CDO Step 1 SPR

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Abstract

This document sets out the Safety and Performance Requirements relating to the concept defined in Project 05.06.02 Step 1 for improvement of the vertical profile through new closed loop flight procedure and new operating method: Vectoring to Merge Point.

This document defines a set of requirements based on assessments, on workshops and on the results of project validation activities.

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Rational for rejection
None.

Document History

Edition	Date	Status	Author	Justification

00.00.01	16/09/2014	Draft	DSNA	New Document
00.00.02	13/04/2016	Draft for review	███	Draft for review including Parallel Legs and Vectoring to Merge Point requirements.
00.00.03	21/04/2016	Final draft for approval	███	Final draft for approval including comments from internal and external reviewers. Addition of requirements relating to Point Merge
00.01.00	22/04/2016	Final version for submission	███	Final Document for submission
00.01.01	27/06/2016	Final version for submission	███	Update according to SJU assessment. Scope of the document / solution notably focused on vectoring to merge point concept

Intellectual Property Rights (foreground)

This deliverable consists of SJU foreground.

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Executive summary

This document sets out the Safety and Performance Requirements relating to the concept defined in Project 05.06.02 Step 1 for improvement of the vertical profile in high traffic density environment through new closed loop flight procedure and new operating method: the Vectoring to Merge Point. This concept constitutes the SESAR Solution 11.

The Vectoring to Merge Point concept is derived from the Point Merge concept but relies on ATCO vectoring skills. This concept is based on a closed loop structure including different flight paths and a merge point. The difference with the Point Merge concept is that in Point Merge concept, the published sequencing legs are used to stretch the flight path and a "direct to merge point" is issued when spacing is achieved. In Vectoring to Merge Point, vectoring instructions are used to stretch the flight path and a "Direct to Merge Point" is issued when spacing is achieved.

This concept does not rely on new ATC tools. Basic AMAN facilitates spacing and sequencing traffic through the new route structure and enables maximum benefits.

This concept can be implemented in medium to high traffic density environment and enables an optimised descent profile as soon as the aircraft receives the "direct to the merge" point" clearance.

The Safety and Performance Requirements developed in this document are derived from workshops, human performance assessment and results of the validation activities carried out within the project.

These requirements relate to procedure design, operating method, phraseology and training.

Note: Another concept variant has been defined within Project 05.06.02 Step 1 for improvement of the vertical profile in medium traffic density environment through new closed loop flight procedure and new operating method: Parallel Legs. This other concept is detailed in the document D07 (that will be submitted the 07/08/2016). Furthermore, Project 05.06.02 activities related to improvements in vertical profiles also included activities using the 'Point Merge' concept. The concept description and REQs related to Point Merge are more than adequately covered in documents elsewhere, so they are not covered again within this SPR

1 Introduction

1.1 Purpose of the document

This Safety and Performance Requirements (SPR) document provides the safety and performance requirements for services related to one of the concepts defined in P05.06.02 D46 CDO Step 1 OSED ([11]): the Vectoring to Merge Point concept.

1.2 Scope

This document supports the operational services and concept elements identified in the P05.06.02 Step1 Operational Service and Environment Definition [11]. It defines a set of requirements for the concept introduced in the OSED. These requirements are traced to the high level requirements of the OSED (see figure below)
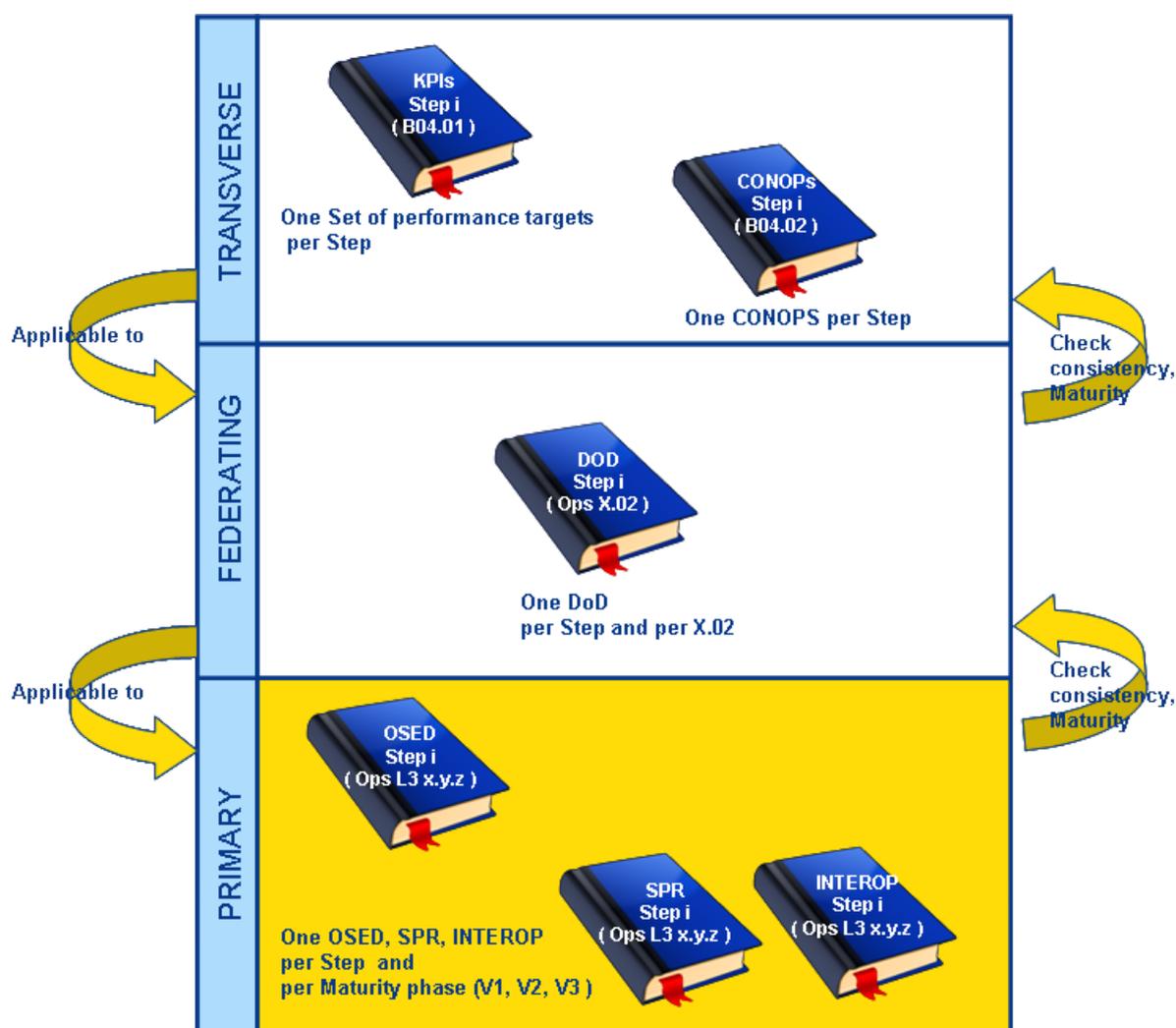
Figure 1: SPR document with regards to other SESAR deliverables

Two OI steps relate to Continuous Descent Operation within the Operational Focus Area (OFA) 02.01.01 ""Optimised 2D/3D Routes":

- AOM-0702-A: Continuous Descent Operations assisted by procedure design

- AOM-0702-B: Advanced Continuous Descent Operations assisted by new controller tools

Only the AOM-0702-A is addressed in Step 1: Safety and performance requirements expressed in this document address solely OI AOM-0702-A.

1.3 Intended readership

The intended readership for the document includes:

- Task leaders and contributors within 5.6.2

- OFA 02.01.01 lead

- WP5 lead

- Project leaders related to the 5.6.2 project

  o Project 5.2: The outcome of the higher level validation objectives of this project feeds into the validation of the SESAR TMA Operations concept for Step1

- Project leaders of Large Scale Demonstrations related to CDO

  o LSD.01.03: Optimized Descent Profile (ODP)

  o LSD.02.10: Budapest 2.0

- Representatives from Airspace Users

- Representatives from ANSP and Airports

1.4 Structure of the document

Chapter 1 provides an explanation of the purpose and scope of this document.

Chapter 2 provide an overview of the Vectoring to Merge Point concept

Chapter 3 lists the safety and performance requirements applicable to Vectoring to Merge Point

Chapter 4 gives all the applicable and the reference documents that have been used to develop the SPR

Appendix A provides the assessment performed on the Vectoring to Merge Point, and used to derive the requirements

1.5 Background

Implementation of projects addressing Continuous Descent Operations have been initiated by several European ANSPs, however, it is recognised that there is a usability limit to these techniques, especially in heavier density traffic.

Project 5.6.2 chose a two stage process to develop a concept enabling a wider deployment of CDO operations:
- For Step 1, P5.6.2 assessed several concept variants based on optimized procedure design and new working method
- For Step 2, P5.6.2 has proposed to further improve the concept by the addition of new systems to support ATC operations, as outlined in D58.

Within the Step 1 activity (which is the subject of this document), several validation activities have been performed for the different concept variants. The synthesis of these activities and the associated deliverables are presented on the figure below:
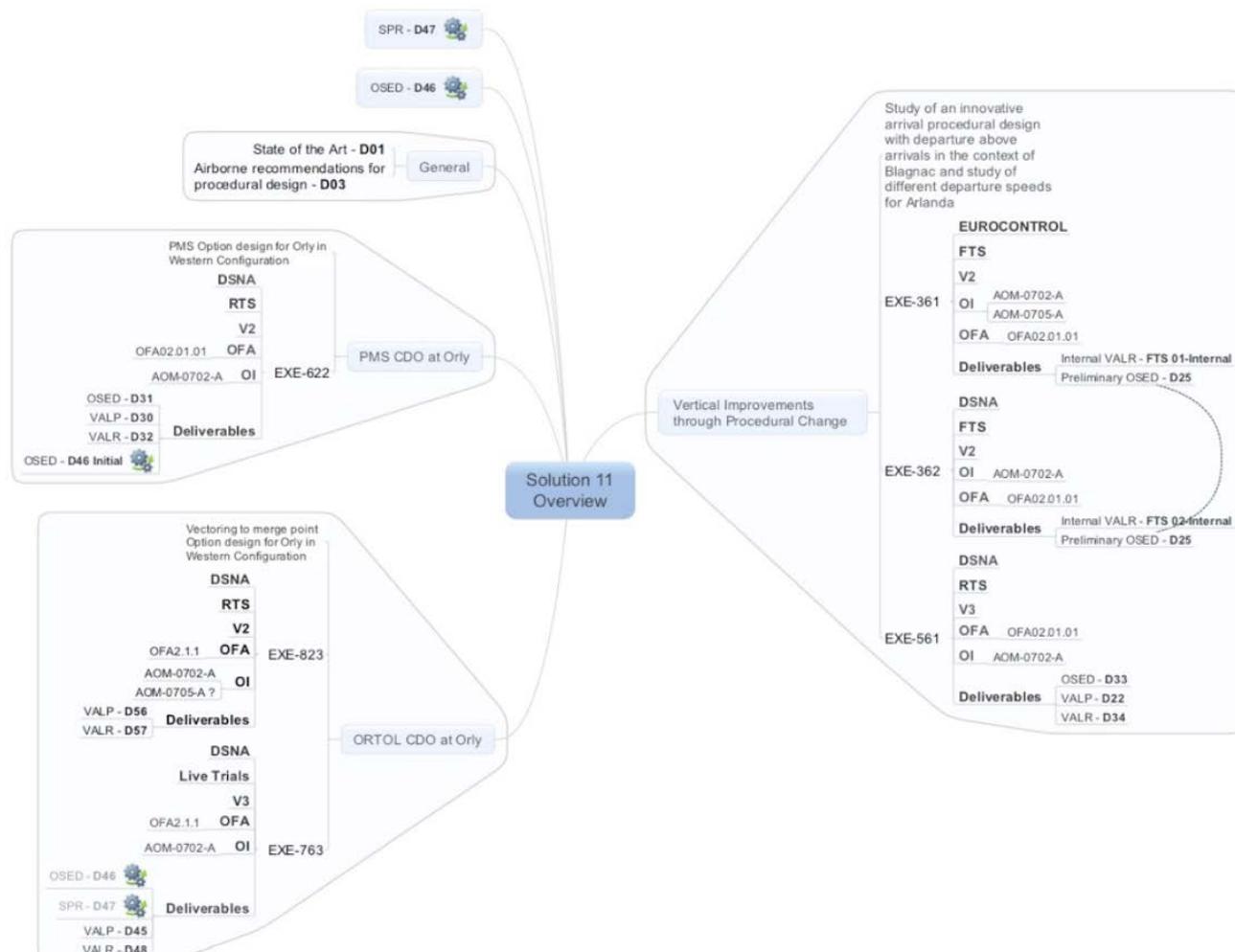
As presented on this figure, three concept variants have been defined and/or assessed within P05.06.02:

- Parallel Leg concept variant. This concept is only applicable to medium traffic density / medium complexity environment without new ATC tool. It is not at full V3 maturity level due partially to the fact that no integrated validations including cockpit / pilot aspects have been performed within Step 1. A specific document, similar to an SPR, has been created within Step 1 in order to present the current status of the concept and the associated requirements / recommendations; this document will be submitted by the project with the reference D07. These elements will be used as inputs for SESAR 2020 for further definition and validation activities.

- Point Merge concept variant. This concept has been assessed in Orly within P05.06.02 in order to facilitate CDO (EXE 622). No specific features have been identified within this experimentation in addition to the ones already identified in the Eurocontrol OSED and others SESAR projects. Consequently, this concept is not considered as part of the SESAR Solution 11. The requirements associated to this concept are defined in the existing documentation: Eurocontrol OSED ([12]) and P05.07.04 PMS in Complex TMA SPR ([20]).

- Vectoring to Merge Point concept variant. This concept is the one associated to the SESAR solution 11 and is the object of the present document. This concept is considered at V3 maturity level for an environment covering single runway operations.

1.6 Glossary of terms

Term	Definition	Source
Approach	ATM phase used in ConOps scenario, from the Initial Approach Fix (IAF) to the Final Approach Fix (FAF) or Final Approach Point (FAP)	B4.2
Arrival Manager (AMAN)	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.	SESAR Integrated Dictionary
Arrival	ATM phase used in ConOps scenario describing descent from cruise to Initial Approach Fix (IAF)	B4.2
ATC Clearance	Authorization for an aircraft to proceed under conditions specified by an air traffic control unit. Note 2.— The abbreviated term "clearance" may be prefixed by the words "taxi", "take-off", "departure", "En-Route", "approach" or "landing" to indicate the particular portion of flight to which the air traffic control clearance relates.	ICAO Doc 4444
ATC Instruction	Directives issued by air traffic control for the purpose of requiring a Flight Crew to take a specific action.	ICAO Doc 4444
Closed loop clearance	A closed loop clearance is a clearance from a point on the current RBT/RMT to another point of the current RBT/RMT. It may result in a revision of the RBT/RMT.	SESAR Integrated Dictionary
Continuous Climb Operation (CCO)	An operation, enabled by airspace design, procedure design and ATC , in which a departing aircraft climbs without interruption, to the greatest possible extent, by employing optimum climb engine thrust, at climb speeds until reaching the cruise flight level.	ICAO Doc 9993
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. Note 1 - An optimal CDO starts from the top of descent and uses descent profiles that reduce segments of level flight, noise, fuel burn, emissions and controller/pilot communications, while increasing predictability to pilots and controllers and flight stability. Note 2 - A CDO initiated from the highest possible level in the En-Route or arrival phases of flight will achieve the maximum reduction in fuel burn, noise and emissions.	ICAO Doc 9931
En Route phase	That part of the flight from the end of the take-off and initial climb phase to the commencement of the approach and landing phase.	ATM Lexicon

Term	Definition	Source
Final approach	ATM phase used in ConOps scenario, from the FAF or FAP to the beginning of the landing flare	SESAR Integrated Dictionary
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.	SESAR Integrated Dictionary
Navigation specification	A navigation specification is a set of aircraft and aircrew requirements needed to support a navigation application within a defined airspace concept. The navigation specification: - defines the performance required by the navigation system, - prescribes the performance requirements in terms of accuracy, integrity, continuity and availability for proposed operations in a particular Airspace, - also describes how these performance requirements are to be achieved i.e. which navigation functionalities are required to achieve the prescribed performance and associated requirements related to pilot knowledge and training and operational approval. A Performance-Based Navigation Specification is either a **RNAV** specification or a **RNP** specification. RNAV specifies a required accuracy whilst RNP specifies, in addition to a required accuracy, an aircraft system alert in case of deviation, with the pilot responsible to remain the aircraft within the RNP accuracy; it allows reducing ATC buffer with the controller still responsible for the separation against traffic.	ICAO Doc 9613 WP B04.02 CONOPS Step 1
Open Loop Instruction	An open-loop instruction is an ATC instruction that does not include a specified or implied point where the restriction on the trajectory ends and does not include a specified or implied return path to a downstream computed, known or expected trajectory.	SESAR Integrated Dictionary
Performance Based Navigation (PBN)	Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace. Note.— Performance requirements are expressed in navigation specifications in terms of accuracy, integrity, continuity, availability and functionality needed for the proposed operation in the context of a particular airspace concept	ICAO Doc 9613 PBN Manual

1.7 Acronyms and Terminology

Term	Definition
AMAN	Arrival Manager
ANSP	Air Navigation Service Provider
APP	Approach Centre / Control
ASAS	Airborne Separation Assistance System
ATM	Air Traffic Management
CDA	Continuous Descent Approach
CDO	Continuous Descent Operation
CNS	Communication Navigation Surveillance
CONOPS	Concept of Operations
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
DOD	Detailed Operational Description
DSAM	Downlinked SFL Adherence Monitoring
ENR	En-Route
E-TMA	Extended TMA
FAF	Final Approach Fix
FL	Flight Level
FMS	Flight Management System
HMI	Human Machine Interface
IAF	Initial Approach Fix
ICAO	International Civil Aviation Organisation
IF	Intermediate Fix
ILS	Instrument Landing System
IP	Implementation Package (SESAR)
Kts	Knots
KPA	Key Performance Area
KPI	Key Performance Indicator
LSD	Large Scale Demonstration
MP	Merge Point
NM, nm	Nautical Mile
OCD	Operational Concept Document
OFA	Operational Focus Area

Term	Definition
OI	Operational Improvements
OSED	Operational Services and Environment Definition
PBN	Performance Based Navigation
PL	Planning Controller
PMS	Point Merge System
PMS-TE	PMS TMA Extended
P&S	Processes and Services
P-RNAV	Precision Area Navigation
RBT	Reference Business Trajectory
RNAV	Area Navigation
RWY	Runway
SESAR Programme	The programme which defines the Research and Development activities and Projects for the SJU.
SFL	Selected Flight Level
SJU	SESAR Joint Undertaking (Agency of the European Commission)
SJU Work Programme	The programme which addresses all activities of the SESAR Joint Undertaking Agency.
SPR	Safety and Performance Requirements
STAR	Standard Arrival Route
TOD	Top Of Descent

2 Summary of Operational Concept (from OSED)

2.1 Description of the Concept Element

Vectoring to Merge Point is a new concept, based on procedure design and operating method, that can be implemented for different purposes, and particularly to improve vertical profile in terms of fuel efficiency and noise emissions.

This concept is derived from the Merge Point technique (see document [12]). The main difference between the two concepts is that:

- In Point Merge concept, the published sequencing legs are used to stretch the flight path and a "direct to merge point" instruction is sent when spacing is achieved

- In vectoring to Merge Point concept, vectoring instructions are used to stretch the flight path and "direct to merge point" instruction is sent when spacing is achieved

For both concepts, an optimised descent can be flown by the aircraft once the "direct to merge point" instruction is received until the Intermediate Fix. The Vectoring to Merge Point can be seen as an alternative to the Point Merge technique or as a transition towards Point Merge. It could be the preferred alternative to the Point Merge technique in environments where changes in the working method need to be minimised.

Main features of the **procedure design** associated to this concept are:

- New initial approach procedures are published between the existing IAFs and the IF

- All these initial approaches merge in the same point (the merge point) and include a similar segment from the merge point to the IF

- All the initial approaches are PBN closed loop procedure

- Flight paths of the initial approach procedures are designed as a compromise between Airspace User needs and ANSP needs, based on local particularities and local traffic

  - From Airspace User perspective, the ideal flight path is the shortest flight path between the IAF and the merge point (considering the existing constraints such as satellite airports, noise restriction area)

  - From ANSP perspective, it is necessary to integrate a "margin" with regard to this shortest flight path in order to facilitate the sequencing in situations of high traffic density.

  Note: One possible solution could also be to publish different closed loop procedures with different flight path lengths: one corresponding to the Direct between IAF and the merge point, usable in low traffic density, one longer flight path integrating a margin for sequencing purposes, usable in higher traffic density.

An example of design (corresponding to the case experimented in Orly [15]) is illustrated on the figure below.
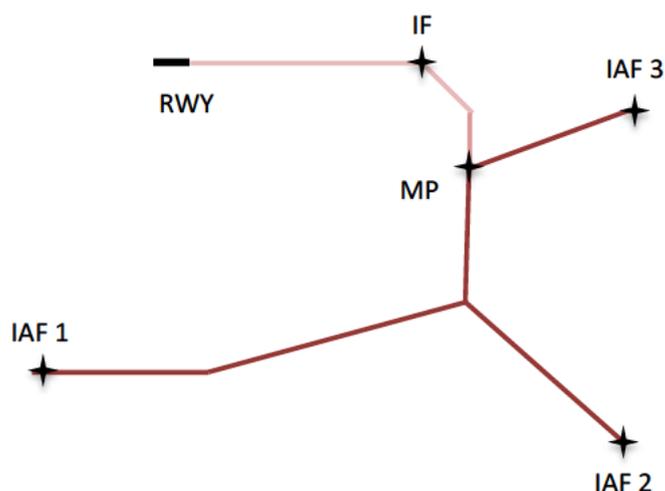
Figure 2: Example of arrival procedure design for the Vectoring to Merge Point concept variant

Main features of the **operating methods** associated to this concept are:

- Sequence is established as in current day operation. Accurate arrival management processes/techniques for the definition of the sequence is important with the Vectoring to Merge Point technique, considering that it requires an earlier stabilization of the sequence and thus reduces flexibility to modify the sequence.

- Aircraft are cleared on the new initial approach procedures

- When there is no traffic, aircraft are directly cleared to the merge point (or left on the Intermediate Approach Procedure if the design of the initial approach already corresponds to the direct between IAF and merge point ("MP" on the Figure 2 above)

- In case of necessity to sequence the aircraft:

  o Speed restrictions are used as primary means to sequence the aircraft, and if not enough

  o Aircraft are radar vectored and a "direct to merge point" instruction is given as soon as appropriate spacing is obtained. Distance markers are displayed on the controller HMI to facilitate the determination of the appropriate timing to give the "direct to merge point" clearance.

- Aircraft can fly an optimised descent as soon as they receive the "direct to merge point" instruction (through appropriate phraseology) and until the Intermediate Fix. Speed restrictions can be applied during this descent in order to adjust the sequence.

- After the Intermediate Fix, standard procedures apply.

This concept is further described in the OSED ([11])

2.2 Description of Operational Services

This new concept does not introduce a new operational service but impacts the following operational services.

- SQ1: Define the arrival sequence

- SQ2: Coordinate the arrival sequence

- SQ3: Create the arrival sequence: create separation within the same arrival flow and between the arrival flows of the landing sequence

- SQ4: Maintain the arrival sequence: maintain separation within the same arrival flow and between the arrival flows of the landing sequence

- SEP1: Separate arrivals from departures, transit flights, over flights

- SEP2: Separate arrivals from arrival to other airport

- SEP3: Separate aircraft from terrain / obstacles during the arrival

- SEP4: Separate aircraft from ARES in En Route / TMA airspace

No Safety Assessment Report was conducted for the Vectoring to Merge Point concept. However, the impacts of the concept on these services were evaluated during workshops with operational and concept experts (see section A.1.1)

2.3 Description of Operational Environment

This section provides a brief description of the operational environment for which the Vectoring to Merge Point concept is intended. A more comprehensive description of this operational environment is presented in the OSED ([11])

The operational envelope for which the Vectoring to Merge Point concept is being defined is:

- Airspace characteristics:
    - o   Single or several airfield TMA
    - o   High complexity environment

- Traffic density: high traffic density

- Airspace / route structure: new route structure as defined in section 2.1.

- Aircraft capabilities: Appropriate PBN capability; from this perspective it has been identified that enabler A/C#04 (Flight management and guidance for improved lateral navigation in approach via RNP) is a baseline enabler

- Ground equipment: standard ground equipment including basic AMAN

3 Requirements

This section presents the safety and performance requirements for the Vectoring to Merge Point concept developed within P05.06.02:

Safety and Performance Requirements were identified during a workshop with the following operational and concept experts:

- Vincent Kapp (DSNA) - P05.06.02 leader

- Lucile Mirabail (DSNA) - Orly ATCO involved in Vectoring to Merge Point Live Trial

- Florence Philips (Egis Avia for DSNA) - P05.06.contributor in charge of validation activities

- Nicolas Giraudon (Egis Avia for DSNA) - P05.06.02 contributor - In charge of OSED and SPR

Additionally, the results of the validation exercises (EXE 823 / RTS and EXE 763 / Live Trial), the Security assessment and the Human Performance assessment, were considered to derive new safety and performance requirements.

Most of the requirements identified for this concept address both safety and performance. Consequently, the requirements are classified in the section (safety or performance) where they most contribute.

Additional assessment would be required during industrialisation and deployment in order to complete this list of Safety and Performance requirements, particularly:

- Further security assessment should be conducted during industrialization and deployment n, in accordance with the local security policy, in order to determine the applicable Security Controls.

- A formal safety assessment should be conducted during industrialization and deployment, in accordance with local safety policy and methodology in order to determine appropriate additional safety requirements will be added.

Disclaimer regarding design requirements

Vectoring to Merge Point is based on new flight procedure design and a new operating method, and some of the requirements listed in the following sections include requirements relating to procedure design.

The procedure design requirements proposed within this SPR have not yet reached the same level of testing and widespread agreement as those contained within ICAO PBN Manual ([16]) and PANS OPS ([17]) and it is these documents that should continue to be considered as the reference documents for PBN operations and flight procedure design.

3.1 Notation

It has been adopted the following principle to identify the Operational Requirements:

"REQ-05.06.02-SPR-" as the prefix suggested by SJU guidelines

- XXX : four alphanumeric characters indicating the name of the concept: VTMP for requirements relating to Vectoring to Merge Point concept

- YYYY : four digit representing an increment in the numbering
  - o 0101 to 0199 for safety requirements
  - o 0201 to 0299 for performance requirements

3.2 Safety Requirements

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0101
Requirement	Vectoring to Merge Point concept shall at least maintain safety level (compared to the situation without Vectoring to Merge Point concept)
Title	Impact of Vectoring to Merge Point on safety
Status	<Validated>
Rationale	Proposed concept does not reduce safety of operations.
Category	<Safety>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED- KPA1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0104
Requirement	ANSPs shall publish, on the appropriate charts, any elements of the airborne operating method considered essential for safe operations.
Title	Design of initial approach procedure for Vectoring to Merge Point (5)
Status	<Validated>
Rationale	E.g. ANSP shall indicate on the published chart that that flight crew shall expect a "direct to merge point" instruction clearance in case of radar vectoring and then not delete the RNAV points: even if they are radar vectored for sequencing purpose, they need to resume navigation after the merge point (and fly the published flight path between the merge point and the Intermediate Fix)
Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-DES1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0105
Requirement	ATCO shall coordinate with departure controller when required to ensure safe arrival / departure crossing
Title	New operating method for Vectoring to Merge Point (2)
Status	<Validated>
Rationale	When necessary, coordination with departure controller is necessary to ensure that aircraft will be able to fly their optimised descent without affecting the departure. The coordination can be performed either by the Arrival Sequencing Manager o the ATCO responsible of the arriving flight.
Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A

<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPM1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0106
Requirement	ATCOs shall be trained to take into account any particular tendencies for spacing reduction due to variability in aircraft performance in their execution of the concept
Title	New operating method for Vectoring to Merge Point (7)
Status	<Validated>
Rationale	ATCOs consider notably an appropriate separation margin when sending the DIRECT clearance to account for variability of aircraft performances that may result in a reduction of inter-aircraft spacing during the manoeuvre. For instance live trial in Orly demonstrated that ATCO cleared the aircraft to the Merge Point once separated of 5NM with the previous one to achieve a spacing of 3NM on the final approach
Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPM1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0107
Requirement	ATCO shall build and optimise the sequence during the descent primarily through speed instructions, but using other types of instructions where required
Title	New operating method for Vectoring to Merge Point (9)
Status	<Validated>
Rationale	After issuing the direct clearance, ATCO should avoid modification of the lateral or vertical profile as much as possible. Speed instructions are the preferred method of optimising the sequence, if needed..
Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPM1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0108
Requirement	ATCOs shall be trained to a standard sufficient to enable, when needed and for whatever reason, a smooth transition from the new concept to current operating methods
Title	Revert to current operating method within Vectoring to Merge Point
Status	<Validated>
Rationale	Some specific situations will not be fully manageable with the vectoring to merge point, considering that it induces a reduction of the airspace available to sequence the aircraft (aircraft need to be sequenced before the merge Point). In these situations, ATCOs need to be able to revert to current operating method where vectoring is possible until the Intermediate Fix.

Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPM1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0110
Requirement	ATCOs shall be trained to be familiar with the operating environment , with particular emphasis on the use of radar vectors to implement a sequence on a fixed PBN based route structure
Title	Training to Vectoring to Merge Point (2)
Status	<Validated>
Rationale	Vectoring to merge point technique will still rely on ATCO vectoring skills. Additionally, in a degraded situation, ATCOs will revert to current operating method where vectoring is possible until the Intermediate Fix
Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPM1-0005	<Full>

3.3 Performance Requirements

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0201
Requirement	Vectoring to Merge Point concept shall have a positive impact on environment and/or fuel efficiency
Title	Impact of Vectoring to Merge Point on flight efficiency and environment
Status	<Validated>
Rationale	The Vectoring to Merge Point concept is supposed to improve the gas emissions and fuel consumption by allowing aircraft to fly their optimum descent profile from the moment when they receive the "direct to merge point" clearance to the Intermediate Fix Additionally new CDO concept is supposed to decrease the noise emission, by reducing the number of changes in thrust settings.
Category	<Performance>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED- KPA1-0002	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0202

Requirement	Vectoring to Merge Point concept shall at least maintain capacity
Title	Impact of Vectoring to Merge Point on capacity
Status	<Validated>
Rationale	Capacity (i.e. spacing accuracy, throughput on final) should not be negatively impacted by the introduction of CDO.
Category	<Performance>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED- KPA1-0003	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0203
Requirement	If the concept is applied to an existing route structure, an initial approach procedure shall be published between the existing IAF and the existing Intermediate Fix
Title	Design of initial approach procedure for Vectoring to Merge Point (1)
Status	<Validated>
Rationale	Vectoring to Merge Point concept should not negatively impact the other existing procedures, more particularly the interface with the STAR and with the final approach.
Category	<Design>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-DES1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0204
Requirement	Flight paths of the initial approach procedures shall merge at a common merge point and include a common lateral flight path from the merge point to the Intermediate Fix
Title	Design of initial approach procedure for Vectoring to Merge Point (2)
Status	<Validated>
Rationale	Principle of the Vectoring to Merge Point is that appropriate "direct to merge point" clearances will be sent to the aircraft to ensure a correct spacing after the merge point, on a common lateral flight path
Category	<Design>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-DES1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0206
Requirement	The relevant PBN specifications to be applied shall be assessed and procedures shall be designed in accordance with the required

	specifications.
Title	Navigation specification for Vectoring to Merge Point procedure
Status	<Validated>
Rationale	Vectoring to Merge Point concept does not require applying a specific navigation specification; it must comply with all required specifications and standards. Either RNAVs or RNPs navigation specification can be applied.
Category	<Design>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-DES1-0002	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0207
Requirement	ATIS broadcasts shall contain required information, on the approach procedure to be used and on elements considered essential for safe operation.
Title	ATIS message for Vectoring to Merge Point
Status	<Validated>
Rationale	New approach procedures are defined as standard procedures to ensure that they will be used by a maximum number of aircraft and consequently to maximize the benefits, and ATIS ensures transmission of this information to all aircraft arriving.
Additionally it is important to inform airspace users that even if they are radar vectored for sequencing purpose, they need to resume navigation after the merge point (and fly the published flight path between the merge point and the Intermediate Fix)
Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPM1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0208
Requirement	Pilots shall be trained with respect to the specifics of the operating method, including the requirement to retain the originally planned path in the background while vectoring is taking place
Title	Pilots training to Vectoring to Merge Point
Status	<Validated>
Rationale	It is important to train airspace users to the fact that even if they are radar vectored for sequencing purpose, they need to resume navigation after the merge point (and fly the published flight path between the merge point and the Intermediate Fix)
Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPM1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0209
Requirement	Arrival sequencing manager shall establish the sequence as in current day operation, through the use of an AMAN in high traffic density environment
Title	New operating method for Vectoring to Merge Point (1)
Status	<Validated>
Rationale	Vectoring to Merge Point does not impact the way to determine the sequence. However, the use of AMAN for the definition of the sequence is more important with the Vectoring to Merge Point technique compared to current day of operation, considering that Vectoring to Merge Point requires to define the sequence earlier, and it reduces the flexibility to modify the sequence
Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPM1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0210
Requirement	ATCO shall clear the aircraft on the new initial approach procedure to ensure they will always be able to resume navigation on this procedure
Title	New operating method for vectoring to merge point (3)
Status	<Validated>
Rationale	All aircraft entering in the TMA are cleared on the new procedure to ensure they will always be able to resume navigation on this procedure
Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPM1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0211
Requirement	ATCOs shall be trained to identify and execute opportunities to optimise flight efficiency, always within the confines of their safe operation of the concept
Title	New operating method for vectoring to merge point (4)
Status	<Validated>
Rationale	ATCOs notably gives direct clearance to the aircraft to the Merge Point when traffic allows within the confines imposed for safe operations in order to reduce the flight path and thus optimize flight efficiency. ATCO will use the distance markers of the HMI in order to determine the appropriate timing to send this clearance. (see requirement below regarding distance marker on the HMI).

Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPM1-0001	<Full>

[

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0212
Requirement	ATCO training shall ensure that ATCOs are appropriately aware of the airborne intent and airborne operation during execution of the concept
Title	New operating method for Vectoring to Merge Point (8)
Status	<Validated>
Rationale	ATCOs have to notably be aware that flight crew are expected to optimise their descent profile from the moment they receive the "direct to merge point" clearance to the Intermediate Fix. Once the "direct" clearance is received, the flight path from the current position to the IF is known by the pilot. They are consequently able to optimize their descent profile, based on the distance to go calculated by the FMS.
Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPM1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0213
Requirement	ATCO shall use appropriate phraseology during execution of the concept
Title	Phraseology for Vectoring to Merge Point
Status	<Validated>
Rationale	Phraseology enables notably unambiguous notification that flight crew can fly their preferred descent profile and that they do not necessarily need to start the descent when they receive the clearance (e.g. Descent when ready). It is also important to notify unambiguously flight crew that even if they are radar vectored for sequencing purpose, they may need to resume navigation after the Merge Point (and fly the published flight path between the Merge Point and the IF). E.g. phraseology used during Orly Trial ([15]): "*Direct ORTOL to (join/resume) 3G approach*"
Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPM1-0002	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0214
Requirement	Airspace Users shall be informed of the new procedure and associated concept of operation
Title	Information of airspace user within Vectoring to Merge Point
Status	<Validated>
Rationale	It is necessary to develop a shared understanding of the operating method between controllers and pilots in order to limit potential ATCOs or pilots' misinterpretation or confusion when applying the procedure (see results from the live trial in Orly: [15]).

This measure is complementary to the publication in the AIP to reinforce or ensure common understanding between controllers and pilots. |
Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPM1-0004	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0215
Requirement	ATCO shall be trained to the new operating method associated to the vectoring to merge point concept, including non-nominal situations
Title	Training to Vectoring to Merge Point (1)
Status	<Validated>
Rationale	Vectoring to Merge Point constitutes an important change at the heart of the controller sequencing tasks. One of the most important points is that the concept imposes that the sequencing task is completed earlier and it also reduces the vectoring area. A specific training on the new operating method is therefore necessary for safety of operations but also for an efficient and optimized use of the technique.
Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPM1-0003	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0216
Requirement	Aircraft shall have appropriate PBN approval to fly the new initial approach procedure
Title	PBN approval for Vectoring to Merge Ppoint
Status	<Validated>
Rationale	Aircraft need to have the appropriate PBN approval to fly the new procedure.
Otherwise, they will be managed by ATCO through radar vectoring, outside the new route structure. According to local decision / type of aircraft, these aircraft may be penalised in favour of equipped aircraft.
Category	<Performance>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-SYS1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0217
Requirement	ATCO HMI shall support the concept as defined by the local implementers.
Title	CWP evolutions for Vectoring to Merge Point
Status	<Validated>
Rationale	E.g. circular distance markers spaced by X NM and centred on the Merge Point could be available for display on the Controller Working Position. These markers could be used by the ATCO to determine the appropriate spacing to give the "Direct to Merge Point" and ensuring an appropriate spacing at the merge point. Distance markers were spaced by 5 NM during the Orly Trial ([15]).
Category	<HMI>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-SYS1-0002	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0220
Requirement	Arrival sequencing manager shall be provided with an AMAN to determine and monitor the sequence in high traffic density environment
Title	AMAN within Vectoring to Merge Point
Status	<Validated>
Rationale	Use of AMAN for the definition of the sequence becomes much more important with the vectoring to merge point concept (see result of the validation activity in Orly) [15] considering that this concept requires a sooner definition of the sequence sooner and reduces the flexibility to modify the sequence.
Category	<Functional>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-SYS1-0002	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0221
Requirement	SESAR Minimum Set of Security Controls (MSSCs) shall be applied when implementing the Vectoring to Merge Point concept
Title	Security aspects for vectoring to merge point concept
Status	<Validated>
Rationale	See section A.1.2 for P05.06.02 Security Assessment and details regarding the Minimum Set of Security Control to be applied.
Category	<Security>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPR1-0003	<Full>

3.4 Deleted Requirements

This section lists the requirements deleted during convergence process. Most of these requirements are considered as unnecessary because already covered by requirement from ICAO PBN manual ([16]) and PANS Ops manual ([17]).

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0102
Requirement	Missed Approach procedure shall not be impacted by the new initial approach procedures
Title	Design of initial approach procedure for vectoring to merge point (4)
Status	<Deleted>
Rationale	Vectoring to Merge Point concept does no impact the others existing procedures however it might be necessary to modify the Missed Approach procedure for some implementations.
Category	<Design>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-DES1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0103
Requirement	Design of the initial approach procedures shall facilitate integration with departure procedure and arrival to other airports
Title	Design of initial approach procedure for vectoring to merge point (5)
Status	<Deleted>
Rationale	Considered as standard procedure design principle
Category	<Design>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-DES1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0109
Requirement	When receiving the initial approach clearance, flight crew shall inform ATC in case of absence of P-RNAV approval required to fly the cleared procedure
Title	Absence of appropriate PBN approval within vectoring to merge point
Status	<Deleted>
Rationale	Considered as standard requirement when performing PBN operations
Category	<Operational>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-OPM1-0001	<Full>

[REQ]

Identifier	REQ-05.06.02-SPR-VTMP.0205
Requirement	Flight path of the initial approach procedure between the IAF and the Merge Point (MP) shall be a compromise between airspace users' needs and ANSP needs
Title	Design of initial approach procedure for vectoring to merge point (3)
Status	<Deleted>
Rationale	Considered as standard requirement when performing PBN operations. From Airspace User perspective, the ideal flight path is the shortest flight path between the IAF and the Merge Point (considering the existing constraints such as satellite airports, noise restriction area) From ANSP perspective, it is necessary to integrate a "margin" with regard to this shortest flight path in order to facilitate the sequencing in situation of high traffic density.
Category	<Design>
Validation Method	<Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.06.02-OSED-DES1-0001	<Full>

3.5 Information Exchange Requirements (IER)

Not applicable. New concept described in this document is based on new procedure design and operating method. There are no new systems introduced and no new information exchanged within the frame of this new concept.

4 References and Applicable Documents

4.1 Applicable 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

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

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

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

[11] P05.06.02 - D46 - CDO Step 1 - OSED - V00.00.03 – 08/04/2016

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

[13] P5.6.2 – D03 Airborne Recommendations for CDO Procedure Design, 00.01.00, 29/11/2015

[14] P5.6.2 – D57 - Validation Report CDO at Orly RTS (Vectoring To Merge Point) – 00.01.01, 14/08/2015

[15] P5.6.2 – D48 - Validation Report CDO at Orly Live Trial (Vectoring To Merge Point) – 00.01.00, 02/03/2016

[16] ICAO PBN Manual – Doc 9613 - Third edition – 2008

[17] ICAO Procedure for Air Navigation Services – Aircraft Operations – ICAO 8168 – Fifth Edition – 2008

[18] SESAR Airspace Users Office "Airspace Users vision on additional SESAR Research and Innovation on Fuel Efficiency", V1.0, May 2015

[19] P05.02 – D84 - Step 1 DOD Report – Fifth update - WP5 TMA Step 1 Detailed Operational Description – 00.01.01 - 30/04/15

[20] P05.07.04 – D7&D8 - Safety and Performance Requirements (SPR) for Point Merge in Complex TMA – 00.01.00 - 06/07/2012

Appendix A   Assessment / Justifications

A.1 Safety and Performance Assessments

A.1.1 Safety assessment

No safety assessment was conducted for Vectoring to Merge Point concept. However, a workshop was organised with operational and concept experts were safety requirements were identified. The workshops enabled to produce a set of requirements on a **working** document that can be find below.

Review of Vectoring to Merge

A.1.2 Security risk assessment

A security risk assessment has been conducted by P16.06.02, in accordance with Safety Reference Material [7] and is included in the following file:

SESAR P5.6.2 Security Risk Assessn

This security risk assessment has highlighted a number of risks to the Supporting Assets. It has been assumed that these risks are addressed within the context of current ATC systems and their security management processes. Nevertheless, the SESAR Security Reference Material requires the application of the SESAR Minimum Set of Security Controls (MSSCs).

This security risk assessment also further recommend that more detailed ACC-level risk assessments should be carried out in the context of larger system changes than CDO and updated prior to deployment of the CDO concept.

The Minimum Set of Security Controls (MSSCs) to be applied are listed in the following table:

Ref (acronym)	Name	Description
MSSC_C_2_1	Security policy 1	The Responsible Organization shall produce, approve, and adopt a security policy which complies with the Reference SESAR ATM Security Policy; this security policy shall be communicated to all relevant parties.
MSSC_C_2_2	Security policy 2	The Responsible Organization shall regularly review the security policy and ensure that it remains effective.
MSSC_C_3_1	Organization of Information and ATM service Security 1	The Responsible Organization shall provide the resources needed for information and ATM services security and assign roles and responsibilities for all security management functions.
MSSC_C_3_2	Organization of Information and ATM service Security 2	The Responsible Organization shall ensure that the implementation of information and
MSSC_C_3_3	Organization of Information and ATM service Security 3	ATM services security controls is co-ordinated across the organization.

Ref (acronym)	Name	Description
MSSC_C_3_4	Organization of Information and ATM service Security 4	Information storage and exchange means shall be defined according to information confidentiality/criticality level.
MSSC_C_4_1	Human resource security 1	Background verification checks on all staff shall be carried out in accordance with relevant laws, regulation, and ethics. The checks shall be proportional to the roles and responsibilities, in particular in respect to the business requirements (e.g. safety-critical function, developments), the classification of information to be accessed, and the perceived risks.
MSSC_C_4_2	Human resource security 2	Staff shall apply security in accordance with the established policies and procedures.
MSSC_C_4_3	Human resource security 3	Staff shall receive appropriate awareness training and regular updates in organisational policies and procedures, as relevant for their job function.
MSSC_C_4_4	Human resource security 4	Staff shall undergo a formal rotation, change, and close-out procedure.
MSSC_C_5_1	Responsibility for assets 1	All assets shall be clearly identified and an inventory of all important assets drawn up and maintained.
MSSC_C_5_2	Responsibility for assets 2	All+information+and+ATM+services+associated+with+information+processing+facilities+shall+be+%91owned%92+by+a+designated+responsible+individual+or+role
MSSC_C_5_3	Responsibility for assets 3	Rules for the acceptable use of assets shall be identified, documented, and implemented.
MSSC_C_5_4	Asset classification 1	All Information and ATM services shall be classified in terms of its value, legal requirements, sensitivity and criticality to ATM, ATM organizations and stakeholders.
MSSC_C_5_5	Asset classification 2	An appropriate set of procedures for information and ATM services labelling and handling shall be developed and implemented in accordance with the classification scheme adopted
MSSC_C_5_6	Media handling 1	There shall be procedures in place for the management of removable media
MSSC_C_5_7	Media handling 2	Media shall be disposed of securely and safely when no longer required, using formal procedures
MSSC_C_5_8	Media handling 3	Procedures for the handling and storage of ATM information shall be established to protect ATM services and information from unauthorized disclosure or misuse
MSSC_C_5_9	Media handling 4	ATM system documentation shall be protected against unauthorized access
MSSC_C_6_1	Secure access controls 1	An access control policy shall be established, documented, and reviewed based on business and security requirements for access
MSSC_C_6_10	Usser access management 3	A security policy for papers and removable storage media and information processing facilities shall be adopted
MSSC_C_6_2	Secure access controls 2	There shall be an access control procedure in place for granting and revoking access to all information systems and services
MSSC_C_6_3	Secure access controls 3	The allocation of access privileges shall be restricted to users who have been specifically authorized to use ATM facilities, and such privileges should be controlled by a formal management process

Ref (acronym)	Name	Description
MSSC_C_6_4	Secure access controls 4	For shared ATM networks, especially those extending across the Responsible Organization's boundaries, the capability of users to connect to the network shall be restricted, in accordance with the access control policy and requirements of the operational applications.
MSSC_C_6_5	Secure access controls 5	The use of utility programs that might be capable of overriding system and application controls shall be restricted and tightly controlled
MSSC_C_6_6	Secure access controls 6	Sensitive systems shall have a dedicated (protected) computing environment
MSSC_C_6_7	Secure access controls 7	The Responsible Organization shall review the security requirements and risks of every external access to information or ATM Services before granting access
MSSC_C_6_8	Usser access management 1	User shall be required to follow good security practices in the protection of authentication information or devices
MSSC_C_6_9	Usser access management 2	Users shall ensure that unattended equipment has appropriate protection
MSSC_C_7_1	Physical and environmental security 1	Security perimeters shall be used to protect ATM sensitive areas and ATM processing facilities
MSSC_C_7_2	Physical and environmental security 2	ATM secure areas shall be protected by appropriate entry controls which allow access only to authorized personnel and which detect unauthorized access
MSSC_C_7_3	Physical and environmental security 3	ATM equipment shall be provided with auxiliary means to compensate for deliberate compromising of power supply, overheating and fire
MSSC_C_7_4	Physical and environmental security 4	ATM cabling shall be protected from deliberate damage, eavesdropping or interference
MSSC_C_7_5	Physical and environmental security 5	ATM equipment shall be maintained and serviced to ensure their availability and integrity
MSSC_C_8_1	Operational procedures and responsibilities 1	Operating ATM procedures shall be documented, maintained, and made available to all users who need to know them
MSSC_C_8_2	Operational procedures and responsibilities 2	Changes to ATM information processing facilities, ATM services and systems shall be controlled
MSSC_C_8_3	Protection from malware 1	Detection, prevention, and recovery controls to protect ATM software against malicious code and appropriate user awareness procedures shall be implemented
MSSC_C_8_4	Backup 1	Backup copies of ATM information and software shall be taken and tested regularly in accordance with an agreed backup policy
MSSC_C_8_5	Logging and Monitoring 1	Procedures for monitoring the use of ATM services and information processing facilities shall be established and the results of the monitoring activities reviewed regularly
MSSC_C_8_6	Logging and Monitoring 2	ATM logging facilities and log information shall be protected against tampering and unauthorized access
MSSC_C_8_7	Logging and Monitoring 3	Faults shall be logged, analysed, and appropriate action taken
MSSC_C_9_1	Network security management 1	ATM Networks shall be adequately managed and controlled, in order to be protected from threats, and to maintain security for the ATM systems and applications using the network, including information in transit

Ref (acronym)	Name	Description
MSSC_C_9_2	Information transfer 1	Formal exchange policies, procedures, and controls shall be in place to protect the exchange of ATM services and information through the use of all types of communication facilities. Agreements shall be established for the exchange of ATM services and information and software between the Responsible Organization and external parties
MSSC_C_9_3	Information transfer 2	Information conveyed by electronic messaging shall be appropriately protected
MSSC_C_10_1	Security requirements of information systems 1	Every specification for new or updated facilities includes security requirements
MSSC_C_10_2	Security requirements of information systems 2	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
MSSC_C_10_3	Security requirements of information systems 3	Security testing shall be performed whenever a system is updated
MSSC_C_10_4	System planning and acceptance 1	Security acceptance criteria for new ATM information systems or services, upgrades, and new versions shall be established, and suitable security tests of the ATM system(s) carried out during development and prior to acceptance. This shall include individual development activities such as specification, design, develop and qualify may have corresponding acceptance criteria
MSSC_C_11_1	Information security incident management 1	ATM service and Information security events shall be reported through appropriate management channels as quickly as possible
MSSC_C_11_2	Information security incident management 2	All employees, contractors and third party users of information systems and services shall be required to note and report any observed or suspected security weaknesses or malfunctions in ATM systems or services
MSSC_C_11_3	Information security incident management 3	Management responsibilities and procedures shall be established to ensure an effective and orderly response to ATM service and information security incidents
MSSC_C_11_4	Information security incident management 4	Where a follow-up action against a person or organization after an ATM service or information security incident involves legal action (either civil or criminal), pieces of evidence shall be collected, retained, and presented to the relevant jurisdiction(s).
MSSC_C_11_5	Information security incident management 5	The Responsible Organization shall have procedures in place that specify when and by whom external authorities (e.g. law enforcement, fire department, supervisory authorities) shall be contacted in the event of a security incident
MSSC_C_12_1	Information Security aspects of business continuity management 1	A managed process shall be developed and maintained that addresses the ATM service and information security requirements needed for ATM business continuity
MSSC_C_12_2	Information Security aspects of business continuity	Events that can cause interruptions to ATM business processes shall be identified, along with the likelihood and impact of such interruptions and their consequences for ATM information security

Ref (acronym)	Name	Description
	management 2	
MSSC_C_12_3	Information Security aspects of business continuity management 3	Plans shall be developed and implemented to maintain or restore operations and to ensure the availability, integrity and confidentiality of information at the required level and in the required time scales following interruption to critical ATM business processes
MSSC_C_12_4	Information Security aspects of business continuity management 4	ATM business continuity plans shall be tested and updated regularly to ensure that they are up to date and effective
MSSC_C_13_1	Compliance 1	Compliance to statutory, regulatory and contractual requirements shall be checked, and the correct and authorized use of facilities and assets shall be defined
MSSC_C_13_2	Compliance 2	Any personal or protectively classified information shall be protected in accordance with National and European requirements

A.1.3 Environment impact assessment

No environment impact assessment compliant with Environment Reference Material (ERM) has been performed regarding the concept introduced in this document.

However, evaluations of the environmental impact have been performed within the different validation activities. See following documents:

- Document [14]: VALR for the RTS of the vectoring to merge point concept in Orly (EXE 823)
- Document [15]: VALR for the Live Trial of the vectoring to merge point concept in Orly (EXE 763)

The results of these assessments were considered to mature the different concepts and to derive the safety and performance requirements.

A.1.4 OPA / Human Performance assessment

Human Performance assessments have been conducted, according to the Human Performance Reference Material ([9]), for following exercises:

- EXE 622 – RTS for Point Merge Concept In Orly
- EXE 823 – Real Time Simulation for Vectoring To Merge Point concept in Orly
- EXE 763 – Live Trial for Vectoring To Merge Point concept in Orly

The results of these assessments are recorded in the following file (HP Log):

DEL
05.06.02-D48-00.01.

-END OF DOCUMENT-