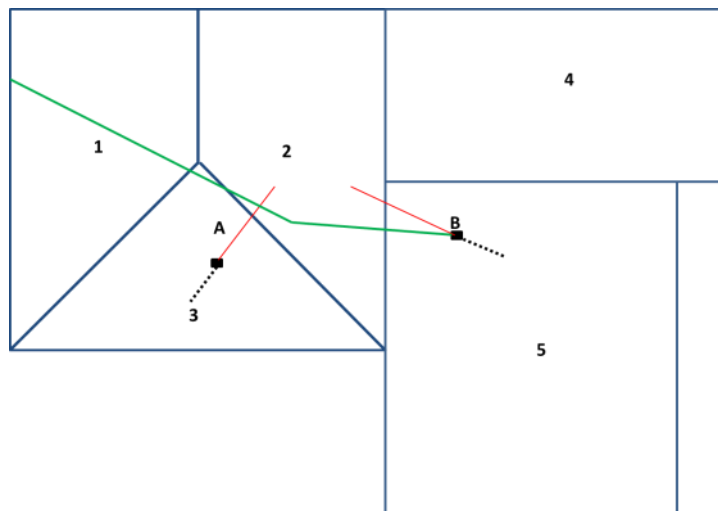
- Sector 1, 2 and 3 are managed by 1 EXE each.
- Sector 1, 2 and 3 are jointly managed by an MSP.
- Sector 5 is a conventional sector managed by a team of one Executive Controller (EXE5) and one Planning Controller (PLN5)
- Aircraft location in S5.
- Possible Conflict location in S2 at the time T1 and at FL.
- Assessment performed by MSP.
- Key aspect: three sectors are involved, one outside MSA.

Post-conditions Success End State

- MSP solves the conflict in the sector 2 within the MSA.
- EXE2 clears the aircraft to the new route through the MSA, till the potential conflict is completely solved.



MSP drags the trajectory of aircraft B (step 3)



Aircraft B trajectory displayed on the HMI

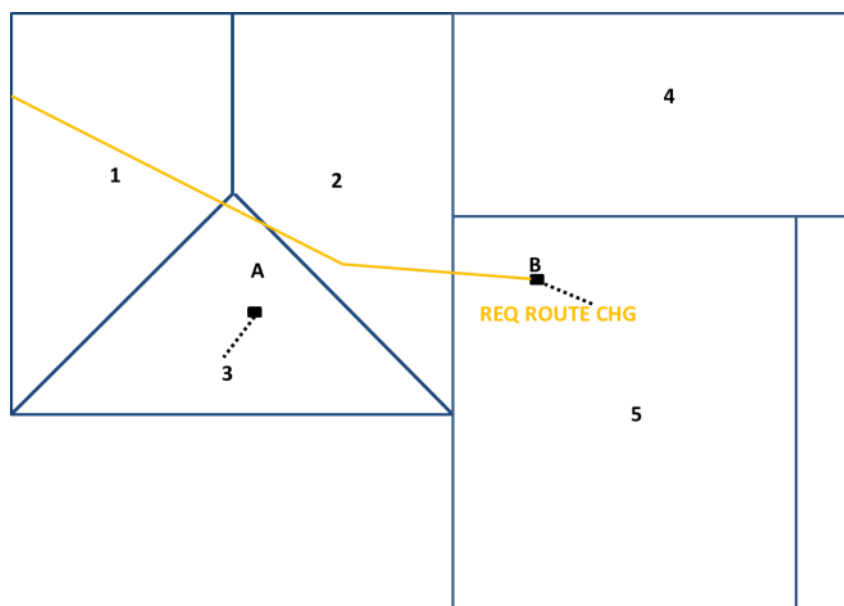


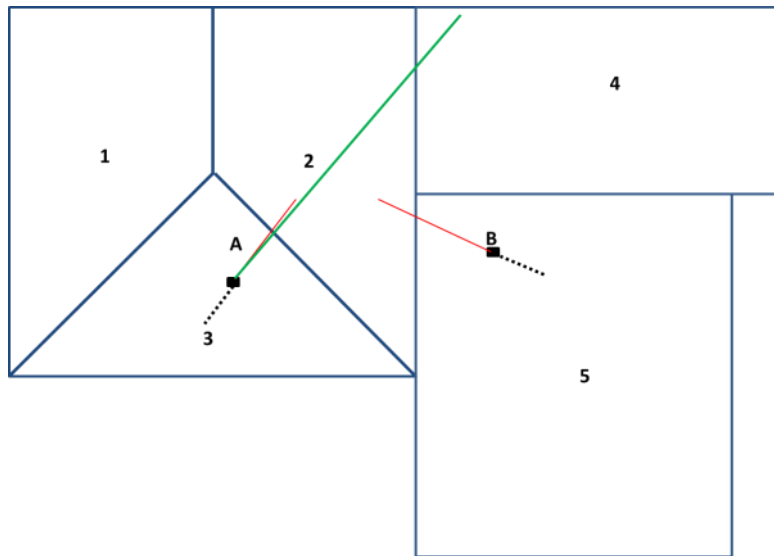
Figure 12 - Strategic resolution of potential traffic conflict (step 7 and step 8) – Main flow

Operating Method

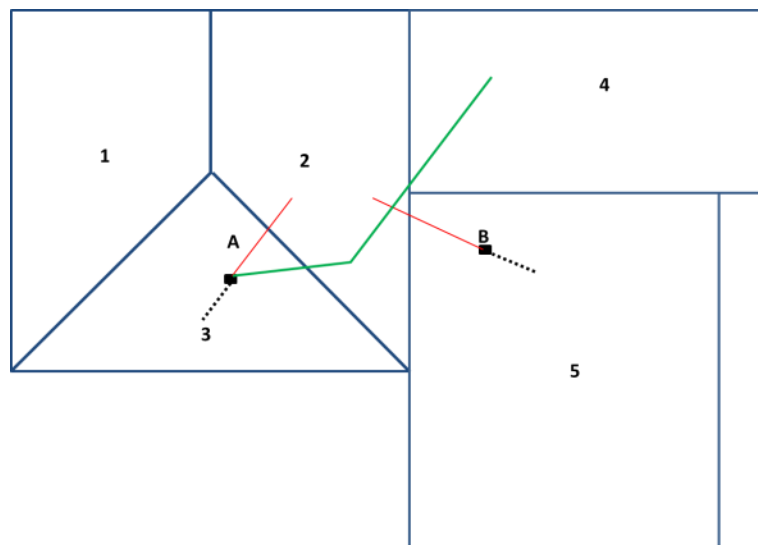
Step	MSP	Executive C. S1	Executive C. S2	Executive C. S3	PLN5	Executive C. S5
1	MSP receives an offer for a/c B for MSA entry	EXE1 receives flight data for B	EXE2 receives flight data for B	EXE3 receives flight data for B		

Step	MSP	Executive C. S1	Executive C. S2	Executive C. S3	PLN5	Executive C. S5
2	MSP using Planner Support tools detects a potential conflict in sector 2, between acft A coming from sector 3, and aircraft B coming from sector 5					
3	MSP displays on the HMI the route of acft B and using what-if function, drags the trajectory to assess the impact of a route change of acft B to solve the potential conflict.					
4	If the new trajectory can positively solve the conflict, MSP starts coordinating with PLN5 and requests for acft B on the new trajectory (ex. Direct to a point, or on heading xxx)					
5					PLN5 checks the effect of the new requested trajectory in his/her sector by the use of Planner Support tools and accepts the request.	
6					PLN5 pass the request to EXE5 via automatic coordination on HMI	
7						EXE5 can see on HMI an automatic request of route change for acft B

Step	MSP	Executive C. S1	Executive C. S2	Executive C. S3	PLN5	Executive C. S5
						received by PLN5
8						EXE5 clears acft B according to the input received by his/her Planner (PLN5)
9						EXE5 transfer the traffic to the next executive sector (EXE2)
10			EXE2 clears acft B to proceed via new route within his/her sector, till the potential conflict is completely solved and then, transfers the traffic to the next executive sector (EXE1) within the MSA.			



A/c A trajectory display on the HMI (step 8)



MSP drags the the trajectory of a/C A (step 8)

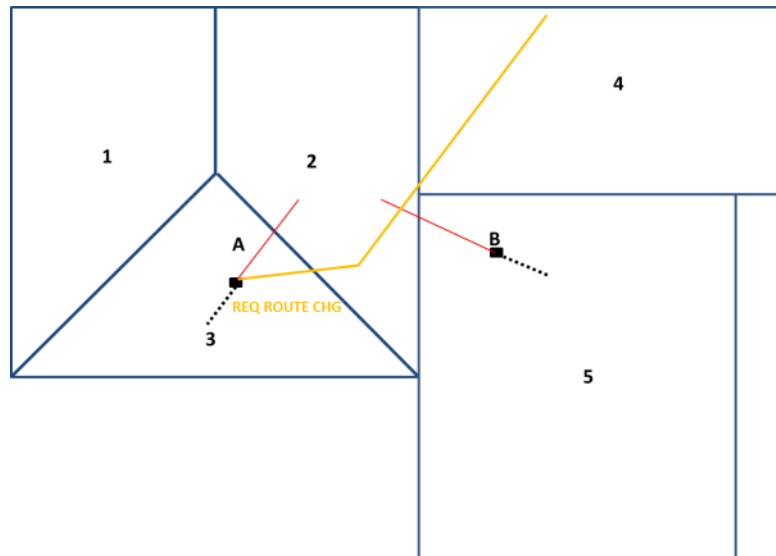


Figure 13 – Strategic resolution of potential traffic conflicts (steps 10 & 11) – Alternative flow

Alternative flow – PLN5 denies the request from MSP:

Step	MSP	Executive C. Sector 1	Executive C. S2	Executive C. S3	PLN5
6					PLN5 checks the effect of the new requested trajectory on his/her sector by the use of Planner Support tools and denies the request
7					PLN5 informs MSP that the request cannot be complied
8	Then, MSP displays the trajectory of acft A and using what-if function, drags the trajectory to assess the re-routing of				

	acft A to solve the potential conflict				
9	If the new trajectory can solve the potential conflict, MSP sends to EXE3 an automatic request for the new trajectory, via HMI.				
10				EXE3 can see on HMI an automatic request of route change for acft A, received by MSP	
11				EXE3 confirms the re-routing and clears acft A according to the input received by MSP.	
12				EXE3 transfer the traffic to the next executive sector (EXE2)	
13			EXE2 clears acft A to proceed via new route, till the potential conflict is completely solved		
14			EXE2 when the traffic is next to the MSA exit point transfer the traffic to the next executive sector (EXE4) outside the MSA.		

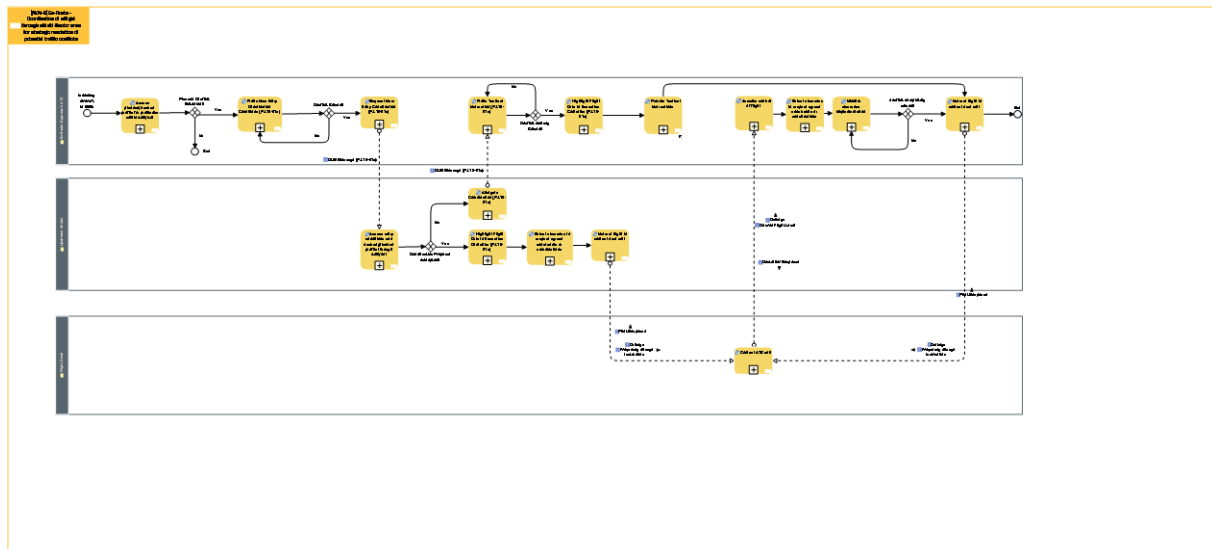


Figure 14: [NOV-5] En-Route - Coordination of a flight through a Multi-Sector area for strategic resolution of potential traffic conflicts

3.3.3.1.2 Use Case #2 - MSA configuration transition (from 1 MSP - 3 EC --> MSP - 2EC and 1PC - 1EC)

This MSA configuration transition use case represents the change of sectors configuration from a Multi-Sector Area with a MSP and three ECs to a configuration composed by MSP-2ECs and 1PC-1EC, under specific circumstances (e.g. traffic higher than expected).

The ATCO Supervisor informs all ATCOs of the MSA about the transition and change of staffing. The MSP prepares and conducts the hand-over by verbal coordination with the PC of the split sector.

The conditions and the operating method substantially don't change to manage the coordination of a flight through a Multi-Sector Area for strategic resolution of potential traffic conflicts. Refer to Use Case #1.

3.3.3.2 eTMA Use cases (V3 Maturity target)

Thanks to introduction of new tools such as Arrival Management tools and extended Arrival Management concept, the role of MSP can be also applicable in extended TMA where activities are different from TMA and under En route.

Therefore the Operational Concept of MSP can be transposed and adapted to eTMA sectors (lower En Route airspace).

The OI CM-0304b is addressing specifically the eTMA environment for MSP.

After study of different MSP operating in some TMA environment (e.g. Copenhagen TMA, Stockholm TMA, Munich TMA), it is proposed to derive the MSP concept in eTMA in high complex environment.



3.3.3.2.1 Use Case #2 - Coordination and sequencing of two flights landing within a Multi-Sector Area with horizontal Internal Boundaries

Use Case environment

1. Sectors S1 and S2 (eTMA FL110 – FL245) encompass the Multi Sector Area managed by a MSP.
2. The STARs will merge over the same IAF within sector S1.

Assumptions

It is assumed that the following tools will be available to the Executive Controller and the Multi-Sector Planning Controller (MSP):

- Conflict Detection Tools
- Monitoring Aids Tools
- System supported coordination tools (Adjacent ATSU sector/ MSA sector and MSA sector/ MSA sector, MSA sector / ACC sector)
- AMAN with extended horizon, information available to all ATCOs involved

Pre-conditions

- Sector S1 and S2 are managed by 1 EC each
- Sector S1 and S2 are jointly managed by an MSP
- An inbound flight (FLY01) is announced to the MSA (sector.1)
- An inbound flight (FLY02) is announced to the MSA (Sector 2)

Post-conditions

- FLY01 is coordinated through both sectors within the Multi-sector team.
- FLY02 is coordinated through both sectors within the Multi-sector team.
- FLY01 and FLY02 are handed over to the Approach Unit.

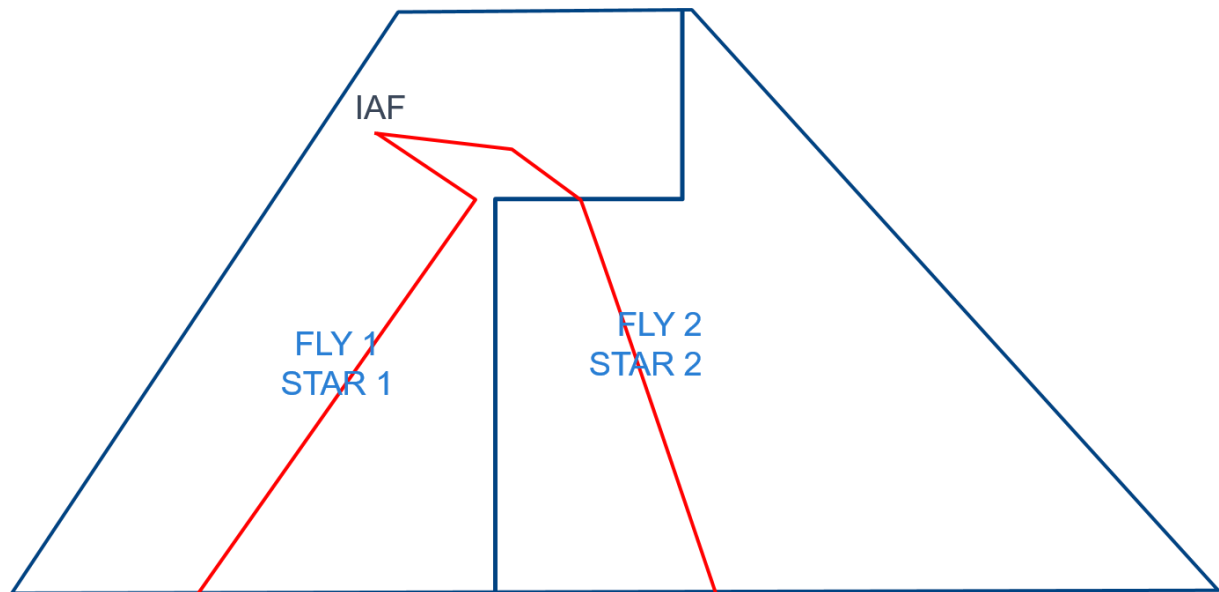


Figure 15: Use Case #2

Operating Method

Step	Multi-Sector Planner (MSP)	Executive controller Sector 1 (EC 1)	Executive controller Sector 2 (EC 2)	Notes
1	MSP receives flight data for FLY01	EC 1 receives flight data for FLY01		FLY01 is activated in the MSA FLY01 is sequenced by the AMAN AMAN sequence is visible to EC 1 and EC 2
2	MSP assesses the AMAN sequence, trajectory of FLY01, confirms the AMAN sequence of inbound flows by acknowledging the ACFT in AMAN			MSP may adjust the Arrival sequence manually
3	MSP receives flight data for FLY02		EC 2 receives flight data for FLY02	FLY02 is activated in the MSA

				FLY02 is sequenced by the AMAN AMAN sequence is visible to EC 1 and EC 2
4	MSP assesses the AMAN sequence, trajectory of FLY02, confirms the AMAN sequence of inbound flows by acknowledging the ACFT in AMAN		EC 2 receives flight data and AMAN update for FLY02	MSP may adjust the AMAN sequence manually
5	MSP updates and adjusts inputs using system coordination according traffic situation or on request from approach unit	EC 1 receives updates and system coordination, acknowledges and clears FLY01 1 accordingly		AMAN is updated accordingly AMAN sequence is visible to EC 1 and EC 2
6	MSP updates and adjusts inputs using system coordination according traffic situation or on request from approach unit		EC 2 receives updates and system coordination, acknowledges and clears FLY02 accordingly	AMAN is updated accordingly AMAN sequence is visible to EC 1 and EC 2
7	MSP sets XFLs to the approach unit	EC 1 receives XFL and clears FLY01 accordingly	EC 2 receives XFL and clears FLY02 accordingly	AMAN sequence is visible to EC 1 and EC 2 therefore both ECs are aware of the inbound traffic to be considered
8	MSP monitors the traffic flow and initiates changes if deemed necessary (go back to no. 7)			MSP assess the suitability of an XFL by the use of Planner Support tools as detailed in section 3.2.2. Also for use cases detailing the use of such tools

				refer to P04.07.02 OSD
9	MSP coordinates with EC 1 resp. EC 2, if necessary, if FLY01 and FLY02 have to be separated	EC 1 receives information and clears FLY01 accordingly	EC 1 receives information and clears FLY02 accordingly	
10		EC 1 clears FLY01 accordingly and hand-overs FLY01 to the approach unit	EC 2 clears FLY02 accordingly and hand-overs FLY01 to the approach unit	

Table 6: Use Case #2 – Operating method step description

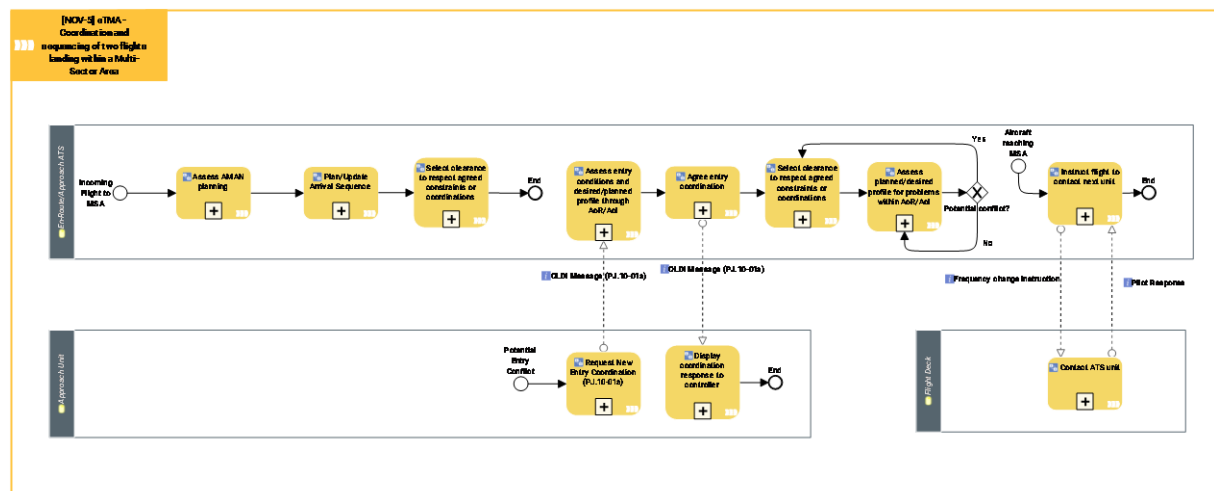


Figure 16: [NOV-5] eTMA - Coordination and sequencing of two flights landing within a Multi-Sector Area

3.3.3.2.2 Use Case #3 - Coordination of a flight departing within a Multi-Sector Area crossing horizontal Internal sector Boundaries

Use Case environment

- Sectors S1 and S2 (eTMA FL110 – FL2145) encompass the Multi Sector Area managed by a MSP.
- The SID and/or link routes to the following en-route and/or free route airspace will cross the common sector boundary

Assumptions

It is assumed that the following tools will be available to the Executive Controller (EC) and the Multi-Sector Planning Controller (MSP):

- Conflict Detection Tools

- Monitoring Aids Tools
- System supported coordination tools (Adjacent ATSU sector/ MSA sector and MSA sector/ MSA sector, MSA sector / ACC sector)
- AMAN with extended horizon, information available to all ATCO involved
- Automatic IFL are set by the system according local procedures

Pre-conditions

- Sector S1 and S2 are managed by 1 EC each
- Sector S1 and S2 are jointly managed by an MSP
- The departing flight (FLY01) is announced to the MSA (Sector 1 and sector 2)
- The departing flight (FLY01) will enter Sector 1 vertically, climbing from TMA of ADEP below MSA

Post-conditions Success End State

- FLY01 is coordinated through both sectors within the MSA.
- FLY01 is cleared by the EC 1 to IFL and handed-over to EC 2 according local procedures
- FLY01 is cleared and handed over to the en-route sector above the MSA by EC 2.

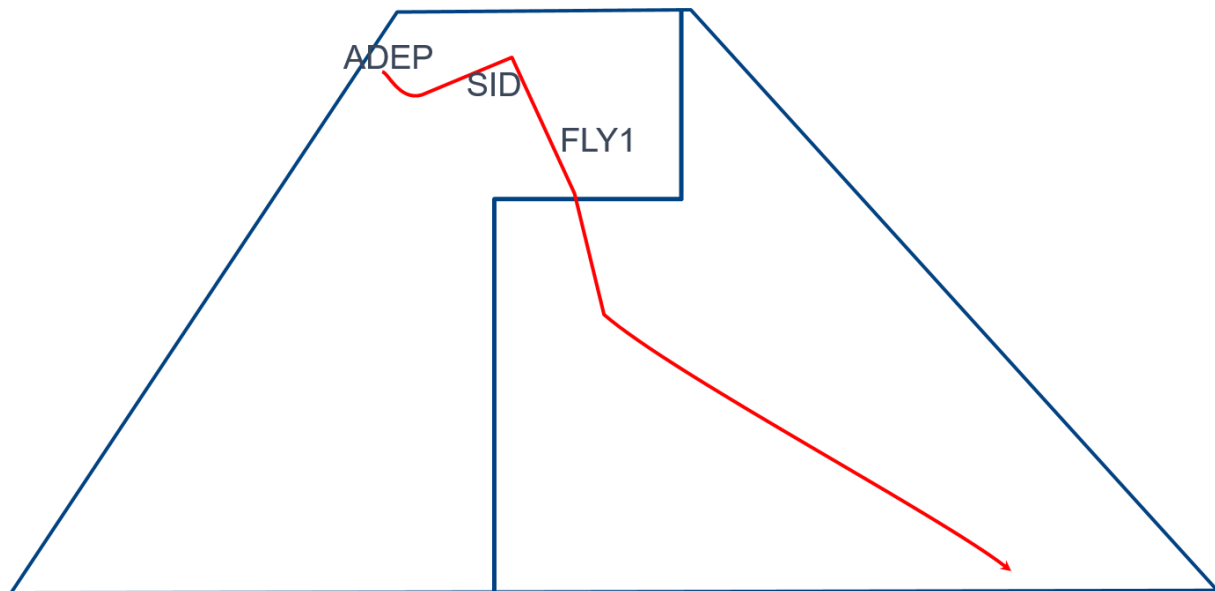


Figure 17: Use Case #3

Operating Method

Founding Members

Step	Multi-Sector Planner (MSP)	Executive controller Sector 1 (EC 1)	Executive controller Sector 2 (EC 2)	Notes
1	MSP receives flight data of FLY01 with the entry flight conditions according LoA with resp. departing unit for ADEP MSP receives IFL and hand-over conditions pre-set for FLY01 to sector 2 in the MSA MSP receives XFL and exit conditions for FLY01 to the en-route sector above	EC 1 receives flight data of FLY01 with the entry flight conditions according LoA with resp. departing unit for ADEP EC 1 receives IFL and exit conditions pre-set for FLY01 to sector 2 in the MSA	EC 2 receives flight data of FLY01 with IFL and entry conditions according local procedures EC 2 receives XFL and exit conditions for FLY01 to the en-route sector above	FLY01 is activated in the MSA Flight data is visible to EC 1 and EC 2
2	MSP assesses traffic situation and initiates coordination with departure unit by electronic coordination	EC 1 receives update and information for FLY01 according the coordination and acknowledges		The initiative may be vice versa (EC 1 could also take the initiative for coordination)
3		EC 1 clears FLY01 accordingly		
4	MSP assesses traffic situation and initiates coordination with EC 2 and/or changes IFL and/or hand-over conditions	EC 1 receives update of IFL and/or exit conditions for FLY01 to sector 2 in the MSA and acknowledges	EC 2 receives revisions on IFL and entry conditions according MSP inputs and acknowledges	The initiative may be vice versa (EC 2 could also take the initiative for changes of hand-over conditions within MSA))
5		EC 1 (re-)clears FLY01 accordingly and hands-over FLY01 to sector 2		

6			EC 2 accepts FLY01 and clears FLY01 according exit conditions	
7	MSP assesses traffic situation and initiates coordination with en-route sector above		EC 2 receives revisions on XFL and exit conditions according MSP inputs and acknowledges	The initiative may be vice versa (accepting en-route sector could also take the initiative for changes of hand-over conditions)
8			EC 2 (re-)clears FLY01 accordingly and hands-over FLY01 to en-sector above	

Table 7: Use Case #3 – Operating method step description

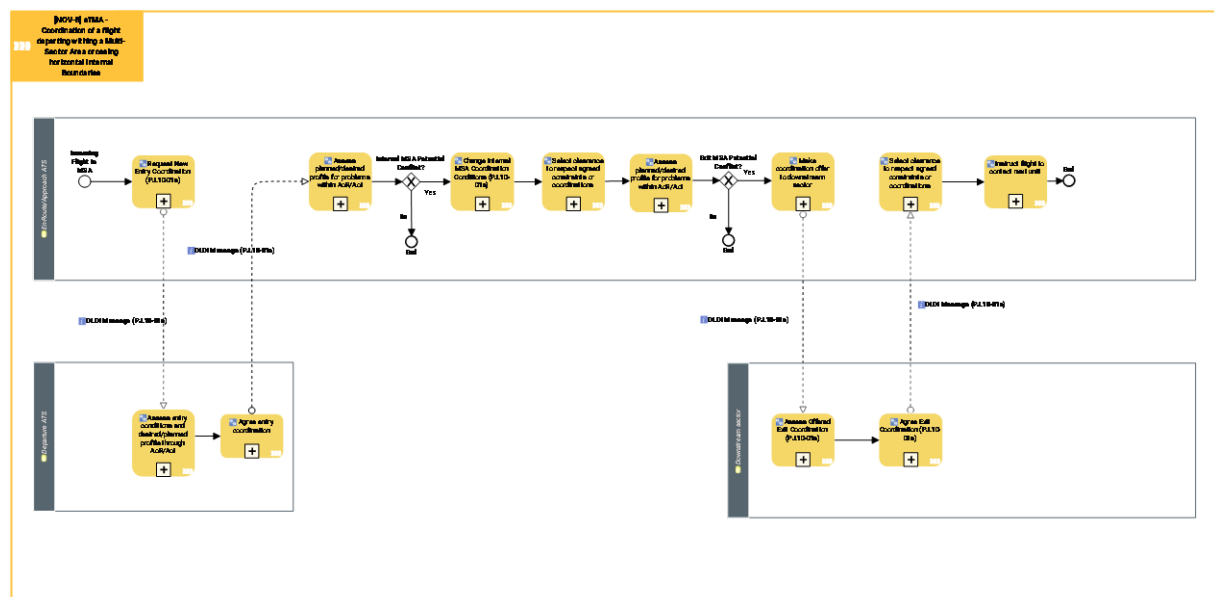


Figure 18: [NOV-5] eTMA - Coordination of a flight departing withing a Multi-Sector Area crossing horizontal Internal Boundaries

3.3.3.2.3 Use Case #4 - TMA/eTMA Transition from 1 MSP / 2 ECs --> 2 PCs / 2 ECs

Use Case environment

- Sectors S1 and S2 (eTMA FL110 – FL245) encompass the Multi Sector Area managed by a MSP.



2. Due to higher expected traffic demand the MSA will be split into two 2-manned ATCO staffed sectors (2 PC / 2 EC).

Assumptions

It is assumed that the following tools will be available to the Executive Controller (EC) and the Multi-Sector Planning Controller (MSP) as well as the Planning Controller (PC)

- Conflict Detection Tools
- Monitoring Aids Tools
- System supported coordination tools (Adjacent ATSU sector/ MSA sector and MSA sector/ MSA sector, MSA sector / ACC sector)
- AMAN with extended horizon, information available to all ATCO involved
- Automatic IFL are set by the system according local procedures
- Hand-over coordination tool by electronic means

Pre-conditions

- Sector S1 and S2 are managed by 1 EC each
- Sector S1 and S2 are jointly managed by an MSP
- Sectors shall be split and manned by 2 EC/2PC
- MSP hands-over the traffic of one part of the MSA (sector 2/S2)
- MSP will stay PC at sector 1 (S1)

Post-conditions

- two sectors working independently, each managed by one EC and PC

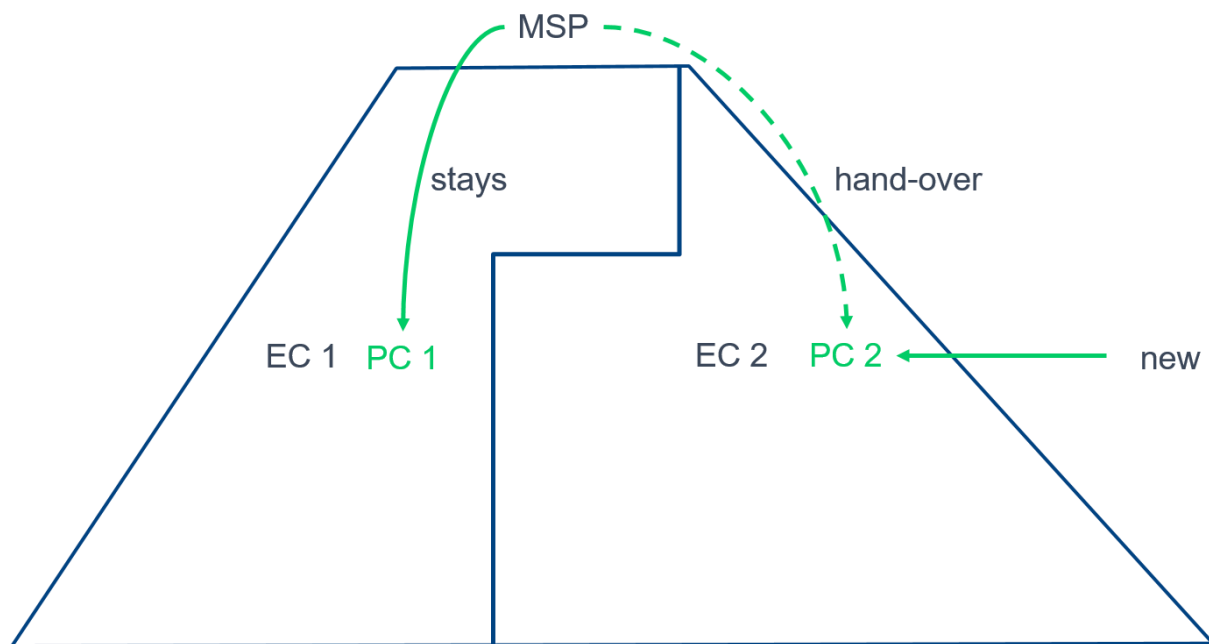


Figure 19: Use Case #4

Operating Method

Step	Multi-Sector Planner (MSP)	Executive controller Sector 1 (EC 1)	Executive controller Sector 2 (EC 2)	Notes/ Planning Controller Sector 2 (PC2)
1				SPVR announces the split and change of staffing to all ATCO of the MSA
2	MSP prepares the hand-over by input of the new sectorisation into hand-over tool	EC 1 receives new sectorisation information	EC 2 receives new sectorisation information	
4	MSP conducts the hand-over by verbal coordination to the PC2 of the split sector			
5	MSP acknowledges the hand-over in			PC 2 acknowledges the hand-over in the

	the electronic hand-over tool			electronic hand-over tool
6	MSP stays PC 1 responsible for sector 1	EC 1 acknowledges the hand-over in the hand-over tool	EC 2 acknowledges the hand-over in the hand-over tool	PC 2 now responsible for sector 2

Table 8: Use Case #4 – Operating method step description

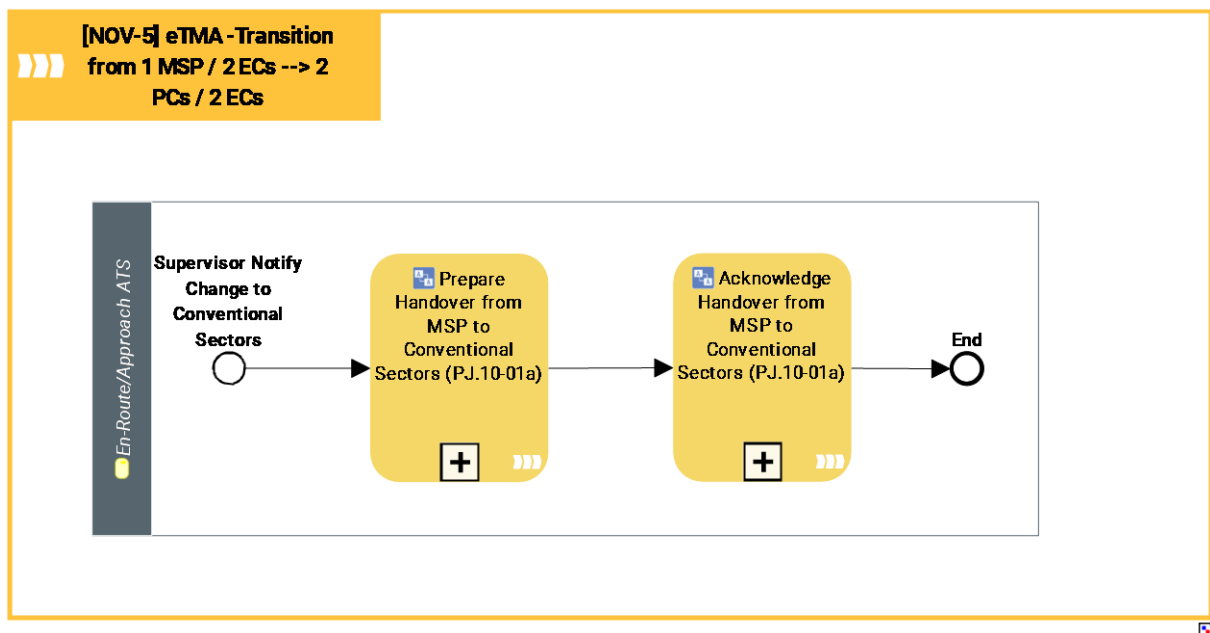


Figure 20: [NOV-5] eTMA -Transition from 1 MSP / 2 ECs --> 2 PCs / 2 ECs

3.3.3.2.4 Use Case #5 – Working within a Multi-Sector Area with high traffic scenario

Use Case environment

1. Sectors S1 and S2 (eTMA FL110 – FL245) encompass the Multi Sector Area managed by a MSP.
2. Several in- and outbound traffic flows to an aerodrome (AD).

Assumptions

It is assumed that the following tools will be available to the Executive Controller and the Multi-Sector Planning Controller (MSP):

- Conflict Detection Tools
- Monitoring Aids Tools
- System supported coordination tools (Adjacent ATSU sector/ MSA sector and MSA sector/ MSA sector, MSA sector / ACC sector)
- AMAN with extended horizon, information available to all ATCOs involved
- Automatic IFL are set by the system according local procedures

Founding Members

Pre-conditions

- Sector S1 and S2 are managed by 1 EC each
- Sector S1 and S2 are jointly managed by an MSP
- Inbound flight flows (green) are announced to the MSA
- Outbound flight flows (red) are announced to the MSA

Post-conditions

- Inbound flights are coordinated through both sectors within the Multi-sector team.
- Inbound flights are handed over to the Approach Unit.
- Outbound flights are coordinated through both sectors within the MSA.
- Outbound flights are handed over to the en-route sector above or the adjacent sectors / units.

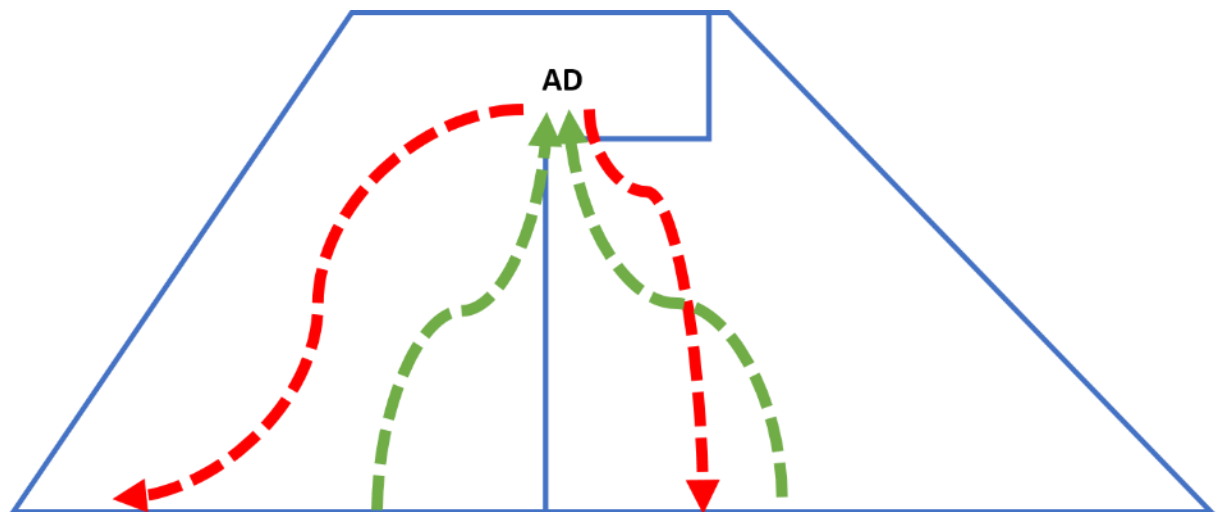


Figure 21: Use Case #2

Operating Method

Step	Multi-Sector Planner (MSP)	Executive controller Sector 1 (EC 1)	Executive controller Sector 2 (EC 2)	Notes
1	MSP receives flight data for arrival flights	EC 1 receives flight data for arrival flights		Arrival flights are activated in the MSA Arrival flights are sequenced by the AMAN

				AMAN sequence is visible to EC 1 and EC 2
2	MSP assesses the AMAN sequence, trajectory of the arrival flights and, confirms the AMAN sequence of inbound flows by acknowledging the ACFT in AMAN			MSP may adjust the Arrival sequence manually
5	MSP updates and adjusts inputs using system coordination according traffic situation or on request from approach unit	EC 1 receives updates and system coordination, acknowledges and clears arrival flights accordingly	EC 2 receives updates and system coordination, acknowledges and clears arrival flights accordingly	AMAN is updated accordingly AMAN sequence is visible to EC 1 and EC 2
7	MSP sets XFL to the approach unit	EC 1 receives XFL and clears FLY01 accordingly	EC 2 receives XFL and clears FLY02 accordingly	AMAN sequence is visible to EC 1 and EC 2 therefore both ECs are aware of the inbound traffic to be considered
8	MSP monitors the traffic flow and initiates changes if deemed necessary (go back to no. 7)			MSP assess the suitability of an XFL by the use of Planner Support tools as detailed in section 3.2.2. Also for use cases detailing the use of such tools refer to P04.07.02 OSD
9	MSP coordinates with EC 1 resp. EC 2, if necessary, if arrival flights have to be separated	EC 1 receives information, clears arrival flights accordingly and	EC 1 receives information, clears arrival flights accordingly and	

		hand-overs FLY01 to the approach unit	hand-overs FLY01 to the approach unit	
10	MSP receives flight data of departing flights with the entry flight conditions according LoA with resp. departing unit for ADEP MSP receives IFL and hand-over conditions pre-set for FLY01 to sector 2 in the MSA MSP receives XFL and exit conditions for FLY01 to the en-route sector above	EC 1 receives flight data of departing flights with the entry flight conditions according LoA with resp. departing unit for ADEP EC 1 receives IFL and exit conditions pre-set for departing flights to sector 2 in the MSA	EC 2 receives flight data of departing flights with IFL and entry conditions according local procedures EC 2 receives XFL and exit conditions for departing flights to the en-route sector above or adjacent sector	Departing flights are activated in the MSA Flight data is visible to EC 1 and EC 2
2	MSP assesses traffic situation and initiates coordination with departure unit by electronic coordination	EC 1 receives update and information for departing flights according the coordination and acknowledges		The initiative may be vice versa (EC 1 could also take the initiative for coordination)
3		EC 1 clears departing flights accordingly		
4	MSP assesses traffic situation and initiates coordination with EC 2 and/or changes IFL and/or hand-over conditions	EC 1 receives update of IFL and/or exit conditions for departing flights to sector 2 in the MSA and acknowledges	EC 2 receives revisions on IFL and entry conditions according MSP inputs and acknowledges	The initiative may be vice versa (EC 2 could also take the initiative for changes of hand-over conditions within MSA))
5		EC 1 (re-)clears departing flights accordingly and hands-over departing		

		flights to sector 2 or adjacent sector		
6			EC 2 accepts departing flights and clears them according exit conditions	
7	MSP assesses traffic situation and initiates coordination with en-route sector above or adjacent sector		EC 2 receives revisions on XFL and exit conditions according MSP inputs and acknowledges	The initiative may be vice versa (accepting en-route sector could also take the initiative for changes of hand-over conditions)
8			EC 2 (re-)clears departing flights accordingly and hands-over to en-sector above or adjacent sector	

Table 9: Use Case #5 – Operating method step description

3.3.4 Differences between new and previous Operating Methods

Activities (in EATMA) that are impacted by the SESAR Solution	Current Operating Method	New Operating Method
Agree coordination actions	The PC is responsible for inter-sector coordination tasks (e.g. entry / exit coordination, FL changes, direct routings). The EC can amend and set a new coordination.	The MSP is responsible for managing the coordination across MSA external boundaries using system support (SYSCO) The MSP is also responsible for ensuring the coordination across sectors within the MSA (with ECs) using system support (SYSCO)
Agree entry coordination	Verbal or electronic communication to open a negotiation process with previous sector if needed.	To negotiate with previous sector, if needed, the coordination is supported by electronic coordination (screen to screen).

Assess offered entry coordination and desired profile	The PC, using their knowledge of the environment, airspace, LoAs, constraint and the current situation, to set entry/exit conditions across sector boundaries with external sectors.	The MSP sets the most optimal entry/exit conditions at MSA external boundaries looking for encounters and traffic issues in order to facilitate the flight intent. Unnecessary vertical constraints are removed when possible. Internal MSA coordination values can be established as internal constraints by the MSP for separation management if required by ECs or for workload balancing purposes. The MSP will be supported with tools.
Assess traffic complexity	This activity is run periodically to assess the complexity of the current and future traffic situation at the ACC level based on forecasts. This is mainly performed at ACC planning phase	In coordination with LTM, the MSP will constantly monitor complexity in order to ensure adequate workload for the ECs in the MSA.
Assess trajectory profile through the AoR for tactical controller suitability	The PC looks along the flight path in his/her AoR to assess whether the anticipated exit conditions or any in-AoR constraints present an unacceptably high level of difficulty for the tactical controller to achieve (e.g. due to conflicting flights within the sector).	The MSP will assess trajectory profile with the MSA with the support of CDTs
Determine de-complexing solutions	When the traffic situation involves an increase level of complexity, the PC identify potential solutions with support of the supervisor and/or LTM	The MSP will determine de-complexing solutions with the support of additional tools such as What if facilities to assess several pre-determine scenarios for complexity resolution before their actual implementation. This could be performed also with the EAP/LTM support at ACC level instead of MSA level.

Determine planning problems at offered entry conditions	the PC assesses the entry conditions of the flight and, taking into account any separation/complexity issues, determines: - The possibility to remove any unnecessary pre-tactical and/or procedural constraint which was so far applicable for the flight - The potential need to apply additional constraints	The MSP will perform this task within the MSA, taking benefit to optimise exit/entry conditions between sectors in the MSA.
Determine safe potential exit coordination	The PC looks at the characteristics of the flight and its expected trajectory profile through his/her AoR, gaining an overview of potential issues and optimisation opportunities within his/her AoI and potentially anticipating new exit conditions if necessary	The MSP will perform this task within the MSA, taking benefit to optimise exit/entry conditions between sectors in the MSA..
Implement trajectory management solutions		
Make coordination offer to following sector	Having identified appropriate exit conditions, coordination offer is made by the PC to the following sector.	Coordination offer at MSA external boundaries is made by the MSP controller. The EC can make explicit coordination offer at MSA internal boundaries (or require the MSP to do it on their behalf) only when needed.
Monitor de-complexing solution implementation	The PC monitors the de-complexing solution's implementation and impact. If the evolution of the situation is not satisfactory, another cycle of complexity assessment and resolution is launched	
Refer to Executive Controller who assesses problems	The PC highlights issue to the tactical controller. The Executive controller makes a decision whether he/she accepts the responsibility for monitoring and/or resolving the problem or whether a	The MSP will highlights issue to the concerned EC.



	revised sector entry coordination is required	
Reject flight	If the flight cannot be reasonably accepted into the sector the coordination is to be rejected	No change
Revise entry coordination with previous sector	Entry coordination is amended as required in agreement with offering sector in the form of verbal coordination.	The coordination is supported by electronic coordination (screen to screen). Verbal coordination will be reduced to minimum.

Table 10: Difference between new and previous Operating Method

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

4.1 Naming rules

Requirements identifier follows the following schema:

REQ-10-01a-SPRINTEROP-AAij.Oxyz

where 'AA' is set to:

- 'FM' for operational requirements related to Air Traffic Flow and Capacity Management in the frame of INAP12
- 'SP' for operational requirements related to Separation Provision (in general)
- 'PC' for operational requirements related to Planning Separation Assurance
- 'TC' for operational requirements related to Executive Separation Assurance

and 'ij' is set to:

- '00' for operational requirements at airspace level
- '01' for operational requirements at actor/role level
- '02' for operational requirements at system level

All these OSD requirements are traced with the <Operational> category.

4.2 Operational Requirements

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0001
Title	Multi Frequency Monitoring for MSP
Requirement	The MSP shall have the ability to monitor any of the Executive sector frequencies at any one time and be able to switch between them
Status	<validated>
Rationale	MSP may need to be able to monitor two (or more) non-coupled frequencies at the same time. However, there could be concurrent radio communications within monitored frequencies. This may result to a reduction of situation awareness for Multi-Sector Planner. The MSP may be less aware of both (or more) sectors' traffic requests due to divided attention. The EC(s) may have to wait for actions to be taken by the MSP. (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>,<Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Monitor Traffic
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0002
Title	Highlight of calling aircraft to the MSP
Requirement	The MSP shall visualize the calling ACFT. Visualisation of calling ACFT (or incoming requests by CPDLC) for MSP, or a time staggered replay of transmissions on the different frequencies, to mitigate a loss of calls. The effect of an enhanced radio direction finder (RDF) equipment is the visual indication on the radar label of an in-calling ACFT. E.g. MUAC used a 7NM circle around the target to visualize the calling ACFT. Remark: This could be achieved either by a triangulation of a direction finder (DF) signal of more than one antenna (See MUAC solution), - or by using the ADS-B (Automatic Dependent Surveillance) technology by which radio transmissions will be sent via datalink instead of radio frequencies.
Status	<validated>
Rationale	MSP may not be able to monitor two (or more) non-coupled frequencies at the same time, resulting in less efficient operations. This may result to a reduction of situation awareness for the planner, as a Multi-Sector Planner. The MSP may be less aware of both (or more) sectors' traffic requests due to divided attention. The EC(s) may have to wait for actions to be taken by the MSP. <u>Remark:</u> Considering the situation in the present two-manned sector setup, the RP may have a reduced awareness and perception already now in high traffic load situation. Indicate (if applicable) the changes with respect to previous versions of this requirement in previous editions of the SPR-INTEROP/OSED. (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>,<Human Performance>

[REQ Trace]



Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Monitor Traffic
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity



[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0003
Title	Controller Support Tools
Requirement	The controllers (MSP, PCs and ECs) shall be aided by support tools in all configurations (1PC – 1EC, 1PC – ‘n’ EC configuration, (PC-Aid, TC-Aid), CMON, etc...
Status	<validated>
Rationale	The Controller Support Tools shall be configurable to MSP configuration including 2 to n sectors in order for the MSP to keep situation awareness on the MSA (EXE-10-01a-V3-VALP-001)
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Monitor Traffic Monitor trajectories and assess traffic situation Monitor conflict
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0004
Title	System Coordination between MSP and Executives
Requirement	Executive and MSP controllers shall visualize the same information whenever they electronically communicate; whenever a modification is performed is performed on one side, it should be reflected on both parts.
Status	<validated>
Rationale	Reduced Situational Awareness (SA) by the MSP: MSP needs to follow the executive traffic to understand the plans of the ECs. MSP may not have sufficient situational awareness (SA) to follow the executive traffic plans in all sectors in the MSA, due to divided attention. This issue, may, however, be dependent on the sectors that are going to be combined for MSP concept, and the traffic load of all sectors in the MSA. Trajectory Based ATC system with a System Co-ordination functionality (SYSCO) which allows electronic interaction with the system and information sharing via configurable CWP HMIs. This enables both EC and PC to have the same information visible at the CWP. An electronic communication tool shall be existing between ECs and MSP for e.g. updating RFL and XFL. EC receives pilots request > puts in update in FPL mask > PC receives update visually and executes planning updates (REV, etc.) (E.g. updating RFL and XFL) (EXE-10-01a-V3-VALP-001)
Category	<Operational>, <Safety>, <Human Performance>,

[REQ Trace]



Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Coordination of new routing/transfer conditions
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0006
Title	Information update and display for MSA actors
Requirement	Any change made by any ATCO in the MSA shall be visible to the actors involved.
Status	<validated>
Rationale	Actors (ATCOs) within the Multi-Sector Area shall have the most up to date coordination displayed (Locally configured HMI). (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>,<Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Monitor and Separate traffic Highlight Flight Data to Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0007
Title	CWP sectors Role Configuration
Requirement	The CWP shall be able to be configured for different roles including MSP working in a combine scenario (En Route / eTMA).
Status	<validated>
Rationale	The Platform shall allow supervisors to configure the control room disposition in the most suitable way for the income task regarding the task and roles of the taskforce. (EXE-10-01a-V2-VALP-001, EXE-10-01a-V3-VALP-001)
Category	<Operational>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	handover
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0008
Title	Selective Flight Data Display
Requirement	The MSP should be able to select a view that filters flight data and encounters from all of the other Executive Sectors except for the one of interest (although critical information associated with the non-selected Executive sector/s may override that filter).
Status	<validated>
Rationale	There may be situations where the MSP only wishes to view 1 sector for a brief period of time (e.g. if there is clutter on the situation display) and there should be no opportunity for confusion for the MSP between the sets of Executive data and encounters (EXE-10-01a-V3-VALP-001)
Category	<Operational>, <Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Monitor and Separate traffic
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a--SPRINTEROP-MSP01.0009
Title	Encounter Filtering
Requirement	Information from CD/R tools shall be configurable for each role and CWP including MSP
Status	<validated>
Rationale	The information shall only be displayed to relevant actor (EXE-10-01a-V2-VALP-001, EXE-10-01a-V3-VALP-001)
Category	<Operational>, <Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Controller Working Position personal setting
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity



[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0010
Title	MSP traffic monitoring before it enters the MSA
Requirement	The MSP role SHALL be able to monitor traffic prior it enters the MSA
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. (EXE-10-01a-V2-VALP-001, EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>,<Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Monitor and Separate traffic
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0011
Title	Conflict identification of the CDT prior a/c enter the MSA
Requirement	The CDT SHALL support ATCOs to timely identify conflicts in the two sectors of the MSA prior a/c enters it
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. (EXE-10-01a-V2-VALP-001, EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Conflict Detection Conflict Assessment
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0012
Title	MSP HMI anticipation support
Requirement	The CWP display SHALL support the MSP role in anticipating how a new flight will impact on the traffic of the two sectors of the MSA
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>

[REQ Trace]



Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Traffic monitoring Traffic planning
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0013
Title	MSP HMI identification support
Requirement	The CWP display SHALL support the MSP role in identifying which flight belong to which sectors of the MSA
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. (EXE-10-01a-V2-VALP-001, EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Traffic monitoring Assume control of flight
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0015
Title	MSP coordination with upstream/downstream sector
Requirement	The MSP role SHALL be able to coordinate with an upstream/downstream sector—via telephone or electronic coordination tool—a change of the entry/exit point and/or flight level of individual flights in order to prevent conflict at planning level.
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>,<Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Coordinate with tactical controller for situation awareness sharing or tactical resolution assessment Coordination with next ATSU Change Internal MSA Coordination Conditions
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0016
Title	ECs coordination with upstream/downstream sector
Requirement	The ECs SHALL be able to coordinate with an upstream/downstream sector—via the electronic coordination tool—a change of the entry/exit point and/or flight level of individual flights in order to prevent conflict at tactical/planning level.
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>,<Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Coordinate with tactical controller for situation awareness sharing or tactical resolution assessment Coordination with next ATSU Change Internal MSA Coordination Conditions
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0017
Title	ECs coordination with EC and/or MSP
Requirement	The ECs SHALL be able to coordinate with the EC and/or the MSP a change of the entry/exit point and/or flight level of individual flights in order to prevent conflict at planning level.
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. See section 4.4.2 of the Human Performance Report (EXE-10-01a-V2-VALP-001, EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>,<Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Coordinate with tactical controller for situation awareness sharing or tactical resolution assessment Coordination with next ATSU Change Internal MSA Coordination Conditions
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0018
Title	MSPs coordination with EC and/or MSP
Requirement	The MSPs SHALL be able to coordinate with the EC and/or the MSP a change of the entry/exit point and/or flight level of individual flights in order to prevent conflict at planning level.
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. See section 4.4.2 of the Human Performance Report (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>,<Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Coordinate with tactical controller for situation awareness sharing or tactical resolution assessment Coordination with next ATSU Change Internal MSA Coordination Conditions
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0020
Title	Coordination tool clarity of communication status
Requirement	Whenever a controller is involved in an electronic coordination (screen to screen), he/she should be notified of the status of the coordination (request vs proposal)
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. See section 4.4.2 of the Human Performance Report. (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>,<Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Coordinate with tactical controller for situation awareness sharing or tactical resolution assessment Coordination with next ATSU Change Internal MSA Coordination Conditions
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0021
Title	Coordination tool clarity about communication perspective
Requirement	Whenever a controller is involved in an electronic coordination (screen to screen), he/she should be notified of whether a MSP or EC controller is involved
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. See section 4.4.2 of the Human Performance Report. (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>,<Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Coordinate with tactical controller for situation awareness sharing or tactical resolution assessment Coordination with next ATSU Change Internal MSA Coordination Conditions
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0022
Title	Coordination tool clarity about the communication initiator vs recipient
Requirement	. Whenever a controller is involved in an electronic coordination (screen to screen), he/she should have the mean to see if he/she is the initiator or the recipient
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. See section 4.4.2 of the Human Performance Report.
Category	<Operational>,<Safety>,<Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Coordinate with tactical controller for situation awareness sharing or tactical resolution assessment Coordination with next ATSU Change Internal MSA Coordination Conditions
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0023
Title	Coordination visibility to MSP team
Requirement	The Coordination tool SHALL make visible electronic coordination to all members of the MSP team (all-in-the-loop philosophy). Whenever a controller is involved in an electronic coordination (screen to screen), he/she should be notified of the actors that are involved in the sequence (MSP or EC)
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. See section 4.4.2 of the Human Performance Report. (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>,<Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Coordinate with tactical controller for situation awareness sharing or tactical resolution assessment Coordination with next ATSU Change Internal MSA Coordination Conditions
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0024
Title	CWP symmetric seating plan
Requirement	The CWP SHALL allow a symmetric seating plan, with the MSP at the center, and the two ECs at the side.
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. See section 4.4.2 of the Human Performance Report.
Category	<Operational>,<Safety>,<Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0025
Title	Proximity of MSP CWP to ECs CWP
Requirement	MSP and its ECs SHALL seat sufficiently close so that verbal communication is possible, and that the MSP can see ECs' screen and vice versa.
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. See section 4.4.2 of the Human Performance Report (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>,<Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0026
Title	EC support tool
Requirement	The EC SHALL be provided with system support to anticipate deviation of a/c in theirs sector.
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report.
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Monitor and Separate Traffic
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0027
Title	MSP support tool
Requirement	The MSP role SHALL be provided with support to anticipate deviation of a/c in the MSA.
Status	
Rationale	See section 4.3.3 of the Safety Assessment Report. (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Monitor and Separate Traffic
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0028
Title	Team configuration transition
Requirement	Hardware (chairs and hardware) SHALL permit a rapid transition from one team configuration to the other.
Status	
Rationale	See section 4.3.3 of the Safety Assessment Report.
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0029
Title	Detection of erroneous read back by the pilot
Requirement	In order to ensure correct readback from the pilot, the ATCO shall be provided with a mean detect erroneous read back by the pilot.
Status	
Rationale	See section 4.3.3 of the Safety Assessment Report. (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Radio frequency listening Provide Pilot Response
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0030
Title	Detection of erroneous/inconsistent clearances provided by the EC
Requirement	In order to ensure correct situation awareness the ATCO SHALL be provided with a mean to permit the detection of erroneous/inconsistent clearances provided by the EC.
Status	
Rationale	See section 4.3.3 of the Safety Assessment Report.
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0031
Title	Traffic level definition
Requirement	Lower and upper traffic levels for which the MSP team should be in use SHALL be defined at unit level.
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Adapt Sector Configurations
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0032
Title	MSP periods in use planning
Requirement	The supervisor SHALL be able to plan the periods when the MSP shall be in used and when not.
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report.
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Adapt Sector Configurations
<ALLOCATED_TO>	<Role>	ATC Supervisor
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0033
Title	MSP team workload monitoring
Requirement	The supervisor SHALL be able to monitor the workload of the MSP team members.
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Role>	ATC Supervisor
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0034
Title	Decision to teams configuration split
Requirement	The supervisor SHALL command a split—from the MSP configuration to two 1PC-1EC teams—before traffic levels exceed the maximum tolerable workload level.
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report.
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Monitor complexity/optimization opportunities Adapt Sector Configurations
<ALLOCATED_TO>	<Role>	ATC Supervisor
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0035
Title	MSP team workload level report
Requirement	MSP team members SHALL be able to report electronically their individual workload levels.
Status	<validated>
Rationale	See section 4.3.3 of the Safety Assessment Report. (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0036
Title	EC training to MSP operations
Requirement	The EC role SHALL be trained in MSP operations in normal and abnormal conditions.
Status	<in progress>
Rationale	See section 4.3.3 of the Safety Assessment Report.
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0037
Title	MSP training to MSP operations
Requirement	The MSP role SHALL be trained in MSP operations in normal and abnormal conditions.
Status	<In progress>
Rationale	See section 4.3.3 of the Safety Assessment Report.
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0038
Title	System support to handover
Requirement	System functionalities should be developed to support handover (providing, e.g. info on a/c on the frequency, pending coordination).
Status	<In progress>
Rationale	See section 4.3.3 of the Safety Assessment Report. See section 4.4.2 of the Human Performance Report
Category	<Operational>,<Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	ATCO prepares for New Sectorisation
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0039
Title	MSP role
Requirement	Working Methods SHALL specify that MSP role has to exploit his/her global view (of the two sectors combined) to streamline the work for both ECs.
Status	<validated>
Rationale	Section 4.4.2 of the HPAR V3 <i>Explanation: Compared to a classic 1PC-1EC configuration, the planner on a MSP configuration has to serve two executives, not one. Therefore, it is needed that the traffic is streamlined for both ECs, i.e., the MSP should not complicate the work for one EC while trying to optimize traffic only for one EC. The MSP can take this optimising role for both EC given that he has a larger view of the traffic than anyone of his Executives. (The MSP maintains a view of the Multisector Area, which comprises the two sectors controlled by each Executives.)</i> (EXE-10-01a-V3-VALP-001)
Category	<Operational>,<Human Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0040
Title	MTCD alerts
Requirement	Only MTCD alerts corresponding to a predicted loss of both vertical and horizontal separation minima shall be displayed on the track label of the flight tracks involved in the conflict.
Status	<In progress>
Rationale	To avoid confusion and to minimize time to complete a conflict detection task, need for MSP to have displayed just information pertinent to the flight tracks involved in the conflict, directly from the label. Derived from Safety assessment related to EXE-10-01a-V2-001
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Conflict Detection Conflict Assessment
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0041
Title	Visualization of the what-if try on HMI
Requirement	When the MSP uses the What-if function to check if a given FL change or Route change is conflict free, the visualisation of the outcome shall be provided as close as possible to the HMI area where the request was issued (e.g. in the track label)
Status	<In progress>
Rationale	Need for MSP to minimize the risk that he/she will spend too much time to check the validity of the proposed change. Derived from Safety assessment related to EXE-10-01a-V2-001
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Conflict detection Conflict Assessment Assess Negotiating Trajectory (What-if)
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0042
Title	HMI feature for EC
Requirement	When receiving a conflict resolution proposal (either FL change or Route change) via the What-if functionality, the EC shall be able to implement/reject the proposal using an HMI feature located as close as possible to the affected flight (e.g. in the track label).
Status	<In progress>
Rationale	Need for EC to minimize the risk of spending too much time before implementing/rejecting the conflict resolution proposal. Derived from Safety assessment related to EXE-10-01a-V2-001
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Resolution of conflict Coordinate conflict responsibility and resolution; possible re-assignment
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0043
Title	Coordination proposal notification to MSP/PLN on HMI
Requirement	When receiving a coordination proposal via the E-Coordination tool, the PLN or MSP shall receive on the HMI a visible notification that the proposal has arrived, as close as possible to the affected flight (e.g. in the track label) in order to minimize the risk that the proposal will go unnoticed.
Status	<In progress>
Rationale	The MSP shall be able to coordinate with an upstream/downstream sector a change of the exit/entry flight level or of the exit/entry point of individual flights to prevent conflict at planning level, minimizing the risk that the proposal will go unnoticed. Derived from Safety assessment related to EXE-10-01a-V2-001
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Coordination of new routing/transfer conditions Coordination with next ATSU
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Role>	ATC Planning Controller
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0044
Title	Coordination proposal notification to EC on HMI
Requirement	When receiving a coordination proposal via the E-Coordination tool, the EC shall receive on the HMI a visible notification that the proposal has arrived, as close as possible to the affected flight (e.g. in the track label) in order to minimize the risk that the proposal will go unnoticed.
Status	<In progress>
Rationale	The EC within a MSA shall be able to coordinate with an upstream/downstream sector a change of the exit/entry flight level or of the exit/entry point of individual flights, to prevent conflict at planning level minimizing the risk that the proposal will go unnoticed. Derived from Safety assessment related to EXE-10-01a-V2-001
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Coordination of new routing/transfer conditions Coordination with next ATSU
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0045
Title	HMI indication
Requirement	When receiving a coordination proposal via the E-Coordination tool, the EC shall be able to immediately determine via a clear HMI indication who is the controller originator of the proposal.
Status	<In progress>
Rationale	Need for the EC within a MSA to avoid the uncertainty on the originator of a proposal to change an exit/entry flight level or point issued via the E-Coordination. Derived from Safety assessment related to EXE-10-01a-V2-001
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Monitor and Separate Traffic
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

[REQ]

Identifier	REQ-10-01a-SPRINTEROP-MSP02.0046
Title	Notification for loss of MTCD
Requirement	In case of total loss of MTCD functionalities, a visible and permanent notification shall be displayed to all MSP and PLN CWPs, with no need for the ATCO to autonomously check whether the MTCD is working or not in a dedicated diagnostic window
Status	<In progress>
Rationale	Integrity/Reliability Derived from Safety assessment related to EXE-10-01a-V2-001
Category	<Operational>,<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ.10-01a
<ALLOCATED_TO>	<Activity>	Monitor and Separate Traffic
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Role>	ATC Planning Controller
<ALLOCATED_TO>	<Sub-Operating Environment>	En Route – High complexity

Table 11: Requirements capture layout

4.3 Safety and Performance Requirements (at SPR level)

4.3.1 Safety Requirements

The requirements linked to safety are detailed in the previous chapter 4.2 as they are also linked to operational requirements

4.3.2 Performance Requirements

The introduction of MSP is mainly focused on improving Cost Efficiency by optimising the sectors allocation with combination of several Executive Controllers with a single Planning Controller.

[REQ]

Identifier	REQ-10.01a-SPRINTEROP-CC02.001
Title	Cost Efficiency (ATCO productivity) – Medium/High Complexity eTMA environment
Requirement	Cost efficiency shall be increased by at least 1.9% in a Medium/High Complexity eTMA environment.
Status	<validated>
Rationale	PJ19: Validation Targets (2019) This requirement has been validated in EXE-10-01a-V3-VALP-001. MSP implementation confirm that roster staff can gain from MSP.
Category	<Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	10-01a
<ALLOCATED_TO>	<Activity>	Select clearance to achieve desired profile Select collaborative clearance to bypass soft constraints Issue clearances to achieve conditions Modify trajectory Establish necessary separation

		Assess planned profile constraints or agreed coordinations Assess planned/desired profile for problems Check conformance to planned constraints Monitor clearance implementation Select clearance to respect agreed constraints or coordinations Execute ATC clearance Assess ATC clearance Agree coordination actions
<ALLOCATED_TO>	<Role>	Multi Sector Planner
<ALLOCATED_TO>	<Role>	ATC Executive Controller
<ALLOCATED_TO>	<Role>	ATC Planning Controller
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – Medium complexity
<ALLOCATED_TO>	<Sub-Operating Environment>	Extended TMA – High complexity

4.3.3 Human Performance Requirements

The requirements ae linked to Human Performance are detailed in the previous chapter 4.2 as they are also linked to operational requirements

4.3.4 Security Requirements

[REQ]

Identifier	REQ-10.01a-SPRINTEROP-SEC02.001
Title	Operations security controls – ATM MSP procedures
Requirement	Operating ATM MSP procedures shall be documented, maintained, and made available to all users who need to know them.
Status	< in progress >
Rationale	Ensure that ATM procedures linked to MSP concept operations are documented, maintained and made available
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	10-01a
<ALLOCATED_TO>	<Activity>	Security
<ALLOCATED_TO>	<Role>	Multi Sector Planner

[REQ]

Identifier	REQ-10.01a-SPRINTEROP-SEC02.002
Title	Operations security controls – ATM MSP facilities & services
Requirement	Changes to ATM information processing facilities, ATM services and systems shall be controlled
Status	< in progress >
Rationale	Changes to ATM procedures linked to MSP concept operations are controlled
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	10-01a
<ALLOCATED_TO>	<Activity>	Information processing
<ALLOCATED_TO>	<Role>	Multi Sector Planner

[REQ]

Identifier	REQ-10.01a-SPRINTEROP-SEC02.003
Title	Information systems security – ATM MSP facilities
Requirement	Every specification for new or updated facilities includes security requirements.
Status	< in progress >
Rationale	Ensure security is addressed in specification design
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	10-01a
<ALLOCATED_TO>	<Activity>	Specification
<ALLOCATED_TO>	<Role>	Multi Sector Planner

[REQ]

Identifier	REQ-10.01a-SPRINTEROP-SEC02.004
Title	Information systems security – ATM MSP change process
Requirement	An operational process and plan which controls how system changes are approved and implemented, and how security considerations are incorporated in the change process shall be enacted.
Status	< in progress >
Rationale	Ensure security is addressed in change process
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	10-01a
<ALLOCATED_TO>	<Activity>	Change process
<ALLOCATED_TO>	<Role>	Multi Sector Planner

[REQ]

Identifier	REQ-10.01a-SPRINTEROP-SEC02.005
Title	Information systems security – ATM MSP change testing
Requirement	Security testing shall be performed whenever a system is updated
Status	<in progress>
Rationale	Ensure security is addressed in system update
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	10-01a
<ALLOCATED_TO>	<Activity>	Testing
<ALLOCATED_TO>	<Role>	Multi Sector Planner

[REQ]

Identifier	REQ-10.01a-SPRINTEROP-SEC02.006
Title	Software design & operation security – ATM MSP
Requirement	Software design and operation shall provide detection, prevention, and recovery controls to protect ATM software against malicious code. In addition, appropriate user awareness procedures shall be implemented
Status	<in progress>
Rationale	The loss of software function or the unauthorised replay of sensitive data has a potentially high impact on Operational Safety, Performance (Delay, Environment), Cost of Operation and/or ATM reputation. Malicious software may stop operations, manipulate data to the detriment of operations, or provide unauthorised access to data or operations. Malicious software may be introduced in design or production coding, via operational updates or through the use of viruses.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	10-01a
<ALLOCATED_TO>	<Activity>	Software development

[REQ]

Identifier	REQ-10.01a-SPRINTEROP-SEC02.007
Title	Information systems security – ATM MSP Sensitive data, processing facilities protection
Requirement	Security perimeters shall be used to protect ATM sensitive areas and ATM processing facilities
Status	<in progress>
Rationale	The loss of these facilities has a high impact on Operational Safety, Performance (Delay, Environment) and Cost of Operation to ANSP and second order on Airline Operators ATM installations should be protected by physical barriers, such as external walls, and should be provided with access control mechanisms, such as external doors with badge readers, alarms and/or specific locks. ATM processing facilities should have an intruder detection system and video monitoring systems particularly when considering remote unmanned sites.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	10-01a
<ALLOCATED_TO>	<Activity>	ATM facilities



4.4 INTEROP Requirements (system level)

No Information Exchange Requirements at Service level (between Nodes) are identified in the scope of the Solution PJ.10-01a.

5 References and Applicable Documents

5.1 Applicable Documents

Content Integration

- [1] B.04.01 D138 EATMA Guidance Material
- [2] EATMA Community pages
- [3] SESAR ATM Lexicon

Content Development

- [4] D2-1 SESAR 2020 Concept of Operations Edition 2017 v01.00.00, 01 Dec 2017
- [5] D2-3 SESAR 2020 Concept of Operations Edition 2018 v01.00.00, 31 Oct 2018

System and Service Development

- [6] 08.01.01 D52: SWIM Foundation v2
- [7] 08.01.01 D49: SWIM Compliance Criteria
- [8] 08.01.03 D47: AIRM v4.1.0
- [9] 08.03.10 D45: ISRM Foundation v00.08.00
- [10] B.04.03 D102 SESAR Working Method on Services
- [11] B.04.03 D128 ADD SESAR1
- [12] B.04.05 Common Service Foundation Method

Performance Management

- [13] PJ19 D4.1 SESAR 2020 Transition Performance Framework, Edition 2017
- [14] PJ19 D4.8 SESAR2020 Transition Validation (2019) (1.0)
- [15] B.05 D86 Guidance on KPIs and Data Collection support to SESAR 2020 transition.
- [16] 16.06.06-D68 Part 1 –SESAR Cost Benefit Analysis – Integrated Model
- [17] 16.06.06-D51-SESAR_1 Business Case Consolidated_Deliverable-00.01.00 and CBA
- [18] Method to assess cost of European ATM improvements and technologies, EUROCONTROL (2014)

- [19]ATM Cost Breakdown Structure_ed02_2014
- [20]Standard Inputs for EUROCONTROL Cost Benefit Analyses
- [21]16.06.06_D26-08 ATM CBA Quality Checklist
- [22]16.06.06_D26_04_Guidelines_for_Producing_Benefit_and_Impact_Mechanisms

Validation

- [23]03.00 D16 WP3 Engineering methodology
- [24]Transition VALS SESAR 2020 - Consolidated deliverable with contribution from Operational Federating Projects
- [25]European Operational Concept Validation Methodology (E-OCVM) - 3.0 [February 2010]

System Engineering

- [26]SESAR 2020 Requirements and Validation Guidelines

Safety

- [27]SESAR, Safety Reference Material, Edition 4.0, April 2016
- [28]SESAR, Guidance to Apply the Safety Reference Material, Edition 3.0, April 2016
- [29]SESAR, Final Guidance Material to Execute Proof of Concept, Ed00.04.00, August 2015
- [30]SESAR, Resilience Engineering Guidance, May 2016

Human Performance

- [31]16.06.05 D 27 HP Reference Material D27
- [32]16.04.02 D04 e-HP Repository - Release note

Environment Assessment

- [33]SESAR, Environment Reference Material, alias, “Environmental impact assessment as part of the global SESAR validation”, Project 16.06.03, Deliverable D26, 2014.
- [34]ICAO CAEP – “Guidance on Environmental Assessment of Proposed Air Traffic Management Operational Changes” document, Doc 10031.

Security

- [35]Security Risk Assessment methodology for SESAR 2020
- [36]SecRAM catalogues 02_00_00.



5.2 Reference Documents

- [37]ED-78A GUIDELINES FOR APPROVAL OF THE PROVISION AND USE OF AIR TRAFFIC SERVICES SUPPORTED BY DATA COMMUNICATIONS.¹³
- [38]EUROCONTROL Seven-Year Forecast – February 2017, Flight Movements and Service Units 2017-2023, STATFOR Team, Edition 17/01/02-100
- [39]European Route Network Improvement Plan (ERNIP), Part 1, European Airspace Design Methodology Guidelines - General principles and technical specifications for airspace design, Edition 1.6, June 2016
- [40]PJ10 PROSA – D1.1.050 – Final VALR (etMA V3 - En Route V2)

Appendix A Cost and Benefit Mechanisms

A.1 Stakeholders identification and Expectations

Stakeholder	KPA Focus Area	R&D Needs
ANSPs	SAF	Safety will be maintained due to reduced likelihood of overload of a executive controller and better oversight of multiple sectors by the planner.
	PRD	Predictability will be increased due to reduced executive interventions, as planning will be conducted across sectors.
	FEFF	A reduction in coordination workload and improvement in planning across sectors may enable more efficient profiles to be adopted.
	CEF	Appropriate application of new team roles will enable more cost efficient use of resources.
Airspace Users	SAF	Safety will be maintained due to the improved oversight of the planning controller and the reduced likelihood of executive controller overload.
	PRD	Predictability will be increased due to a reduction in the need for executive interventions.
	FEFF	A reduction in coordination workload and improvement in planning across sectors may enable more efficient profiles to be adopted.
	FLX	An increase in flexibility would better enable requests by

Stakeholder	KPA Focus Area	R&D Needs
		airspace users for trajectory changes and also increase the options to optimise airspace management.
ATCOs	SAF	Safety will be maintained due to the improved oversight of the planning controller and the reduced likelihood of executive controller overload.
	PRD	Predictability will be increased due to a reduction in the need for executive interventions.
	FEFF	A reduction in coordination workload and improvement in planning across sectors may enable more efficient profiles to be adopted.
Pilots, flight crew	SAF	Safety will be maintained due to the improved oversight of the planning controller and the reduced likelihood of executive controller overload.
	PRD	Predictability will be increased due to a reduction in the need for executive interventions.
	FEFF	A reduction in coordination workload and improvement in planning across sectors may enable more efficient profiles to be adopted.

Table 12: Stakeholder's expectations per KPA

Stakeholder	Involvement	Why it matters to stakeholder
ANSP	Internal	Expect to optimize ATCO rostering and potentially gain in term of number of ATCOs thanks to the reduction of the

Stakeholder	Involvement	Why it matters to stakeholder
		number of Planning Controller in a MSA area when MSP is operating. Expect an increase of ATCO productivity thanks to a reduction of controller workload derived from the reduction of coordination tasks and a better distribution of workload amongst the ECs in the MSA. Expect an increase of sector capacity and a reduction of executive delays thanks to a reduction of controller workload derived from the reduction of coordination tasks and a better distribution of workload amongst the ECs in the MSA, which allows the management of the expected traffic demand. Expect to provide more optimal profiles by removing constraints. Expect to increase the situational awareness (then safety levels) of ECs and MSP in high density/complexity scenarios with high traffic load.
Airspace Users: • Scheduled Airlines; • Business Aviation; • General Aviation.	External	Expect more efficient flight profiles (less fuel burn and CO₂) during departure and arrival phase while maintaining safety levels thanks to the application of fewer constraints at sector boundaries. Expect a reduction of ATFM delay / flight time variability thanks to the reduction of flight constraints at sector boundaries.

Table 13: Stakeholder's expectations

A.2 Benefits mechanisms

The following figures illustrate – per Stakeholder group impacted – the cause-effect description of the relevant impacts that the Solution PJ.10-01a is expected to provide.

Benefits in terms of ATCO Productivity due to MSP staffing configuration (along with the associated costs) are accounted for within Solution PJ.10-01a whereas the benefits and in terms of Capacity and ATCO Productivity (and related costs) associated with CD&R tools are accounted for within PJ.10-02a.

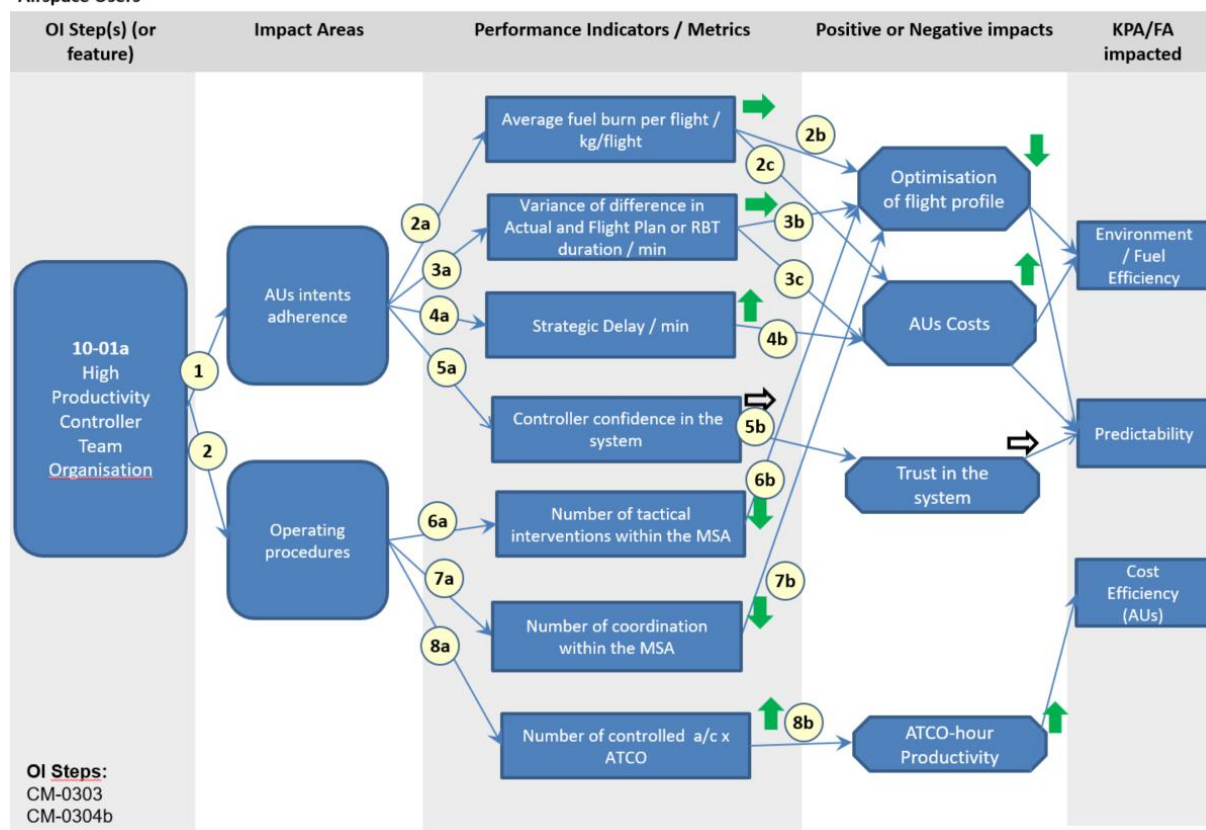
The goal for this Solution is to develop the concepts of operation and to identify the nature of system support required for operating in team structures that are not the usual Planner-Executive (1PC-1EC) two-person ATC sector team. In particular, the distinct role of the Multi-Sector Planner (MSP) where a Planner has responsibility for the airspace that is under the executive control of two or more independent Executive Controllers (1PC-nECs). High Productivity Controller Team Organization, based on one Planning Controller (Multi-Sector Planner) to several Executive Controllers, shall provide efficient and safe distribution of responsibility for traffic and separation management across the team, in order to provide efficient flight profiles through the airspace sectors under control and ensure an efficient distribution of tactical workload between the Executive Controllers.

Benefits for ANSPs & Controllers

PJ.10-01a: High Productivity Controller Team Organisation

00.00.02

Airspace Users



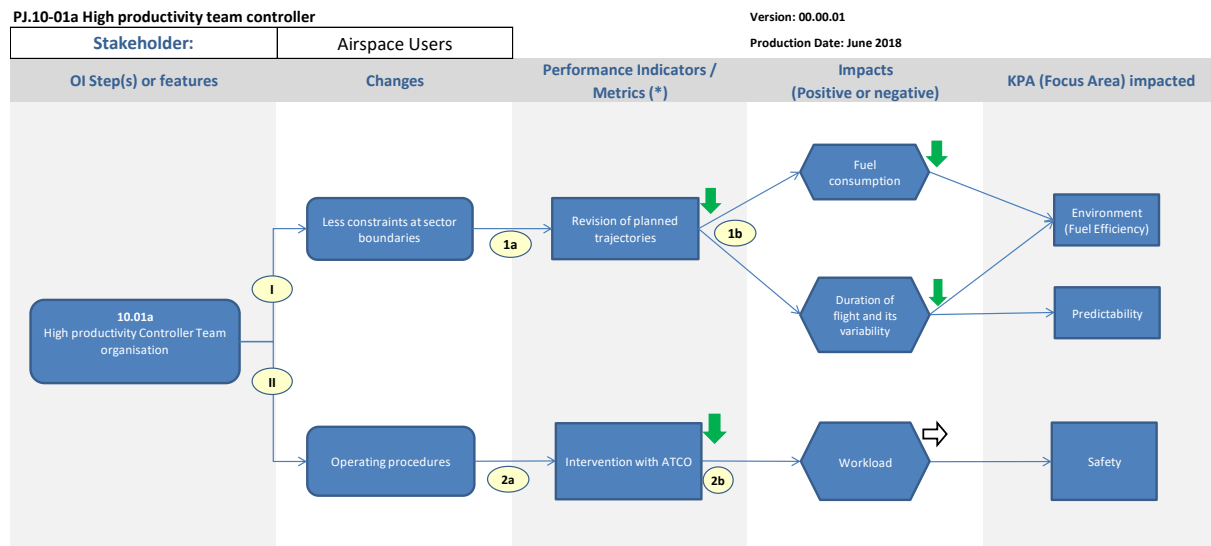
Appendix E : Figure 22: Multi Sector Planning – ANSPs & Controllers Benefit Mechanisms

Feature Description:

Founding Members

Multi-Sector Planner		Stakeholder group: ANSPs & Controllers
<i>OI CM-0303: Sector Team Operations Adapted to New Responsibilities in En Route, 1 Planning to several Tactical Controllers team structure</i>		
<i>OI CM-0304b: Sector Team Operations Adapted to New Responsibilities in eTMA, 1 Planning to several Tactical Controllers team structure</i>		
(1)	<u>Organization of controllers team and role & responsibility</u>	
(2a), (3a), (4a)	Improved oversight by the planner across more than one sector can enable best use of resources improving the balance of workload between ECs and MSP and optimizing the task sharing.	
(2b), (3b)	This is expected to provide with a positive benefit in Controller Workload which links to both Safety and Human Performance.	
(2c), (3c), (4b)	This is expected to increase situational awareness of the EC and to ensure the Planner in the loop, which links to both Safety and Human Performance.	
(5a)	The introduction of the MSP will have an impact on the ATCO confidence on the system.	
(2)	<u>“Operating procedures”</u>	
	Unexpected tactical interventions may be reduced as well.	
(6a)	By reducing the number of missed conflicts, the number of last minute trajectory changes are also reduced.	
(6b)	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 are increased.	
(7a)	The burden of coordination between sectors within the MSA is expected to be reduced.	
(7b)	A reduction in ATCO workload is envisaged, which links to Human Performance.	
(8a)	The use of MSP is expected to safely optimize the operational resources available: reducing /balancing the workload per flight may allow to increase the number of flights that an individual controller can handle safely with no negative impact on workload.	
(8b)	This can drive potential benefit in ATCO productivity (e.g. in terms of number of controlled a/c per ATCO), which links to Cost Effectiveness.	

Benefits for Airspace Users



Appendix E : Figure 23: Multi Sector Planning – Airspace Users Benefit Mechanisms

Feature Description:

Multi-Sector Planner		Stakeholder group: Airspace Users	
OI CM-0303: Sector Team Operations Adapted to New Responsibilities in En Route, 1 Planning to several Tactical Controllers team structure			
OI CM-0304b: Sector Team Operations Adapted to New Responsibilities in eTMA, 1 Planning to several Tactical Controllers team structure			
Change I Description: Introduction of MSP role in eTMA & En-Route in medium to high complexity environment will allow AUs to fly closer to their planned trajectories			
Change II Description: Introduction of MSP role in eTMA & En-Route in medium to high complexity environment will maintain Safety environments for Aus			
(1)			
(1a)	The reduction of constraints at sector boundaries in En-Route (Medium to high complexity) and extended TMA (high complexity) means less planned trajectories to be modified		
(1b)	The resulting higher adherence to the initial planned trajectory will improve - fuel consumption and flight emissions (CO2/NOx) which are linked to Environment / Fuel efficiency - In flight duration and its variability : there will be less trajectory revisions in extended TMA and En-Route. Therefore the RBT is more stable and shorter. This is linked to Predictability		

(2a)	The decrease in the revision of trajectories reduces the intervention with ATCO.
(2b)	Less intervention with ATCO will maintain workload at an acceptable level. This is linked to Safety

A.3 Costs mechanisms

The following table summarises the costs associated with the solution PJ.10-01c Collaborative Control in accordance with the categorisation of costs made by PJ19[19].

The costs of this solution have only been identified for ANSPs.

The costs have been deduced from past and similar experiences on ATM tools and systems' evolutions and provided in this document per tool or service to update.

In the OSED as in the TS, the requirements are provided per service, so it should be easy to identify each requirements' scope.

One major issue when evaluating costs is the difficulty to remain sufficiently general to englobe most of the situations (e.g.: each ANSP has its own way of managing costs) and sufficiently detailed to provide accurate data and give a rough but good idea of the implementing costs.

To avoid as much as possible this bias, 3 ANSPs have been involved to perform the cost evaluation, including the two ANSPs involved in the exercises.

Category	Sub-category	Cost type	Description
Pre-implementation Costs			
			R&D and Pre-Industrialisation costs are already incurred in the SESAR Development Phase and therefore not included in the cost assessment
Implementation Costs			
	One-Off Costs		Costs incurred during the implementation period and that are paid once
		Initial Training & Staffing	Initial Training for the new actors (MSP) Training in simulator

Category	Sub-category	Cost type	Description
		Project Management	Project Definition, Programme management and support, Planning costs, including design costs, planning authority resources and other planning costs Change management Procurement activities Meeting/ travel costs Processes and documentation costs
		Airspace design & Procedures	Changes to and design of new ATC procedures. Modification of LoAs
		Administrative costs	New procedures, regulation, processes to put in place Documentation
		Installation & Commissioning	Installation costs, Initial Test and evaluation (<i>Test plans, procedures, reports ; Test equipment/tools, including aircraft ; Test staff and training</i>) Functional integration (<i>standardisation</i>) Human/product interface
		Validation & Certification costs	Validation Safety assessments / audits
		Other One-off Costs	
	Capital Costs		
		Equipment & System	Hardware and software acquisition, Software development (<i>development, engineering, knowledge base: adaptation data, production, reviews and audit</i>) Initial software licensing
		Integration costs	Physical integration Software development System integration
		Building & Facilities	N/A

Category	Sub-category	Cost type	Description
		Land & property costs	N/A
		Licences, patent	N/A
		Other Capital Costs	N/A
	Transition Costs		Costs for maintaining current systems, during transition to a new system
		Transition Investments costs	N/A
		Transition Operations costs	N/A
		Transition Staff costs	N/A
		Other	N/A
Operating costs (includes only delta costs , i.e. changes to the operating costs that this project(s) will bring when deployed)			
	Raw Material		
		Material, supplies, utilities	
	Personal & Training		Change in costs for staff, training due to operational improvements implemented
		Personnel cost	Increase of costs associated with ATCO ratings.
		Training	ATCO should be qualified as Multi Sector Planner (extension of the Planning Controller qualification). Minor additional costs for training should be considered
		Staff support	N/A
	Maintenance & Repair		

Category	Sub-category	Cost type	Description
		Hardware & Software	Only for new functionalities for MSP and specific hardware linked to radio listening capabilities
		Other services	N/A
	Facility costs		
		Rent & Lease	N/A
		Furniture & equipment	N/A
		Communication costs	N/A
		Energy	N/A
		Property Taxes	N/A
	Administration Costs		
			Standard expenditures related to changes in procedures, regulation, processes
		Documentation	
		Travel	N/A
	Other Operating Costs		

