Step 1 AMAN + Point Merge in E-TMA - SPR

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Abstract

This document sets out the Safety and Performance Requirements related to the Operational Focus Area (OFA) 04.01.03, "AMAN + Point Merge" produced by Project 5.6.7 in STEP1.

The concept extends the usage of Point Merge to the E-TMA airspace, based on the concept previously developed by EUROCONTROL for the TMA. It describes the operating method associated with a Point Merge centric route structure, with the support of an AMAN, for Enroute ACCs and TMAs with Very High Capacity needs (VHCn).

The Requirements apply to the following operational services:

1. Airspace Design Service
2. Traffic Separation Service
3. Traffic Sequencing Service

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Executive summary

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The concept extends the usage of Point Merge to the E-TMA airspace, based on the concept previously developed by EUROCONTROL for the TMA. It describes the operating method associated with a Point Merge centric route structure, with the support of an AMAN, for En-route ACCs and TMAs with Very High Capacity needs (VHCn).

The Requirements apply to the following operational services:

1. Airspace Design Service
2. Traffic Separation Service
3. Traffic Sequencing

Safety and Performance Requirements have mainly been extracted from Safety Assessment Report (SAR) provided in Annex A of this document. The results and conclusions of this safety assessment report, and more specifically the derived Safety Requirements, are valid provided that all the **Assumptions** made during this assessment are valid. These assumptions are consolidated in Appendix G.1 of the Safety Assessment Report.

It shall be noted that the impact on safety (especially regarding level bust and TCAS) of the following elements have not been fully investigated:

- Use of multiple levels per leg, a bidirectional leg, and absence of formal “spare” level.
- Possibility to send aircraft on intermediate points along the leg.
- Higher speeds and specific trajectory geometries.

Therefore, the list of safety requirements cannot be claimed to be complete. Further analysis must be conducted prior to any implementation which may lead to additional safety requirements related to Point Merge.

1 Introduction

1.1 Purpose of the document

This Safety and Performance Requirements (SPR) document provides the safety and performance requirements for the services related to the operational concept defined in the corresponding OSED for “Step1 AMAN + Point Merge in E-TMA” ([14]).

1.2 Scope

This document defines the requirements that support the operational services and concept elements identified in the OSED for “Step1 AMAN + Point Merge in E-TMA” ([14]). These services are expected to be operational (IOC) in the 2013-2016 timeframe.

This SPR relates to the operational concept for the **OFA04.01.03** of **AMAN + Point Merge**, which is developed in the above-mentioned OSED as an airspace structure combining an RNAV route and a closed-loop vector in the form of a “direct-to” instruction to the Merge Point, and the associated operating method, including the usage of an AMAN, for a complex Extended TMA (E-TMA).

Only Project 5.6.7 contributes to this OFA.

The requirements developed in this document show traceability to the higher level requirements described in the corresponding OSED, which, in turn, show traceability to the higher level KPAs (through DOD), as represented in Figure 1

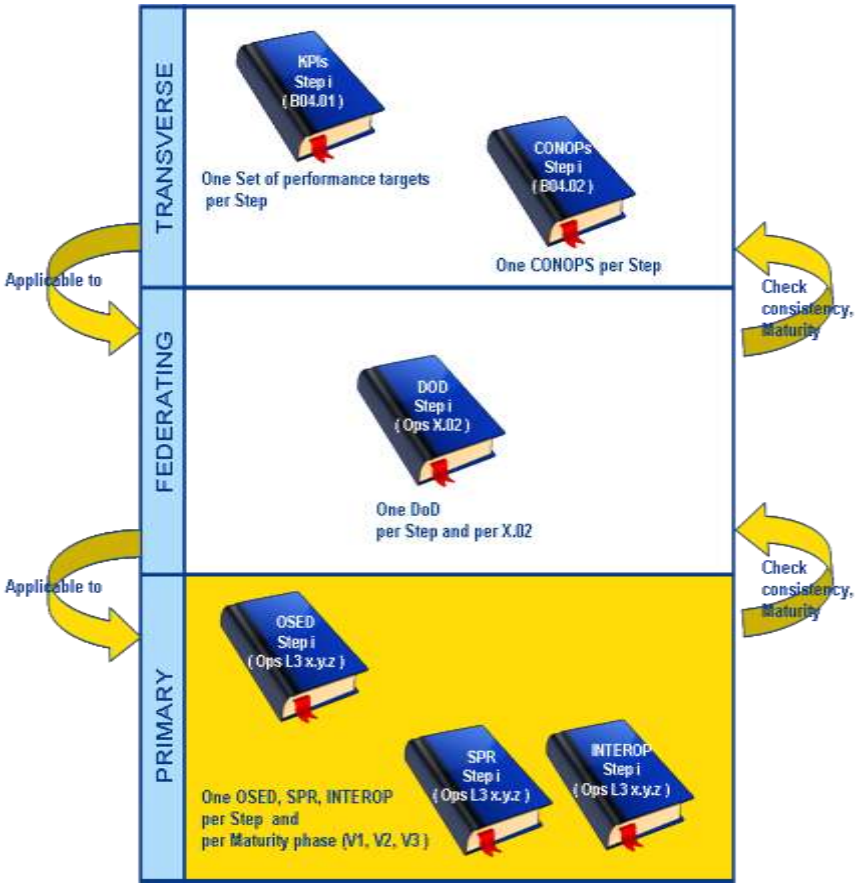

Figure 1: SPR document with regards to other SESAR deliverables

In Figure 1, the Steps are driven by the OI Steps addressed by the project in the Integrated Roadmap document [10].

1.3 Intended readership

This document is intended for the following audience:

- Primary projects developing the Queue Management concept (**P5.6.y**) and their associated technical projects (mainly **P10.x.y** but not exclusively) to provide them with the requirements related to AMAN + Point Merge in E-TMA operational concept; in particular **P5.6.4** for compatibility with queue management concept;
- **SWP 05.02** for Consolidation;
- **SWP 05.03** for cross WP integrated validation with 5.6.4;
- **SWP 05.09** for HMI needs/requirements;
- **WP8** for Information needs/requirements
- **WPB** for concept consolidation, architecture and performance modelling;
- **P16.6** for the Business Case;
- ANSPs who are considering development of a P-RNAV route structure using Point Merge
- And, more generally, the SESAR JU community.

1.4 Structure of the document

This document is structured as follows:

- **Section 1** introduces the document, its purpose and scope, its structure, provides background of the concept and identifies a definition/glossary and acronyms;
- **Section 2** provides a brief summary of the concept taken from the OSED;
- **Section 3** establishes clear relationships between the concept and the application/information services through a set of requirements.
- .**Section 4** identifies and lists the applicable and reference documents.

Additionally the annex identifies the material that justifies the requirements allocation.

1.5 Background

Point Merge was developed by the experimental Centre of EUROCONTROL located in France (EEC) as an innovative technique to improve and standardize the terminal space after the IAF, i.e. the approach airspace. The concept has been then adapted to extended terminal areas (See Extended TMA definition in the next section).

To support its implementation EUROCONTROL has developed an Operational Services and Environment Definition (OSED) for “Point Merge” (Ref. [15]) which summarizes the status of Point Merge in TMA as “*already been studied and found feasible and beneficial in various ‘generic’ environments in Approach, notably with two, three or four entry points; one or two runways; and different TMA sizes (Ref. [16], [17]). Under this generic validation thread, validation activities (2005-2008) include ground prototyping sessions using real-time human-in-the-loop simulations, flight deck simulations, and model-based simulations.”*

Since then, different implementation projects in support to the implementation of Point Merge System in TMA were launched with ENAV (Italian ANSP) and IAA (Irish ANSP) through simulations conducted respectively in 2008-2009 and in 2010; and with AVINOR (Norwegian ANSP) through a Point Merge System deployment in April 2011 for Oslo Gardemoen arrivals.

The Point Merge in Extended TMA has been studied by DSNA, jointly with EUROCONTROL to investigate the “*potential applicability, benefits and limitations of Point Merge for ACC arrivals, as a potential solution for pre-sequencing arrival flows*” (Ref. [15]). This study consisted in series of small scale real-time simulations at EEC and in larger sessions at Paris ACC to expose the application to a large panel of controllers. These real-time simulations constitute a feasibility study of PMS in generic Extended TMA environments.

Pursuing the activity on Point Merge in Extended TMA in connection with the AMAN + Point Merge OFA, the project P5.6.7 aims at instantiating the concept in a realistic Extended TMA environment.

In the project P5.6.7, the use of Point Merge in Extended TMA for achieving high CDOs[1], coupled with the use of an AMAN tool, will be assessed through live trials. This validation exercise is entitled EXE-05.06.07-VP-427.

1.6 Glossary of terms

A list of the important terminology and acronyms used in this document is presented below; they are taken, when available, from the SESAR ATM Lexicon (See [4]) In case of any difference between the definitions provided here and the SESAR Lexicon, the SESAR Lexicon should be taken as the authority. Definitions under refinement are included here and will be submitted to the Lexicon when they are mature and agreed across the Programme.

Term	Definition
Actor	An implementation independent unit of responsibility that performs an action to achieve an effect that contributes to a desired end state.
Airspace	A defined three dimensional region of space relevant to air traffic.
Arrival Management Service	Arrival Management Service is provided through procedures used to establish sequences and related times e.g. as planned by an arrival manager.
Arrival Manager (AMAN)	AMAN is a planning system to improve arrival flows at one or more airports by calculating the optimised approach / landing sequence and Target Landing Times (TLDT) and where needed times for specific fixes for each flight, taking multiple constraints and preferences into account.
Closed Loop Clearance	A clearance resulting in a revision of one portion of the Reference Business Trajectory (RBT), e.g. a direct route from a point of the original RBT to another point of the original RBT.
Complexity	In the ATM context, complexity refers to the number of simultaneous or near-simultaneous interactions of trajectories in a given volume of airspace.
Constraint	Any restriction brought to the preferred trajectory of an aircraft, being either a tactical constraint such as ATCO instruction, or a strategic constraint derived from the operations of the network
Continuous Descent Operation	An operation, enabled by airspace design, procedure design and ATC facilitation, in which an arriving aircraft descends continuously, to the greatest possible extent, by employing minimum engine thrust, ideally in a low drag configuration, prior to the final approach fix /final approach point.
Extended TMA (E-TMA)	The E-TMA corresponds to ACC terminal sector(s) (between Top Of Descent (ToD) and the Initial Approach Fix (IAF)) which make(s) the transition between the En-Route and the TMA sectors, which encompass the Approach airspace (between IAF and Final Approach Fix (FAF) or transfer to the Tower). In the present document, arrival management starts in E-TMA to feed TMA entry points.
Intermediate Approach	The downwind, base and intercept approach path segments for positioning and turning on to merge on to final approach ending at the interception of the final approach localiser and glideslope.
Level	A generic term relating to the vertical position of an aircraft in flight and meaning variously, height, altitude or flight level.
Level Constraint	The constraint defined by an objective to set the cleared flight level (CFL) for the flight.
Level Off	To maneuver an aircraft into a flight attitude that is parallel to the surface of the earth after gaining or losing altitude.
Managed Airspace	Airspace in which all traffic is known to the Air Traffic System
Open Loop Clearance	An ATC clearance that does not include a specified or implied point where the restriction on the trajectory ends.

[1] The notion of high CDO refers to the ability of performing CDO in two parts: in Extended TMA (high part of the CDO) and then in TMA (low part of the CDO) with a breaking FL at the FL of point of transfer between ETMA and TMA (e.g . at FL110). The continuous descent in extended TMA starts while leaving the sequencing leg of the Point Merge System in Extended TMA.

Term	Definition
Operating Environment	An environment with a consistent type of flight operations.
Operational Sub-Package	A sub-grouping of connected operational and technical improvements related to the Operational Package with closely related operational focus, designed to meet performance expectations of the ATM Performance Partnership.
Operational Concept	A proposed system in terms of the user needs it will fulfil, its relationship to existing systems or procedures and the ways it will be used. It is used to obtain consensus among the acquirer, developer, support, and user agencies on the operational concept of a proposed system.
Operational Focus Area	A limited set of dependent operational and technical improvements related to an Operational sub-package, comprising specific interrelated OIs designed to meet specific performance expectations of the ATM Performance Partnership.
Operational Improvement	The result of any operational measure or action taken through time in order to improve the performance of the ATM system.
Operational Package	1. A deployment focused grouping of performance driven operational changes and associated technical and procedural enablers. 2. A (very) high level grouping of (related) Operational Improvement Steps for the purpose of (very) high level communication.
Performance-Based Navigation	Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.
Primary Project	Projects that develop and perform validation on aspects of the operational concept and the system
Queue Management	The tactical establishment and maintenance of a safe, orderly and efficient flow of traffic.
Required Navigation Performance	A statement of the navigation performance necessary for operation within a defined airspace.
Separation Constraint	The separation to keep aircraft operating safely on final approach. Examples are minimum radar separation to keep risk of collision to an acceptable safe level and wake turbulence radar separation to keep the risk of an adverse wake turbulence encounter to an acceptable safe level.
Spacing Constraint	The spacing required to be set on final approach for runway operations in the prevailing meteorological conditions. Examples are VIS2 spacing, LVP spacing, runway surface inspection spacing and non-nominal runway occupancy spacing.
Traffic Metering	Traffic metering is the process of organising aircraft into a flow of aircraft with a specific rate.
Traffic Sequencing	Traffic sequencing is the process of organising aircraft into a specific order.
Vectoring (Error! Reference source not found.)	Air traffic controllers may have to vector aircraft on their course, e.g. in the frame of a tactical intervention involving a deviation from the planned route for safety reasons, or in a more systematic way – as is often the case in terminal airspace, to sequence aircraft towards the runway(s). Open-loop vectors, as opposed to closed-loop vectors, correspond to the case when no indication is given as to the duration or limit of the ATC vector instruction, nor how the aircraft will re-join its initial route. Typically, a simple heading instruction is an open-loop vector, while a “Direct-to-Merge-Point” instruction is a closed-loop vector. Throughout this document, the term vectoring without additional indication refer to open-loop vectors.

1.7 Acronyms and Terminology

Acronyms	Definition
ACC	Area Control Centre
AMAN	Arrival Manager
ANSP	Air Navigation Service Provider
APP	Approach Centre / Control
ASAS	Airborne Separation Assistance System
CB	Cumulonimbus
CDA	Continuous Descent Approach
CDO	Continuous Descent Operation
CNS	Communication Navigation Surveillance
CTA	Controlled Time of Arrival
CWP	Controller Working Position
DSNA	Direction des Services de la Navigation Aérienne
EC	Executive Controller
ECAC	European Civil Aviation Conference
EEC	EUROCONTROL Experimental Centre
EHQ	EUROCONTROL Headquarters
DOD	Detailed Operational Description
ENR	En-Route
ETA	Estimated Time of Arrival
ETA-FF	Estimated Time of Arrival at Feeder Fix
ETMA	Extended TMA
E-TMA	Extended TMA
FAF	Final Approach Fix
FDPS	Flight Data Processing System
FL	Flight Level
FMS	Flight Management System
HMI	Human Machine Interface
IAF	Initial Approach Fix
IAS	Indicated Air Speed
ICAO	International Civil Aviation Organisation
IP	Implementation Package (SESAR)
Kts	Knots
KPA	Key Performance Area
KPI	Key Performance Indicator
LoA	Letter of Agreement

Acronyms	Definition
NM, nm	Nautical Mile
OCD	Operational Concept Document
OFA	Operational Focus Area
OI	Operational Improvements
OSED	Operational Services and Environment Definition
PBN	Performance Based Navigation
PF	Pilot Flying
PL	Planning Controller
PMS	Point Merge System
PMS-TE	PMS TMA Extended
PNF	Pilot Not Flying
P&S	Processes and Services
P-RNAV	Precision Area Navigation
RBT	Reference Business Trajectory
RNAV	Area Navigation
STAR	Standard Arrival Route
STA	Scheduled Time of Arrival
TMA	Terminal Manoeuvring Area, or Terminal Control Area
TOC	Top Of Climb
TOD	Top Of Descent
TP	Trajectory Prediction
TTA	Target Time of Arrival
TTG	Time To Go

2 Summary of Operational Concept from OSED

This chapter provides the traceability to the OSED (Ref.[14]) for the concept of "AMAN + Point Merge in E-TMA", in which the SESAR operating method, the Use Cases, the environment, the processes and services and the requirements relevant for this OSED are detailed.

2.1 Description of the Concept Element

Terminal Control (TC) Approach operations currently employ "Open-loop" techniques to sequence and space the arrival traffic. This entails the use of tactical vectors: heading, speed and vertical altitude intervention, to merge traffic onto the line of the Final Approach ILS (Instrument Landing System).

Point Merge is an innovative method developed by the EUROCONTROL Experimental Centre (EEC) for merging arrival flows with existing technology, including the support of an AMAN. Under a Point Merge System, the aircraft are merged to a point using "Closed-loop" techniques.

Point Merge is based on a route structure denoted the Point Merge System (PMS), contained in a "triangle-shaped" area (See Figure 2), which is made of:

- One point (the **Merge Point**) used for traffic integration;
- With pre-defined legs (the **sequencing legs**) equidistant from this point that should be used for path shortening or stretching for each inbound flow.

The concept studied in the "*AMAN + Point Merge in E-TMA*" OSED extends the usage of Point Merge to the E-TMA airspace, based on the concept previously developed by EUROCONTROL for the TMA (See ref. [15]).

In E-TMA the operational objective of a Point Merge is not only the sequencing and separation towards a merge point, but also includes the metering (or pre-sequencing) of arrival flows in Extended TMA sectors as illustrated on Figure 2, together with the support of an AMAN system.

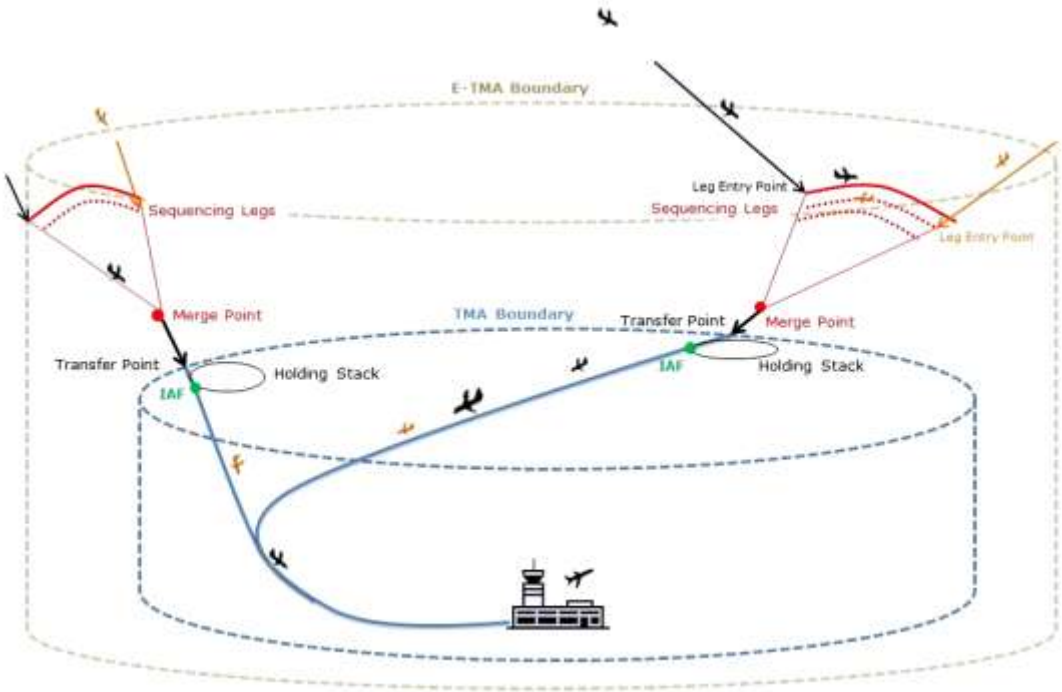

Figure 2: Example of integration of arrival flows using Point Merge Systems in Extended TMA

Please refer to *Step 1 AMAN + Point Merge in E-TMA OSED* [14] for a detailed description.

2.2 Description of Operational Services

As described in the OSED (Ref.[14]), the following ATS operational process and services apply:

Phase of Flight	Provider	Process	Operational Service Name
Long Term Planning - Medium/Short Term Planning	ATS Operations	PCS-05.06.07-OSED-PMAD.0001: Plan and Implement Point Merge Structure	SVC-05.06.07-OSED-PMAD.0001: Airspace Design Service
Trajectory Execution =>Descent	ATS Operations	PCS-05.06.07-OSED-PMTS.0001: Separate Traffic	SVC-05.06.07-OSED-PMTS.0001: Traffic Separation Service
		PCS-05.06.07-OSED-PMTQ.0001: Plan Arrival Sequence	SVC-05.06.07-OSED-PMTQ.0001: Traffic Sequencing Service

Table 1: Operational Processes and Services

Refer to *Step 1 V3 AMAN + Point Merge in E-TMA OSED* [14] for further details regarding operational process and services.

In chapter 3, requirements are organized according to the Operational Services listed above.

2.3 Description of Operational Environment

The concept of "*AMAN + Point Merge in E-TMA*" is developed for an high density traffic Extended TMA (E-TMA), with the following characteristics applying to the TMA airspace:

- Airspace Constrained (severely limited airspace availability),
- Traffic Volume and Variation Constrained (high traffic density and aircraft mix),
- Environmentally Constrained (major environmental constraints apply),
- Airfield interaction Constrained (multiple Airfields within the TMA).

The SESAR ATM Master Plan [6] equates complexity with capacity needs. By this scale, the Operational Environment of "Extended TMA" applicable to this concept equates to Enroute ACCs and TMAs with **Very High Capacity needs (VHCn)**.

This categorisation is:

- For airports and TMAs > 100 movements per busy hour;
- For en-route ACCs > 300 movements per busy hour Airports or TMAs with >100 movements per hour;

E.g. the Paris ACC + TMA.

Refer to *Step 1 AMAN + Point Merge in E-TMA OSED* [14] for further details regarding the operational environment.

3 Requirements

This section describes the Safety and Performance requirements either extracted from the assessments presented in Safety Assessment Report (SAR) provided in Annex A of this document or newly created.

The results and conclusions of this safety assessment report, and more specifically the derived Safety Requirements, are valid provided that all the **Assumptions** made during this assessment are valid. These assumptions are consolidated in Appendix G.1 of the Safety Assessment Report in Annex A.

Last but not least, the list of Safety Requirements derived cannot be claimed to be complete as far as the identified Safety Issues remain unsolved. These Safety Issues, consolidated in Appendix G.2 of the Safety Assessment Report, remain to be addressed in each local implementation safety assessment.

The Safety and Performance requirements presented here are organized after the operational services identified in the OSED ([14]), namely:

- **SVC-05.06.07-OSED-PMAD.0001**: Airspace Design Service
- **SVC-05.06.07-OSED-PMTS.0001**: Traffic Separation Service
- **SVC-05.06.07-OSED-PMTQ.0001**: Traffic Sequencing Service

The requirements identifiers are set accordingly to the rules defined in the chapter 4 of the *Requirements and V&V Guidelines* document (See Ref. [2]). The generic pattern applied is as follows:

<Object type>-<Project code>-<Document code>-<Reference code 1>.<Reference number 2>

Where:

- <Object type> is as follows
  - **REQ** for a requirement
  - **REC** for a recommendation
- <Project code> is **05.06.07**
- <Document code> is **SPR**
- <Reference code 1> reflects the above-mentioned organisation as follows:
  - **0200**: Safety and Performance Requirements for **Airspace Design** Service
  - **0210**: Safety and Performance Recommendations for **Airspace Design** Service
  - **0300**: Safety and Performance Requirements for **Traffic Separation** Service
  - **0310:** Safety and Performance Recommendations for **Traffic Separation** Service
  - **0400**: Safety and Performance Requirements for **Traffic Sequencing** Service
  - **0410:** Safety and Performance Recommendations for **Traffic Sequencing** Service
- <Reference number 2> is a sequence number for each series of requirements (from 10 to 10).

3.1 Requirements overview

The table below provides a synthetic view of the requirements detailed in chapter 3. It provides also the allocation of safety and operational requirements to the following categories:

- High Level Requirements
- Overall ATM Requirements
  (This category encompasses overall ATC requirements, overall RNAV/PRNAV procedure design requirements and overall RNAV/PRNAV procedure publication requirements)
- Overall ATM Recommendations
  (This category encompasses overall ATC recommendations, overall RNAV/PRNAV procedure design recommendations and overall RNAV/PRNAV procedure publication recommendations)
- Overall PMS Requirements
- Overall PMS Recommendations
- Requirements related to PMS in E-TMA
- Recommendations related to PMS in E-TMA
- Requirements related to specific implementation of PMS in E-TMA
- AMAN requirements

Requirement Identifier	Requirement Title	Requirement Description
High-Level Requirements		
REQ-05.06.07-SPR-0300.0190	E-TMA controller workload reduction using Point Merge in E-TMA	E-TMA controller workload shall be maintained at an acceptable level or be reduced
REQ-05.06.07-SPR-0300.0200	Approach controller workload reduction using Point Merge in E-TMA	Approach controller workload shall be maintained at an acceptable level or be reduced
Overall ATM Requirements		
REQ-05.06.07-SPR-0200.0010	Full PM Structure details in published procedure Charts	As for any RNAV publication, **Approach Charts** shall show full details of the entire PMS structure (as defined by Airspace Design) including Way Points, published speed and altitude constraints**.**
REQ-05.06.07-SPR-0200.0020	Altitude restriction on a WayPoint before PMS entry	As for any RNAV design involving 1000 ft vertical separation routes in descent phase and in order to cope with the stabilisation need, for each leg, **Airspace Design** shall specify an altitude restriction on the waypoint before the leg entry or another point upstream, that is the same as the level/altitude (band) designed for the leg.

Requirement Identifier	Requirement Title	Requirement Description
REQ-05.06.07-SPR-0200.0030	A/S Design enabling traffic transfer at level pre-determined according to LOA	As for any RNAV design, **Airspace Design** shall ensure that the descent from sequencing legs FL/altitude to the required level of transfer at Transfer Point (TP) as pre-determined according to LOA is possible for all aircraft types that are expected to follow the procedure and in conditions as defined by ICAO (Ref [18]), given a defined "distance to go".
REQ-05.06.07-SPR-0200.0040	A/S Design enabling traffic transfer at LOA pre-determined speed	As for any RNAV design, **Airspace Design** together with the speeds recommended to be instructed by E-TMA Executive Controller in different portions of the PMS (legs entry, along legs, descent to MP) shall ensure that the aircraft speed when being transferred at TP (as pre-determined in LoA) can be met by all aircraft types that are expected to follow the procedure and in conditions as defined by ICAO (Ref [18]).
REQ-05.06.07-SPR-0200.0100	Clearance for Flight level at Transfer Point	As for any PRNAV procedure, the E-TMA Executive Controller shall give the descent clearance such as the aircraft is able to reach the requested level at Transfer Point (TP).
REQ-05.06.07-SPR-0300.0010	Flight conditions before entering PMS in E-TMA	As for any RNAV procedure, **ATC Procedure Design** (LoA) and, where necessary, E-TMA Planner Controller's coordination with adjacent En Route sectors, shall ensure compliance with the entry conditions required by PMS in E-TMA, in particular: • Aircraft stable at the assigned level on leg, prior to leg entry.
REQ-05.06.07-SPR-0300.0030	STAR instruction prior to PMS entry	As for any RNAV procedure, the STAR shall be instructed by E-TMA controller before PMS entry
REQ-05.06.07-SPR-0300.0090	Speed/descent rate management at the Transfer Point	The E-TMA Executive Controllers shall manage speed and/or descent rate such as to achieve the adequate spacing at the Transfer Point
REQ-05.06.07-SPR-0300.0160	Severe weather conditions in the PMS	In case of storm or CB within PMS structure, the **PMS operations in E-TMA** shall be stopped (revert to Baseline i.e. vectoring), and ATFCM restrictions are applied.
REQ-05.06.07-SPR-0300.0170	Radio failure	As for any radio failure, in case of radio failure, flight crew shall follow published radio communication failure procedure. The sequencing leg run-off procedure shall be the basis for the radio failure procedure for equipped aircraft.
REQ-05.06.07-SPR-0300.0220	Training on working method changes	The E-TMA Executive and Planner Controllers shall be trained about changes in the working method involved by PMS+AMAN in E-TMA (including nominal, alternative flows and abnormal conditions)
REQ-05.06.07-SPR-0400.0050	Sequencing leg run-off, vectoring and/or holding at IAF to absorb residual delay	In case the AMAN-required delay cannot be absorbed on leg, The E-TMA executive controller shall apply sequencing leg run-off, vectoring and/or holding at IAF to absorb residual delay.

Requirement Identifier	Requirement Title	Requirement Description
REQ-05.06.07-SPR-0400.0060	Low performance aircraft integration in the arrival sequence	The E-TMA executive and planner controllers shall ensure that the low performance aircraft (regarding leg level and/or speed) will be integrated in the arrival sequence in accordance with the sequencing needs (i.e. TTL in E-TMA)
Overall ATM Recommendations		
REC-05.06.07-SPR-0210.0010	Inner leg constraint	A/S Design should ensure that inner leg level is established accounting for the following constraint: the Inner leg is not at a level involving a descent plan to the level of the Transfer Point of more than 3° (5.67%)
REC-05.06.07-SPR-0210.0050	Adapted routes for low performance aircraft	Subject to traffic performance characteristics, it may be necessary that A/S Design and procedures for by E-TMA Executive and Planner Controllers should ensure that the low performance aircraft (regarding leg level and/or speed) will follow adapted routes allowing their integration in the arrival sequence (either in E-TMA or in TMA) if type of traffic requires that.
REC-05.06.07-SPR-0310.0030	Descent guidance in radio failure procedure	The radio failure procedure should contain some guidance for the descent (e.g. in the form of level restrictions embedded in the procedure)
Overall PMS Requirements		
REQ-05.06.07-SPR-0200.0060	Lateral separation between sequencing legs and local implementation constraints	**A/S Design** shall ensure that sequencing legs are laterally apart by construction. The lateral distance between legs shall be established in each local implementation, accounting for the following constraints: • A minimal distance determined by the ATCO capability for adequate radar monitoring of aircraft flying on adjacent legs • A minimal distance allowing to mitigate situations where entry level on leg is not met. However, it only mitigates partially, due to legs with multiple levels. • A maximal distance determined by the need for equi distance of legs to the Merge Point
REQ-05.06.07-SPR-0200.0130	Higher PMS inner leg than outer leg	A/S Design shall ensure that PMS inner leg will be higher than outer leg
REQ-05.06.07-SPR-0300.0040	Spacing margin when instructing the direct-to	The E-TMA Executive Controller shall consider a spacing margin when instructing the direct-to, in order to enable subsequent spacing maintenance for aircraft that are on course to the merge point, solely relying on speed control.
REQ-05.06.07-SPR-0300.0050	Safety track buffer for longitudinal separation during descent toward Merge Point	The E-TMA Executive Controller shall take into account the following constraint: an along track buffer shall be added on top of the required longitudinal separation between two successive aircraft on the same leg. This buffer shall be such that direct distance remains greater than the required separation, with leading aircraft remaining on leg or turning to Merge Point, taking into account: the PMS segment geometry; the aircraft turn performance variability and the wind.

Requirement Identifier	Requirement Title	Requirement Description
REQ-05.06.07-SPR-0300.0070	Display of Range Rings or markings centred on the MP (radar HMI)	Predefined set of Range Rings or markings, centred on the MP, shall be displayed on the Controller Work Position **(radar HMI)**
REQ-05.06.07-SPR-0300.0110	Vectoring skills maintenance	Training of E-TMA Executive Controllers shall maintain their radar vectoring skills
REQ-05.06.07-SPR-0300.0210	Use of conventional ATC procedures	The use of conventional ATC procedures (vectors) shall remain possible when needed. However, it shall be adapted to the Point Merge environment so as to ensure compatibility with its normal operation. Specific procedures for mixed traffic and for recovery of unexpected events shall be defined and included in the recurrent training.
REQ-05.06.07-SPR-0300.0230	Altitude monitoring in ATCOs training	E-TMA Controllers training for PMS shall stress the importance of altitude monitoring (prior to and along the sequencing leg).
REQ-05.06.07-SPR-0300.0240	Monitoring of events with potential for separation reduction	Adequate measures shall be implemented to maintain a high level of vigilance of E-TMA Executive Controllers e.g. safety awareness campaigns, recurrent training, monitoring of events with potential for separation reduction (e.g. case of departing aircraft not achieving the required climb gradient; arrivals not achieving their levels; etc)
REQ-05.06.07-SPR-0300.0250	Altitude monitoring in flight crew briefing	Flight Crew briefing for PMS shall stress the importance of altitude monitoring (prior to and along the sequencing leg)
REQ-05.06.07-SPR-0300.0260	Leg saturation avoidance	ATCO training shall stress how to anticipate/avoid leg saturation.
Overall PMS Recommendations		
REC-05.06.07-SPR-0210.0040	Procedure awareness in published procedure charts	**Approach Charts** should include note to Flight Crew to expect a Direct-to instruction after the Way Point at the start of each Sequencing Leg.
REC-05.06.07-SPR-0410.0030	Vectoring of aircraft not fitting the sequence	An aircraft not fitting the sequence (eg wrong aircraft takes the turn) should be taken on vectors by the E-TMA executive controller out from the PMS/sequence, rather than acting on the whole sequence
Requirements related to PMS in E-TMA		
REQ-05.06.07-SPR-0200.0150	Difference in altitude between the sequencing legs	Difference in altitude between the sequencing legs shall be limited such as to keep aircraft at compatible speeds to maintain the sequence while meeting the level delivery condition at Transfer Point.

Requirement Identifier	Requirement Title	Requirement Description
REQ-05.06.07-SPR-0300.0020	Inbound via intermediary leg points & Multi-levels on leg	In nominal operation, when needed for deconfliction, in case of multiple arrivals to leg entry, the PMS entry conditions applied by E-TMA Executive and Planner Controllers shall accommodate the following two solutions alternatively or in combination : - Inbound to via intermediary leg point: Aircraft inbound to sequencing leg either via the leg entry point or other leg intermediary point - Multi levels on leg: Aircraft stable at the appropriate level prior to leg entry for each level used on each sequencing leg.
REQ-05.06.07-SPR-0400.0030	AMAN Stability Horizon before PMS legs	AMAN configuration and PMS design shall ensure that PMS sequencing legs lie within the AMAN stability horizon
Recommendations related to PMS in E-TMA		
REC-05.06.07-SPR-0210.0020	Point Merge integration into existing network	As for any terminal airspace, redesign, the **design** of Point Merge systems for any airport, or group of airports, must take into account the effects on the overall network and on the impact on upstream flows of traffic, taking into account high traffic demand. The Point Merge structure should be easily integrated into the existing network so as to have no impact in flight preparation
REC-05.06.07-SPR-0210.0030	Distance coordination point and sequencing leg entry	Transfer point should be placed far enough from the leg so that tactical de-confliction (vertical and lateral) of aircraft feeding the same sequencing leg can be achieved within the sector while minimising coordination needs with upstream sectors
REC-05.06.07-SPR-0310.0020	Training of ATCOs on adjacent upstream ACC sectors	Training of ATCOs on adjacent upstream ACC sectors to timely transfer flights although they are by PMS design on horizontally converging paths, provided they are cleared to levels ensuring vertical separation
AMAN Requirements		
REQ-05.06.07-SPR-0400.0010	AMAN Time To Lose provision on the E-TMA Controllers positions	AMAN shall provide reliable TTL (Time To Lose) in E-TMA to CWP, for all E-TMA arrivals.

3.2 Gaps and limitations of the analysis

Compared to past work that focussed on TMA, in E-TMA the assumption that the inbound traffic was metered cannot be made. Indeed, inbound traffic may be received in “clusters” and there is a need to provide additional tactical deconfliction means: vertically with additional levels and laterally with additional paths. In addition, in the specific environment considered, a bidirectional leg was defined.

The following specific elements that have not been fully investigated with regards to safety and especially level bust (increased occurrences and severity, impact on mitigation means) and TCAS (increased nuisance RAs and effect of an RA):

- Use of multiple levels per leg, absence of formal “spare” level (or no clear distinction between nominal use of multiple levels and use of spare level as mitigation) and a bidirectional leg.
- Possibility to send aircraft on intermediate points along the leg (skipping the entry point and deleting the attached vertical constraints, changing tactically the aircraft path geometries).
- Higher speeds and specific trajectory geometries (higher closing speeds on projected paths).

Therefore, the list of safety requirements cannot be claimed to be complete. Further analysis must be conducted prior to any implementation which may lead to additional safety requirements related to Point Merge design and/or operating method.

3.3 SVC-05.06.07-OSED-PMAD.0001: Airspace Design Service

This service corresponds to all the changes to be applied to the E-TMA airspace to incorporate Point Merge System design (P-RNAV routes and procedures).
This service takes place during Long Term Planning and Medium/Short Term Planning phases. It covers initial design as well as any further adjustment that may be needed to optimize usage of the Point Merge structure.

3.3.1 Safety Requirements & Recommendations

3.3.1.1 Safety Requirements

[REQ]

Identifier	**REQ-05.06.07-SPR-0200.0010**
Requirement	As for any RNAV publication, **Approach Charts** shall show full details of the entire PMS structure (as defined by Airspace Design) including Way Points, published speed and altitude constraints
Title	Full PM Structure details in published procedure charts
Status	<In Progress>
Category	<Safety>
Rationale	SR 007 Overall PRNAV publication requirement
Type	Overall ATM Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0010	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMAD.001	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0200.0020**
Requirement	As for any RNAV design involving 1000 ft vertical separation routes in descent phase and in order to cope with the stabilisation need, **f**or each leg, **Airspace Design** shall specify an altitude restriction on the waypoint before the leg entry or another point upstream, that is the same as the level/altitude (band) designed for the leg.
Title	Altitude restriction on a waypoint before PMS entry
Status	<In Progress>
Category	<Safety>
Rationale	SR 009 For any RNAV design involving 1000 ft vertical separation of routes in descent phase, stabilisation is needed. This requirement is an instantiation in a PMS design.
Type	Overall ATM Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>

<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0010	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMAD.001	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001: Traffic sequencing Service	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0200.0030**
Requirement	As for any RNAV design, **Airspace Design** shall ensure that the descent from sequencing legs FL/altitude to the required level of transfer at Transfer Point (TP) as pre-determined according to LOA is possible for all aircraft types that are expected to follow the procedure and in conditions as defined by ICAO (Ref [18]), given a defined “distance to go”.
Title	A/S Design enabling traffic transfer at level pre-determined according to LOA
Status	<In Progress>
Category	<Safety>
Rationale	SR 029
Type	Overall ATM Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP1.0027	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0150	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMAD.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0200.0040**
Requirement	As for any RNAV design, **Airspace Design** together with the speeds recommended to be instructed by E-TMA Executive Controller in different portions of the PMS (legs entry, along legs, descent to MP) shall ensure that the aircraft speed when being transferred at TP (as pre-determined in LoA) can be met by all aircraft types that are expected to follow the procedure and in conditions as defined by ICAO (Ref [18]).
Title	A/S Design enabling traffic transfer at LOA pre-determined speed
Status	<In Progress>
Category	<Safety>
Rationale	SR 045 Overall procedure design requirement as defined in TMA Procedure Design guidelines (Ref. [18])
Type	Overall ATM Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP1.0027	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0150	N/A

<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMAD.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0200.0060**
Requirement	**A/S Design** shall ensure that sequencing legs are laterally apart by construction. The lateral distance between legs shall be established in each local implementation, accounting for the following constraints : • A minimal distance determined by the ATCO capability for adequate radar monitoring of aircraft flying on adjacent legs • A minimal distance allowing to mitigate situations where entry level on leg is not met. However it only mitigates partially, due to legs with multiple levels. • A maximal distance determined by the need for equi distance of legs to the Merge Point
Title	Lateral separation between sequencing legs and local implementation constraints
Status	<In Progress>
Category	<Safety>
Rationale	SR 010 Overall procedure design requirement as defined in TMA Procedure Design guidelines (Ref. [18]) ensuring lateral separation by design. The safety requirement would be to mitigate the severity of loss of vertical separation for distinct parallel legs, but would not work obviously for the same leg if different levels are used.
Type	Overall PMS Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0080	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMAD.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0200.0100**
Requirement	As for any PRNAV procedure, the E-TMA Executive Controller shall give the descent clearance such as the aircraft is able to reach the requested level at Transfer Point (TP).
Title	Clearance for Flight level at Transfer Point
Status	<In Progress>
Category	<Safety>
Rationale	SR 018
Type	Overall ATM Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0140	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMAD.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0200.0130**
Requirement	**A/S Design** shall ensure that PMS inner leg will be higher than outer leg
Title	Higher PMS inner leg than outer leg
Status	<In Progress>
Category	<Safety>
Rationale	SR 034 This recommendation already exists in the generic EUROCONTROL OSED (Ref. [15]).
Type	Overall PMS Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>		N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMAD.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0200.0150**
Requirement	Difference in altitude between the sequencing legs shall be limited such as to keep aircraft at compatible speeds to maintain the sequence while meeting the level delivery condition at Transfer Point.
Title	Difference in altitude between the sequencing legs
Status	<In Progress>
Category	<Safety>
Rationale	SR 058 The difference in altitude between sequencing legs is relevant when multiple levels are used as it is the case for PMS in E-TMA.
Type	Requirement related to PMS in E-TMA
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMAD.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A

<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

3.3.1.2 Safety Recommendations

[REQ]

Identifier	**REC-05.06.07-SPR-0210.0010**
Requirement	**A/S Design** should ensure that inner leg level is established accounting for the following constraint: the Inner leg is not at a level involving a descent plan to the level of the Transfer Point of more than 3° (5.67%)
Title	Inner leg constraint
Status	<In Progress>
Category	<Safety>
Rationale	R 001
Type	Overall ATM Recommendation
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0140	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMAD.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REC-05.06.07-SPR-0210.0020**
Requirement	As for any terminal airspace redesign, the **design** of Point Merge systems for any airport, or group of airports, must take into account the effects on the overall network and on the impact on upstream flows of traffic, taking into account high traffic demand. The Point Merge structure should be easily integrated into the existing network so as to have no impact in flight preparation
Title	Point Merge integration into existing network
Status	<In Progress>
Category	<Safety>
Rationale	R 004
Type	Recommendation related to PMS in E-TMA
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0010	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMAD.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REC-05.06.07-SPR-0210.0030**
Requirement	Transfer point should be placed far enough from the leg so that tactical de-confliction (vertical and lateral) of aircraft feeding the same sequencing leg can be achieved within the sector while minimising coordination needs with upstream sectors
Title	Distance coordination point and sequencing leg entry
Status	<In Progress>
Category	<Safety>
Rationale	R 005 The consideration on setting a point bearing vertical constraints already exists as PMS generic (the location of that point shall be defined according to local specific considerations) (Ref. [15])
Type	Recommendation related to PMS in E-TMA
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0010	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMAD.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REC-05.06.07-SPR-0210.0040**
Requirement	**Approach Charts** should include note to Flight Crew to expect a Direct-to instruction after the Way Point at the start of each Sequencing Leg.
Title	Procedure awareness in published procedure charts
Status	<In Progress>
Category	<Safety>
Rationale	SR 007 This recommendation already exists in the generic EUROCONTROL OSED (Ref. [15]).
Type	Overall PMS Recommendation
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0010	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMAD.001	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REC-05.06.07-SPR-0210.0050**
Requirement	Subject to traffic performance characteristics, it may be necessary that **A/S Design** and procedures for by E-TMA Executive and Planner Controllers should ensure that the low performance aircraft (regarding leg level and/or speed) will follow adapted routes allowing their integration in the arrival sequence (either in E-TMA or in TMA) if type of traffic requires that.
Title	Adapted routes for low performance aircraft
Status	<In Progress>
Category	<Safety>
Rationale	SR 049
Type	Overall ATM Recommendation
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0250	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMAD.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

3.3.2 Performance Requirements

N/A

3.4 SVC-05.06.07-OSED-PMTS.0001: Traffic Separation Service

This service corresponds to the traffic separation maintained by timing of instructions on Point Merge procedures and a reduced usage of open loop vectoring.

3.4.1 Safety Requirements & Recommendations

3.4.1.1 Safety Requirements

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0010**
Requirement	As for any RNAV procedure, **ATC Procedure Design** (LoA) and, where necessary, E-TMA Planner Controller's coordination with adjacent En Route sectors, shall ensure compliance with the entry conditions required by PMS in E-TMA, in particular: • Aircraft stable at the assigned level on leg, prior to leg entry
Title	Flight conditions before entering PMS in E-TMA
Status	<In Progress>
Category	<Safety>
Rationale	SR 001 This requirement is true for any RNAV procedure.
Type	Overall ATM Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0010	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0020**
Requirement	In nominal operation, when needed for deconfliction, in case of multiple arrivals to leg entry, the PMS entry conditions applied by E-TMA Executive and Planner Controllers shall accommodate the following two solutions alternatively or in combination : • Inbound to via intermediary leg point: Aircraft inbound to sequencing leg either via the leg entry point or other leg intermediary point • Multi levels on leg: Aircraft stable at the appropriate level prior to leg entry for each level used on each sequencing leg. In this latter case,
Title	Inbound via intermediary leg points & Multi-level on legs
Status	<In Progress>
Category	<Safety>
Rationale	SR 001bis
Type	Requirement related to PMS in E-TMA
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>

<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0010	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0030**
Requirement	As for any RNAV procedure, the STAR shall be instructed by E-TMA controller before PMS entry
Title	STAR instruction prior to PMS entry
Status	<In Progress>
Category	<Safety>
Rationale	SR 002 True for any RNAV procedure.
Type	Overall ATM Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0010	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0040**
Requirement	The E-TMA Executive Controller shall consider a spacing margin when instructing the direct-to, in order to enable subsequent spacing maintenance for aircraft that are on course to the merge point, solely relying on speed control.
Title	Spacing margin when instructing the direct-to
Status	<In Progress>
Category	<Safety>
Rationale	SR 030 This requirement already exists in the generic EUROCONTROL OSED (Ref. [15]).
Type	Overall PMS Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0120	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0050**
Requirement	The E-TMA Executive Controller shall take into account the following constraint: an along track buffer shall be added on top of the required longitudinal separation between two successive aircraft on the same leg. This buffer shall be such that direct distance remains greater than the required separation, with leading aircraft remaining on leg or turning to Merge Point, taking into account: the PMS segment geometry; the aircraft turn performance variability and the wind.
Title	Safety track buffer for longitudinal separation during descent toward Merge Point
Status	<In Progress>
Category	<Safety>
Rationale	SR 015
Type	Overall PMS Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0330	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0070**
Requirement	Predefined set of Range Rings or markings, centred on the MP, shall be displayed on the Controller Work Position **(radar HMI)**
Title	Display of Range Rings or markings centred on the MP (radar HMI)
Status	<In Progress>
Category	<HMI>
Rationale	SR 005 This requirement is part of PMS principles.
Type	Overall PMS Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-00100	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0120	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0090**

Requirement	The E-TMA Executive Controllers shall manage speed and/or descent rate such as to achieve the adequate spacing at the Transfer Point
Title	Speed/descent rate management at the Transfer Point.
Status	<In Progress>
Category	<HMI>
Rationale	SR 042
Type	Overall ATM Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0120	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0110**
Requirement	Training of E-TMA Executive Controllers shall maintain their radar vectoring skills
Title	Vectoring skills maintenance
Status	<In Progress>
Category	<Safety>
Rationale	SR 025 This requirement already exists in the generic EUROCONTROL OSED (Ref. [15]).
Type	Overall PMS Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP1.0027	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0190	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0195	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0020	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0250	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0290	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTQ.001: Traffic Sequencing Service	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0160**
Requirement	In case of strong wind the **PMS operations in E-TMA** shall be adapted, if necessary, accounting for the reduced sector capacity

Title	PMS operations adaptation to reduced capacity in strong wind conditions
Status	<In Progress>
Category	<Safety>
Rationale	SR 052 RNV/PRNAV requirement.
Type	Overall ATM Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP1.0027	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0290	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0170**
Requirement	As for any radio failure, in case of radio failure, flight crew shall follow published radio communication failure procedure. The sequencing leg run-off procedure shall be the basis for the radio failure procedure for equipped aircraft.
Title	Radio failure
Status	<In Progress>
Category	<Safety>
Rationale	SR 033
Type	Overall ATM Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0310	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

3.4.1.2 Safety Recommendations

[REQ]

Identifier	**REC-05.06.07-SPR-0310.0020**
Requirement	Training of ATCOs on adjacent upstream ACC sectors to timely transfer flights although they are by PMS design on horizontally converging paths, provided they are cleared to levels ensuring vertical separation
Title	Training of ATCOs on adjacent upstream ACC sectors
Status	<In Progress>
Category	<Safety>
Rationale	R 009
Type	Recommendation related to PMS in E-TMA

Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REC-05.06.07-SPR-0310.0030**
Requirement	The radio failure procedure should contain some guidance for the descent (e.g. in the form of level restrictions embedded in the procedure)
Title	Descent guidance in radio failure procedure
Status	<In Progress>
Category	<Safety>
Rationale	SR 033
Type	Overall ATM Recommendation
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0310	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

3.4.2 Performance Requirements

3.4.2.1 Human Performance Requirements

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0190**
Requirement	E-TMA controller workload shall be maintained at an acceptable level or be reduced
Title	E-TMA controller workload reduction using Point Merge in E-TMA
Status	<In Progress>
Rationale	
Category	<Operational>
Type	High-Level Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP1.0027	<Partial>
<SATISFIES>	<ATMS Requirement>	OBJ-05.06.07-OSED-0100-0030	N/A
<APPLIES_TO>	<Operational Service>	N/A	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0200**
Requirement	Approach controller workload shall be maintained at an acceptable level or be reduced
Title	Approach controller workload reduction using Point Merge in E-TMA
Status	<In Progress>
Rationale	
Category	<Operational>
Type	High-Level Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP1.0027	<Partial>
<SATISFIES>	<ATMS Requirement>	OBJ-05.06.07-OSED-0100-0040	N/A
<APPLIES_TO>	<Operational Service>	N/A	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0210**
Requirement	The use of conventional ATC procedures (vectors) shall remain possible when needed. However, it shall be adapted to the Point Merge environment so as to ensure compatibility with its normal operation. Specific procedures for mixed traffic and for recovery of unexpected events shall be defined and included in the recurrent training.
Title	Use of conventional ATC procedures
Status	<In Progress>
Category	<Safety>

Type	Overall PMS Requirement
Rationale	This requirement already exists in the generic EUROCONTROL OSED (Ref. [15]).
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>		N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0220**
Requirement	The E-TMA Executive and Planner Controllers shall be trained about changes in the working method involved by PMS+AMAN in E-TMA (including nominal, alternative flows and abnormal conditions)
Title	Training on working method changes
Status	<In Progress>
Category	<Safety>
Rationale	SR 012
Type	Overall ATM Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<APPLIES_TO>	<Operational Service>	N/A	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0230**
Requirement	E-TMA Controllers training for PMS shall stress the importance of altitude monitoring (prior to and along the sequencing leg).
Title	Altitude monitoring in ATCOs training
Status	<In Progress>
Category	<Safety>
Rationale	SR 057
Type	Overall PMS Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<APPLIES_TO>	<Operational Service>	N/A	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0240**
Requirement	Adequate measures shall be implemented to maintain a high level of vigilance of E-TMA Executive Controllers e.g. safety awareness campaigns, recurrent training, monitoring of events with potential for separation reduction (e.g. case of departing aircraft not achieving the required climb gradient; arrivals not achieving their levels; etc)
Title	Monitoring of events with potential for separation reduction
Status	<In Progress>
Category	<Safety>
Rationale	SR 057c
Type	Overall PMS Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<APPLIES_TO>	<Operational Service>	N/A	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0250**
Requirement	Flight Crew briefing for PMS shall stress the importance of altitude monitoring (prior to and along the sequencing leg)
Title	Altitude monitoring in flight crew briefing
Status	<In Progress>
Category	<Safety>
Rationale	SR 057b This requirement already exists in the generic EUROCONTROL OSED (Ref. [15]).
Type	Overall PMS Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<APPLIES_TO>	<Operational Service>	N/A	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0300.0260**
Requirement	ATCO training shall stress how to anticipate/avoid leg saturation.
Title	Leg saturation avoidance
Status	<In Progress>
Category	<Safety>
Rationale	SR 063
Type	Overall PMS Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<APPLIES_TO>	<Operational Service>	N/A	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

3.5 SVC-05.06.07-OSED-PMTQ.0001: Traffic Sequencing Service

This service covers the optimisation of the pre-sequencing arrival flows thanks to traffic pre-regulation using the Point Merge. It corresponds mainly to the support brought by the AMAN to Point merge operations in the E-TMA.

3.5.1 Safety Requirements & Recommendations

3.5.1.1 Safety Requirements

[REQ]

Identifier	**REQ-05.06.07-SPR-0400.0010**
Requirement	**AMAN** shall provide reliable TTL (Time To Lose) in E-TMA to CWP, for all E-TMA arrivals.
Title	AMAN Time To Lose provision on the E-TMA Controllers positions
Status	<In Progress>
Category	<Safety>
Rationale	SR 017
Type	AMAN Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP1.0027	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0250	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTQ.001: Traffic Sequencing Service	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTS.001	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0400.0030**
Requirement	AMAN configuration and PMS design shall ensure that PMS sequencing legs lie within the AMAN stability horizon
Title	AMAN Stability Horizon before PMS legs
Status	<In Progress>
Category	<Safety>
Rationale	SR 027
Type	Requirement related to PMS in E-TMA
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP1.0027	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF1.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0020	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTQ.001: Traffic Sequencing Service	N/A

<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0400.0050**
Requirement	In case the AMAN-required delay cannot be absorbed on leg, The E-TMA executive controller shall apply sequencing leg run-off, vectoring and/or holding at IAF to absorb residual delay.
Title	Sequencing leg run-off, vectoring and/or holding at IAF to absorb residual delay
Status	<In Progress>
Category	<Safety>
Rationale	SR 046
Type	Overall ATM Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP1.0027	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0190	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTQ.001: Traffic Sequencing Service	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

[REQ]

Identifier	**REQ-05.06.07-SPR-0400.0060**
Requirement	The E-TMA executive and planner controllers shall ensure that the low performance aircraft (regarding leg level and/or speed) will be integrated in the arrival sequence in accordance with the sequencing needs (i.e. TTL in E-TMA)
Title	Low performance aircraft integration in the arrival sequence
Status	<In Progress>
Category	<Safety>
Rationale	SR 050
Type	Overall ATM Requirement
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP1.0027	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.06.07-OSED-0200-0250	N/A
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTQ.001: Traffic Sequencing Service	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

3.5.1.2 Safety Recommendations

[REQ]

Identifier	**REC-05.06.07-SPR-0410.0030**
Requirement	An aircraft not fitting the sequence (eg wrong aircraft takes the turn) should be taken on vectors by the E-TMA executive controller out from the PMS/sequence, rather than acting on the whole sequence
Title	Vectoring of aircraft not fitting the sequence
Status	<In Progress>
Category	<Safety>
Rationale	SR 060 – Case of non P-RNAV equipped aircraft.
Type	Overall PMS Recommendation
Validation Method	<Live Trial>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-SAF1.0011	<Partial>
<APPLIES_TO>	<Operational Service>	SVC-05.06.07-OSED-PMTQ.001: Traffic Sequencing Service	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.01.03	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	VHCn TMA	N/A

3.5.2 Performance Requirements

N/A

3.6 Information Exchange Requirements (IER)

N/A

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4 References and Applicable Documents

4.1 Applicable Documents

This SPR complies with the requirements set out in the following documents:

[1] Template Toolbox 03.00.00
https://extranet.sesarju.eu/Programme%20Library/SESAR%20Template%20Toolbox.dot

[2] Requirements and V&V Guidelines 03.00.00
https://extranet.sesarju.eu/Programme%20Library/Requirements%20and%20VV%20Guidelines.doc

[3] Templates and Toolbox User Manual 03.00.00
https://extranet.sesarju.eu/Programme%20Library/Templates%20and%20Toolbox%20User%20Manual.doc

[4] EUROCONTROL ATM Lexicon
https://extranet.eurocontrol.int/http://atmlexicon.eurocontrol.int/en/index.php/SESAR

4.2 Reference Documents

The following documents were used to provide input and guidance:

[5] B.4.1 Performance Framework (validation targets, influence diagrams)

[6] SESAR European ATM Master Plan, Edition 2, October 2012

[7] SESAR Safety Reference Material
https://extranet.sesarju.eu/Programme%20Library/Forms/Procedures%20and%20Guidelines.aspx

[8] SESAR Environment Reference Material
https://extranet.sesarju.eu/Programme%20Library/Forms/Procedures%20and%20Guidelines.aspx

[9] SESAR Human Performance Reference Material
https://extranet.sesarju.eu/Programme%20Library/Forms/Procedures%20and%20Guidelines.aspx

[10]WPB.01 Integrated Roadmap Latest version

[11]DSNA Safety Case for Merge Point Trials –- V1 – 2012/08/07
https://extranet.sesarju.eu/WP_05/Project_05.06.07/Other%20Documentation/DSNA%20EXE%20427%20Point%20Merge%20in%20complex%20E-TMA/REP-05.06.07%20-%20Exercise%20427%20-%20DSNA%20Safety%20Case%20for%20Merge%20Point%20Trials%20-%20V1.pdf

[12]MUAC Safety Assessment for Merge Point Trials –- V0.07 – 2012/06/22
https://extranet.sesarju.eu/WP_05/Project_05.06.07/Other%20Documentation/DSNA%20EXE%20427%20Point%20Merge%20in%20complex%20E-TMA/REP-05.06.07%20-%20Exercise%20427%20-%20MUAC%20Safety%20Case%20for%20Merge%20Point%20Trials%20-%20V0.07.pdf

[13]Belgocontrol Change Safety Case for Merge Point Trials 2012 –- V1.01 – 2012/08/06
https://extranet.sesarju.eu/WP_05/Project_05.06.07/Other%20Documentation/DSNA%20EXE%20427%20Point%20Merge%20in%20complex%20E-TMA/REP-05.06.07%20-%20Exercise%20427%20-%20BELGOCONTROL%20Safety%20Case%20for%20Merge%20Point%20Trials%20-%20V1.01.pdf

[14] SESAR P05.06.07 D14 Step 1 V3 AMAN + Point Merge in E-TMA: OSED V00.00.02 - dated 2013/02/28
https://extranet.sesarju.eu/WP_05/Project_05.06.07/Project%20Plan/Deliverables/DEL-05.06.07%20D14%20-%20Step1%20V3%20AMAN%20Point%20Merge%20-%20OSED.pdf

[15] EUROCONTROL "Point Merge Integration of Arrival Flows Enabling Extensive RNAV Application and Continuous Descent OSED" V2.0, 19/07/10, CND/COE/AT/AO

[16] Integrating Aircraft Flows in the Terminal Area with no Radar Vectoring, L. Boursier, B. Favennec, E. Hoffman, A. Trzmiel, F. Vergne, K. Zeghal, 6th AIAA Aviation Technology, Integration and Operation Conference (ATIO) 25-27 September 2006, Wichita, Kansas.

[17] Airborne Spacing in the Terminal Area: Controller Experiments on Mixed Equipage, Abnormal Situations and Transition, EEC Note No. 24/06.

[18] EUROCONTROL Guidance Material for the Design of Terminal Procedures for Area Navigation (DME/DME, B-GNSS, Baro-VNAV & RNP-RNAV)n Ed 3.0, March 2003

Appendix A Assessment / Justifications

This annex identifies the material that justifies the requirements allocation.

A.1 Safety and Performance Assessments

A.1.1 Safety assessment

This SPR relies on two layers of works in safety done in preparation of the validation of the concept for AMAN + Point Merge in E-TMA (SESAR Work Package 5.6.7, exercise 427) as follows:

- Safety Assessment performed by each ANSP involved in the validation exercise 427, namely DSNA (Ref. [11]), MUAC (Ref. [12]) and Belgocontrol (Ref. [13]); The scope of these works is the assessment and mitigation, from each ANSP's perspective, of risks during the Point Merge live trials planned for November 2012; and
- The development of a Safety Assessment Report, based on the above-mentioned works, targeted at the **generic** concept for AMAN + Point Merge in E-TMA.
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PMS+AMAN Safety Assessment Report (S

A.1.2 Security risk assessment

N/A.

A.1.3 Environment impact assessment

N/A

An initial assessment of environmental impact / flight efficiency was carried out. It is based on the fact that the concept does not promote a serious change in flight duration or vertical profile. The objective is to loose time in a better, more organised way than with radar vectoring. As a matter of fact, loosing time (ie burning fuel for nothing) at different altitudes does not change fuel burn.
This is often confused with the fact that for the same IAS and the same fuel burn, aircraft flying higher will cover a greater distance. This can be converted, as aircraft usually try to get closer to their destinations, in better efficiency. But in our case, aircraft "waiting" (either on holding patterns, vectoring or Point Merge arcs) at higher altitude just cover more "useless" distance for the same amount of time and fuel.
Figures extracted from several aircraft performance models show slight differences, mostly due to engine efficiency, but these are very small, and models are not perfectly tuned for these specific flying behaviours.
It is thus considered that replacing radar vectoring with Point Merge procedures will have no significant impact on fuel burn. As the considered procedures are well above 6000 feet, they will neither have any direct impact on noise or local air pollution.

Therefore, no specific requirement can be traced to environment or flight efficiency.

A.1.4 OPA

N/A

A.1.4.1 Human Performance assessment

A Human Factor Case has been developed in preparation of the validation of the concept for AMAN + Point Merge in E-TMA [Ref. TBC].

-END OF DOCUMENT-