Enhanced Arrival Procedures Enabled by GBAS - SPR – Consolidation (RNP Transition to xLS)

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ENAV (L); AIRBUS; EUROCONTROL; DFS; HONEYWELL; THALES	

Abstract

This document collects a set of safety and performance requirements developed for the concept of "Curved RNP transition to GLS/ILS precision approach" assessed by the project "Enhanced arrival procedures enabled by GBAS" under the operational focus area "Optimised 2D/3D Routes". The requirements were consolidated through several iterations taking into account the growing maturity of the concept during the project lifecycle. The document also provides the safety and performance assessments performed in order to collect and validate the requirements.

Authoring & Approval

Prepared By - *Authors of the document.*		
Name & Company	Position & Title	Date
[redacted] EUROCONTROL	[redacted]	14/11/2016
[redacted] EUROCONTROL	[redacted]	30/09/2016
[redacted] EUROCONTROL	[redacted]	30/09/2016
[redacted] SICTA on behalf of ENAV	[redacted]	14/11/2016

Reviewed By - *Reviewers internal to the project.*		
Name & Company	Position & Title	Date
[redacted] SICTA on behalf of ENAV	[redacted]	16/09/2016
[redacted] HONEYWELL	[redacted]	16/09/2016
[redacted] HONEYWELL	[redacted]	16/09/2016
[redacted] AIRBUS	[redacted]	16/09/2016
[redacted] AIRBUS	[redacted]	16/09/2016
[redacted] SII on behalf of AIRBUS	[redacted]	16/09/2016
[redacted] EUROCONTROL	[redacted]	15/09/2016
[redacted] EUROCONTROL	[redacted]	15/09/2016
[redacted] EUROCONTROL	[redacted]	15/09/2016
[redacted] EUROCONTROL	[redacted]	15/09/2016
[redacted] NORACON	[redacted]	15/09/2016
[redacted] DFS	[redacted]	15/09/2016
[redacted] THALES	[redacted]	15/09/2016

Reviewed By - *Other SESAR projects, Airspace Users, staff association, military, Industrial Support, other organisations.*		
Name & Company	Position & Title	Date
[redacted] NATS	[redacted]	15/09/2016
[redacted] NATS	[redacted]	16/09/2016
[redacted] EUROCONTROL	[redacted]	16/09/2016
[redacted] EBAA	[redacted]	16/09/2016
[redacted] NOVAIR	[redacted]	16/09/2016
[redacted] AIRFRANCE	[redacted]	21/09/2016
[redacted] AIRBUS (No comment Received)	[redacted]	09/11/2016
[redacted] AENA (No comment Received)	[redacted]	16/09/2016
[redacted] Lufthansa (no comment received)	[redacted]	16/09/2016
[redacted] EUROCONTROL (no comment received)	[redacted]	16/09/2016
[redacted] EUROCONTROL (no comment received)	[redacted]	16/09/2016
[redacted] EUROCONTROL (no comment received)	[redacted]	16/09/2016

[redacted] EUROCONTROL (no comment received)	[redacted]	16/09/2016
[redacted] EUROCONTROL (no comment received)	[redacted]	16/09/2016
[redacted] NATS (no comment received)	[redacted]	16/09/2016
[redacted] Met Office (no comment received)	[redacted]	16/09/2016

Approved for submission to the SJU By - *Representatives of the company involved in the project.*		
Name & Company	Position & Title	Date
[redacted] SICTA on behalf ENAV	[redacted]	27/09/2016
[redacted] AIRBUS	[redacted]	30/09/2016
[redacted] ALENIA	[redacted]	30/09/2016
[redacted] DFS	[redacted]	27/09/2016
[redacted] EUROCONTROL	[redacted]	30/09/2016
[redacted] HONEYWELL	[redacted]	28/09/2016
[redacted] NATS	[redacted]	30/09/2016
[redacted] NORACON	[redacted]	30/09/2016
[redacted] SEAC	[redacted]	30/09/2016
[redacted] THALES	[redacted]	30/09/2016

Rejected By - *Representatives of the company involved in the project.*		
Name & Company	Position & Title	Date
<Name / Company>	<Position / Title>	<DD/MM/YYYY>

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Executive summary

This document focus on the safety and performance requirements for Curved Required Navigation Performance (RNP) transition to GBAS Landing System precision approach matured through iterative cycles of fast-time and real-time simulations as well as flight trials at Frankfurt, Malpensa and Arlanda airports.
The SPR requirements have been identified starting from the analysis of the existing material of the related OSED [58].

This safety assessment started by the identification of Safety Criteria (SAC) describing what is acceptably safe for the different operational concepts. Then Safety Objectives were derived at operational level (OSED) to satisfy the Safety Criteria in normal, abnormal and failure conditions. Finally when the high-level design architecture supporting the operational level was defined, Safety Requirements in normal/abnormal conditions and considering failure aspects were derived to satisfy the Safety Objectives. Safety Requirements were determined through the success and the failure approach as described by the SESAR Safety reference Material (SRM).

During SAR iterative process, safety validation objectives have been identified and have been addressed during Validation Exercises.

This Safety Assessment was conducted jointly with the Human Performance assessment in particular during the different meetings/workshops, validation exercises and analysis. At the end of this joint process the identification of common and consistent Safety and Human Performance requirements and recommendations has been performed.

Safety objectives have been set at ATM service level to ensure satisfaction of the SAC by the operational concepts, in all operating conditions (normal, abnormal, and failure). A functional hazard assessment has been conducted to identify operational hazards and corresponding operational risk.

Validation activities have been performed at V2 and V3 level to assess satisfaction of the safety objectives in normal operating conditions.

A High-level design architecture supporting the operational level was defined. Based on that, Safety Requirements in normal/abnormal conditions and considering failure aspects were derived to satisfy the Safety Objectives. It should be noted that the design analysis at SPR level is not complete for the time being.

The requirements collected in this context are properly justified by the Safety and Performance Assessments presented into the dedicated appendix A.1.

The Safety assessment A.1.1 aims at defining Safety Requirements following the guidelines provided by SESAR Safety Reference Material (SRM) [8]. It covers a broader approach applying both success and failure approach:

- The Success Approach seeks to assess the achieved level of safety when the ATM system in question is working as intended (i.e. in the absence of failure) - What we want the system to do (i.e. analyzing how the pre-existing hazards and associated risk can be mitigated).
- The Failure Approach seeks to assess the effect, on the achieved level of safety, in the event of failure (i.e. deviation from what is intended internal to the ATM system). What we don't want the system to do.

The derivation of performance requirements has followed the top-down principle, cascaded down from validation targets at OFA level and supported by the conducted fast time simulations, real time simulations and flight trials:

- Listing the identified operational potential issues which may impact negatively on Key Performance Areas (KPAs);
- Listing the mitigations or preventions for these issues and then
- Deriving the associated Operational Performance Requirements.

At the end of the project, V3 level of maturity was fully achieved for Curved RNP to GLS precision Approach reported within SESAR solution #9 Enhanced terminal operations with automatic RNP transition to ILS/GLS.

1 Introduction

1.1 Purpose of the document

SESAR Project 06.08.08 aims at developing and validating advanced approach procedures enabled by Ground Based Augmentation System (GBAS) to reduce noise impact, improve fuel efficiency and increase runway throughput. Specifically, the project focuses on:

- Curved Required Navigation Performance (RNP) transition to GBAS Landing System precision approach: curved RNP initial and intermediate segments with a transition to final approach segment provided by GBAS landing system
- Increased Glide Slope: a glide path with a glide slope increased up to 4.5° with respect to the standard 3°
- Multiple Runway Aiming Points: a glide path anchored to shifted touch down points with respect to the standard threshold
- Adaptive Increased Glide Slope: an on-board functionality that calculates the best descent glide slope in accordance to the local conditions (e.g. wind, aircraft mass etc.) on the basis of a lower published slope
- Double Slope Approach: a glide path split in two different segments, a first increased segment followed by a standard one

These procedures have been matured through iterative cycles of fast-time and real-time simulations as well as flight trials at Frankfurt, Heathrow, Malpensa, Schiphol and Arlanda airports.

The Safety and Performance Requirements (SPR) document provides the safety and performance requirements for services related to the operational processes defined in the corresponding OSED [14]. In the document, traceability and justification to all collected requirements is provided through the conducted safety and performance assessment.

The purpose of the SPR is to provide the basis for ensuring that all requirements are applicable during the initial implementation and continued operation. In particular, the requirements were obtained through different iterations that follow the European Operational Concept Validation Methodology steps V2 and V3 [59]:

- **Enhanced Arrival Procedures Enabled by GBAS - SPR Updating - V2**
  The V2 iteration: it collected the requirements updated after the V2 validation activities and was used as input for the V3 validation activities.

- **Enhanced Arrival Procedures Enabled by GBAS - SPR - Consolidation**
  The final version that provided the consolidated safety and performance requirements useful to assure an appropriate level of safety to the elements investigated by the project. The assessment includes an evaluation of the operational concepts updated through V3 validation activities results.

This SPR document, fully dependent to the reference OSED, has been updated taking into account the progress of activities made internally to the project.

Finally this SPR is split in two different parts and documents for the operational concepts under OFA01.03.01 and OFA02.01.01. This is the SPR part for OFA02.01.01 concept.

1.2 Scope

The SPR supports the operational services and concept elements identified in the Operational Service and Environment Definition (OSED) [58].

The requirements collected in this document are traced to the requirements described in the corresponding OSED, which show traceability to the DOD.

In detail, the performance requirements considered in this document shall apply to Services in the scope of the Operational Focus Areas "*Optimised 2D/3D Routes*"".

The Operational Improvement steps (OIs from the definition phase), within the associated Operational Focus Area addressed by project is in the table below:

OI Steps	OIs short description	OFA ref
AOM-0605 (Enhanced terminal operations with RNP transition to ILS/GLS/LPV)	RNP transition to ILS/GLS/LPV with curved procedures connecting directly to the final approach can provide improved access in obstacle rich environments and can reduce environmental impact. RNP transition to ILS/GLS/LPV should be compatible with CDA operations, where appropriate.	OFA02.01.01 Optimised 2D/3D Routes

Table 1:-OI addressed by SESAR Project 06.08.08

1.3 Intended readership

This document is to support any ATC, Airspace Users, ANSPs, Airport Operations and Safety Regulators willing to develop operations of IGS, A-IGS, DS, MRAP, RNP to xLS, taking advantage of GBAS capabilities.

Additionally, the main audience for this SPR could be:

- P05.02: Consolidation of Operational Concept Definition and Validation
- P06.02: Coordination and consolidation of operational concept definition and validation
- P06.08.01: Flexible and Dynamic Use of Wake Vortex Separations
- P06.08.02: Enhanced Runway Management Through Optimised Braking Systems
- P06.08.05: GBAS Operational Implementation
- P09.09: RNP Transition to xLS

1.4 Structure of the document

The structure of this SPR is as follows:

- **Chapter 1** provides general information about the document.
- **Chapter 2** provides a summary of the operational concept in relation to P06.08.08 OSED [14].
- **Chapter 3** is dedicated to the collection of the safety and performance requirements coming from safety and performance assessments (Appendix A).
- **Chapter 4** lists the applicable and reference documents.
- **Appendix A** describes the whole assessment and justification performed developed by the P06.06.08 SAR in order to derive the related safety and performance requirements as well as the performance requirements.

1.5 Background

The process applied to perform a complete safety assessment follows the 16.06.01 SRM methodology [8] and deals with the «Broader» approach divided in:

Success approach

> Aimed at assessing how effective the new concepts and technologies would be when they are working as intended – i.e. how much the pre-existing risks that are already in aviation will be reduced by the ATM changes. This is concerned with the positive contribution to aviation safety that the ATM changes make in the absence of failure.

Failure approach

> Aimed at assessing the ATM system generated risks, i.e. induced by the ATM changes failing. This is concerned with the negative contribution to the risk of an accident that the ATM changes might make in the event of failure(s), however caused.

1.6 Glossary of terms

Term	Definition
Hazard	Hazard shall mean any condition, event, or circumstance which could induce an accident. This covers both pre-existing aviation hazards (not caused by ATM/ANS functional systems) and new hazards introduced by the failure of the ATM/ANS functional systems.[8]
Mixed Approach Mode	Current approach operations mixed with GBAS approach operations
Pre-existing hazard	Pre-existing hazard by definition exists in the operational environment before any form of 'deconfliction' has taken place. It is, therefore, not caused by the system – rather, the main purpose of introducing the system is to eliminate this pre-existing hazard or at least maintain the associated risks at an acceptably low level.[8]
Safety objectives	Safety objective shall mean the functional, performance and integrity safety properties of the air navigation system, derived at the OSED level. Safety objectives describe what the air navigation system has to provide across the interface between the service provider and service user in order that the Safety Criteria are satisfied. They provide mitigation of the pre-existing risks; and limit the risks arising from failures within the air navigation system. As objectives, they should specify what has to be achieved – how it is achieved is covered by safety requirements – from Article 2(11) of Regulation (EC) No 1035/2011. This definition relates to a broader interpretation of what a hazard is. It addresses two types of hazards: “pre-existing”, which the ATM/ANS functional system has to mitigate; and “system-generated” hazards, which are created by failure of the ATM/ANS functional system. Consequently the safety objectives have to provide mitigation of the pre-existing hazards as well as mitigations of the system-generated hazards derived from the service-level failure analysis. Currently, in Regulation (EC) No 1035/2011, the following definitions apply: “‘hazard’ means any condition, event, or circumstance which could induce an accident” and “‘safety objective’ means a qualitative or quantitative statement that defines the maximum frequency or probability at which a hazard can be

Term	Definition
	expected to occur".[8]
Safety requirements	Safety requirement shall mean the necessary risk reduction measures identified in the risk assessment to achieve a particular safety objective. They describe the functional, performance and integrity safety properties at the system-design level as well as organisational, operational, procedural, and interoperability requirements or environmental characteristics – from Article 2(12) of Regulation (EC) No 1035/2011. Currently, in Regulation (EC) No 1035/2011, the following definition applies: "'safety requirement' means a risk-mitigation means, defined from the risk-mitigation strategy that achieves a particular safety objective, including organisational, operational, procedural, functional, performance, and interoperability requirements or environment characteristics".[8]
Success approach	It is the first step required to perform a complete Operational Safety Assessment in which we assess how effective the new concepts and technologies would be when they are working as intended – i.e. how much the pre-existing risks that are already in aviation will be reduced by the ATM changes. This is concerned with the positive contribution to aviation safety that the ATM changes make in the absence of failure.[8]

Table 2 - Glossary of terms

1.7 Acronyms and Terminology

Term	Definition
ADD	Architecture Definition Document
A-IGS	Adaptive Increased Glide Slope
ANSPs	Air Navigation Service Providers
AO	Aircraft Operator
ATC	Air Traffic Controller
ATM	Air Traffic Management
AUs	Airspace Users
CA	Competent Authority
CWP	Controller Working Position
DS	Double Slope
DOD	Detailed Operational Description
E-ATMS	European Air Traffic Management System
FC	Flight Crew

Term	Definition
FCRW	Flight Crew
GAST	GBAS Approach Service Type
GBAS	Ground Based Augmentation System
GLS	GBAS Landing System
GNSS	Global Navigation Satellite System
IGS	Increased Glide Slope
IRS	Interface Requirements Specification
INTEROP	Interoperability Requirements
KPA	Key Performance Area
LVP	Low Visibility Procedures
MA	Missed Approach
MRAP	Multiple Runway Aiming Point
OFA	Operational Focus Area
OIs	Operational Improvement step
OPA	Operational Performance Assessment
OSA	Operational Safety Assessment
OSED	Operational Service and Environment Definition
RC	Runway Collision
RE	Runway Excursion
RET	Rapid Exit Taxiways
RNP	Required Navigation Performance
RNP to GLS	Curved RNP transition to GLS precision approach
RPID	Reference Path IDentifier
SAR	Safety Assessment Report
SESAR	Single European Sky ATM Research Programme
SESAR Programme	The programme which defines the Research and Development activities and Projects for the SJU.

Term	Definition
SIS	Signal In Space
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
SRM	Safety Reference Material
TAD	Technical Architecture Description
TS	Technical Specification
xLS	either GLS or ILS

Table 3 - Acronyms and Terminology

2 Summary of Operational Concept (from OSED)

Since the following paragraphs are derived from P06.08.08 OSED [58] a complete and detailed description of the operational concept is provided in that document.

2.1 Description of the Concept Element

A Ground-Based Augmentation System (GBAS) is a safety-critical system that supports local augmentation at airport level of the primary GPS constellations by providing guidance signals with different levels of service to support approach and landing. Project 06.08.08 considers GBAS application up to CAT I operations.

The aim of the GBAS is the provision of Signal in Space (SIS) augmenting the Global Positioning System (GPS) performance to improve aircraft safety during airport approaches and landings.

GBAS Operational concept, the definition and the performance level of the provided signals have been derived from equivalent operations using ILS system.

It is expected that the GBAS end-state configuration will provide a significant improvement in service flexibility and user operating costs compared with ILS, also considering that it needs less preventive maintenance.

2.2 Description of Operational Services

Enhanced arrival procedures enabled by GBAS project focuses on three CAT I approach procedure concepts dealing with glide slope increase, multiple runway aiming points and Curved RNP transition to GLS Precision Approach as described in P06.08.08 D07 – OSED Consolidation [58].

As explained in previous section 1.2 the document is split in two different parts: one for glide slope increase and multiple runway aiming points, the other for Curved RNP transition to GLS Precision Approach. This part applies to Curved RNP transition to GLS Precision Approach concept only that is described below.

2.3 Operational concept, services and environment definition

2.3.1 Operational concept

This concept covers the use of a curved RNP initial / intermediate approach with continuous descent profile transitioning to a short xLS straight final approach (final turn may end as close as 5 NM to runway threshold in the case of GLS).

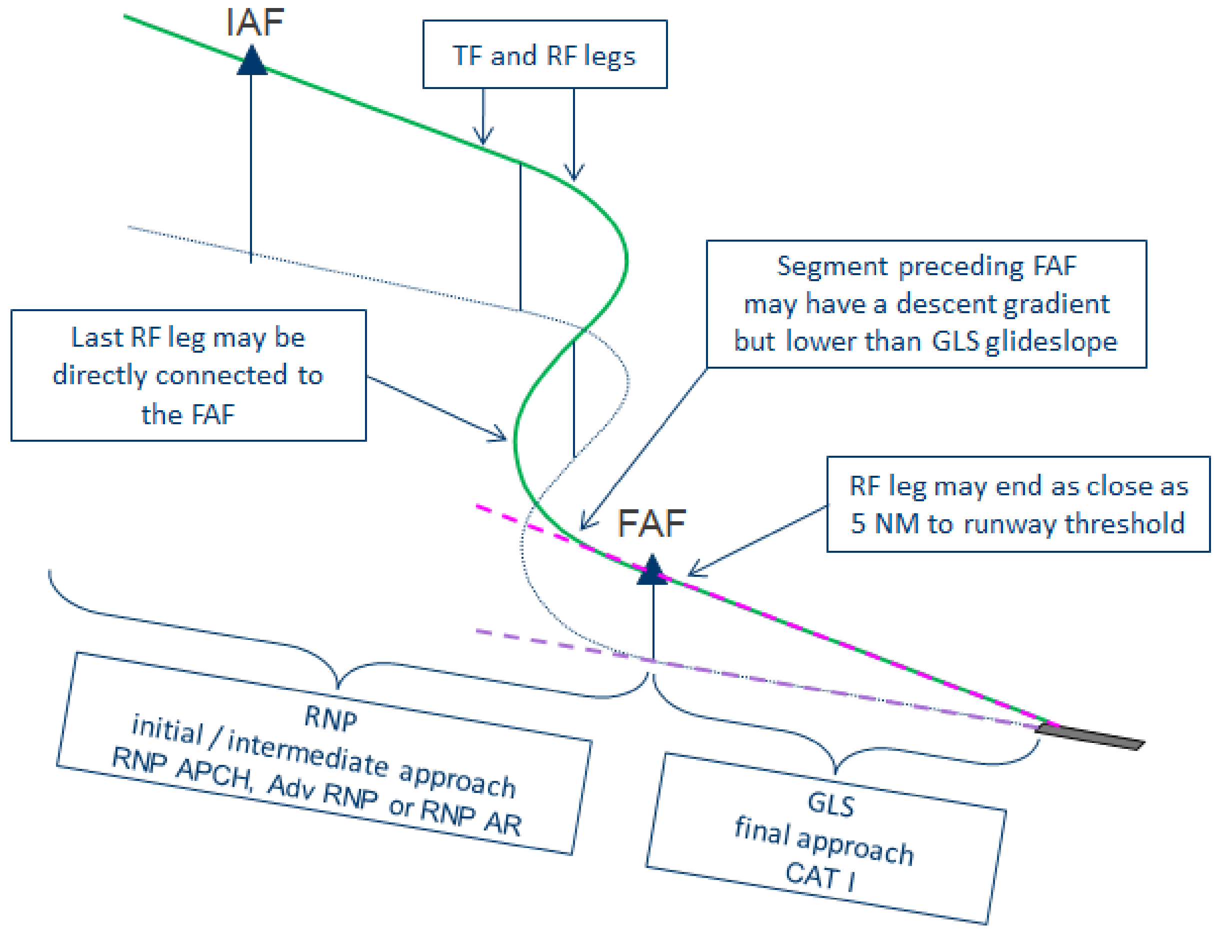

Figure 1: Illustration of RNP to GLS concept

<u>Note 1</u>: The illustrated concept is limited to GLS CAT I approaches. However, the same concept can also be defined for other xLS approach systems as well as for CAT II and CAT III minima, provided performance differences are taken into account when defining procedure design limitations.

<u>Note 2</u>: The curved RNP transition to GLS precision approach concept will sometimes be referred as “RNP to GLS” within this document

2.3.1.1 Expected benefits

All the benefits presented hereafter are stated with respect to conventional straight-in approaches.

<u>Environment / Fuel Efficiency</u>

RNP to GLS operations are an enabler for:

- Reduced number of people impacted by noise, since sensitive areas can be avoided thanks to flexible procedure design.
- Fuel savings and reduced emissions, since track-miles for downwind traffic can be reduced thanks to a more efficient procedure design and a shorter final segment.

<u>Airport Capacity</u>

- RNP to GLS operations are an enabler for improved accessibility to airports that are constrained by terrain / obstacles (i.e. airports where conventional straight-in approaches have impractical landing minima or cannot even be deployed).

- RNP to GLS operations might be an enabler for improving capacity at airports that are constrained by noise restrictions (e.g. night curfew), depending on how local authorities consider operational noise as a key driver to alleviate such restrictions.

Economics

- RNP to GLS operations could be an enabler for increased ATC productivity in the TMA depending on the capability of anticipating the aircraft separation (to minimize ATC interventions in the TMA).
- RNP to GLS operations might be an enabler for noise charges reduction for airspace users depending on how local authorities consider operational noise as a key driver to reduce noise charges.

Predictability

- RNP to GLS operations could be an enabler for reduced TMA arrival duration variability depending on the capability of anticipating the aircraft separation (to minimize ATC interventions in the TMA).
- RNP to GLS operations could provide the ability for planning the descent before ToD using most optimum trajectory.

Safety

- RNP to GLS operations can be deployed to replace visual circling to land on runways where conventional straight-in approaches cannot be deployed due to terrain / obstacle constraints.

2.3.1.2 Challenges

Aircraft operation

The aircraft operation challenge is twofold:

- Ensure the respect of the RNP lateral and vertical performance requirements until the aircraft is properly established on the GLS beam.
- Ensure the timely capture of the GLS lateral and vertical axes to satisfy operational and technical requirements for landing (stabilization and autoland).

Appropriate procedure design criteria and flight crew operational procedures will need to be defined to ensure adequate aircraft performance on RNP to GLS transitions. Aircraft RNP to GLS technical constraints are detailed in Appendix E.

Air Traffic Management

- Understand how to ensure separation when an aircraft is following this procedure in a sequence. This challenge is valid for both single runway and parallel runways approach configurations.
- Tools will probably need to be developed to support ATC sequencing and spacing. These may require airborne derived data to ensure ground based predictions are accurate enough for sequencing in times of many arrivals.

2.3.2 Flight Crew Operating Method

RNP-xLS operations can be defined as those approach operations where the aircraft intercepts the xLS LOC and G/S axes following a published RNP trajectory (i.e. RNP APCH, ADV RNP or RNP AR), instead of being guided by ATC or following a conventional procedure. The aircraft ideally follows the RNP trajectory starting from the IAF, but ATC guidance or conventional segments may be used before the final turn.

This definition of RNP-xLS operations covers a large variety of possible procedure geometries. It can go from just overlays of current ILS approaches, up to more ambitious procedures that take the full benefit of the curved RNP transition to GLS precision approach concept. Very few in-service RNP-xLS approaches exist for the moment, but several experimental ones have been tested". An example of in-service RNP-xLS approach is provided in Appendix D.

The RNP to GLS concept that is addressed in the frame of this project aims at ambitious procedures that take the full benefit of the curved RNP transition to GLS precision approach. The following table highlights the main novelties introduced by the enhanced RNP to GLS operations considered in this project with respect to more conservative RNP to ILS operations like the one deployed in the U.S.A:

	Feature	Current RNP to ILS operations	Advanced RNP to GLS operations
Initial / intermediate approach	RNP navigation specification before the FAF	**RNP APCH** (RNP = 1 NM)	**RNP APCH** (RNP = 1 NM) or **ADV RNP** (standard 1 NM, optional down to 0.3) or **RNP AR** (standard 0.3 NM, optional down to 0.1)
	Vertical profile before the FAF	**G/S captured from a level segment**	**G/S captured from a level segment or CDO**
	Last RF leg	Ends at least 2 NM before the FAP	May end at the FAP
Final approach	Final approach segment length	Length of conventional ILS approaches (≈ 6-15 NM)	Down to 5 NM if RF leg ends at FAP Down to 3 NM if a TF is included between RF leg and FAP (RF leg distance to threshold ≥ 5 NM)

Table 4: Enhanced features introduced by the proposed RNP to GLS concept

Note: It must be highlighted that the enhanced features introduced by the new concept could also be applicable to RNP to ILS. However, procedure design criteria may not be identical since RNP to ILS transition performance is not identical to that of RNP to GLS. A dedicated performance assessment should be conducted to identify any difference between RNP to GLS and RNP to ILS procedure design criteria.

2.3.2.1 Pre-flight Planning

The proposed RNP to GLS operations introduce some additional dispatch pre-conditions with respect to conventional GLS straight-in approaches:

- The specific aircraft to be used for the intended RNP to GLS operation must support the enhanced features associated to the operation. This may not be obvious because:
  - RF leg directly connected to the FAP. Current ARINC 424 coding rules do not consider the case of RF legs directly connected to the FAP on precision approaches. Indeed, it is necessary to include a TF leg which length is no less than 2NM between last RF leg and FAP.

- The aircraft intended for the operation must be capable of the corresponding RNP operation. This includes RF leg capability if the procedure includes RF legs.
- The flight plan submitted to ATC before departure must indicate the aircraft RNP capabilities.

  Note: the dedicated codes defined in the current ICAO PANS-ATM version do not include RF leg or Advanced RNP capability. A standardization effort should be performed to include the appropriate codes, in order to ensure that ATC is aware of aircraft capability to fly the curved RNP transition to GLS precision approach. This evolution would probably require modifications on some flight plan processing systems.
- NOTAMs for both RNP and GLS positioning services (i.e. GPS and GBAS) must be taken into account.
- The flight crew should verify that sufficient means are available to navigate and land at the destination or at an alternate aerodrome in case of loss of RNP or GLS capabilities.

2.3.2.2 Before approach (en-route to IAF)

Ideally, before commencing the descent to the destination airport, the crew will check the approach and runway in use and request an approach procedure accordingly. However, currently the most common procedure is that the inbound clearance is received after ToD, but this is expected to be changed in the future, especially in a future SESAR-concept, i.e. SBT/RBT, etc.

The crew will select the RNP approach transition and the GLS final approach from the on-board navigation database.

Several checks (such as correctness of the loaded procedure and GBAS availability) are to be carried out by the flight crew before the IAF and in preparation for flying the approach.

CDO may be used from the ToD along the whole arrival procedure.

In addition to the normal procedure, the flight crew can be requested by ATC to:

- Fly following a given heading (radar vector)
- Fly “Direct-To” a waypoint to by-pass the initial legs of the approach
- Intercept a specific segment of the initial or intermediate approach
- Insert additional waypoints from the navigation database

Note: Aircraft must be established on the inbound track to the RF leg prior to sequencing its starting waypoint. ATC must therefore not issue a Direct-To clearance to the starting waypoint of the RF leg, nor vector the aircraft to intercept the RF leg. A minimum intercept distance before the start of the RF leg should be defined. Some related criteria have already been developed by the FAA.

In complying with ATC instructions, the flight crew should be aware of the implications for the RNAV system:

a) The manual entry of coordinates into the RNAV system by the flight crew for operation within the terminal area is not permitted.

b) “Direct-To” clearances may be accepted to any waypoint prior to FAP, except for the starting waypoint of a RF leg, and in particular to the Intermediate Fix (IF) provided that the resulting track change does not exceed 45º at the IF.

c) “Direct-To” clearance to FAP is not acceptable. (Ref. PBN Manual – Vol-II B.5.3.4.4.2).

ATC vectoring does not imply termination of CDO (Ref. ICAO Doc 9931 – 1.2.1) though tactical ATC vectoring will, most likely, sub-optimise the CDO.

2.3.2.3 From IAF up to Final Approach Course intercept

To establish the aircraft on the final approach course:

- Ideally, the pilot follows the Initial and Intermediate approach segments as published

- Otherwise, the pilot follows a vector provided by ATC to intercept the published procedure before intercepting the final approach course. If the ATC radar vector made the aircraft intercept the final approach course (and under the provisions specified in 3.2.2.3.2), then no RNP to GLS operation would be flown, so this case is not considered.

It is assumed that ATC clearance for approach includes both lateral and vertical path of the published RNP transition to GLS.

The final approach course interception is understood as the switch from RNAV (LNAV) guidance to GLS lateral guidance (the switch to the GLS vertical guidance does not usually occur at the same time as the switch to GLS lateral guidance). To be noted that different aircraft could have different behaviours for this interception.

ATC shall not allocate a speed that exceeds the published RF leg maximum speed. It is expected that ATC will be familiar with RF leg benefits and their limitations e.g., speed. (Ref. PBN Manual, Volume II, Appendix 1 to Part C: RF Path Terminator, section 3.3 ATC coordination). Specific ATC training will be required.

If an aircraft system failure results in the loss of capability to follow an RF turn, the flight crew should maintain the current bank and roll out on the charted RF exit course, even manually. Flight crew should notify Air Traffic Control about the system failure as soon as possible. (Ref. PBN Manual – Vol-II – Part C – App-1[16]). This default criterion may differ depending on local procedures.

CDO may be used along the initial and intermediate approach segments.

2.3.2.4 From Final Approach Course interception to FAP (transition to FAS)

RNP to GLS transition presents some technical challenges derived from the following facts:

- Guidance modes used for GLS approaches are not designed to follow a planned trajectory to intercept the GLS axis, so they generally make the aircraft deviate from the prescribed interception trajectory.
- The positioning means used in the RNP part of the approach (hybrid GPS/INS + barometric altitude) are different from those used in the GLS part of the approach (GBAS 3D position), potentially leading to LOC and/or G/S capture issues.

These facts lead to two main technical challenges:

1. Need to ensure the respect of RNP lateral and vertical performance requirements before the aircraft is established on the GLS beam. The following figures illustrate the aforementioned challenge:

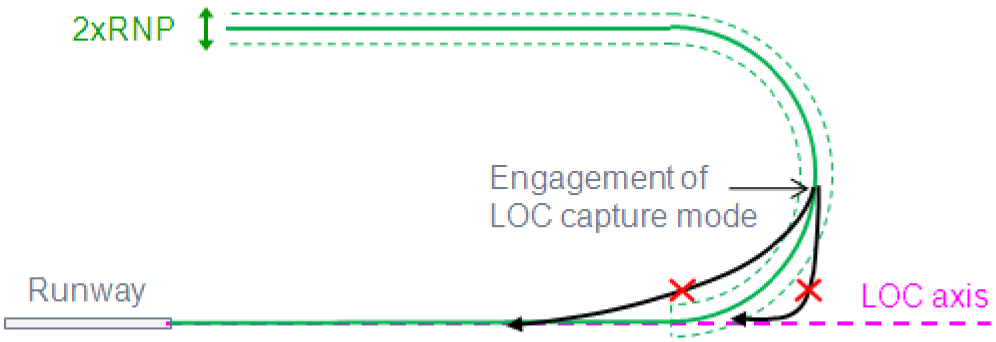

Figure 2: Respect of RNP lateral requirements

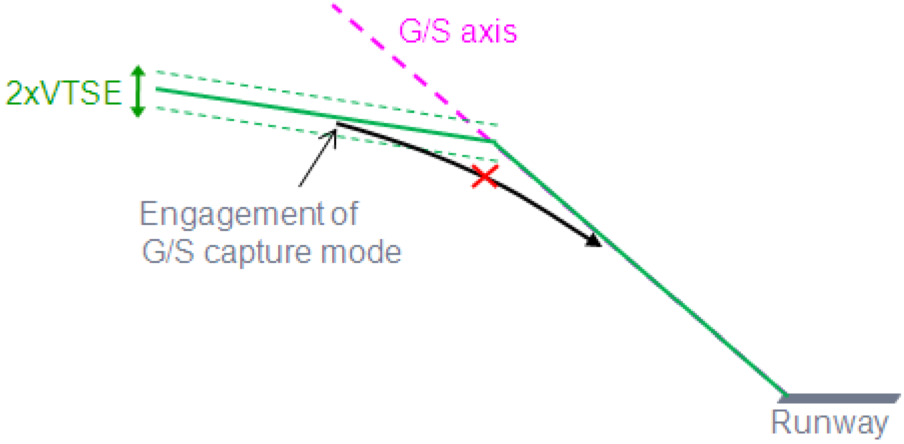

Figure 3: Respect of Barometric-VNAV vertical requirements

2. Need to ensure a timely capture of GLS LOC and G/S axes considering the expected navigation performance (including non-ISA temperature effect). The following figures illustrate the aforementioned challenge:

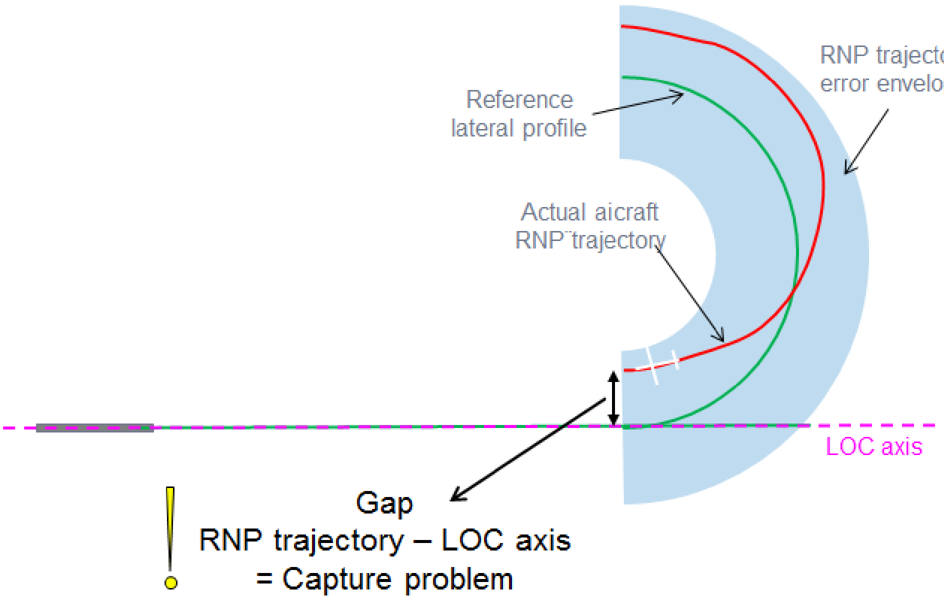

Figure 4: LOC capture issues

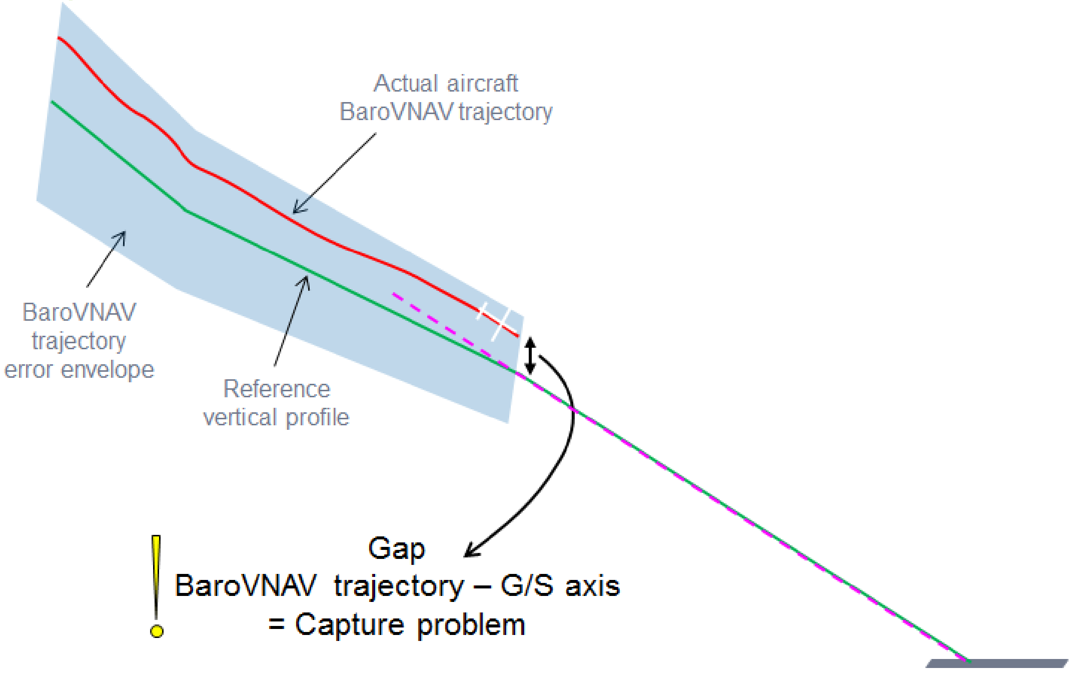

Figure 5: G/S capture issues

Note: *Non-ISA temperature effect is included in the Barometric-VNAV trajectory error envelope*

Since no change in aircraft design is expected in the short term to address these challenges, it becomes necessary to define procedure design limitations, temperature limitations and specific operational procedures for the appropriate deployment of RNP to GLS operations

The transition to a GLS final segment with an RF leg finishing at the FAP has been studied in P09.09 and P06.08.05. The deliverable 9.09.D05 describes the transition from an aircraft and crew point of view, and details two possible scenarios to manage the transition. To ensure that the RNP corridor is respected until the FAP in case of an RF leg finishing at the FAP:

- The transition to GLS mode can be delayed until the FAP. In LNAV mode, it is ensured that the RNP corridor is respected. But this may change the current operating procedures and may induce human factors issues, as well as leading to potential LOC capture issues.
- The transition to GLS mode is not delayed. The aircraft will fly the last part of the RNP corridor in GLS mode, but appropriate procedure design limitations will be established to ensure that the RNP corridor is respected in all the expected conditions.

2.3.2.5 Final Approach Segment (from FAP to DA/H)

Although this segment is carried out as for a standard GLS approach, the fact that an RF leg can join directly the beginning of a short FAS has led to an analysis of the applicable autoland technical requirements (for autoland case) and stabilized approach criteria (for both autoland and manual landing cases).

Autoland technical requirements

A too short FAS may not allow autopilot control laws to ensure the necessary performance for landing. As identified in past P06.08.05 [20], the minimum distance is 5 NM for localizer intercept and 3 NM for glideslope intercept.

Stabilized approach criteria

The general criterion is that the aircraft has to be stabilized at the latest when reaching 1000 ft above the runway threshold (this gate is airline dependent and may vary). This corresponds to 3.0 NM from runway threshold on a typical 3° slope.

However, the precise conditions to consider an aircraft “stabilized” are not universally defined.

The traditional “wings level” condition (see note below) should not be a showstopper for RNP-xLS operations with short FAS, since it could be reviewed as it has been done for RNP AR operations (which may have turns below 1000ft).

However, there is an additional stabilization issue specific to RNP-xLS with short FAS related to the autopilot guidance modes transition. Indeed, autopilot guidance modes may not be in their final configuration when reaching 1000ft if the RF turn ends too close to this gate.

<u>As a result, P06.08.08 concludes that</u>:

The final turn (RF leg) of the RNP transition can end directly at the FAP. The RF leg is assumed to end aligned with the GLS final approach.

The minimum distance from the RF leg end to the runway threshold is 5 NM for autoland (if applicable) and stabilization requirements.

A straight segment (TF leg aligned with the GLS final approach), can be included between the RF leg and the FAP. In this case, the FAP can be located as close as 3 NM from runway threshold, while the RF leg respects the aforementioned requirement of 5 NM.

<u>Note on “stabilized” criteria:</u>

Standards and regulations (e.g. doc 8168 [14], EASA OPS and associated AMCs) draw attention to the aircraft being in the correct landing configuration, speed and control of the flight path, while it provides no precise criteria about the due attitude (e.g. ALAR Briefing Note 7-1 refers to “excessive bank angle”) provided it is flown in a controlled and appropriate manner.

In some flight manuals it is observed that stabilized criteria include a reduced back angle (near ”Wings Level”), but this is understandable as they refer to straight in approaches including long final segments.

Project P05.06.03 regarding curved RNP to LPV and project P06.08.05 regarding curved RNP to GLS recollected AUs and project members view on the stabilization criteria, and both of them concluded that the stabilization criteria for these kinds of curved RNP transition to GLS precision approaches must be reviewed (as it has been done for RNP AR).

In particular, Project 05.06.03 concluded that the applicable stabilized approach criteria should not include a predefined max bank angle criterion. Following AUs feedback, it is understood that flight crew flying RNP to GLS procedures will be trained for this type of operation and will have their own judgment with respect to whether they can easily maintain the correct flight path or not.

Meanwhile, Project 06.08.05 concluded that it can be considered that the aircraft is correctly stabilized as long as it is "stabilized along the desired flight path" or “stabilized on guidance trajectory, even if curved”.

Both conclusions are in line with EUR OPS definition: “*stabilized approach (SAp)’ means an approach that is flown in a controlled and appropriate manner in terms of configuration, energy and control of the flight path from a pre-determined point or altitude/height down to a point 50 ft above the threshold or the point where the flare manoeuvre is initiated if higher*”.

2.3.3 ATC Operating Method

2.3.3.1 Planning Phase

Aircraft capability to fly curved RNP transition to GLS precision approach should be indicated in the flight plan so that the capability may be considered in the DCB process.

2.3.3.2 Execution Phase (first call to landing)

It is assumed that information about aircraft performance and status are shared between aircraft and ATC.

Single Runway and Independent Runway Operations

In the new operating method of the enhanced arrival procedures enabled by GBAS it is expected that the landing sequence and the related arrival spacing is built taking into that radar vectoring intervention needs to be minimised for the concept of curved RNP transition to GLS precision approach (to take full advantages of the use of RNP RF legs).

In particular, the landing sequence that is organised to minimise delay and noise pollution (while maximising the arrival rate) should be built integrating aircraft flying standard approach procedures with GBAS enhanced arrival procedures.

To support ATCO in establishing a landing sequence and managing the spacing of aircraft, ATCO tools could be implemented and improved to include GBAS enhanced arrival procedures.

Aircraft that are approaching an aerodrome are informed about curved RNP transition to GLS precision approach in use, in addition to the standard final approach instrument procedure, through the automatic terminal information service (ATIS).

GBAS enhanced arrival procedures request can be initiated by ATC or flight crew.

TMA/APP ATCO instruct, at first call, aircraft to fly a standard arrival route (STAR) or lead aircraft through radar vectoring clearances until initial point of the GBAS enhanced arrival procedure.

In case of curved RNP transition to GLS precision approach, radar vectoring intervention shall be minimised after IAF to take full advantages of RF legs of Curved RNP initial and intermediate segments to not affect the expected noise and/or efficiency benefits:

- In case the RNP/GLS procedure was designed to avoid noise sensitive areas, there is a risk that vectoring might lead to overflying such areas
- In case the RNP/GLS procedure was designed for efficiency purpose (lower track mile and/or optimised vertical profile), there is a risk that vectoring compromise those benefits

During final approach, ATCO monitors aircraft route, altitude and speed, in addition to the standard information (the position in the sequence, leading aircraft, runway, distance to be flown until the engagement of the GBAS or ILS signal and clearance to the instrument approach procedure).

Once aircraft have reported “Established”, as a consequence of the ATCO request to report GLS/ILS establishment, and have reached a defined distance from touch down, flight crew acquires the responsibility for horizontal and vertical navigation that is not anymore ATCO responsibility.

ATCO remains responsible for the separation and constantly monitor speed and altitude during the final approach segment and provide aircraft with:

- landing clearance to the determined runway aiming point,
- any deviation from the nominal or requested approach path (lateral and vertical from the GLS or ILS glide path),
- request for a runway vacation with a target or a convenient runway exit is strictly related to the assigned runway aiming point.

ATCO can be supported by tools to check any discrepancy from the nominal path in the final approach segment (GLS, ILS or non-published procedure).

Dependent Runway Operations

The main difference, between dependent runway operations and independent ones, consists of an added coordination and communication workload for ATCO controlling dependent runway operations to assure vertical and lateral dependent runway separation and to provide flight crew with information on dependent parallel approach.

Dependent parallel runway separations could be reduced through the use of increased glide slope and/or multiple runway aiming points that can assure a vertical separation between aircraft approaching dependent parallel runways.

RNP to GLS: initiation by ATC

At the top of descent or as soon as practicable, aircraft are instructed to fly curved RNP transition to GLS precision approach to reduce noise pollution and distance flown by ATCO.

Although it may still be useful for ensuring maximum runway throughput, ATCO vectoring intervention shall be minimised to take advantage of the curved RNP transition to GLS precision approach concept and increase ATCO situation awareness thanks to the RNP capabilities of a reliable and predictable path.

RNP to GLS: initiation by flight crew

At the top of descent or as soon as practicable, flight crew request to fly curved RNP transition to GLS precision approach to reduce noise pollution and distance flown.

Although it may still be useful for ensuring maximum runway throughput, ATCO vectoring intervention shall be minimised to take advantage of the curved RNP transition to GLS precision approach concept and increase ATCO situation awareness thanks to the RNP capabilities of a reliable and predictable path.

2.3.4 Support Systems: GBAS

A Ground-Based Augmentation System (GBAS) is a safety-critical system that supports local augmentation at airport level of the primary GPS constellations by providing guidance signals with different levels of service to support approach and landing up to CATIII operations (CATI already operational, CATII/III under final validation).

The aim of the GBAS is the provision of Signal in Space (SIS) augmenting the Global Positioning System (GPS) performance to improve aircraft safety during airport approaches and landings.

GBAS Operational concept, the definition and the performance level of the provided signals have been derived from equivalent operations using ILS system.

It is expected that the GBAS end-state configuration will provide a significant improvement in service flexibility and user operating costs compared with ILS, also considering that it needs less preventive maintenance.

GBAS consists of a GBAS Ground Subsystem, a GBAS Aircraft Subsystem and a GNSS Space Segment (see Figure 28). One GBAS Ground Subsystem can support an unlimited number of aircraft subsystems within its GBAS coverage volume. The Ground Subsystem provides the aircraft with approach path data and, for each satellite in view, corrections and integrity information. The corrections enable the aircraft to determine its position relative to the approach path more accurately.

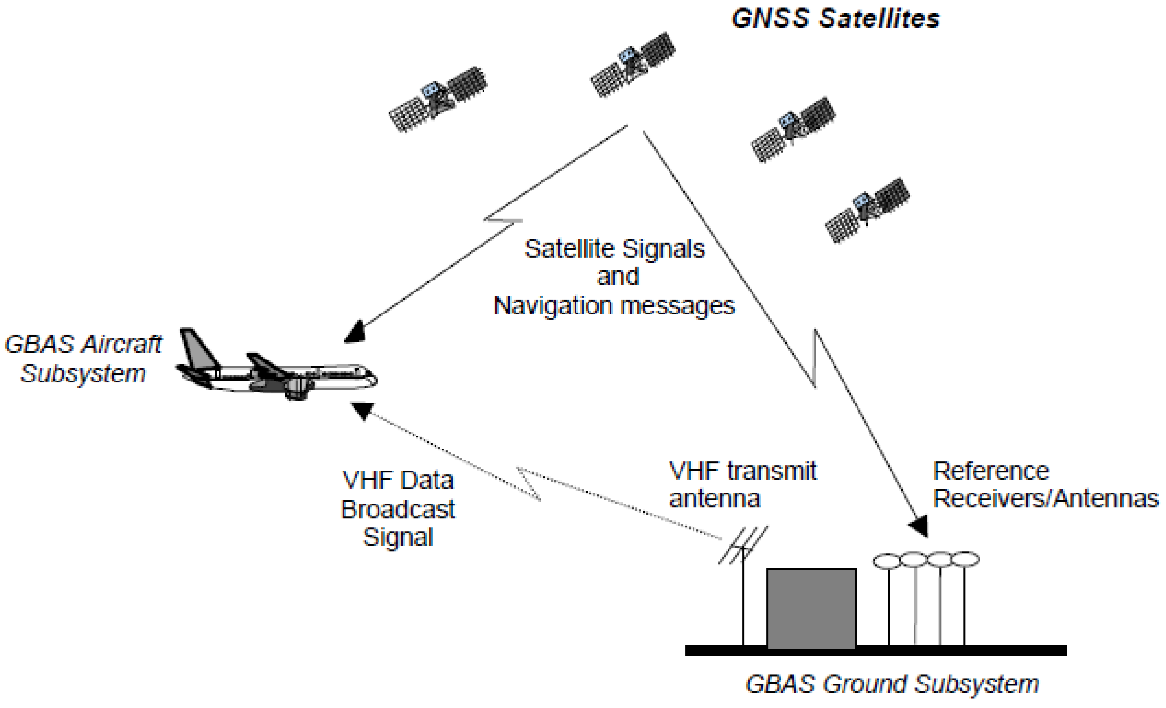

Figure 6: GBAS system overview

As described in [23], the GBAS Ground Subsystem uses at least two reference receivers, a GBAS ground facility, and a VHF Data Broadcast (VDB) transmitter.

Signals from GPS satellites are received by the GBAS / GPS Reference Receivers at the GBAS-equipped airport. Reference receivers calculate pseudo-ranges (high accuracy ranging measurements) for all GPS satellites within view. The GPS Reference Receivers and GBAS Ground Facility work together to estimate in the GPS-ranging measurements the deviation errors from the expected geometrical distances to the satellites. Then, the GBAS Ground Facility produces a GBAS ranges correction message which includes as well integrity parameters.

It also produces additional messages with various static parameters and approach paths information (FAS Data-block). The GBAS messages are then sent to the aircraft subsystems through a VHF Data Broadcast (VDB) transmitter in order that it uses the messages to correct their own measurements according to the differential principle.

Consequently this principle requires that the ground and aircraft subsystems use exactly the same ephemeris and satellite clock corrections. Moreover, since the differential principle removes all the ranging errors that are common to ground and aircraft subsystems, absolute tropospheric or SBAS corrections are not applied by the two subsystems.

Furthermore it must be considered that a unique GBAS ground subsystem may serve several approach paths towards the runway of a given airport. Indeed the VDB transmitter broadcasts the GBAS signal throughout the GBAS coverage area to avionics in GBAS-equipped aircraft. GBAS provides its service to a local area (approximately a 40 kilometre radius and 10000 ft in height). The signal coverage is designed to support the aircraft's transition from en route airspace into and throughout the terminal area airspace.

As described in [28], the GBAS airborne equipment is composed of a VDB receiver and a GBAS / GPS airborne receiver. The VDB receiver gets the VHF signal transmitted by the GBAS ground subsystem in its service coverage, and demodulates the GBAS messages. The GBAS / GPS equipment processes the corrections and integrity parameter from the GBAS correction message to compute accurate positioning with high integrity. Then GBAS / GPS equipment corrects its own pseudo-range measurements for each satellite with the differential correction data received from the ground subsystem. The corrected pseudo-range measurements are then used to more accurately determine the aircraft's position relative to the selected Final Approach Path. This position is also used to generate ILS look-alike deviation to guide the aircraft safely to the runway along a flight path whose characteristics are provided in the GBAS FAS Data-block.

The GBAS integrity concept requires the aircraft subsystem to assess the integrity risk due to:

- Satellite and/or signal errors
- Anomalous ionospheric errors
- Ground Subsystem errors

taking into account the geometry of the satellites used by the aircraft subsystem. In order to do that, the ground subsystem broadcasts specific integrity data to the aircraft subsystem for each pseudo-range correction. The aircraft subsystem uses specific integrity received data to limit the integrity risk.

For the cases where integrity is not a function of current satellite geometry at the aircraft subsystem, such as ranging source failures or ground subsystem faults, the integrity mechanisms are provided by the ground subsystem.

GBAS proposes different levels of services named GAST (GBAS Approach Service Type):

- A GAST-C GBAS system can be used as low as 200 feet (60 m) above touchdown to support CATI operation.
- A GAST-D GBAS system is intended to support approach and landing all the way to the runway surface to support up to CATIIIB operations.

2.3.4.1 RNP to GLS

A RNP to GLS operation is composed of RNP Initial and/or Intermediate segment until the interception of the Final Approach Segment (FAS) of a GLS approach. This type of approach is thus constructed on 2 successive RNP and GLS portions.

The crew first selects in the FMS the RNP initial and/or intermediate flight plan and the associated GLS final approach. A manual GLS tuning is still possible in case the GLS approach is not coded in the NavDB through the backup tuning system (RMP on Airbus aircraft).

The FMS computes linear lateral and vertical deviations with regard to the FPLN and deduces orders that are sent to the guidance computer to track the RNP path.

The MMR receives the GLS channel tuning from the FMS or the radio management system. The GLS FAS Data Block is then received from the GBAS ground station with the GBAS corrections. Angular lateral and vertical deviations are subsequently computed and output to the guidance computer to track the final GLS approach.

During the RNP part of the RNP to XLS operation, horizontal and vertical linear deviations with respect to the RNAV path are displayed to the pilot. During the XLS part of the RNP to XLS operation, horizontal and vertical angular deviations with respect to the XLS beam are displayed to the pilot.

The guidance computer uses successively orders from linear deviations in the RNP part, and angular deviations in the GLS part. For that, dedicated guidance or control modes are required.

2.3.5 Differences between new and previous Operating Methods

Table 1 traces the main differences between new and previous Operating Methods that are described in previous sections:

	Feature	Previous Operating Methods	New Operating Methods
xLS	Concept	Straight-in RNP(APCH) / RNAV(GNSS) approach, or straight-in xLS approach or straight-in ILS approach	RNP initial and intermediate curved segments with transition to final xLS precision segment

	Feature	Previous Operating Methods	New Operating Methods
	Aircraft operating method	Selection of the RNP(APCH) / RNAV(GNSS) or GLS or ILS approach cleared by ATC, compute approach and landing performances, engagement of the appropriate managed guidance modes to fly the approach according to published or ATC constraints.	Selection of the RNP initial and intermediate segments associated to one final xLS precision approach cleared by ATC, compute approach and landing performances, engagement of the appropriate managed guidance modes to fly both the RNP part and the final xLS approach according to published or ATC constraints.
	ATC operating method	Vectoring only if needed for managing separation	Vectoring only if needed for managing separation
	Support Systems	GNSS + barometric sensors or GBAS or ILS	GBAS
		ATIS provides operative final approach	ATIS provides operative final approaches
		Spacing tools if any	Spacing tools supporting curved RNP transition to xLS precision approach operations if any
		AMAN if any	AMAN supporting curved RNP transition to xLS precision approach operations if any
		Monitoring tool if any (speed and route deviation check)	Monitoring/Discrepancy check tool supporting curved RNP transition to xLS precision approach operations (speed and route deviation check)

Table 5 - Differences between new and previous Operating Methods

2.3.6 Description of Operational Environment

The objective of this chapter is to describe the detailed airport and TMA operational environment which is the focus of this OSED. The following aspects are covered:

- ATM phases: Long Term Planning, Medium / Short Term Planning, Execution Phase, including Arrival, and Post-Operations analysis.
- A detailed description of the environmental context.

The concept is mapped against the operational characteristics of airports as described in the Airport DOD for step 2 [24], together with an indication of traffic characteristics, airport and TMA capabilities and aircraft equipage. Additionally, some assumptions and limitations are listed:

- Actors / roles involved and their responsibilities,
- Human factors and safety issues are briefly described, and
- Constraints.

2.3.6.1 ATM Phases

2.3.6.1.1 Long term planning

In the context of this OSED the proposed GBAS enhanced arrival procedures should be considered when designing new TMA arrival routing, approach procedures and changes to current runway usage plans with the objective of reducing the environmental impact and optimising efficiency and capacity. Safety assessment and approval of new GBAS approaches is still needed.

Several further actions are required in order to realise the potential of these GBAS enhanced arrival procedures e.g.

- Environmental authorities and surrounding communities need to be informed before implementing new routes in the TMA,
- ATC tools such as DCB and AMAN/DMAN shall be capable of considering the enhanced GBAS approaches,
- Air space users need to invest in GBAS capabilities on board,
- Airports need to invest in GBAS ground systems, and
- Systems responsible for collecting post-operational data need to incorporate data concerning the use of enhanced GBAS approaches.

2.3.6.1.2 Medium/short term planning

Aircraft capabilities to fly different types of GBAS based approaches will have to be taken into account when calculating the arrival sequence. It will also impact the selection of runways in use and the demand and capacity balancing and KPI balancing, especially capacity KPI versus environmental impact KPI. A what-if capability linked to the airport operation plan (AOP) is foreseen when an airport plans the overall daily runway usage, the use of the enhanced GBAS approaches will be incorporated in the what-if calculations.

2.3.6.1.3 Execution phase

The main focus of this OSED is to describe the execution phase. Only the arrival and landing phases of flights are addressed and will be detailed for TMA and airport in the following sub-chapters.

2.3.6.1.4 Post Operation analysis phase

In this phase flight trajectory data collection will ensure that future planning will have a correct view of the usage of GBAS enhanced approach procedures and the evolution of this usage over time.

2.3.6.2 Operational Characteristics

It is assumed that all GBAS enhanced arrival procedures in this OSED are compatible with current operations at all types of European airports serving civil IFR traffic provided a GBAS station is installed.

The focus of this OSED is to cover at least large and complex airports; it is assumed that any issues regarding the implementation on other types of airports will be identified elsewhere.

The same reasoning is valid for influencing factors, traffic mix, runway layout etc.

Additionally two different ATC operating modes must be covered per GBAS enhanced arrival procedure for the completeness of this OSED.

1. Unconstrained; i.e. where the flight profile and approach path of an arriving aircraft is not affected or is subject to only minor adjustment (speed) due to the proximity of other aircraft.
2. Constrained i.e. where the flight profile and approach path of an arriving aircraft is affected by closely adjacent arriving aircraft requiring route, profile or major speed adjustments.

Unconstrained flight:

An unconstrained flight will be able to follow an optimised flight profile without intervention from air traffic control, meaning full continuous descent and shortest published route to threshold. Sometimes even unconstrained flights will have to be reduced in speed or be given a non-optimised control time of arrival which requires some minor adjustment to optimised speed. This environment is likely to be observed during late night hours (semi-curfew), certain weekdays, certain seasons, during adverse weather or other capacity reduced situations and in some off-peak hours at large to medium airports. At small non-congested airports this environment can be observed during a large part of a normal day.

Constrained flight:

A constrained flight is affected by the flows of surrounding traffic. It has to be inserted in a sequence and will be separated from other aircraft by Air Traffic Control often using distances close to the required minimum separation for spacing that is required in order to obtain efficient use of the runway. In this type of environment any extra distance that might be needed due to the flight trajectory will have a negative effect on subsequent traffic and can cause delays overall in order to maximize runway throughput. Effects can be avoided if more than one arrival runway is available, by the use of intelligent tools for managing the complexity of bunching/sequencing traffic, and controller tools for setting up most effective spacing when looking at runway utilization and aircraft taxiing issues. Trade-off between fuel burn/noise/capacity/delay/productivity will likely have to be considered for each arrival. The constrained environment can be observed at large and medium airports during peak hours and in some cases over most of the day. In constrained TMA's it is expected that ATC applies strict speed management procedures and that open loop conventional vectoring will be used parts of the time.

2.3.6.2.1 Separation

It is assumed that all GBAS enhanced arrival procedures are compatible with both current and future separation schemes such as Time Based Spacing and Weather Dependent separation as described in P 06.08.01 [31].

It is assumed that under certain conditions it will be possible to reduce wake turbulence separations when applying MRAP to a lighter aircraft following a heavier category.

For the purpose of this project, the wake turbulence separation is assumed to be either fixed (e.g. ICAO, RECAT-EU and NATS UK) or flexible as described by P06.08.01[31]. It is assumed that in some combinations of traffic sequence and for some GBAS enhanced arrival procedures the separation and spacing scheme can be changed compared to the wake turbulence rules that are now prescribed. In some cases increased separations due to safety concerns might be needed. In other cases extra spacing might be needed when mixing various routes merging on short final. For some GBAS enhanced arrival procedures there is a possibility to reduce current separation due to reduced risks of wake vortex encounter.

The wake encounter risks and wake encounter avoidance aspects of the various GBAS enhanced arrival procedures will be explored further and reflected.

2.3.6.2.2 Airport layout

The enhanced arrival procedures supported by GBAS enhanced arrival procedures are applicable to any airport layout from single to multiple runways with simple or complex taxiway structures.

However the airport layout may bring constraints. For instance lack of rapid runway exits (RET) or the use of dependent runways. Indirectly the runway layout and the localisation of the airport can also impose various environmental constraints such as fixed operating hours for certain runway usage or the need for a curved RNP transition to GLS precision approach in order to avoid densely populated areas.

2.3.6.2.3 Runway operating mode

Mixed mode operations and segregated mode operations for departures and arrivals can both be handled by respecting dependencies between runways and traffic types. Both dependent and independent runways can use the proposed GBAS enhanced arrival procedures.

2.3.6.2.4 Traffic

The proposed GBAS enhanced arrival procedures yields benefit in both high traffic density situations and in low traffic. Any aircraft wake category mix can be serviced but only aircraft capable of flying GBAS approaches can be serviced by the proposed approach procedures. It is difficult to estimate how much of an airline fleet will be equipped at any given time so various transition scenarios need to be assessed.

2.3.6.2.5 Weather

Flight crew shall at all times take into consideration the current and forecasted weather conditions during approach and at the airport destination. ATC needs to be aware of the limitations imposed by weather on the use of GBAS procedures.

2.3.6.2.5.1 Wind

Winds will have an impact on the increased glide slope applications. In fact tailwind aloft while approaching the runway will make the energy management on board more challenging and it can be expected that flight crews will avoid flying DS, IGS and/or A-IGS operations under such conditions. Gusty wind conditions that may appear for instance in conjunction with thunderstorm activity will also be a likely cause to avoid applying steeper glide slopes.

2.3.6.2.5.2 Runway conditions

Runway conditions are mainly determined by measuring the amount of contamination on the runway. Normally the reported phenomena are defined as wet runway or runway being contaminated by snow, ice or slush. The braking effect on a wet or contaminated runway will also be influenced by the wind strength and direction. In particular MRAP will be limited by a deteriorated runway condition. A local assessment needs to be done in order to determine such limitations. Flight crews and ATCOS need to be aware of the constraining impact the braking action might have on the use of the GBAS procedures.

2.3.6.2.5.3 Visibility conditions

One limitation for applying the GBAS enhanced arrival procedures is the visibility. So far the scope of the OSED is to only apply the concept in at least CAT I conditions or better. The visibility limitation is considered as a reasonable starting point for assessing and implementing the various GBAS applications. Technically there are no problems foreseen in applying the GBAS procedures even in lower visibility but for the moment the validation will only target CAT I or better conditions.

Referring to ICAO EUR DOC 13 European Guidance Material on All Weather Operations [48]. at Aerodromes the conclusion is that the arrival procedures proposed in this OSED can be conducted in CAT I. CAT I includes different visibility conditions. See Figure 30 below and the following extract from ICAO EUR DOC 13 for visibility conditions notions:

"The transition from Visibility Condition 1 to Visibility Condition 2 occurs when meteorological conditions deteriorate to the point that personnel of control units are unable to exercise control over traffic on the basis of visual surveillance and in practice defines the entry to Reduced Aerodrome Visibility Conditions (RAVC). The transition will be different for each aerodrome, depending on factors such as the location and height of the ATC tower and the size and layout of the manoeuvring area. Reduced ground visibility will normally be the determining factor for this transition. However at some locations, such as those with tall control towers, low cloud may be a prevalent factor requiring consideration."

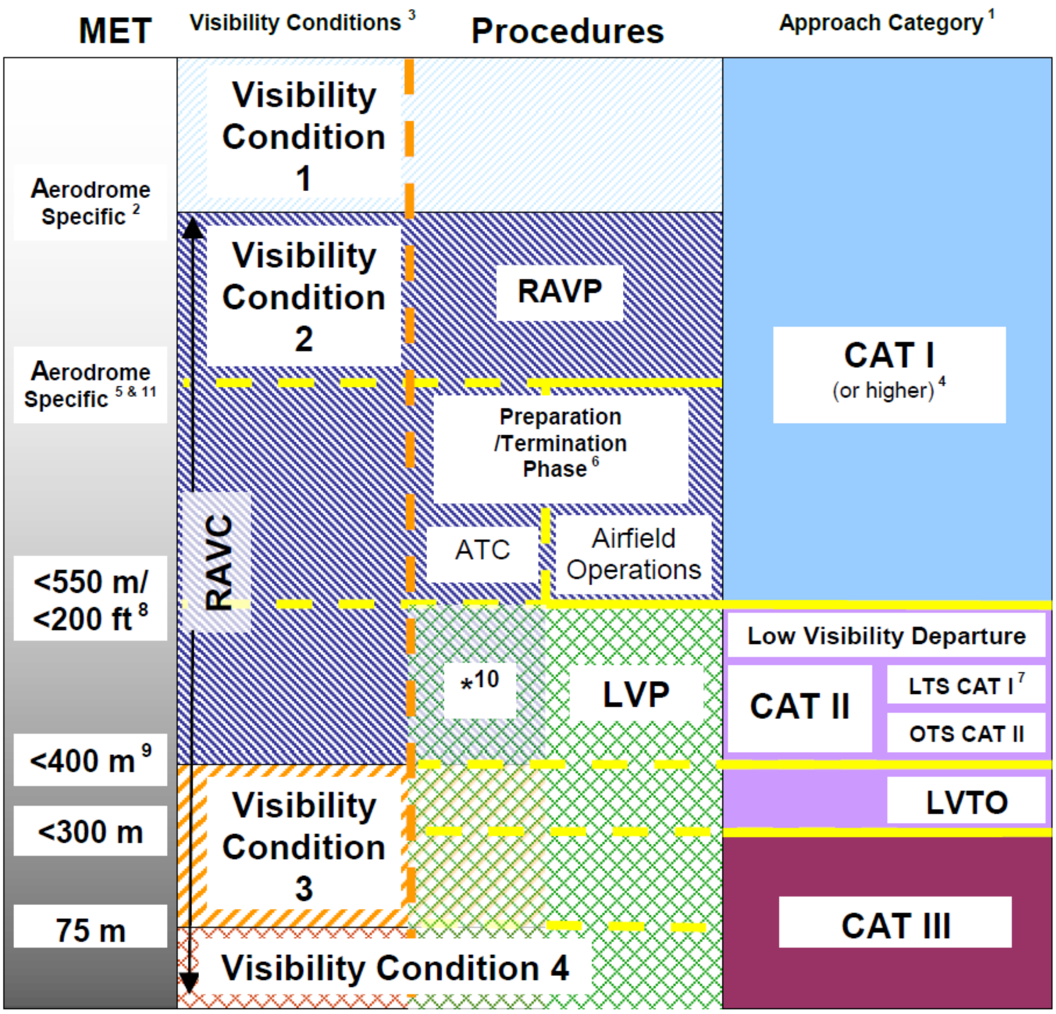

Figure 7: The relationship between Visibility Conditions, Low Visibility Procedures and Approach Categories

2.3.6.3 System environment relevant to this OSED

Apart from GBAS, the following sub-systems are implicated by the proposed GBAS enhanced arrival procedures.

2.3.6.3.1 Airport Operations Plan (AOP) and coupled AMAN/DMAN

Referring to OFA 05.01.01 OSED 00.03.00 [36] there is a need to describe the link between applying the GBAS enhanced arrival procedures and the Airport Operations Plan (AOP). When using GBAS enhanced arrival procedures the time of arrival will in many cases change due to either change in speed or trajectory or runway allocation. This change will appear in a late phase of the flight and for the purpose of the airport planning, it is necessary to remain as predictable as possible as soon as possible. It is therefore important that the tools that feed the Airport Operations Plan (AOP) get relevant updates automatically.

At the beginning of STEP2, it is considered that the execution of the Airport Operations Plan processes supports the connexion of all operational sub-systems existing at the airport in a common data base: the Airport Operational Data Base (AODB).

The coupled AMAN/DMAN function requests data provided by the AODB, especially:

- Flight details (including aircraft types and parameters),
- The FPL data,
- NM regulations (ATC slots and SIDs capacity),
- Estimated and Actual Landing Time (ELDT/ALDT),
- Estimated and Actual Taxi Times and Periods (EXOP/AXOT, AXIP/AXIT), provided by A-SMGCS,

To be the reference of computations by the Coupled AMAN/DMAN tactical planning system in order to use them as input for the coupling functionality and for a demand capacity balancing (DCB). During the execution phase, the Coupled AMAN/DMAN tool will receive the time updates of all milestone events.

The Airport Operational Data Base is dynamic and continuously updated by the connected systems.

In return, the Coupled AMAN/DMAN tool will provide AODB and all necessary systems with the results of the computations (TLDT, TTOT) reflecting the latest tactical planning.

The relevance of the AODB and coupled AMAN/DMAN to the GBAS enhanced arrival procedures described in this OSED is the need for the AODB to receive accurate and updated information about the execution of each flight. Since the choice of approach procedure might affect the time of arrival due to changes to the 4D trajectory there is a need to ensure the link between AODB and the update of the 4D trajectory for each approach type. It might also be required that the AODB receives explicit information about each flown approach type in order to analyse potential noise reduction and the relation to each such approach type.

In case the ATC approach unit will be using a more advanced sequencing procedure (as described in 4.3.5) in the TMA the AODB shall have access to updated arrival times from such a system since this data will be more accurate than traditional AMAN data.

2.3.6.3.2 Airport demand and capacity balancing (DCB)

Referring to OFA 05.01.01 OSED there is a need to understand the link between GBAS enhanced arrival procedures and the Demand and capacity balancing (DCB) function at the airport. The accuracy of DCB predictions about the capacity of complex airports relies on correct information being input to the system. Available capacity can be distributed over the runways in different ways according to the applicable dependencies and needs.

In order to correctly distribute traffic and allocate optimised runway usage DCB needs to know the approach and departure rate to each runway based on the input from the Aircraft Operator. GBAS enhanced arrival procedures availability and usage needs to be determined in advance and the trade-offs between competing KPI (i.e. noise reduction versus delay reduction) to be performed in order to correctly optimise the operations hour by hour over the day.

Coupled AMAN/DMAN and DCB have to update each other with the latest calculations. They shall work very closely and update permanently each other.

Distribution of the maximum number of arrivals and departures within the respective time interval is then the task of the coupled AMAN/DMAN.

2.3.6.3.3 A-SMGCS

A-SMGCS provides feedback to the tower controller related to runway aiming point and taxiway exits. New HMI features need to be developed such as maps depicting each aiming point. There might also be a need to operate from ground various new runway lights adjusted per approach glide path angle and runway aiming point.

2.3.6.3.4 Controller spacing tool

There is a need for a controller spacing tool [26] in order to handle the spacing between consecutive aircraft movements that are using different types of approach procedures (conventional procedures mixed with new GBAS procedures) if ASAS and or Point Merge is not applicable or available. The issue to be resolved is the introduction of less homogeneous speed performance among aircraft of the same type. If controllers will have too many criteria to consider when setting up spacing on final approach they might need a tool that calculates the correct distances and display target indication to the controller.

In P06.08.01 the Leading Optimised Runway Delivery (LORD) concept is described. The picture below describes how various needs for refined runway management can be incorporated in the design of such a tool.

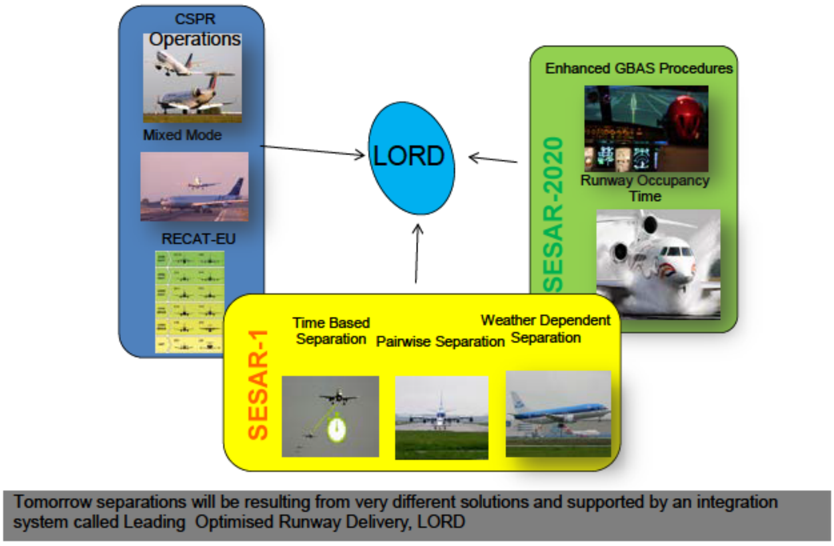

Figure 8: Controller spacing tool

The advanced spacing and separation tool will be capable of assigning any pairwise or standardised separation requirement expressed as time or distance and convert it into an initial target distance (ITD) indicator and final target indicator (FTD) for the approach and tower controller. The ITD shows to the controller the spacing to be set up in order to deliver the required separation at threshold. It will incorporate the compression expected during the final stages of approach when aircraft stabilises to land. FTD is calculated which represents the minimum required separation to be applied at the point of separation delivery (normally at the threshold. The latter indicator can be used for raising a separation infringement alert to the controller.

The proposed HMI consists of two chevrons displayed along the centre line. See picture below.

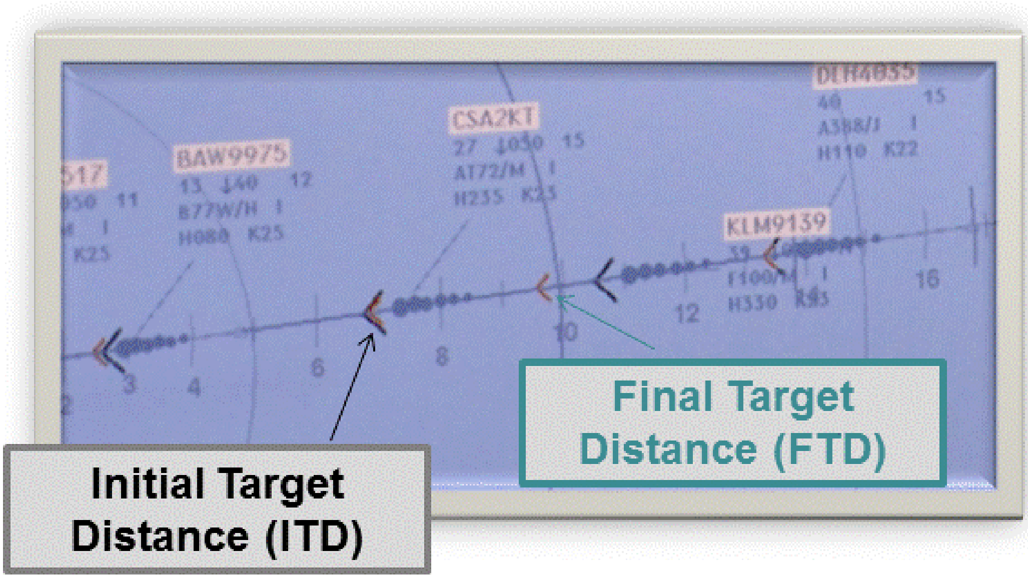

Figure 9: Controller spacing tool HMI

2.3.6.3.5 Sequencing tool

In order to support the FTD and ITD HMI there is a need to maintain the correct sequence at all times. By using an AMAN and adding some new features it is possible to automatically detect the order the controller in approach has attributed to each aircraft. It is also possible for the ATCO to change the sequence manually if this is needed. In this way it can be assured that the correct calculation is applied to each aircraft pair. Another way of ensuring the sequence is correct would be to use electronic flight strips that are continuously put in the order the controller plans to execute the sequence.

2.3.6.3.6 ASAS and Point Merge system

It cannot be determined at this point in time how the proposed GBAS enhanced arrival procedures will interact with or if it will be possible to integrate them with ASAS and Point Merge.

2.3.6.3.7 SWIM and Datalink

Both SWIM (System wide information management) and Datalink are assumed to be available and capable of supporting the execution of the proposed approach procedures. SWIM core services will enable systems to request and receive information when they need it, subscribe for automatic receipt, and publish information and services as appropriate. This will provide for sharing of information across different systems. This will allow airspace users and controllers to access the most current information that may be affecting their area of responsibility in a more efficient manner. SWIM will improve decision-making and streamline information sharing for improved planning and execution. The CPDLC (Controller-Pilot data link communication) application provides air-ground data communication for the ATC service. This includes a set of clearance/information/request message elements which correspond to voice phraseology employed by air traffic control procedures. CPDLC could be used to request and deliver approach clearance. It is however not determined to what extent these services are required and if so on what types of airports.

2.3.6.3.8 Safety Nets

Various safety net systems are implemented in some TMAs and towers. They need to be considered when applying the services of this OSED. They are features like;

Mid-Term Conflict Detection (MTCD),

Abnormal IAS Monitor,

Glideslope Conformance Monitor and

Runway Incursion Monitor (RIMS).

2.3.6.4 Roles and Responsibilities

This section describes the actors involved in the utilisation of services provided in this OSED.

This description relies on the hierarchical organisation of actors of the ATM system defined in the document: *SESAR B4.2 Actors - Roles and Responsibilities.* The description below, extracted from this reference document, highlight the main items related to GBAS enhanced approach GBAS enhanced arrival procedures. Described responsibilities focus mainly on the day of operations.

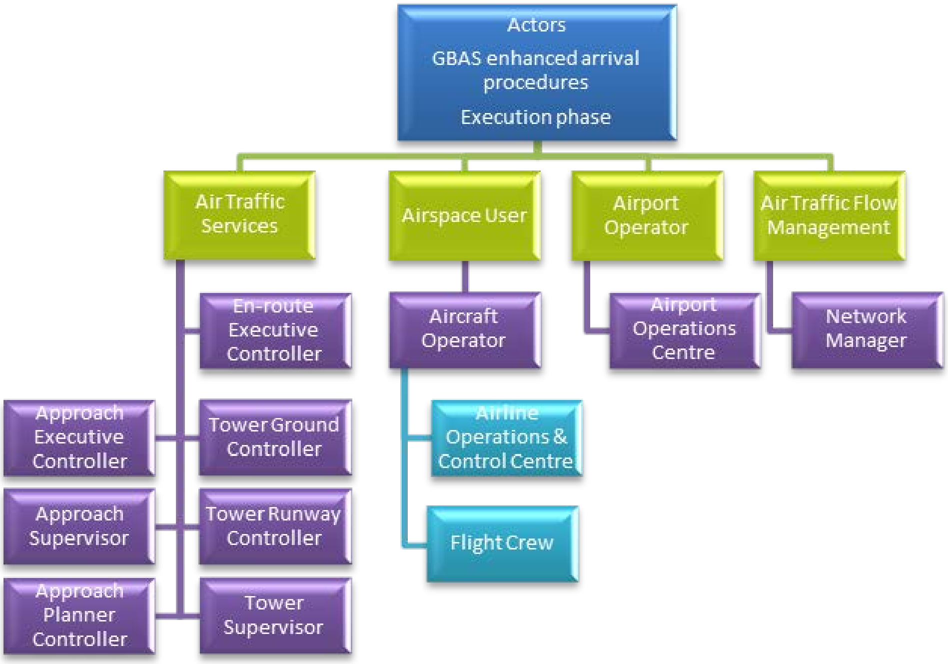

Figure 10: Relevant actors for this OSED

2.3.6.4.1 Aircraft Operator

The aircraft operator is expected to run sophisticated support tools for flight route planning, including 4D flight trajectory calculation, management of route catalogue, management of relevant aeronautical information, meteorological information, route cost estimations and airspace reservations.

In the context of this OSED these supporting systems will be used for pre-tactical and tactical flight planning. The aircraft operator considers what preferences a GBAS equipped aircraft will have in terms of following any GBAS approach as described in this OSED.

These responsibilities are assumed either by the Aircraft Operator/Airspace User or by the Ground Handling Agent.

Responsibilities in this OSED context:

- Provides turn-around progress information (milestones) through Airport CDM,
- Proposes "arrival and departure priorities" (slot swapping and inbound priority sequencing) in the frame of a CDM process as part of the User Preferred Prioritisation Process (UDPP),

- Optimises the RBT (execution phase) to ensure the users' business objectives for a flight are met.

2.3.6.4.2 Flight crew

The flight crew remains ultimately responsible for the safe and orderly operation of the flight in compliance with the ICAO Rules of the Air, other relevant ICAO and CAA/EASA provisions, and within airline standard operating procedures. It ensures that the aircraft operates in accordance with ATC clearances and with the agreed Reference Trajectory.

Responsibilities in this OSED context:

- Execute the flight according to the current flight plan i.e. agreed User Preferred 4D trajectory where appropriate
- Comply with clearance/instruction given by ATC using voice or data link (e.g. CTA)
- Request deviations of agreed User Preferred 4D trajectory where appropriate if deemed necessary mainly for safety, operational and/or economic reasons
- Assume responsibility to maintain own spacing from designated target aircraft using ASAS Spacing (e.g. sequencing and merging) when temporarily delegated by ATC, ATC retains responsibility for separation from target and other aircraft.
- Perform planning of a flight adhering to a TTA
- Execute the flight according to the agreed Reference Business or Mission Trajectory (RBT/RMT) including Continuous Descent (A-CDA), Free Routeing with Required Navigational Performance (A-RNP), Controlled Time Over way points (CTA/CTO) where appropriate
- Comply with the clearance/instruction given by ATC using voice or data link, leading to the revision of RBT/RMT in case of close loop (normal case) or suspending RBT/RMT temporarily in case of open loop
- Manage more predictable Runway Occupancy Time at arrival
- Manage a more diverse range of glide slopes and / or touchdown aiming points in the airports that require/justify them
- Use Combined Vision for Equivalent Visual Landing, taxi and take off in Low Visibility Conditions
- Manage on-board generated alerts in case of no compliance with taxi clearance or airport configuration, or in case of risk of collision with obstacles or vehicles during operation at airport surface

2.3.6.4.3 Airport Operator

The Airport Operator is responsible for the physical conditions on the manoeuvring area (taxiways, runways) and apron. This includes assurance that the scale of equipment and facilities provided are adequate for the scheduled flying activities which are expected to take place at that Airport. The Airport Operator is leading the APOC which is responsible for airport operations.

Responsibilities in this OSED context:

- Ensures that all necessary data are available, consistent and transmitted in time to the specialised tools used by other stakeholders and in particular to ATC for such systems as DCB, AMAN/DMAN and CDM
- Leads and coordinates the APOC and stakeholder collaboration

2.3.6.4.4 ATFCM and Network Manager

The airport can be constrained by TMA or en route capacity; the Network Manager occupies a key position to assess the demand regarding the capacity and has to take appropriate actions to solve capacity problems.

The scope of Air Traffic Flow and Capacity Management (ATFCM) is to manage the balance of Demand and Capacity, in a gate-to-gate perspective, by all partners. The goal is to:

- Optimise the use of the available capacity to deal with traffic demand,
- Improve the adaptability of the ATFM plan according to new information including feedback,
- Assess the impact of the expected airport traffic demand (based on airport slots) on the network capacity.

2.3.6.4.5 Air Traffic Services Operations

2.3.6.4.5.1 Approach Supervisor

The Approach Supervisor is responsible for the safe and efficient provision of air traffic services by the approach team. The Approach Supervisor decides on staffing and manning of controller working positions in accordance with expected traffic demand.

Approach Supervisor represents the approach when coordinating with the Tower Supervisor on operational issues.

Responsibilities in this OSED context:

- Decides on nominal Arrival Capacity,
- Coordinates with the APOC or with the Tower Supervisor and ACC regarding the measures related to Demand Capacity Balancing (DCB),
- Coordinates with Tower Supervisor on the capacity depending on the current and future weather situation (used in the coupled AMAN/DMAN),
- Verifies that correct values are input in AMAN/DMAN regarding flights expected to perform GBAS approaches,
- Coordinates with ACC the flow admitted into TMA based on arrival capacity. Consider output of the coupled AMAN/DMAN for arrival capacity.

2.3.6.4.5.2 Airport Tower Supervisor

The Airport Tower Supervisor is responsible for the safe and efficient provision of air traffic services by the Airport Tower crew. The supervisor decides on staffing and manning of controller working positions in accordance with expected traffic demand.

The supervisor represents the tower when coordinating with the APOC on operational issues.

Responsibilities in this OSED context:

- Decides on runway(s) for landing and take-off in co-operation with all concerned partners using Demand Capacity Balancing (DCB) support and the CDM processes,
- Selects KPIs and DCB parameters for sequence optimisation verified through the CDM process,
- Decides on nominal departure capacity,
- Coordinates with APOC or with the Approach Supervisor regarding the measures related to DCB and traffic smoothing measures,
- Coordinates with the Approach Supervisor on the runway configuration and associated capacity depending on the current and future weather situation (used in the coupled AMAN/DMAN),

- Maintains close liaison with the Airport Operator with respect to the daily inspection of the movement area, the aerodrome lighting system, the marking of obstructions, snow clearance etc…,

2.3.6.4.5.3 Tower Runway Controller

The Tower Runway Controller is responsible for the provision of air traffic services to aircraft within the aerodrome traffic zone and on final approach by issuing clearances, instructions and permission to aircraft for the safe and efficient flow of traffic onto and off the runway. The Tower Runway Controller will be assisted by arrival, departure and surface management systems, where available.

Responsibilities in this OSED context:

- Verifies type of GBAS approach,
- Verifies runway aiming point,
- Monitor approaching aircraft by airborne surveillance system and/or visually,
- Ensures sufficient spacing between successive arrivals and departures,
- If possible, fine tunes sequence for throughput improvement by speed management,
- If necessary, adjusts the sequence for safety by ordering go-around,
- Issues landing clearance to arriving flights,
- Proposes optimised runway exit to flight crew,
- Manages integration of departures in the arrival sequence in mixed-mode operations according to coupled AMAN/DMAN proposals,
- Receives and disseminates weather information to the flight crew,
- Acts as prescribed to any installed air traffic alerts and warning systems such as runway incursion management system (RIMS), conflict alerts, separation infringement alerts and proximity to ground alerts,
- Operates the runway lights.

2.3.6.4.5.4 Tower Ground Controller

- The Tower Ground Controller is part of the controller team responsible for providing an Air Traffic Service at controlled aerodromes. The main task is the provision of ATS to aircraft and vehicles on the manoeuvring area. The Tower Ground Controller will be assisted by an advanced surface movement guidance and control system (A-SMGCS).

Responsibilities in this OSED context:

The Tower Ground Controller's main responsibilities are:

- Issue clearances, instructions and permission to aircraft, vehicles and persons operating on the manoeuvring area as required for the safe and efficient flow of traffic, e.g.:
    - o Taxi instructions to arriving and departing flights;
    - o instruction on arrival stand;
- Co-ordinate ground movements on the landing runway exit with regard to the Tower Runway Controller.
- Monitoring the progress of arriving aircraft until the aircraft is safely parked on stand and the engines shut down.

2.3.6.4.5.5 Approach Planning Controller

The Approach ATC Sector Planning Controller is mainly responsible for planning and coordination of the traffic entering, exiting or existing within the ATC Sector. Furthermore, the Approach Planning Controller provides tactical flight control assistance to the ATC Sector Executive role.

Responsibilities in this OSED context:

The responsibilities of ATC Sector Planning are to:

- Co-ordinate entry and exit conditions.
- Evaluate meteorological conditions suitable for GBAS arrival procedures.
- Identify potential candidate flights to use GBAS arrival procedures.

2.3.6.4.5.6 Approach Executive Controller

The Approach Executive Controller is responsible for the safe and efficient air traffic management service for the aircraft approach to the runway.

Responsibilities in this OSED context:

- Provides arrival clearance,
- Provides clearance for GBAS approach,
- Follows target landing times (TLDT) provided by coupled AMAN/DMAN function proposals and sequence arrivals accordingly by issuing approach clearances,
- Ensures sufficient spacing between successive arrivals according to the spacing proposed by AMAN/DMAN coupled function and the type of selected approach,
- Follows the proposed separations as presented by a special spacing tool if such tool exists,
- If needed, fine tunes sequence for throughput improvement by speed management,
- If necessary, adjusts the sequence for safety by ordering go-around,
- Receives and disseminates to the flight crew weather information,
- Acts as prescribed to any installed air traffic alerts and warning systems such as conflict alerts, separation infringement alerts and proximity to ground alerts.

2.3.6.4.5.7 En-route Executive Controller

Depending of the Coupled AMAN/DMAN horizon, the En-route Controller has to follow the Target Metering Times and arrival sequence (order and time).

1. Verifies the flight crew intention of performing a GBAS approach according to the information provided by ATIS broadcast.

2.3.6.4.6 Human factors

A human performance assessment has been conducted (P06.08.08 D09 VALR V2 [47]) to assess human performance issues triggered by the concepts. The identified mitigation to the human performance issues led to requirements detailed in Chapter 6 and are partly integrated already in the present OSED and will be considered for future developments. The human factors issues concern for instance workload issues for flight crew and controllers, the development of new HMI, the use of new spacing tools, the GBAS advanced arrival procedures and their integration with other STEP 2 GBAS enhanced arrival procedures, the visual references for flight crew on the runway when flying MRAP or IGS and the training on the operation of all concept elements..

2.3.6.4.7 Constraints and limitations

2.3.6.4.7.1 General

There is a need to develop a controller spacing tool similar to the TBS tool in order to handle the spacing between consecutive aircraft movements that are using different types of approach procedures (conventional procedures mixed with new GBAS procedures) if ASAS or point merge is not applicable or available.

In high density and complex TMAs as well as during peak hours at any airport, it is likely that both advanced sequencing and spacing tools are required for ATC in order to not lose capacity.

The proposed GBAS enhanced arrival procedures in this OSED can be applied in IMC meteorological conditions but in a first step the scope is limited to CAT I conditions.

Other weather conditions might limit the applicability of the various GBAS enhanced arrival procedures. Certain wind and runway conditions are believed to pose such constraints.

The larger part of the GBAS enhanced arrival procedures described in this OSED requires GBAS installations on ground and on board and it is not in the scope of this OSED to develop applications using any other technology.

It is difficult at this moment to estimate to what extent and when the European aircraft fleet will be equipped with GBAS or how many airports will provide GBAS approaches. Several scenarios need to be validated in order to capture any transition issues and the benefits.

Multiple runway aiming points is limited to runways of a certain minimum length; this length has to be determined. This will be further explored and reflected in future versions of the OSED.

Multiple runway aiming points will need some kind of visual aid for flight crew. This can either be a fixed installation on ground or a virtual/artificial installation on board. If consecutive aircraft will follow different glideslopes and aiming points it is necessary to assure that different visual aids will not confuse flight crew. Further exploration is needed in order to determine the design of such visual aid. This issue will be further explored and reflected in future versions of the OSED.

In case it is found that the risk of a wake vortex encounter will increase and that this also will increase the risk for controlled flight into terrain, CFIT, when consecutive aircraft follow different glide paths to the same or closely spaced runways, the solution might be an increased wake turbulence separation (compared to ICAO) for some aircraft pairs. This might in turn reduce the runway throughput. This will be further explored and reflected in future versions of the OSED.

2.3.6.4.7.2 Affecting systems / concepts and solution proposals

Concepts in P06.08.08 identified in section 2 may have impact or could benefit from different concepts / systems investigated in several SJU projects. The table below provides a view on such concepts, the description of the impact, the relevant SJU project and deliverables, the expected interaction and the solution proposals with respect to 06.08.08 needs.

Affecting system / concept	Description of the interaction analysed	SESAR related projects and other sources	Deliverables	Interaction status	Interaction analysis	Solution proposals
Datalink	Analyse issues when handing over between different sectors of ATC and between different ATC centres	04.02 (Consolidation of operational concept definition and validation including operating mode and air-ground task sharing) 06.08.05 (GBAS operational implementation)	D02 (06.08.05)	No clear interaction regarding datalink during handovers. GBAS information stated in Flight plan. Future GBAS regulatory activities will apply (AIP changes).	The following Operational Improvements (OIs) will be refined and may potentially influence the interaction between GBAS and datalink communications: - CM-0104-A: Automated Controller Support for Trajectory Management - CM-0201-A: Automated assistance to controller for seamless coodination, transfer and dialogue through improved trajectory data sharing	As GBAS landing capabilities are included in the Flight Plan, ATCOs in different sectors or centres should be aware of the aircraft capabilities, as this information should flow the same way as the rest of the flight plan. A different but related topic commented in D02 of 06.08.05 is the upcoming tasks (generally regulatory) for the ANSPs regarding GBAS approaches implementation, for instance, AIP changes.

Affecting system / concept	Description of the interaction analysed	SESAR related projects and other sources	Deliverables	Interaction status	Interaction analysis	Solution proposals
Flight Planning	How the flight plan will help ATC at being aware of: - Aircraft capability to perform GBAS approaches - Whether airline operations request/assume GBAS approaches at a given airport - Whether flight crew has requested GBAS approach	04.07.03 (Use of Performance Based Navigation (PBN) for En Route Separation Purposes) 06.08.05 (GBAS operational implementation) 07.06.02 (Optimised Airspace User Operations) 08.03.10 (Information Service Modelling deliverables)	-	GBAS capabilities are included in the ICAO Flight Plan 2012. GBAS intentions cannot be stated in the ICAO flight plan yet.	04.07.03 addresses the need to establish Flight Plan codes for A-RNP and FRT (Fixed Radius Transition) in the PANS ATM According to ICAO Flight Plan 2012, in field **10a** (Navigation), code "A" represents GBAS capabilities. However, there is no field to include the request to perform a GBAS approach and apparently, ICAO is not considering an update of the Flight Plan in this regard in the near future.	As GBAS landing capabilities are included in the Flight Plan, ATCOs should be aware of the capabilities. Airlines may establish a default assumption: perform GBAS approach at that specific airport or not. This may consist of a contract or a binding document stating the airline preferred mode. Radio communications shall be established between the ATCO and the pilot in case the default status did not apply for a specific operation. Aiming for more automation, ICAO may be suggested to amend its ICAO Flight Plan to include GBAS approach requests in its next update. Another option would be to register the GBAS approaches as if they were Standard Arrival (STAR) procedures. This way, these GBAS approach procedures could be included in the item 15 (section: Route) of the ICAO Flight Plan, and the ATCOs would already know if a specific flight intends to perform a GBAS approach. However, nowadays the standard procedure for filing Flight Plans in Europe does not include SIDs/STARs in field 15 (section: Route). The content of this field finishes with the first waypoint of the approach procedure, which may lead to more than one STAR and therefore, being the ATCOs in charge of assigning STARs based on weather and traffic. Nevertheless, in the United States current procedures show that SIDs/STARs are included in this field and are generally respected when feasible. As per 06.08.05, some ANSP may require that the GBAS capability of the aircraft and the ability of the aircrew to conduct this type of operation are

Affecting system / concept	Description of the interaction analysed	SESAR related projects and other sources	Deliverables	Interaction status	Interaction analysis	Solution proposals
						indicated in the flight plan. However, already during the initial call the pilot has to inform the controller which approach he will use, either ILS or GBAS or another one.

Affecting system / concept	Description of the interaction analysed	SESAR related projects and other sources	Deliverables	Interaction status	Interaction analysis	Solution proposals
ATC system integration	Address the technical feasibility and limitations of inserting GBAS info into the label of an ATC system	05.09 (Usability Requirements and Human Factors Aspects for the Controller Working Position) 06.08.05 (GBAS operational implementation) **06.09.02 (Advanced integrated CWP (A-CWP))** 10.10.03 (CWP Prototyping) SWP 06.00 (Global Co-ordination & Management)	EXE-06.08.05-VP-563 D02 (06.08.05) D42 (06.08.05)	Validation exercises including GBAS information were conducted with good feedback.	ICAO GBAS CONOPS does not include details on ATC interface integration Validation exercises were performed in late 2014 in order to validate EUROCONTROL prototypes and GBAS approach procedures. Regarding ATC HMI, two elements were tested: - eDEP/ITWP: early Demonstration and Evaluation Platform/Integrated Tower Working Position (including GBAS elements) - ESCAPE: real-time ATC simulator (used for approach and with GBAS elements) Positive feeback on GBAS HMI elements was received Future requirements regarding ATC integration: - GLS/GBAS Phraseology - New flight procedures * To support mixed ILS/GBAS operations * Fallback procedures (in case of GBAS failure) * To facilitate runway switching or shortening approach paths	It would be advisable to continue with further validation exercises and with the development of ATC HMIs with GBAS elements integrated. A new aircraft label at the ATC HMI authorising/confirming a specific type of approach could be feasible as shown in the Operational Validation Activities Release 4 (WP 06.08.05). One of these approach types would be GBAS APPROACH. Other feasible option would be a small figure, letter or colour dot located next to the aircraft figure at the ATC HMI. This way, the controller would be aware that this flight is intending to perform a GBAS approach. As per 06.08.05, it was stated that individual aircraft FPL navigation equipment info (including GBAS) shall be displayed to ATCOs by ATS automated systems. As for the simulations performed for Malaga, Zurich and Palermo airports, the GBAS ATC interface has been designed to be compliant with the requirements set within the EUROCAE ED-114, indicating the availability of the GBAS CAT I approaches by using a colour code. In addition, it was also concluded that flight data processing and display for ATC/pilot will have to be adapted to the local conditions according to A-CDM and GBAS approaches.

Affecting system / concept	Description of the interaction analysed	SESAR related projects and other sources	Deliverables	Interaction status	Interaction analysis	Solution proposals
ADS	Analyse the ADS-B and ADS-C reports content in order to identify information regarding navigation capabilities or GBAS approaches Identify potential areas for future interaction	08.03.07 (Identify and Develop AIRSPACE USERS (incl AOC) ATM Information Services) 09.21 (ADS-B - 1090 Higher Performance Study) Air Services Australia SITA EUROCONTROL ATM Lexicon	D02 (09.21)	No clear link with GBAS or Navigation Capabilities Future ADS-C Extended Profile could entail complementary navigation features	No interaction with navigation capabilities has been found **ADS-B report content** a) ICAO 24-bit address b) Aircraft Identification c) Mode A code d) Special Position Indication (SPI) e) Emergency status f) ADS-B version number g) ADS-B emitter category h) Geodetic horizontal position i) Geodetic horizontal position quality indicators j) Pressure altitude k) Geometric altitude l) Geometric vertical accuracy m) Velocity over the ground n) Velocity quality indicator o) Aircraft length and width p) Global Positioning System (GPS) antenna offset. q) aircraft vertical position; r) Vertical rate s) Mode Control Panel/Flight Control Unit selected altitude t) Barometric pressure setting u) ACAS Active Resolution advisories	No clear link with GBAS or Navigation Capabilities ADS is mostly related to Surveillance and its associated report content. Only some of the elements contained in the ADS-C report content may be associated to the intended route (and approach): g) Predicted route group. However, further analysis is needed and it is significantly unlikely that links with GBAS approaches are found in these reports. Nevertheless, the future ADS-C Extended Profile development could entail complementary features, which could be linked to navigation and to GBAS approaches.

Affecting system / concept	Description of the interaction analysed	SESAR related projects and other sources	Deliverables	Interaction status	Interaction analysis	Solution proposals
					A potential interaction was found: g) and h) **ADS-C report content** a) Basic group (Position, altitude, FOM, Time, TCAS status, Navigation system redundancy) b) Flight identification group c) Earth reference group d) Air reference group e) Airframe identification group f) Meteorological group g) **Predicted route group** h) **Fixed projected intent group** i) Intermediate projected intent group	
CPDLC	Analyse the ADS-B and ADS-C reports content in order to identify information regarding navigation capabilities or GBAS approaches Identify potential areas for future interaction	04.07.04b (ASAS-ASEP Oceanic Applications) EUROCONTRO L Skybrary German AIP	-	No clear link with GBAS or Navigation Capabilities Potential development of the ACL message, in order to include GBAS approach clearance "Free text" capabilities may be used to express GBAS intentions	Among the various CPDLC message types, only one was found to potentially interact with navigation capabilities: **CPDLC message types** · Data link integration capability (DLIC) **· Air traffic control clearance (ACL)** · Air traffic control communication management (ACM) · Air traffic control microphone check (AMC) · Departure Clearance (DCL) · Downstream Clearance Service (DSC)	No clear link with GBAS or Navigation Capabilities GBAS operations requests could be made via ACL message The controllers are provided with the capability to issue ATC clearances (level assignments, lateral deviations/vectoring, speed assignments, etc), radio frequency assignments, and various requests for information. The pilots are provided with the capability to respond to messages, to request/receive clearances and information, and to report information. A "free text" capability is also provided to exchange information not conforming to defined formats. This capability may be employed to express GBAS intentions. CPDLC shall only be used in the context of non-

Affecting system / concept	Description of the interaction analysed	SESAR related projects and other sources	Deliverables	Interaction status	Interaction analysis	Solution proposals
						time-critical communications.
OLDI	Analyse the content of the messages exchanged between ATC units via OLDI and their potential relation with navigation capabilities	EUROCONTROL Specifications	-	Potential interaction in the Arrival Management Message (AMA). No other link with navigation capabilities found.	Among the various message types used to transfer flights between two ATC units, the following have been found to be potentially related: ABI: Advance Boundary Information Message; **AMA: Arrival Management Message;** BFD: Basic Flight Data Message; INF: Information Message; SDM: Supplementary Data Message. **Related Data Insertion** Route Other flight plan data Equipment capabilities and status SID identifier	Current OLDI messages structure may include Navigation aspects in some of its messages, mainly regarding Route, as it can be seen in the "Related message types" or "Related Data Insertion". Only the related message types that might have a conection with Navigation Capabilities have been included in this analysis. So was the case for the related data insertion. The message type with the strongest link to navigation capabilities is the "AMA: Arrival Management Message". However, its content does not clearly describes this potential link. Further analysis in this regard would be interesting in order to understand how GBAS intentions could be transmitted via OLDI. No real operational examples have been found.

Affecting system / concept	Description of the interaction analysed	SESAR related projects and other sources	Deliverables	Interaction status	Interaction analysis	Solution proposals
					Arrival Management Message (AMA) contents: Message Type Message Number Aircraft Identification Departure Aerodrome Destination Aerodrome Metering fix and time over metering fix Total time to lose or gain Time at COP Assigned speed **Application point** **Route** Arrival sequence number	
AMAN/DMAN	Analyse the content of the AMAN/DMAN messages and their potential relation with navigation capabilities	06.08.04 (Coupled AMAN-DMAN)	D07	No clear link with GBAS or Navigation Capabilities	**AMAN/DMAN Inputs:** · TOBT and EXOP (estimated outbound taxi) · the size of gap in NM needed to accommodate a departure between successive arrivals · a specific pattern for arrivals and departures, as input by Tower controllers **AMAN/DMAN Outputs:** · a specific pattern for arrivals and departures, which optimizes a determined KPI. The pattern shall be defined as a set of gaps between arrivals in both Nautical Miles and seconds	No clear link with GBAS or Navigation Capabilities The analysis exclusively concerned AMAN system, as GBAS approach intentions may only be integrated in this system. Nevertheless, no clear links have been found. AMAN focuses on arranging a specific landing pattern and the required separation to accommodate a departure between two arrivals. AMAN/DMAN is a purely operational system devoted to ease the approach controllers' duties.

Affecting system / concept	Description of the interaction analysed	SESAR related projects and other sources	Deliverables	Interaction status	Interaction analysis	Solution proposals
					· TLDT (target landing time) for all arrivals in such a way that the KPI measures for arrivals and departures will be optimised · AFIs, each determined by a pair of consecutive TLDTs · Active pattern **AMAN/DMAN HMI Requirements:** · Information on TLDT/TIAT and TTL/TTG of each arrival flight taking into account dependencies between arrivals and departures · TTOT, Callsign, Vortex Category and Status of the Flight (i.e. SUR, SUG, Begin Taxi) of each departing flight · Active pattern, both as Nautical Miles for spacing and as the number of departures expected in each gap · KPIs for arrival and departures separately	

Table 6 P06.08.08 other affecting system / concept

2.3.7 Use Cases

2.3.7.1 Use Cases Summary

To avoid repetition, for each use case only the main flow in constrained environment (definition provided in section 2.3.6) is described and since operational priorities might differ depending on the environment (potentially leading to different operational benefits); so that the following use cases were identified:

1. RNP to GLS:

   1.1 RNP to GLS in constrained environment

   1.2 RNP to GLS in un-constrained environment

In project exaction phase, it was decided to refer only to the operational environment that were addressed in P06.08.08 validation exercises. The objective was to provide sufficient clues on how to address operations of GBAS enhanced arrival procedures in the various validation exercise environments, and prepare the needed basis for both the V2 and V3 cycles.

It was concluded that most of the validation scenarios would consider “current” or ”conventional” environments and no specific use of SESAR solutions was needed.

Hence, the Use Cases listed here below will only deal with such conventional environments.

2.3.7.2 Use Cases Actors

Main actors identified in the use cases are listed below (a cross means the actor of the line has to be considered for the Use Case defined in column). A detailed description of roles and responsibilities of is indicated in section 4.4:

- En-route Executive Controller (primary)
- Flight Crew (primary)
- Approach Executive Controller (primary)
- Tower Runway Controller (primary)
- Tower Ground Controller (primary)
- Approach Planner Controller (support)
- Tower Supervisor (support)
- Approach Supervisor (support)
- Airspace user (support)

2.3.7.3 Use Cases Conditions

This section lists the general conditions, pre-conditions and post-conditions applicable to each use case developed. These are summarized by 3 different tables.

How to read the tables:

- Environment type (see 4.2 for definition):
  - U: Unconstrained TMA/Airport
  - C: Constrained TMA/Airport

2.3.7.3.1 General Conditions

Concept	RNP to GLS	
Environment type	C	U
Flight crew are trained and aircraft is certified and equipped for all the navigation capabilities required for this particular application of the RNP GLS concept. That is: - RNP 1 navigation specification - RF leg capability - CDO capability - GLS CAT I approaches	x	x
Radar vectoring is not used once the aircraft is established on the RNP procedure	x	x
ATC has the responsibility for initiating and coordinate with flight crew that *"concept"* approach procedure shall be followed	x	x
Flight crew has the responsibility for initiating and coordinate with ATC that *"concept"* approach procedure is requested.		
The airport has unique designators for each final approach type to each runway published in the AIP	x	x
The airport has published *"concept"* procedures for some or all of the runways depending on local requirements, these procedures being published in the airport AIP	x	x
On a destination airport with multiple runways, the landing distance computation at dispatch may be performed on the longest landing runway with no wind. The expected landing runway threshold (-s if multiple) should be used for the landing distance computation at dispatch with forecast wind at landing.		
Approach ATC and Tower ATC are trained to facilitate "concept" procedures	x	x
The ATC HMI discriminates between "concept" and previous operating method aircraft	x	x
The flight plan data will provide an indication of when a flight is certified and approved to perform the "concept" procedure	x	x
The flight plan information is displayed to Approach and Tower ATC	x	x
The ATC HMI supports handover of current approach type between working positions	x	x
The ATC system is capable of storing, in the label or elsewhere (i.e. paper strip or electronic strip), what type of approach the aircraft has clearance to fly	x	x
Operations are assumed to take place at a segregated arrival runway, independent from other runways	x	x
An ATC AMAN capable of sequencing arriving aircraft according to their "concept" capability is in use	x	
An ATC spacing tool capable of integrating curved RNP transition to GLS precision approach with consecutive interlaced straight in approaches is available.	x	x
The ATIS broadcast informs flight crew about "concept" procedure being available to the arrival runway(-s) in use	x	x
Approach executive controller can retain control responsibilities until the aircraft crosses 4DME, or the landing runway threshold, depending on local procedures	x	x
Wind data with high granularity are provided to flight crew	x	x

Table 7: Identified General Conditions per Use Case

2.3.7.3.2 Pre-Conditions

Concept	RNP to GLS	
Environment type	C	U
It is assumed that En-Route Executive Controller gives the inbound clearance prior to aircraft entering the TMA	x	x
It is assumed that the traffic demand is such that the airport at this moment optimises in order to maximise runway throughput and minimise average arrival delay.	x	
Conventional vectoring is in use	x	
ATC intervention (i.e. vectoring) is not needed to manage arrival flow		x
The weather conditions are such that they allow the *"concept"* approaches to be completed	x	x
The flight crew have planned for and are expecting to receive a *"concept"* approach clearance from Approach Executive Controller prior to commencing initial approach from the initial approach fix.	x	x
Flight crew has received ATIS or equivalent information regarding destination airport's runway in use, weather and expected "concept" approach	x	x
The flight crew utilise the ATIS information on the landing runway in use, and the weather, to carry out the landing distance computation, and to verify that the intended aiming point is suitable.		
The "concept" approach briefing on board is completed	x	x
If extra spacing due to higher wake vortex risk is required either behind or ahead of the aircraft performing the "concept" approach, this will be provided by the controller	x	x
If reduced spacing due to lower wake vortex risk is required either behind or ahead of the aircraft performing the "concept" approach, this will be provided by the controller	x	
Approach Supervisor manages the capacity and demand tasks including management of the AMAN/DMAN parameters	x	
Approach Supervisor manages the capacity		x
Tower Supervisor informs other ATC stakeholders about the runway capacity	x	x
Tower Supervisor is responsible for providing in the ATIS the availability of the "concept" approach	x	x
Approach and Tower Supervisors will assess and inform the impacted controller positions about the "concept" being available	x	x
A/C systems status is compatible with *"concept"* procedure	x	x
When possible flight crew will facilitate CDOs from TOD, and on merging on to final approach, while employing *"concept"* procedure	x	x
The use of Continuous Descent Operations is facilitated by ATC whenever possible	x	x
Approach ATC will facilitate the airspeed profile required by the *"concept"* procedure and will manage the resulting changes to the distance spacing compression that will be experienced on final approach.	x	x

Table 8: Identified Pre-Conditions per Use Case

2.3.7.3.3 Post-Conditions

Concept	RNP to GLS	
Environment type	C	U
Tower runway controller verifies that aircraft has exited the runway and hands over to tower ground controller.	x	x
The flight is logged in the ATC system for the purpose of post operation analysis as having successfully performed a *“concept”* approach	x	x
If possible each Airspace User performing the *“concept”* approach will also log the trajectory of each *“concept”* approach	x	x

Table 9: Identified Post-Conditions per Use Case

2.3.7.4 RNP to GLS Operational Scenario

2.3.7.4.1 Summary

The use case takes place in the execution phase. It describes how one flight performing a RNP transition to GLS approach is integrated in a flow of traffic. The use case is based on one independent arrival runway. It starts when a flight is at the top of descent and after the flight crew have received the arrival information provided by ATIS. It ends when the aircraft has performed the roll out and has exited the runway.

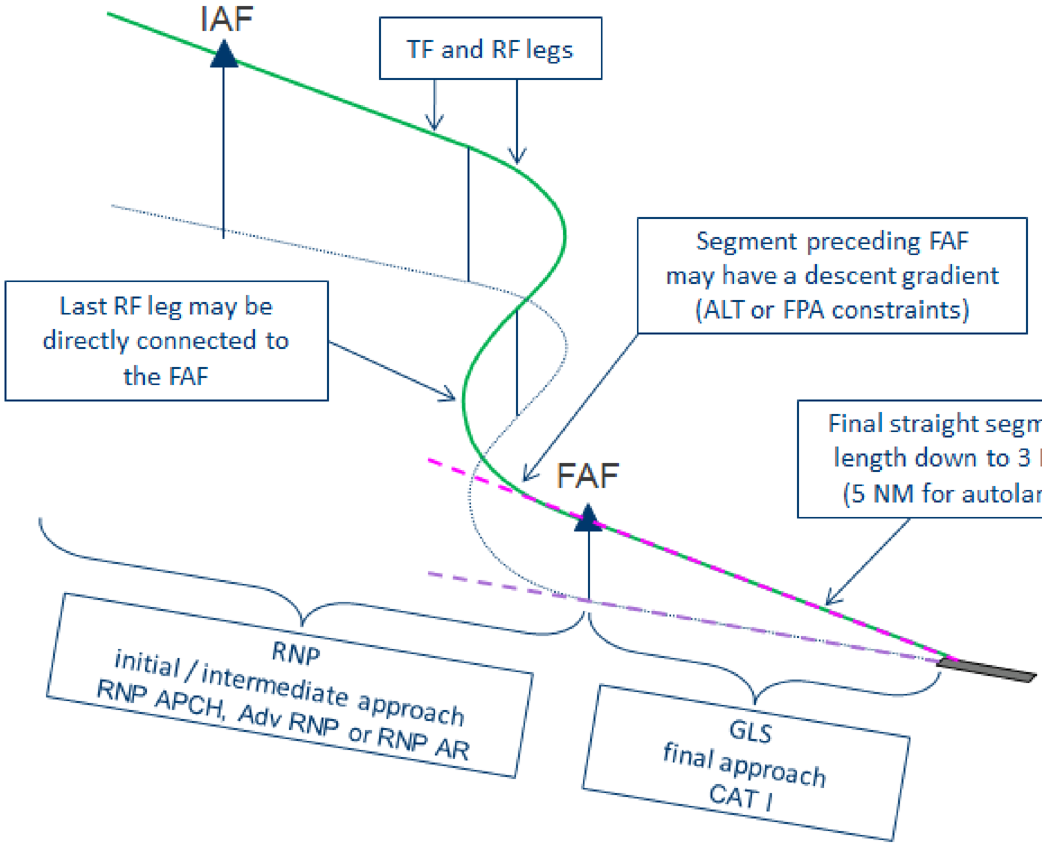

Figure 11: Illustration of RNP transition to GLS concept

2.3.7.4.2 RNP transition to GLS in constrained environment

STEP	Phase	ATC	Flight Crew	Note
1	TOD	Approach planner controller identifies RNP to GLS capable aircraft based on flight plan data (automatically from the HMI or from the strip) and ensures that AMAN sequencing is taking this into account	The flight crew are expecting to receive a RNP to GLS approach clearance from Approach ATC prior to commencing initial approach from the initial approach fix	For ATC this can be after TOD but before aircraft reaches TMA
2		En-route executive controller gives inbound clearance to follow a STAR or any other equivalent approach procedure The en-route executive controller indicates RNP to GLS approach to be expected to the arrival runway in use where able to	Read back: the inbound clearance Carry out the RNP to GLS procedure briefing	STAR clearance might instead be given by the approach controller
3	After TOD before IAF	Approach planner controller verifies ATIS information contains the sudden unavailable approaches Approach planner is aware of the weather and wind conditions	Use the ATIS and other weather data available information to determine whether the operating conditions are suitable for the RNP to GLS procedure Select the appropriate RNP to GLS procedure including the related STAR and Approach for the anticipated landing runway (including missed approach procedure) on the FMS	The tower supervisor ensures ATIS information reflect the operational status of the RNP to GLS procedure. If certain relevant information like runway sudden bad conditions cannot be put into ATIS, it should be communicated by other means (R/T) or NOTAM
4		En-route executive controller sequences aircraft according to AMAN proposal	Engage the AFS managed flight control modes to follow the published procedure Monitor a/c altitude and speed against constraints in the published procedure	Example: AMAN bunches RNP to GLS approaches or puts them on an alternative runway as needed for optimisation
5		En-route executive controller hands over and transfers control to the approach executive	The flight crew follows the ATC instructions	

STEP	Phase	ATC	Flight Crew	Note
		controller En-route executive controller transfers the aircraft to the approach executive controller frequency		
6		Executive approach controller assumes the handover. At first call from the flight crew the approach executive controller gives speed and altitude instructions and clearances in order to safely optimise the flow, while facilitating CDO as far as possible	Monitor a/c RNP navigation. The following data are monitored: o Availability of equipment necessary for RNP navigation o Positioning service performance (e.g., estimated position error and possible integrity alerts) o Lateral guidance performance (e.g., XTE) o Respect of altitude constraints o Respect of speed constraints Check RNP to GLS CAT I capability	
7			The flight crew reads back and follows the ATC instructions The flight crew must cross-check the approach data displayed on the cockpit screens with those of the approach chart (identification, channel/frequency, slope, and course). The flight crew must also check that the GLS function and all aircraft conditions (slat/flap availability…) intended to be used for the RNP to GLS operation are operative	
8	Between IAF and FAF	Approach executive controller applies required spacing after a GLS approach (if extra wake	Arm the AFS GLS flight control modes. This action aims at activating the GLS mode to automatically capture the lateral and vertical paths	NOTE for ATC aspects; Straight in approach behind a curved RNP transition to GLS precision approach might need extra spacing buffer due to wake vortex encounter risk. This is also

STEP	Phase	ATC	Flight Crew	Note
		buffer is needed this is also added) Approach executive approach controller gives RNP to GLS approach clearance using a unique designator code to the runway in use Monitor and waiting for a confirmation from the flight crew that the aircraft is established on the final approach course Approach executive controller receive confirmation that aircraft is established on the final approach course	of the final approach. Flight crew reports established on RNP to GLS approach	valid for consecutive curved RNP transition to GLS precision approaches
9		Approach executive controller transfers aircraft to the tower runway controller frequency	Transfer from approach to tower control. Flight crew changes frequency and contacts tower ATCO	The transfer from APP to TWR could also happen once the aircraft is established on the final approach course; it depends on local conditions and what different criteria apply. In this case, due to the fact that the final segment could be as short as 3 NM and the RF leg is linked to the FAP directly, it is reasonable that the transfer happens before the aircraft is established on the final track.
10			Monitor the engagement of GLS flight control modes and the capture of the GLS lateral and vertical axes, while continue monitoring a/c RNP navigation. When established on the final approach course, inform ATC.	
11	Final approach	Tower runway controller monitors the approach and provides landing clearance when	Landing clearance read-back to TWR.	

STEP	Phase	ATC	Flight Crew	Note
		runway is free		
12		Tower runway controller monitors the landing of the aircraft	Monitor the GLS approach until DA. The following data are monitored: o Availability of equipment necessary for GLS CAT I approach o Positioning service performance (e.g., estimated position error and integrity alerts) o Lateral and vertical guidance performance (e.g., GLS deviations) If distance/altitude are provided on the chart, "Distance to Go" (to threshold) information can be used to perform distance/altitude checks. The purpose is to ensure that database content is valid. This can also enable verification of altimeter settings	Deviation from final approach path is visible in terms of: heading (on PFD and ND) and in terms of course diversion (on CDI and VDI on PFD) and aircraft representation diversion from established trajectory (on ND).
13	Landing	Monitor	Decision for landing/missed approach at DA/H The flight crew shall decide at the latest at the DA/H to continue approach or initiate a missed approach according to the visual cues Continue approach visually and land (manually or with the autoland)	Landing can be performed manually without conditions. Landing can be performed with autoland provided that: - aircraft is certified for autoland on RNP to GLS CATI approaches - the RNP to GLS approach procedure geometry is compatible with any technical limitations - the RNP to GLS approach procedure geometry is compatible with operational considerations
14	Roll-out and runway exiting	Tower runway controller monitors roll-out and runway exiting. He then hands over control and frequency to tower ground controller		

Table 10: Use case 5 – RNP transition to GLS in unconstrained environment

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2.3.7.5 List of other main flows

The following other possible main flows have been identified. Some or all of them will be developed further in the next phase of the OSED development.

Concept number	RNP to GLS	
Environment type	C	U
The flights proceed via a point merge procedure to the FAP	x	x
The flights are applying self-separation such as ASPA-IM-S&M	x	x
Mixed arrival and departure usage of the runway(-s)	x	x
Dependent runways (closely spaced parallel runways)	x	x
The first segment of the DS approach is coded in the Navigation Database, and is flown in a VNAV mode		
The vertical profile before the FAF is defined by a FPA constraints	x	x
The initiation is performed by flight crew	x	x

Table 11: List of other main flows

2.3.7.6 Alternative Flows

The following alternative flows have been identified.

2.3.7.6.1 Glide Path Monitor

Monitoring of the GLS final approach using a Glide Path Monitor

2.3.7.6.2 Datalink instead of Radio

Any communication between pilot and controller to be performed by datalink instead of radio, maybe using CPDLC

2.3.7.6.3 Missed Approach

Performing a missed approach when operating conditions do not allow the establishment at the final approach

2.3.7.6.4 Non-nominal flows

The following non-nominal flows have been identified.

Concept number	RNP to GLS	
Environment type	C	U

Flight Crew is unable to fly *“concept”* approach	x	x
Weather condition changes to below CAT I conditions	x	x
Runway change	x	x
GBAS ground system out of service	x	x
GBAS on-board system failure	x	x
Separation infringement with respect to the aircraft in front	x	x
Aircraft unable to leave the runway at the targeted exit		
Weather condition changes to tail wind		

Table 12: List of non-nominal flows

2.3.7.6.5 Abnormal flows

The following abnormal flows have been identified.

Concept number	RNP to GLS	
Environment type	C	U
Aircraft does not follow the expected glide path	x	x
Aircraft behind *“concept”* reports wake encounter	x	x

Table 13: List of Abnormal flows

2.3.8 General Operational Requirements

This chapter provides general operational and functional GBAS requirements common to all concepts as provided in the OSED [58]

Identifier	REQ-06.08.08-SPR-ACFT.0100
Requirement	To tune the GBAS airborne equipment for the provision of deviations (and distance to runway threshold/aiming point for MRAP), the flight crew shall be able to select the GBAS procedure in a list of coded approaches or through the manual entry of the channel number.
Title	Standard or enhanced GLS procedure selection
Status	<In Progress>
Rationale	Use of airborne GLS tuning mechanism to select a standard or enhanced GLS procedure
Category	<Functional>
Validation Method	<Fast Time Simulation><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0275	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0100	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-FCRW.0010
Requirement	Flight Crew shall be informed and trained, if training need identified, on how to execute the GBAS enhanced arrival procedures
Title	Flight Crew training of GBAS enhanced arrival procedures
Status	<Validated>
Rationale	Training may be needed in order to safely fly the GBAS enhanced arrival procedures. Flight crew also need to have knowledge about the GBAS technology and how that differs from other systems.
Category	<HMI><Operational>
Validation Method	<Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0010	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0011
Requirement	GBAS enhanced arrival procedures shall take into account CDO by limiting

	the use of constraints in the vertical descent profile
Title	CDO procedures
Status	<In Progress>
Rationale	Flying CDO procedures will lead to reduced emissions, noise and/or gaseous in the TMA.
Category	<Operational>
Validation Method	<Real Time Simulation><Live Trial><Analytical Modelling><Flight Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES TO>	<Operational Focus Area>	OFA01.03.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0011	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-FCRW.0020
Requirement	As for today operations, when flying GBAS enhanced arrival procedures flight crew shall make sure they are aware of the actual winds and how it will affect the energy management
Title	Impact of actual wind conditions on IGS, A-IGS, DS, IGS+MRAP and RNP to IGS GLS operations
Status	<Validated>
Rationale	Based on the increased granularity in MET data and depending on the actual wind conditions along the glide slope, it might be needed to configure the aircraft earlier than usual to be able to reduce speed along the glide slope. It is also important to take the actual wind conditions in consideration to be able to choose the most efficient approach in respect of noise, emissions and/or fuel consumption.
Category	<Operational>
Validation Method	<Real Time Simulation><Analytical Modelling><Flight Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0020	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-FCRW.0030
Requirement	For IGS, A-IGS, DS, IGS+MRAP and RNP to IGS GLS, flight crew shall make sure they are aware of the approach slope and how it will affect the energy management
Title	Impact of a different slope for IGS, A-IGS, DS, IGS+MRAP and RNP to IGS GLS operations
Status	<Validated>
Rationale	To be able to fly the aircraft efficiently in respect of noise, emissions and/or fuel the flight crew need to know the slope they are going to fly and how it will affect the energy management. On a steeper than conventional approach it might be needed to configure the aircraft earlier to be able to decelerate along the glide slope.
Category	<Operational><HMI>

Validation Method	<Real Time Simulation><Flight Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Focus Area>	REQ-06.08.08-OSED-FCRW.0030	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-FCRW.0040
Requirement	The flight crew shall make sure the aircraft systems status is compatible with the GBAS enhanced arrival procedure they intend to fly before commencing the approach.
Title	Check of aircraft system status for GBAS enhanced arrival procedures
Status	<Validated>
Rationale	The aircraft systems status has to be compatible with the GBAS enhanced arrival procedures intended to be flown before the flight crew commence the approach.
Category	<Operational>
Validation Method	<Real Time Simulation><Flight Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0040	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-FCRW.0050
Requirement	In preparation for a GBAS enhanced arrival procedure, flight crew shall perform all relevant preparatory activities (approach briefing, weather…).
Title	Preparatory Activities for a GBAS enhanced arrival procedure
Status	<Validated>
Rationale	Different preparatory activities have to be performed in order to perform a safe approach to an airport.
Category	<Operational>
Validation Method	<Real Time Simulation><Flight Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0050	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-APRT.0020
Requirement	Airport shall install GBAS ground station supplying SIS supporting at least

	GAST-C for the different intended standard and enhanced GLS procedures and complying with ICAO Annex 10 related performance requirements
Title	GBAS SIS performance
Status	<In Progress>
Rationale	Interoperable ICAO GBAS ground station must be provided to support enhanced GBAS procedures.
Category	<Functional><Interoperability>
Validation Method	<Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0275	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Focus Area>	REQ-06.08.08-OSED-APRT.0020	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-APRT.0021
Requirement	Tower shall be equipped with a surveillance system to operate GBAS procedures
Title	Tower surveillance equipment
Status	<In Progress>
Rationale	It is critical for tower controllers to be able to monitor flights during the operation of GBAS procedures
Category	<Functional><Interoperability>
Validation Method	<Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0275	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-APRT.0021	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0110
Requirement	The GBAS equipment should provide the flight crew with the GBAS RPID (Reference Path Identifier),the channel number and the GPA (Glide Path Angle)
Title	Data for selection monitoring
Status	<In Progress>
Rationale	The GPA contained in the FAS data can be used to indicate if a non-standard 3° path angle procedure is operated by IGS. The TCH contained in the FAS data can be used to indicate if a procedure leading to a non-standard aiming point is operated.
Category	<Functional>
Validation Method	<Fast Time Simulation><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0275	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0110	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-APRT.0010
Requirement	Any recent failures of ground infrastructure that might not have been written in the NOTAMS, as well as the runway and approach in use and meteorological data, shall be transmitted to the flight crew by either the ATIS or the controller
Title	Failure of ground infrastructure
Status	<In Progress>
Rationale	The flight crew needs to know if the ground infrastructure fails and any operation can't be flown".
Category	<Safety>
Validation Method	<Real Time Simulation><Flight Trial><Analytical Modelling><Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0275	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-APRT.0010	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-FCRW.0051
Requirement	The flight crew shall verify that sufficient means are available to navigate and land at the destination or at an alternate aerodrome in case of loss of RNP or GLS capabilities.
Title	Navigation means
Status	<In Progress>
Rationale	Alternative scenarios in case of loss of RNP or GLS need to be defined
Category	<Safety>
Validation Method	<Real Time Simulation><Flight Trial><Analytical modelling><Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0275	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Focus Area>	REQ-06.08.08-OSED-FCRW.0051	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0010

Requirement	En-route Executive Controller, Approach Executive Controller, Tower Runway Controller, Tower Ground Controller, Approach Planner Controller, Tower Supervisor and Approach Supervisor shall apply combined GBAS enhanced arrival procedures”
Title	ATS support of combined GBAS enhanced arrival procedures
Status	<Validated>
Rationale	The GBAS enhanced arrival procedures may be combined as follows: IGS + MRAP RNP to IGS GLS
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0010	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0020
Requirement	En-route Executive Controller, Approach Executive Controller, Tower Runway Controller, Tower Ground Controller, Approach Planner Controller, Tower Supervisor and Approach Supervisor shall take into account the GBAS enhanced arrival procedures up to CAT I visual conditions related operations.
Title	GBAS CAT I Operations
Status	<Validated>
Rationale	Initially CAT II and CAT III operations will not be supported by the GBAS enhanced arrival procedures.
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0020	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0030
Requirement	Approach Executive Controller and Tower Runway Controller shall take into account airspeed constraints on final approach compatible for each of the GBAS enhanced arrival procedures

Title	ATC Support for GBAS Procedures Airspeed Constraints
Status	<Validated>
Rationale	Challenge with respect to the compatibility with regards to possible ATS speed constraints during approach. Challenge with respect to the ability to deliver the expected noise benefit when operating in high density traffic situations where speed restrictions are imposed by ATC.
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0030	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0040
Requirement	En-route Executive Controller, Approach Executive Controller, Tower Runway Controller, Tower Ground Controller, Approach Planner Controller, Tower Supervisor and Approach Supervisor shall apply GBAS enhanced arrival procedures interleaved with conventional approach procedures.
Title	ATS Support for Interleaving GBAS Procedures with Conventional Procedures
Status	<Validated>
Rationale	Challenge with respect to the potential issues of combining GBAS enhanced arrival procedures with conventional approach procedures on the same runway or dependent runways in terms of sequencing, setting up spacing and the use of speed management. Challenge with respect to potential negative impact on air traffic controller task / workload.
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0040	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0070
Requirement	The wake vortex encounter risk shall be acceptable from employing GBAS

	enhanced arrival procedures in a sequence for the same runway (mixed conventional and GBAS operation) conventional approach procedures
Title	GBAS Procedures Wake Encounter Risk Impact
Status	<Validated>
Rationale	Challenge with respect to potential higher wake vortex encounter risk when flying increased glide slope in a mixed operation.
Category	<Safety>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0445	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0070	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0080
Requirement	The sequencing and spacing consequences shall be acceptable when operating GBAS enhanced arrival procedures with conventional approach procedures
Title	Sequencing and spacing consequences of GBAS procedures
Status	<Validated>
Rationale	Tools will probably need to be developed to support ATC sequencing and spacing. These may require airborne derived data to ensure ground based predictions are accurate enough for sequencing in times of many arrivals.
Category	<Functional>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0445	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0080	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-APRT.0110
Requirement	Environmental authorities and surrounding communities should be informed before implementing of GBAS enhanced arrival procedures
Title	Implementation GBAS enhanced arrival procedures
Status	<In Progress>
Rationale	There is the need to inform all the potential stakeholders that could be impacted by the implementation of GBAS enhanced arrival procedures

Category	<Design>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-ENV2.0001	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-APRT.0110	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0120
Requirement	AMAN/DMAN shall be capable of considering aircraft flying GBAS enhanced arrival procedures
Title	General requirement sequence integration of aircraft flying GBAS enhanced arrival procedures
Status	<In Progress>
Rationale	AMAN/DMAN need to take into account that aircraft capabilities to fly different types of GBAS enhanced arrival procedures can affect the arrival sequence and that these aircraft need to be harmonised in the arrival sequence
Category	<Functional><HMI>
Validation Method	<Fast Time Simulation><Real Time Simulation><Live Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0270	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0120	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0130
Requirement	Demand and Capacity Balancing (DCB) shall be capable of considering GBAS enhanced arrival procedures
Title	General requirement; Demand and Capacity Balancing (DCB) integration of GBAS enhanced arrival procedures sequence
Status	<In Progress>
Rationale	DCB need to take into account that GBAS enhanced arrival procedures can affect the runway capacity: in order to correctly distribute traffic and allocate optimised runway usage DCB needs to know the approach and departure rate to each runway based on the input from the Aircraft Operator and DCB planning. (DCB could arrange arrivals to optimise runway throughput in

	addition to reduce local noise reduction strategy)
Category	<Functional>
Validation Method	<Fast Time Simulation><Real Time Simulation><Live Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0440	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0130	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0140
Requirement	GBAS enhanced arrival procedures shall be compatible with current operations at all types of GBAS equipped European airports serving civil IFR traffic
Title	General requirement GBAS enhanced arrival procedures compatibility with current operations
Status	<Validated>
Rationale	There is the need to ensure that the GBAS enhanced arrival procedures can be implemented without negative effect on current operations
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Live Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0140	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0150
Requirement	GBAS enhanced arrival procedures shall be compatible with current and future separation schemes
Title	GBAS enhanced arrival procedures separation
Status	<Validated>
Rationale	There is the need that GBAS enhanced arrival procedures can be integrated in the current and future separation schemes
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Live Trial><Analytical Modelling>

Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0206	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0150	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0160
Requirement	For GBAS enhanced arrival procedures the wake turbulence separation scheme shall be assessed in order to determine any need for changes to this scheme
Title	GBAS enhanced arrival procedures wake turbulence separation
Status	<Validated>
Rationale	There is a need to assess sufficient spacing to avoid increased serious wake vortex encounter risk when applying GBAS enhanced arrival procedures. There is also an opportunity to reduce the separation in cases where the wake encounter risk is decreased.
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Live Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0210	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0160	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0170
Requirement	GBAS enhanced arrival procedures shall be applicable to any airport layout from single to multiple runways with simple or complex taxiway structures
Title	GBAS enhanced arrival procedures airport layout
Status	<Validated>
Rationale	There is a need to ensure that GBAS enhanced arrival operations are compatible with any airport layout
Category	<Design>
Validation Method	<Fast Time Simulation><Real Time Simulation><Live Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0455	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0170	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0180
Requirement	GBAS enhanced arrival procedures shall be applicable on both dependent and independent runways environment
Title	GBAS enhanced arrival procedures runway environment
Status	<Validated>
Rationale	There is a need to ensure that GBAS enhanced arrival operations are compatible with any runway environment
Category	<Design>
Validation Method	<Fast Time Simulation><Real Time Simulation><Live Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0180	<Full>

-[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0210
Requirement	Certification, limit conditions and weather and runway conditions that lead to the suspension of each type of GBAS approach shall be identified per A/C type (criteria and conditions when the GBAS procedure does not apply)
Title	GBAS enhanced arrival procedures weather, runway and limit conditions
Status	<In Progress>
Rationale	GBAS enhanced arrival procedures are compatible with the decided wind conditions
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Live Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0230
Requirement	A controller spacing tool, on demand available for the controller, shall be provided to approach and en-route controllers to support the determination of spacing between consecutive aircraft using conventional approach procedures and IGS / DS / MRAP GBAS procedures
Title	Spacing tool supporting GBAS enhanced arrival procedures
Status	<In Progress>
Rationale	There is a need of a controller spacing tool to handle the spacing between consecutive aircraft movements that are using different types of approach procedures (conventional procedures mixed with IGS / DS / MRAP GBAS procedures) It is extremely challenging to apply new separation minima specific to every concept in the mixed-traffic environment. Also, flight crew need to know when to start deceleration so that it is early enough. A separation indicator considering the different speed profile per aircraft type and per G/S angle will indicate the extra buffer to apply behind a leader for a given aircraft pair
Category	<Functional>
Validation Method	<Fast Time Simulation><Real Time Simulation><Live Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0230	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0231
Requirement	The spacing tool shall take into calculation the revised separation minima scheme applicable
Title	Spacing tool separation scheme
Status	<In Progress>
Rationale	The spacing tool shall take into account the different concepts affecting aircrafts pairs separations to consider the most constraining one as the separation minima for each situation
Category	<Functional>
Validation Method	<Fast Time Simulation><Real Time Simulation><Live Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>

<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0231	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0232
Requirement	The spacing tool shall indicate the following in the controller HMI, per A/C type and G/S angle: • Distance between an A/C pair • Required distance from the displaced threshold when flying a MRAP procedure
Title	Spacing tool indications in the HMI
Status	<In Progress>
Rationale	The function of the spacing tool is to make the controller aware of the imperative distance minima between aircrafts pairs, as there is a need for the controller to be aware of the limit distances to be applied in the flights progression
Category	<Functional>
Validation Method	<Fast Time Simulation><Real Time Simulation><Live Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0232	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0240
Requirement	Approach supervisor shall decide on nominal arrival capacity taking into account GBAS enhanced arrival procedures which are eligible.
Title	Approach Supervisor responsibility of nominal arrival capacity when GBAS enhanced arrival procedures are eligible
Status	<In Progress>
Rationale	When runway capacity is determined by the supervisor the GBAS impact on capacity has to be assessed.
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Live Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A

<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0240	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0250
Requirement	Approach supervisor shall coordinate with tower supervisor (and if appropriate according to local procedures also with APOC supervisor) any changes in the use of GBAS enhanced arrival procedures or changes in their eligibility
Title	Approach Supervisor responsibility of coordination with the APOC or with the Tower when GBAS enhanced arrival procedures are eligible
Status	<In Progress>
Rationale	Tower supervisor and APOC are collaboratively responsible for implementing the most efficient operation according to KPI selection criteria set up by the airport steering board. This responsibility includes demand capacity balancing and trade-off and what-if assessment depending on current and forecasted KPI preferences. It is therefore important that approach supervisor informs APOC/tower supervisor of any changes to GBAS enhanced arrival procedures.
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Live Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0250	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0260
Requirement	En-route Executive Controller, Approach Executive Controller, Tower Runway Controller, Tower Ground Controller, Approach Planner Controller, Tower Supervisor and Approach Supervisor shall be trained on how to execute the GBAS enhanced arrival procedures
Title	General requirement ATS actors training
Status	<Validated>
Rationale	Training is needed in order to understand aircraft behaviour when following GBAS enhanced arrival procedures and take this into account when setting up sequence and spacing. The controllers also need to understand the technology GBAS is built on and how that differs from for example ILS system.
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>

<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0260	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0261
Requirement	En-route Executive Controller, Approach Executive Controller, Tower Runway Controller, Tower Ground Controller, Approach Planner Controller, Tower Supervisor and Approach Supervisor shall know A/C type deceleration capabilities on a particular glide slope
Title	General requirement ATS actors A/C type deceleration capabilities training
Status	<In Progress>
Rationale	Controller needs to be aware of capabilities to increase safety. A/C deceleration capabilities is aerodynamic performance dependant on many factors and different between aircraft types
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0261	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0270
Requirement	The HMI ATC system displayed in the controller working position shall indicate, as selectable label, the unique designators for each GBAS procedure that are available at a specific airport
Title	General requirement ATC HMI-Generation of designated GBAS approach types
Status	<Validated>
Rationale	ATS actors need unique designators visible on the CWP HMI in order to distinguish the available GBAS approach procedure in an unambiguous manner.
Category	<HMI>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-HMI.0001	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-HMI.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>

<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0270	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0271
Requirement	Each GBAS enhanced arrival procedure shall be indicated by a clear, non-ambiguous and unique designator
Title	General requirement for designating GBAS approach types
Status	<Validated>
Rationale	ATC actors, flight crew and system need unique designators in order to publish and communicate each available GBAS approach procedure in an unambiguous manner.
Category	<Design>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0271	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0272
Requirement	The nomenclature of procedure designation shall allow for uniquely identifying GBAS enhanced arrival procedures for each runway end, glide path or RAP in the controller working position HMI
Title	General requirement ATC HMI - GBAS approach types designator
Status	<Validated>
Rationale	ATS actors need unique designators in order to distinguish the specific enhanced arrival procedure (i.e. MRAP, displaced threshold, IGS, A-IGS, DS, Curved RNP transition to GLS precision approach)
Category	<HMI>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-HMI.0006	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0272	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0273
Requirement	The unique designator for the selected GBAS enhanced arrival procedure shall be presented on the flight progress strip or e-strip
Title	General requirement ATC HMI - GBAS designator on strip
Status	<Validated>
Rationale	ATS actors need unique designators visible on the strip or e-strip in order to distinguish the flight GBAS approach procedure in an unambiguous manner.
Category	<Design><HMI>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0273	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0274
Requirement	Each GBAS enhanced arrival procedure available shall be presented on a different chart
Title	GBAS procedure different publication
Status	<Validated>
Rationale	ATS actors, flight crew and system need charts publication to communicate each available GBAS approach procedure in an unambiguous manner.
Category	<Design>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0274	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0360
Requirement	The organisation responsible for AIP shall publish the unique GBAS designators for all runways
Title	General requirement GBAS approach in AIP
Status	<Validated>
Rationale	ATS actors, flight crew and system need unique designators in order to communicate each available GBAS approach procedure in an unambiguous

	manner.
Category	<Design>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0445	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0360	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0151
Requirement	The flight plan data shall indicate aircraft capability to fly GBAS procedures.
Title	General requirement ATC HMI –Aircraft GBAS capability
Status	<In Progress>
Rationale	ATS actors as well as flight crew and system need accurate access to GBAS enhanced arrival procedures capability information (or GBAS equipped information in case of A-IGS GBAS based) in order to plan the arrival flow and select and initiate the most appropriate approach procedure per flight in any given traffic situation.
Category	<Functional><HMI>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0151	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0280
Requirement	The HMI ATC system in the controller working position shall display data indicating the flight capability for flying GBAS enhanced arrival procedure in the flight plan
Title	General requirement ATC HMI –Aircraft GBAS capability
Status	<Validated>
Rationale	ATS actors as well as flight crew and system need accurate access to this information in order to plan the arrival flow and select and initiate the most appropriate approach procedure per flight in any given traffic situation.
Category	<HMI>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-HMI.0004	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0280	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0290
Requirement	The approach executive controller shall input the type of GBAS enhanced arrival procedures that the flight crew has received clearance to fly into the ATC system.
Title	General requirement ATC HMI – GBAS enhanced arrival procedure input
Status	<Validated>
Rationale	ATC actors shall at all times be aware of the approach procedure that will be followed by each flight in order to avoid misunderstandings and potential safety critical mistakes in setting up the required spacing.
Category	<HMI>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-HMI.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0290	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0291
Requirement	The Controller shall be able to provide an input to the HMI when receiving the approach clearance read-back from the pilot
Title	General requirement ATC HMI – GBAS read-back input
Status	<In Progress>
Rationale	ATC actors shall at all times be aware of the approach procedure that will be followed by each flight in order to avoid misunderstandings and potential safety critical mistakes in setting up the required spacing
Category	<HMI>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-HMI.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>

<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0291	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0292
Requirement	The confirmed approach type (confirmation indicated on the screen) shall be transferable within one system architecture from en-route to APP and to TWR
Title	General requirement - Approach type transference
Status	<Validated>
Rationale	ATC actors shall at all times be aware of the approach procedure that will be followed by each flight in order to avoid misunderstandings and potential safety critical mistakes in setting up the required spacing
Category	<Functional><Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0292	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0300
Requirement	Approach executive controller shall provide the approach clearance clearly stating the unique designator for the GBAS enhanced arrival procedure and ensure a correct read-back from flight crew.
Title	General requirement Provision of approach clearance GBAS enhanced arrival procedure
Status	<Validated>
Rationale	It is safety critical in particular for constrained flights that ATS actors and flight crew at all times are aware of the type of approach that will be performed by each flight
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A

<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0300	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0310
Requirement	The en-route or approach executive controller (depending on local procedures) should initiate the IGS, DS, MRAP, Curved RNP to GLS precision Approach procedures and their possible combination per flight
Title	General requirement approach and en-route executive controller-Initiating IGS, DS, MRAP, Curved RNP to GLS precision Approach procedures and their possible combination
Status	<Validated>
Rationale	In a constrained environment it is more practical if ATC take the initiative to perform the IGS, DS, MRAP, Curved RNP to GLS precision Approach procedures and their possible combination since this might impact the overall performance of the airport in terms of environment versus capacity KPA's
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0310	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0320
Requirement	The en-route or approach executive controller (depending on local procedures) shall issue an arrival clearance including the expectation to later provide approach clearance for a specific GBAS enhanced approach procedure. Expressed as: "Expect XXX approach runway YY"
Title	General requirement approach and en-route executive controller-Inbound clearance
Status	<Validated>
Rationale	Flight crew needs to prepare the proposed approach procedure as early as possible in order to select an optimised descent
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A

<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0320	<Full>

[REQ]

Identifier	REQ-06.08.08-OSED-ATCO.0330
Requirement	The approach planner controller and the approach executive controller shall monitor the weather conditions and the GBAS equipment status in order to determine if the GBAS enhanced approach is feasible or not within the expected duration of the flight trajectory until the flight is landing.
Title	General requirement determining feasibility of GBAS approach
Status	<In Progress>
Rationale	In order to avoid having to change the type of approach procedure because of changes in system or weather and thus disrupting both the arrival flow and the flight trajectory the ATC needs to remain vigilant in supervising this information
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0330	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0340
Requirement	The tower supervisor shall input to ATIS immediately that a certain GBAS approach is unavailable
Title	General requirement determining availability of GBAS approach
Status	<In Progress>
Rationale	ATIS information will assist flight crew in early planning of expected approach procedure
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0340	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0350

Requirement	The tower supervisor and approach supervisor shall together determine the runway and TMA capacity based on the assumed application of GBAS enhanced arrival procedures for the coming hours.
Title	General requirement determining capacity based on use of GBAS procedures
Status	<In Progress>
Rationale	In order to achieve the best performance of the total airport management depending on the selected KPA's ATC need to coordinate in advance the foreseen capacities and various options in selection of runways and approach procedures.
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0350	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0380
Requirement	The ATC system HMI in the controller working position shall handover between working positions the information regarding GBAS capability and GBAS approach clearance
Title	HMI requirement ATC HMI –GBAS capability and clearance handover
Status	<Validated>
Rationale	ATS actors need HMI support when handing over flights between sectors in order to avoid omission, misunderstanding and potential safety risks
Category	<HMI>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-HMI.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-HMI.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-HMI.0006	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0380	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0390
Requirement	The ATC HMI controller working position shall display that the aircraft flies GBAS enhanced arrival procedure

Title	General requirement ATC HMI –Flight crew acceptance HMI
Status	<In Progress>
Rationale	ATC actors shall at all times be aware of the approach procedure that will be followed by each flight in order to avoid misunderstandings and potential safety critical mistakes in setting up the required spacing.
Category	<HMI>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-HMI.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-HMI.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0390	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0410
Requirement	The ATS actors that shall be involved in the execution phase of the GBAS enhanced arrival procedures are: • Tower supervisor • Approach supervisor • Tower controller • Tower runway controller • Approach executive controller including intermediate and final approach controllers if these roles exist at local level • Approach planning controller • En-route executive controller
Title	General requirement Mandatory roles
Status	<Validated>
Rationale	The involved roles for executing the GBAS execution need to be established in order to correctly develop HMI and system features as well as training and local procedures
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0445	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0410	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0420
Requirement	Executive approach controller shall be allowed to use speed control and/or altitude clearances in order to best sequence, organise, space and separate arriving aircraft while providing the GBAS enhanced arrival procedures
Title	General requirement Use of control techniques in TMA
Status	<Validated>
Rationale	In order to cope with varying flight profiles within a constrained TMA the controllers need to apply the control technique (s) that best fit the traffic situation at any given time
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0445	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0420	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0430
Requirement	Approach executive and en-route executive controller should whenever possible facilitate CDO approaches
Title	General requirement Use of CDO in TMA
Status	<Validated>
Rationale	In order to support the need for most efficient flight trajectories the controllers should consider using CDO as much as possible
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0445	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0430	<Partial>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0440
Requirement	Executive approach controller may use closed loop approach clearances for any GBAS approach type. (Closed loop is when vectoring is not applied)
Title	General requirement Use of closed loop approach clearance in constrained TMA for GBAS approach
Status	<Validated>

Rationale	Aircraft operator needs to fly the most efficient flight trajectory
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0445	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0440	<Partial>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0460
Requirement	The ATC system shall store all approach types that are flown per flight, Data that shall be stored shall include at least: • aircraft type • call sign • time stamps for entering TMA and when exiting runway • runway number • approach clearance unique designator
Title	General requirement ATC system Storing approach type
Status	<In Progress>
Rationale	In order to evaluate the capacity and environment performance of the airport in post analysis phase there is a need to know each flown approach type and the evolution over time in how and how often the GBAS enhanced arrival procedures are used.
Category	<Functional>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0460	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0479
Requirement	When operating GBAS procedures in a constrained environment a sequencing tool, on demand available for the controller, shall be provided
Title	ATC system AMAN capable of GBAS optimisation
Status	<In Progress>
Rationale	In order to best accommodate the use of GBAS enhanced arrival procedures for constrained flights, the controllers needs to have AMAN

	available.
Category	<Functional>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-6200.0270	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0479	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0478
Requirement	The sequencing tool HMI, when available, shall indicate each GBAS enhanced arrival procedure.
Title	HMI ATC system AMAN capable of GBAS optimisation
Status	<In Progress>
Rationale	In order to distinguish the GBAS enhanced arrival procedures and the standard approach, the AMAN HMI shall indicate the several approach procedures in use.
Category	<Functional>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-6200.0270	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0478	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0480
Requirement	If available the AMAN shall be capable of optimising the flow depending on the use of GBAS enhanced arrival procedures per flight. Optimisation features/criteria may be: • Grouping of same type of GBAS approach • Assigning another runway than the main arrival runway in use, for the GBAS enhanced arrival procedures
Title	ATC system AMAN capable of GBAS optimisation
Status	<In Progress>
Rationale	In order to best accommodate the use of GBAS enhanced arrival procedures for constrained flights the AMAN needs to know what each arriving aircraft will do.
Category	<Functional>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>

Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0270	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0480	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0490
Requirement	The approach executive controller should use an ATC spacing tool in order to achieve best possible performance in spacing and separation delivery in a constrained TMA
Title	General requirement Use of spacing tool
Status	<In Progress>
Rationale	With a spacing tool ATC is likely to achieve better performance when merging GBAS enhanced arrival procedures with other types of approaches onto the final approach path.
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0490	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0500
Requirement	The approach supervisor shall determine the parameters that AMAN uses during periods when GBAS enhanced arrival procedures are in use
Title	General requirement AMAN parameter setting
Status	<In Progress>
Rationale	Depending on how GBAS affects the capacity the AMAN parameters might have to be changed in order to correctly reflect the foreseen capacity. If grouping or another runway than the main arrival runway in use, is used for GBAS enhanced arrival procedures the AMAN will need this information
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>

<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0270	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0500	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0510
Requirement	The tower and approach supervisors shall inform the involved controllers about start and end of GBAS enhanced arrival procedure operation periods.
Title	General requirement Start and end of GBAS operation period
Status	<In Progress>
Rationale	In a constrained TMA it might be considered that the use of GBAS enhanced arrival procedures is not possible due to high traffic demand. Since weather conditions not always will allow GBAS enhanced arrival procedures there will be periods when GBAS enhanced arrival procedures are disabled.
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0510	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0520
Requirement	The executive approach controller should add or reduce spacing before and/or after GBAS enhanced arrival procedures according to potentially new separation minima related to higher or lower wake vortex encounter risk.
Title	General requirement Wake turbulence separation minima
Status	<In Progress>
Rationale	Depending on what will be determined there might be the possibility that the controller will have to reduce or augment the spacing because the wake turbulence minima has been changed when mixing flights, following the GBAS enhanced arrival procedures, with each other or with flights following conventional approaches.
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>

<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0520	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0530
Requirement	The executive approach controller and the tower runway controller shall pay particular attention to monitoring the glide path when providing GBAS increased glide path approach procedures; IGS, A-IGS, DS, IGS+MRAP and RNP to IGS GLS.
Title	ATC Glide path monitoring
Status	<In Progress>
Rationale	There is a need for the controller to be aware of the boundaries of the increased glideslope in order to detect and react properly and timely to any vertical deviation from the expected path.
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0530	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0540
Requirement	The executive approach controller shall always receive a report from flight crew that they are established on the final part of the GBAS enhanced approach procedure prior to handing over control and frequency to tower runway controller. This requirement is valid for aircraft that are being vectored.
Title	General requirement Receive “Established” report from flight crew
Status	<Validated>
Rationale	As the report to be established signifies that the flight crew takes over the navigation responsibility this report is pertinent for the roles and responsibilities point of view. (For RNP to GLS procedures the navigational responsibility already lies with the flight crew.)
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A

<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0540	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0160
Requirement	The aircraft shall be able to perform CAT I GLS precision approach on GBAS enhanced arrival procedures
Title	Aircraft GLS capability
Status	<Validated>
Rationale	Aircraft systems together with all necessary elements must enable an aircraft to perform GLS CAT I precision approach with sufficient performance.
Category	<Functional>
Validation Method	<Fast Time Simulation><Real Time Simulation><Flight Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0160	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0170
Requirement	GBAS enhanced arrival procedures shall be compatible with manual and automatic landing operations
Title	Category of operations for GBAS enhanced arrival procedures
Status	<In Progress>
Rationale	So as to enable daily operations and adapt to a wide range of airline operations.
Category	<Functional>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0170	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0180
Requirement	The GBAS ground station shall support GBAS enhanced arrival procedures
Title	GBAS capability to GBAS enhanced arrival procedures
Status	<In Progress>
Rationale	The GBAS ground station shall provide enhanced navigation and arrival performance.
Category	<Functional>
Validation Method	<Fast Time Simulation><Real Time Simulation><Flight Trial>

Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0180	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-APRT.0030
Requirement	During IGS, A-IGS and DS approaches/operations, Aircraft should be able to comply with approach speed restrictions associated to those approaches/operations, if any
Title	Flight dynamics – approach speed
Status	<Validated>
Rationale	To ensure compatibility of IGS, A-IGS and DS operations with airport TMA. procedures and environmental restriction
Category	<Functional>
Validation Method	<Real Time Simulation><Flight Trial><Analytical modelling><Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0275	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-APRT.0030	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0560
Requirement	The aircraft shall be certified and approved to fly the GBAS procedures
Title	GBAS certification
Status	<In Progress>
Rationale	Aircraft capabilities shall be compliant with the GBAS procedures needed performance
Category	<Functional>
Validation Method	<Expert Group (Judgement Analysis)><Analytical Modelling><Real Time Simulation><Flight Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0560	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-FCRW.0340
Requirement	The flight crew shall have the capability to fly IGS, A-IGS, DS and MRAP

	final approach manually (without AP not FD) or with FD or with AP"
Title	GBAS operations
Status	<Validated>
Rationale	To meet operational objectives and operational capacity enhancement
Category	<Operational>
Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation><Flight Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0340	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-FCRW.0360
Requirement	The fight crew shall fly IGS, A-IGS, DS, MRAP and RNP to GLS procedures with auto-thrust ON or OFF depending on the needs
Title	GBAS operations with auto-thrust
Status	<Validated>
Rationale	In order to be operational, the function shall enable the crew to fly the approach the way they choose, and shall adapt to aircraft capability.
Category	<Operational>
Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation><Flight Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0360	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

2.3.8.1 Curved RNP transition to GLS precision approach (RNP/GLS) specific requirements

This chapter provides operational and functional GBAS requirements specific to *Curved RNP transition to GLS precision approach (RNP/GLS)* as provided in the OSED [58]

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0190
Requirement	The aircraft shall support RNP to GLS approach with glide slope captured from a level segment or CDO
Title	GBAS capability to GBAS enhanced arrival procedures
Status	<Validated>
Rationale	The Aircraft should fly GBAS enhanced arrival procedures with continuous descent profile respecting altitude constraints and/or shall support FPA constraints before the FAP with enhanced approach performance and reduced environmental impact
Category	<Operational>
Validation Method	<Real Time Simulation><Flight Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>

<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0190	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0430
Requirement	The RNP to GLS approach procedures shall respect the definition of segments of the approach procedure given by PANS OPS 8168.
Title	RNP to GLS Compliance to PANS OPS 8168
Status	<In Progress>
Rationale	Flyability of procedures based on existing regulations. Clarification. The criteria for GBAS CAT I operations are already included in PANS OPS, but no criteria for GBAS CAT II/III has been included yet.
Category	<Design>
Validation Method	<Expert Group (Judgement Analysis)><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.05-OSED-RNPG.0030	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0430	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0440
Requirement	The RNP to GLS approach procedures shall be composed of RNP segments for the initial and intermediate approaches and one GLS segment for final approach.
Title	RNP to GLS Procedure definition
Status	<Validated>
Rationale	Define a generic structure for RNP To GLS approach. Note that the RNP portion may only apply to the intermediate approach.
Category	<Design>
Validation Method	<Expert Group (Judgement Analysis)><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.05-OSED-RNPG.0040	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0440	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0450
Requirement	The design of the RNP to GLS transition shall consider an RNP intermediate segment with a RF leg (more challenging case) or with a TF leg between last RF leg and FAP
Title	RNP to GLS: RF transition to FAP
Status	<Validated>
Rationale	Allow direct transition between RF leg and GLS segment. This capability improves the trajectory flexibility, thus offers more procedure design possibilities, allowing improved access in obstacle rich environments and can reduce environmental impact.
Category	<Design>
Validation Method	<Expert Group (Judgement Analysis)><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.05-OSED-RNPG.0041	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0450	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0642
Requirement	Specific ATC procedures shall be defined for the case in which the distance between a pair of A/C in the RF leg decreases below a certain value, to take an A/C off the leg
Title	Distance minima violation procedure in the RF leg
Status	<Validated>
Rationale	The wake distance separation is measured as a straight line behind the leading aircraft of the aircraft pair, so the minimum distance along the trajectory varies when the flights follows a curved path
Category	<Design>
Validation Method	<Expert Group (Judgement Analysis)><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0642	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0641
Requirement	Separation to be applied by ATC shall be the direct distance between A/C on the RF leg
Title	Separation to be applied in the RF leg
Status	<Validated>
Rationale	Separation to be applied by ATC shall be radar separation on the RF leg
Category	<Design>
Validation Method	<Expert Group (Judgement Analysis)><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0641	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0460
Requirement	RNP to GLS procedures and their characteristics shall be extracted from existing database, which may be consulted by crew before or during the flight.
Title	RNP to GLS procedures - Database availability
Status	<Validated>
Rationale	Check/monitor the procedure before and during the flight.
Category	<Functional>
Validation Method	<Real Time Simulation><Flight Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>

<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0460	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-FCRW.0260
Requirement	During RNP To GLS approach procedures, the flight crew shall be able to monitor each portion of the approach (RNP, transition and GLS) with the same operational procedures as today for RNP and xLS.
Title	RNP to GLS monitoring homogeneity
Status	<Validated>
Rationale	Remain consistent with the current procedures monitoring
Category	<Operational>
Validation Method	<Real Time Simulation><Flight Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.05-OSED-RNPG.0080	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0260	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-FCRW.0270
Requirement	At any time during the flight, the crew shall be aware of required RNP value, and both RNP and GLS aircraft capabilities.
Title	RNP to GLS procedure capability
Status	<In Progress>
Rationale	The crew needs to know whether the procedure can be continued or abandoned if equipment availability and/or navigation performance is downgraded.
Category	<Functional>
Validation Method	<Real Time Simulation><Flight Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.05-OSED-RNPG.0090	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0270	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-FCRW.0280
Requirement	During the transition from the RNP intermediate segment with or without an RF leg directly linked to the GLS final approach segment, the flight crew shall effectively monitor the change from the RNP segment to the GLS segment with its respective raw data and guidance modes.
Title	RNP to GLS transition monitoring
Status	<Validated>
Rationale	To ensure safe transitions, the RNP performances must be monitored until the capture of the GLS Final Approach Segment. During the transition, at the same time, both metric (RNP) and angular (GLS) deviations must be monitored. The crew needs to know on which reference (FPLN or GLS beam) the aircraft is guided and its relative position.
Category	<Operational>
Validation Method	<Real Time Simulation><Flight Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.05-OSED-RNPG.0100	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0280	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0470
Requirement	In case of strong environmental constraints in the missed approach trajectory, the RNP to GLS approach procedure shall include a transition to an RNP coded missed approach.
Title	RNP to GLS - Missed approach transition
Status	<In Progress>
Rationale	Permit a safe extraction in case of inability to pursue the current approach
Category	<Design>
Validation Method	<Expert Group (Judgement Analysis)><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.05-OSED-RNPG.0150	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0470	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-APRT.0040
Requirement	New TIBT shall be transmitted to the GND handling teams / supervisor to provide on-time GND services when changed approach tracks (shorter routes) generate new TIBT
Title	Common Awareness – GND handling
Status	<In Progress>
Rationale	It has to be ensured that the ground handling services at the airport are informed about changes of routings within the TMA which effect the expected In-Block-Time of the aircraft to avoid delays during the ground handling process
Category	<Operational>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-APRT.0040	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0650
Requirement	For RNP to GLS the approach executive controller shall provide closed loop clearance along the approach
Title	General requirement RNP to GLS closed loop
Status	<Validated>
Rationale	As for an ILS, vectoring after a certain point shall be avoided in order for the flight crew and the aircraft to assume the navigation responsibility during final approach.
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>

Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0445	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED IN ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED IN ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0650	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0500
Requirement	The aircraft shall be able to perform RNP operations, GLS approaches, and transition from RNP to GLS.
Title	Aircraft capability - RNP to GLS
Status	<Validated>
Rationale	Ability to perform RNP to GLS approaches
Category	<Functional>
Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation><Flight Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.05-OSED-RNPG.0010	<Full>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0500	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0520
Requirement	The RNP to GLS vertical transition shall ensure the capture of the GLS Final Approach Segment for a range of temperatures.
Title	RNP to GLS transition - Temperature constraints
Status	<In Progress>
Rationale	Ensure the aircraft captures the glide slope for a given range of temperature considering the aircraft glide capture.
Category	<Functional>
Validation Method	<Real Time Simulation><Flight Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.05-OSED-RNPG.0110	<Full>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0520	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0530
Requirement	The transition sequence from RNP to GLS shall avoid unexpected early capture of the xLS final approach segment.
Title	RNP to GLS capture constraints
Status	<Validated>
Rationale	Avoid exit of RNP corridor due to early capture.
Category	<Functional>
Validation Method	<Real Time Simulation><Flight Trial><Analytical Modelling>

Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.05-OSED-RNPG.0140	<Full>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0530	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0540
Requirement	The aircraft shall be capable to fly the RNP coded missed approach, including the RF legs with a managed lateral mode.
Title	RNP to GLS - Missed approach ability
Status	<In Progress>
Rationale	RNP to GLS - Give the aircraft to follow accurately the missed approach
Category	<Functional>
Validation Method	<Real Time Simulation><Flight Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.05-OSED-RNPG.0151	<Full>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0540	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0550
Requirement	The avionics' systems shall meet the current regulations for degraded cases, in accordance with flown operations.
Title	Regulation compliance for degraded cases
Status	<In Progress>
Rationale	RNP to GLS - Define accordance to fly an operation with applicable regulations.
Category	<Functional>
Validation Method	<Real Time Simulation><Flight Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.05-OSED-RNPG.0160	<Full>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0550	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ACFT.0561
Requirement	The aircraft shall be certified for the intended RNP operation.
Title	RNP capability of aircraft
Status	<In Progress>
Rationale	RNP to GLS - Compliance with RNP procedure
Category	<Functional>
Validation Method	<Expert Group (Judgement Analysis)><Analytical Modelling><Real Time Simulation><Flight Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>

<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0561	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0660
Requirement	Approach Executive Controller and or Tower Runway Controller shall not allocate a speed that exceeds the RF leg design speed.
Title	Approach Speed during RF
Status	<Validated>
Rationale	Approach executive controller needs knowledge of the procedure design and what max speeds allowed to be flown.
Category	<Operational>
Validation Method	<Expert Group (Judgement Analysis)><Analytical Modelling><Real Time Simulation><Flight Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0660	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0670
Requirement	Approach Executive Controller shall avoid “direct to” clearance or vectoring to the entry point of the RF leg
Title	Vectoring avoidance for the RF leg entrance
Status	<Validated>
Rationale	When the flight is approximating the entry point of the RF leg, the controller ought to avoid “direct to” clearance or vectoring in order to be able to maintain accurately the RF leg path from the entry point
Category	<Operational>
Validation Method	<Expert Group (Judgement Analysis)><Analytical Modelling><Real Time Simulation><Flight Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0670	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-ATCO.0680
Requirement	RNP to GLS clearance shall be provided in 1 step, clearing to GLS via a transition point
Title	1 step clearance for RNP to GLS
Status	<Validated>
Rationale	The pilot will not require clearance for the final GLS approach course, only one clearance will be necessary for the whole RNP to GLS procedure
Category	<Operational>
Validation Method	<Expert Group (Judgement Analysis)><Analytical Modelling><Real Time Simulation><Flight Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A

<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0680	<Full>

3 Requirements

This section collects all the safety and performance requirements derived from the assessment illustrated in Appendix A. The requirements identifiers are set accordingly to the rules defined in the Requirements and V&V Guidelines document [2].

The used layout is in accordance to the Templates and Toolbox User Manual [3].

The generic pattern applied is as follows:

<Object type>-<Project code>-<Document code>-<Reference code>.<Reference number>
Where:
- **<Object type>** is REQ
- **<Project code>** is 06.08.08
- **<Document code>** is SPR
- **<Reference code>** reflects the following organization:
    - o 1xxx – Safety requirements
    - o 2xxx – Performance requirements
    - o x1xx – General GBAS requirements
    - o x2xx – IGS requirements
    - o x3xx – A-IGS requirements
    - o x4xx – DS requirements
    - o x5xx – MRAP requirements
    - o x6xx – RNP to xLS requirements
    - o xxAT – Air traffic control and air traffic management requirements, including: ATCO training, ATCO equipment, ATCO interaction with the flight plan, ATCO communications, other ATCO actions and features, airport ground equipment and charts and procedures specifications
    - o xxFC – Flight Crew (FC) related requirements, including: training, actions and others
    - o xxAO – Aircraft Operator (AO) requirements, including: AO interaction with the flight plan, AO other actions and features and airborne equipment
- **<Reference number>** is a sequence number (incremental by 10 to leave space for new requirements) for each series of requirements.

As stated above in section 1.2, this documents only applies to OFA02.01.01 only concept and thus the following sections includes general requirements common to all concepts addressed in P06.08.08 scope (increased glide slope, double slope approach, adaptive increased glide slope, multiple runway aiming points and Curved RNP transition to GLS Precision Approach) and requirements related to OFA02.01.01concepts only (Curved RNP transition to GLS Precision Approach).

3.1 Safety Requirements

Safety requirements, coming from the assessment of section A.1, are listed below.

3.1.1 General GBAS

The Safety Requirements which are applicable to all of the three most mature procedures (RNP transition to xLS, IGS and MRAP) have been gathered in this General section and reported in §. 3.1.1 of both the P6.8.8 SPR documents, OFA 02.01.01 and OFA01.03.01 related.

3.1.1.1 Air traffic control and air traffic management requirements

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0010
Requirement	The Controller shall be able to indicate the read-back of the clearance of a certain approach type on the HMI
Title	Approach clearance indication on ATCO HMI
Status	<Validated>
Rationale	ATC actors shall at all times be aware of the approach procedure clearance status in order to avoid misunderstandings and potential safety critical mistakes in setting up the required spacing
Category	<Safety>
Validation Method	<Live Trial><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0290	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0300	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0020
Requirement	If available, the sequencing tool should take flight plan input into consideration to extract the flight GBAS capabilities and preferences
Title	Consideration of flight plan by the sequencing tool
Status	<In Progress>
Rationale	AMAN/DMAN need to take into account that aircraft capabilities and preferences to fly different types of GBAS enhanced arrival procedures can affect the arrival sequence and that these aircraft need to be harmonised in the arrival sequence
Category	<Safety>
Validation Method	<Live Trial><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0120	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0030
Requirement	Flight approach designator should be provided on the label in case of arrival procedures enabled by GBAS
Title	GBAS information on the label
Status	<Validated>
Rationale	ATS actors need unique designators visible on the CWP HMI in order to distinguish aircraft flying the specific enhanced arrival procedure (i.e. MRAP, displaced threshold, IGS, A-IGS, DS, Curved RNP transition to xLS precision approach) but also the glide path angle to be flown in case of IGS and DS and the specific aiming point in case of multiple runway aiming points in an unambiguous manner
Category	<Safety>
Validation Method	<Live Trial><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0272	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0040
Requirement	Information about distance should be displayed in NM from the a/c position to a trajectory point instead of having estimated time of overflying (trajectory). It would be particularly useful in case of curved procedures
Title	HMI information about distance instead of overfly time
Status	<Validated>
Rationale	Controllers state that the distance to a trajectory point in NM allows a clearer and easier understanding of the flight condition
Category	<Safety>
Validation Method	<Live Trial><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-PERF.0232	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0050
Requirement	The confirmed approach information shall be automatically FDP transferred at each handover from en-route to approach and tower controllers
Title	Confirmation transfer to approach and tower
Status	<Validated>
Rationale	ATC actors should, at all times, be aware of the approach procedure clearance status in order to avoid misunderstandings and potential safety critical mistakes in setting up the required spacing
Category	<Safety>
Validation Method	<Live Trial><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0380	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0060
Requirement	The installation of the GBAS Ground Station shall be approved by the competent authority and be at least GAST-C compliant.
Title	GBAS Ground Station installation approval
Status	<Validated>
Rationale	GBAS Ground Station needs to be approved with the GBAS standards that augment at least a single GNSS frequency and support landings to Category-1 minima, which are identified as GBAS Approach Service Type C (GAST-C)
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-APRT.0020	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0070
Requirement	The phraseology and the designators of the approach type shall be clear and unambiguous
Title	Designators clearness and uniqueness
Status	<Validated>
Rationale	ATS actors, flight crew and system need unique designators in order to publish and communicate each available GBAS approach procedure in an unambiguous manner
Category	<Safety>
Validation Method	<Live Trial><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0271	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0080
Requirement	Procedures shall be published with associated speeds (and relevant distances if applicable) and altitude constraints in the AIP
Title	Publication of speeds and distances in the AIP
Status	<Validated>
Rationale	Altitude and speed constrains are critical for the operation at certain points of GBAS procedures
Category	<Safety>
Validation Method	<Live Trial><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0360	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0090
Requirement	The tower supervisor, approach supervisor and airport operator shall decide on priorities per KPA, for instance performing trade off calculation between environmental benefit compared to capacity benefit and shall then decide to what extent GBAS enhanced arrival procedures shall be in use for a given period.
Title	General requirement determining use of GBAS procedures
Status	<Deleted>
Rationale	In order to achieve the best performance of the total airport management depending on the selected KPA's ATC need to coordinate in advance the foreseen capacities and various options in selection of runways and approach procedures.
Category	<Safety>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0400	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0100
Requirement	The AIS provider shall implement a quality assurance process to verify and validate data/elements exchanged with the procedure designer.
Title	AIS Quality assurance process implementation
Status	<Validated>
Rationale	Data quality is essential for the procedure designs and AIS publication errors must not lead to aircraft deviation from the intended path
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0274	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0360	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0110
Requirement	The design of the xLS procedure shall be compliant with ICAO Doc 8168.
Title	Design of xLS procedure
Status	<Validated>
Rationale	The xLS procedure needs to be designed in accordance with the flight procedure design rules
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0430	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0120
Requirement	The design and validation of the xLS procedure shall be made in accordance with the Instrument Flight Procedure process specified in ICAO Doc 9906.

Title	Validation of xLS procedure
Status	<Validated>
Rationale	The xLS design errors need to be detected during the procedure validation process
Category	<Validated>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0430	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0130
Requirement	The terrain, obstacle and aerodrome data used in the design of the xLS approach shall comply with the appropriate data quality requirements of ICAO Annex 14 and 15 and respect the European Regulation N°73/2010 on the quality of aeronautical data/information.
Title	Terrain, obstacle and aerodrome data quality for xLS procedure design
Status	<Validated>
Rationale	Errors in the survey for the xLS procedure design need to be identified in order to ensure data quality
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0274	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0140
Requirement	The GBAS final approach segment shall be defined by a FAS data block transmitted by the GBAS Ground Station to the Aircraft in accordance with ICAO Annex 10 SARPS.
Title	FAS data block definition
Status	<Validated>
Rationale	The GBAS FAS data needs to be transmitted in accordance with ICAO Annex 10 SARPS for interoperability and to avoid data corruption (CRC)
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-APRT.0020	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0180	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0150

Requirement	GBAS FAS data shall be produced by the procedure design tool in an electronic format in accordance with the FAS file format described in EUROCAE ED-114A Appendix M.
Title	FAS Data Block produced by tool
Status	<Validated>
Rationale	The GBAS FAS data format needs to be produced by electronic tool in accordance with EUROCAE ED-114A Appendix M to avoid data corruption
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-APRT.0020	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0180	<Partial>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0160
Requirement	The GBAS Ground Subsystem shall implement capability to load the appropriate FAS data file delivered by the procedure design in accordance with EUROCAE ED-114A Appendix M.
Title	GBAS Ground Subsystem capability to load FAS data
Status	<Validated>
Rationale	FAS data files need to be loaded and processed by GBAS Ground Subsystem in accordance with EUROCAE ED-114A Appendix M to avoid data corruption
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-APRT.0020	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0180	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0170
Requirement	A GBAS GAST-C Ground Station integrity failure shall not occur more frequently than 1x10-7 in any landing.
Title	GBAS GAST-C Ground Station integrity failure
Status	<Validated>
Rationale	GBAS GAST-C Ground Station integrity failures need to be monitored so that undetected erroneous GBAS messages are not transmitted to airspace users
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-APRT.0020	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0180	<Partial>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AT.0180
Requirement	GBAS GAST-C Ground Station continuity of service shall be greater than or equal to 1 – 8.0 × 10–6 per 15 seconds.
Title	GBAS GAST-C Ground Station continuity of service
Status	<Validated>
Rationale	The continuity of the GBAS GAST-C Ground Station service needs to be ensured
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-APRT.0020	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0180	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

3.1.1.2 Aircraft operator requirements

[REQ]

Identifier	REQ-06.08.08-SPR-11AO.0010
Requirement	The GBAS airborne system supporting at least GAST-C requirements shall be certified in accordance with EASA regulation.
Title	GBAS airborne system certification
Status	<Validated>
Rationale	The GBAS airborne system needs to be certified in accordance with EASA regulation
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0560	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-11AO.0020
Requirement	Loss of the GBAS airborne navigation equipment during the final approach of a standard or GBAS enhanced arrival procedure operated in CAT I condition shall be classified as a major failure condition
Title	Continuity of GBAS airborne navigation equipment to support Standard and GBAS enhanced arrival procedure in CATI conditions
Status	<Deleted>
Rationale	Loss of GBAS navigation equipment can have major consequences
Category	<Safety>

Validation Method	<Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0275	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0275	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0150	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

3.1.2 Safety Requirements for RNP transition to xLS (OFA02.01.01 - AOM-0605)

3.1.2.1 RNP to xLS Safety Requirements in Normal Operational Conditions (Functionality and Performance)

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0030
Requirement	The approach planner controller shall identify RNP to xLS capable aircraft based on flight plan data.
Title	APP PLNR ATCO identifies RNP to xLS a/c capability
Status	<Validated>
Rationale	The APP PLNR ATCO needs accurate access to RNP to xLS procedures capability information in order to plan the arrival flow and select the most appropriate approach procedure per flight in any given traffic situation
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1..0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0151	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0280	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0040
Requirement	The En-route and/or approach controller shall verify the aircraft RNP and xLS capabilities using the flight plan data and sequence aircraft accordingly before IAF.
Title	ER / APP ATCO verifies RNP to xLS a/c capability
Status	<Validated>
Rationale	ER / APP ATCOs need to verify RNP to xLS procedures capability before planning the arrival flow

Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0151	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0280	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0050
Requirement	Prior to IAF, the Approach controller shall provide the RNP to xLS approach clearance by indicating the RNP transition for the selected xLS approach and verify the correct read-back.
Title	APP EXE ATCO clears RNP transition to the selected xLS approach
Status	<Validated>
Rationale	The APP EXE ATCO and FCRW, at all times, need to be aware of the type of approach that will be performed by each flight.
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0300	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0320	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0060
Requirement	At each handover, the controller shall repeat the RNP to xLS clearance to prevent any possible misunderstanding between the controller and the Flight Crew unless a local safety assessment demonstrates this is not needed. In constrained environment the automatic handover of information from approach controller to Tower controller should be required.
Title	Misunderstanding prevention via ATCO repeating RNP to xLS clearances
Status	<Validated>
Rationale	The ATCOs and FCRW, at all times, need to be aware of the type of approach that will be performed by each flight
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0300	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A

<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0100
Requirement	The approach controller shall apply separation between arrival aircraft conducting the same curved RNP to xLS transition in accordance with the separation scheme to be used locally and considering the specificity of the curved path (slant distance w.r.t. along track distance).
Title	ATCO apply required arrival separation in relation to A/C RNP to xLS capabilities
Status	<Validated>
Rationale	There is the need that RNP to xLS procedures can be integrated in the current and future separation schemes, with a special consideration for the specificity of the curved path
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0070	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0150	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0110
Requirement	The approach controller shall apply required separation between aircraft merging to the xLS approach from the RNP transition and from radar vectoring (mixed mode of operation).
Title	APP ATCO apply required arrival separation in relation to A/C mixed mode capabilities
Status	<Validated>
Rationale	The APP ATCO needs to consider airport separation scheme in the application of mixed mode of operations
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0420	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0520	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0020
Requirement	An ATC spacing tool which can be activated on demand in constrained environment shall be provided to the Approach controller except if it is shown that separation management for aircraft merging from the RNP transition and from radar vectoring can be safely delivered without such tool.
Title	ATC Spacing Tool activated on demand
Status	<In Progress>
Rationale	In order to avoid aircrafts catch up, which could lead to a loss of separation and possibly wake vortex encounter, the spacing tool computes and displays the required separation for each pair of aircraft on the final approach, by considering the approach conducted by the leader and the follower which might be different (mixed mode of operation)
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0230	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0490	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0080
Requirement	Approach controller shall not issue a Direct-To clearance to the starting waypoint of the RF leg, nor vector the aircraft to intercept the RF leg except if these instructions are required for safety reasons
Title	APP EXE ATCO not provides Direct-to or Vectoring instructions for the entry of the RF leg
Status	<Validated>
Rationale	As for an ILS, vectoring after a certain point needs to be avoided in order for the flight crew and the aircraft to assume the navigation responsibility during final approach and prevent aircraft deviation from this curved path
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1..0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0670	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0090
Requirement	Approach controller shall not provide speed instructions on the RF leg exceeding the published RF speed limitation.
Title	APP EXE ATCO to a/c speed instructions provided on RF leg

Status	<Validated>
Rationale	Approach executive controller needs knowledge of the procedure design and what maximum speeds are allowed to be flown, because there is a need to guarantee the same or an improved level of safety when GBAS enhanced arrival procedures are operated
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0660	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0150
Requirement	The Procedure designer shall consider the following aspects when designing the curved RNP transition to xLS: * In the case of final turn ending at FAP, the vertical path of the RNP transition before the FAP shall be designed to allow aircraft systems to ensure that the aircraft is below the xLS glide slope when entering the localizer full scale deflection for a defined range of expected conditions including (temperature, lateral navigation errors, vertical navigation errors, etc.). *In the case of straight segment between final turn and FAP, it is sufficient to ensure that the aircraft is below the xLS glideslope at the beginning of the straight segment. * The capture point of the xLS glideslope (FAP) can be the final point of the curved RNP transition (end of RF leg on the localizer axis). In any case, the approach procedure shall be designed so that RF turn end aligned with the localiser axis is located at least at 5NM from threshold, while the FAP can be located as close as 3 NM from threshold * The procedure shall be designed in such a way that the aircraft Total System Error (TSE) at the end of the RF leg is within the localizer full scale deflection. To avoid requiring a too long final approach segment for standard RNP value in this phase of flight (e.g. RNP 1), GNSS and Autopilot/Flight Director shall be required to limit aircraft TSE.
Title	Instrument flight procedure designer application of curved RNP transition to xLS constraints
Status	<Validated>
Rationale	It is safety critical the procedure designers follow the described rules to ensure that aircraft will timely capture xLS LOC and G/S axes
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0430	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0440	<Partial>

<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0450	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0520	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0530	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16FC.0040
Requirement	Flight Crew shall verify that the actual navigation performance during the whole curved RNP path transition is compliant with the required navigation performance (RNP value).
Title	FCRW check of NAV PERF in relation with RNP value
Status	<Validated>
Rationale	The FCRW needs to check that the a/c actual navigation performance is respecting the RNP constraint
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Live Trial><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0270	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0280	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16FC.0045
Requirement	Flight Crew shall respect any published speed constraint during the RNP to xLS transition and verify the correct capture of the xLS G/S axis.
Title	FCRW check of NAV PERF during transition and capture
Status	<Validated>
Rationale	The FCRW needs to check that published speed constraint are considered to prevent navigation performance degradation during the RF leg and that xLS G/S is correctly captured
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Live Trial><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0430	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0360	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AO.0020

Requirement	The Aircraft Operator shall be approved/authorised by its competent authority to conduct RNP procedures with RF leg and xLS approach.
Title	Aircraft Operator approval in performing RNP procedures with RF leg and xLS approach
Status	<Validated>
Rationale	The Aircraft Operator needs to be approved/authorised to perform RNP procedures with RF leg and xLS approach
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0500	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16FC.0046
Requirement	The manual arming of the xLS approach mode by the flight crew shall be conducted at the appropriate moment: - not too early to avoid any early Loc capture (case where the RNP path crosses the Loc axis before the end of the last RF turn) and then aircraft deviates from the RNP path and - not too late to avoid any impact on the correct capture of the xLS axis
Title	xLS approach mode manual arming timing
Status	<Validated>
Rationale	The FCRW needs to conduct the manual arming of the xLS approach mode at a precise period of time in order to avoid capture issues.
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Live Trial><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0280	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0500	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0530	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AO.0050
Requirement	During the curved RNP transition, the aircraft flight control system in lateral mode shall capture smoothly the xLS LOC axis before or at the FAP.
Title	A/C Flight Control captures xLS LOC axis
Status	<Validated>
Rationale	If the LOC axis were not correctly captured before the FAP, significant flight trajectory corrections could be necessary, which could compromise the

	execution of the approach manoeuvre
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Live Trial><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0500	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0520	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16FC.0070
Requirement	Flight Crew shall respect any published altitude constraint during the RNP to xLS transition and verify the correct capture of the xLS G/S axis.
Title	FCRW applying published altitude constraints
Status	<Validated>
Rationale	The partial or total loss of GPS signal availability cannot compromise the ability of airspace users to land without any detriment for their safety
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Live Trial><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0520	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16FC.0075
Requirement	The Flight Crew shall report when the aircraft is established on the xLS final approach course.
Title	FCRW reports when establishing xLS final approach
Status	<Validated>
Rationale	FCRW needs to report to ATC when the aircraft is established on the xLS final approach course to relieve ATCo workload
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Live Trial><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0540	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0280	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>

<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AO.0060
Requirement	During the curved RNP transition, the aircraft flight control system shall capture smoothly the xLS G/S axis before or at the FAP considering the range of temperature which might be encountered at that altitude in particular unusual hot and cold temperature.
Title	A/C Flight Control captures xLS LOC axis
Status	<Validated>
Rationale	A/C Flight Control needs to capture smoothly xLS LOC axis in the curved RNP transition
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Live trials><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0520	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

3.1.2.2 RNP to xLS Safety Requirements (Functionality and Performance) in Abnormal Operational Conditions

[REQ]

Identifier	REQ-06.08.08-SPR-16FC.0050
Requirement	In case of tail wind and/or strong cross wind conditions encountered during the RF turn, the Flight Crew shall verify that the Flight Technical Error (FTE) is compliant with the required navigation performance (RNP value) otherwise Flight Crew shall manually correct the flown trajectory or break off the procedure.
Title	FCRW FTE verification in case of tail wind
Status	<Validated>
Rationale	FCRW needs to check that FTE is compliant with RNP in case of tail wind and/or strong cross wind
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0330	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16FC.0060
Requirement	In case of engine failure during the RF turn, Flight Crew shall verify that the Flight Technical Error (FTE) is compliant with the required navigation performance (RNP value) otherwise Flight Crew shall break off the procedure.
Title	FCRW FTE verification after one engine failure
Status	<Validated>
Rationale	If the loss of an engine compromises safety when executing an RNP transition to xLS approach, a missed approach needs to be executed, so that an approach procedure compatible with the reduced aircraft performance can be carried out in emergency conditions
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0550	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16FC.0080
Requirement	In case of engine failure during the curved RNP transition, Flight Crew shall verify that the xLS LOC & G/S axis are correctly captured despite the failure otherwise he/she will execute a missed approach.
Title	FCRW check xLS LOC & G/S axis are correctly captured with one engine failure
Status	<Validated>
Rationale	If the loss of an engine compromises safety when executing the xLS approach, a missed approach needs to be executed, so that an approach procedure compatible with the reduced aircraft performance can be carried out in emergency conditions
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0550	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AO.0070
Requirement	The Aircraft Operator shall check that at least one approach based on conventional means is available at the destination or at the alternate aerodrome in order to mitigate GPS loss events which affect simultaneously the RNP and the GBAS navigation (when xLS is supported by GLS).

Title	GPS loss mitigation via AO approach conventional means based check
Status	<Validated>
Rationale	The AO needs to check that approach conventional means based is available at the destination, or at the alternate aerodrome, in order to mitigate GPS loss events potentially affecting simultaneously the RNP and the GBAS navigation (when xLS is supported by GLS)
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0051	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0130
Requirement	The approach controller shall add extra spacing buffer between aircraft on the RF leg if different wind conditions are encountered on the RF leg.
Title	APP ATCO extra spacing buffer in case of different wind conditions
Status	<Validated>
Rationale	To guarantee the level of safety, there is the need that the APP ATCO adds extra spacing buffer between aircraft on the RF leg if different wind conditions are encountered on the RF leg to prevent possible separation catch-up effect due to the difference in Ground Speed between the entry and the exit of the RF leg
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0070	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0140
Requirement	If it is needed to break off an aircraft from the RF leg, the approach controller shall issue instructions considering possible knock-on effects with other aircraft on the same RF leg, with aircraft already established on the xLS approach or with aircraft conducting straight in approach.
Title	Aircraft on RF leg for xLS approach manoeuvre break off and APP ATCO share instruction to other A/C on the same RF leg
Status	<Validated>
Rationale	In order to guarantee the level of safety, on an aircraft break off during its path through the RF leg, the approach controller has to take into account the possible knock-on effect with aircrafts on the area around the RF leg performing different approach procedures or at different stages of the same

	one
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0642	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

3.1.2.3 RNP to xLS Safety Requirements (Functionality and Performance) as Mitigation to System generated Hazards

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0010
Requirement	Approach and Tower controllers shall be trained on RNP transition to xLS approach including “mixed mode” operation where aircraft (e.g. non RNP aircraft) are vectored to straight in approaches for the same runway end.
Title	APP/TWR ATCO mixed mode/traffic RNP transition to xLS approach training
Status	<Validated>
Rationale	Training is needed in order to understand aircraft behaviour when following RNP transition to xLS approach and take this into account when setting up sequence and spacing. Proper training sessions will ensure that the controllers involved have an effective knowledge of the RNP transition to xLS approach types
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0260	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0272	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0070
Requirement	In a “mixed mode” environment (RNP transition and radar vectoring), the approach controller shall clear aircraft for the RNP to xLS transition only when the traffic load permits.
Title	APP/ ATCO clearance for mixed mode RNP transition to xLS approach when the traffic load permit
Status	<Validated>
Rationale	It is critical for the APP/ ATCO to avoid an excessive traffic load in order to guarantee the level of safety when RNP to xLS procedures are operated
Category	<Safety>

Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0300	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0420	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0120
Requirement	The approach controller shall maintain radar separation (3NM lateral or 1000 ft. vertical) between aircraft flying the RNP transition to xLS and aircraft merging to the xLS approach from radar vectoring (mixed mode of operation).
Title	APP ATCO radar separation with RNP transition to xLS in mixed mode of operation
Status	<Validated>
Rationale	APP ATCO needs to maintain radar separation between a/c flying RNP transition to xLS and aircraft merging to the xLS approach from radar vectoring (mixed mode of operation)
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0070	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0160
Requirement	The RNP transition to xLS shall be published in a separate chart (as an initial/intermediate approach) or with the xLS instrument approach chart (hybrid chart). Whatever the publication the chart shall clearly indicate the RNP accuracy, the RF leg requirement and any applicable speed limit on the RF leg.
Title	RNP to xLS different phases chart publications
Status	<Validated>
Rationale	RNP to xLS different phases needs to be specified on separate charts where shall clearly issue the RNP accuracy and the RF leg requirement
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Live Trial><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0271	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0274	<Partial>

<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0360	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16FC.0010
Requirement	The Flight Crew shall be trained on how to execute RNP transition to xLS with or without an RF leg.
Title	FCRW RNP transition to xLS training
Status	<Validated>
Rationale	FCRW needs to be trained to execute with or without RF leg RNP transition to xLS
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0010	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16FC.0020
Requirement	The Flight Crew shall verify the consistency of whole RNP lateral and vertical path with the published chart using the aircraft displayed data (FPLN, ND…).
Title	FCRW displayed and the published chart consistency check
Status	<Validated>
Rationale	FCRW needs to verify the whole RNP lateral and vertical path transition consistency with the published chart using the aircraft displayed data (FPLN, ND…)
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Live Trial><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0110	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0271	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0360	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16FC.0030

Requirement	When xLS is supported by GLS and before arming the approach, the Flight Crew shall verify that GBAS RPID displayed in the cockpit is identical to the Identifier depicted on the GLS approach chart.
Title	FCRW check GBAS RPID displayed in the cockpit vs Identifier depicted on the GLS approach chart consistency
Status	<Validated>
Rationale	FCRW needs to check GBAS RPID displayed in the cockpit vs Identifier depicted on the GLS approach chart
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0110	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0271	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0360	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AO.0010
Requirement	The Aircraft Operator shall file the flight plan by indicating the aircraft capability to fly the RNP transition and the xLS approach.
Title	AO to fill in a/c capability on RNP transition and the xLS approach in flight plan
Status	<Validated>
Rationale	AO needs to fill in a/c capability on RNP transition and the xLS approach in flight plan
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0151	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AO.0030
Requirement	The Aircraft Operator shall ensure that the airborne navigation data base includes the VIA and xLS approach corresponding to the RNP transition to xLS as published in the State AIP.
Title	AO to ensure airborne navigation data base includes the RNP transition to xLS
Status	<Validated>
Rationale	The AO needs to ensure the airborne navigation data base includes the RNP transition to xLS consistent with the info published in the State AIP
Category	<Safety>

Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0460	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AO.0040
Requirement	The RNP airborne systems shall be certified in accordance with EASA regulation and approved for any RNP requirement required in the published procedure (e.g. RF leg).
Title	EASA regulation certifications
Status	<Validated>
Rationale	RNP airborne systems needs to be EASA certified and approved for any published procedure requirement associated with the RNP accuracy and RNP capability
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0561	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0200
Requirement	The design of the RNP procedure shall be compliant with ICAO Doc 8168. However, procedure design criteria shall be modified to allow RF Leg directly connected to the FAP.
Title	Design of RNP procedure
Status	<Validated>
Rationale	The RNP procedure needs to be designed in accordance with the flight procedure design rules
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0430	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0210
Requirement	The design and validation of the RNP procedure shall be made in accordance with the Instrument Flight Procedure process specified in ICAO Doc 9906.
Title	Validation of the RNP procedure
Status	<Validated>
Rationale	The RNP procedure design errors need to be detected during the procedure validation process
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0430	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0220
Requirement	The terrain, obstacle and aerodrome data used in the design of the RNP transition shall comply with the appropriate data quality requirements of ICAO Annex 14 and 15 and respect the European Regulation N°73/2010 on the quality of aeronautical data/information.
Title	Terrain, obstacle and aerodrome data quality for RNP transition design
Status	<Validated>
Rationale	Errors in the survey for the RNP procedure design need to be identified in order to ensure data quality
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0430	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0440	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0230
Requirement	The processes of producing and updating the RNAV system navigation data base shall meet the standards specified in EUROCAE ED-76/RTCA DO-200A (e.g. Letter Of Acceptance or equivalent process). In particular, the navigation data base shall contain electronic navigation data with an adequate level of accuracy and integrity to ensure proper transition to the xLS final approach segment.

Title	RNAV system navigation data base data quality
Status	<Validated>
Rationale	The navigation data base needs to contain electronic navigation data with an adequate level of accuracy and integrity to ensure proper transition to the GBAS final approach segment in order to avoid incorrect RNP transitions
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0460	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AO.0100
Requirement	The Aircraft Operator shall use a navigation data base for the RNAV system which satisfies the requirements of the IR OPS or equivalent OPS regulation (Electronic navigation data management requirements) in order to meet standards of integrity that are adequate for the intended use of the electronic navigation data.
Title	Use of navigation data base by the Aircraft Operator
Status	<Validated>
Rationale	The aircraft navigation data base needs to satisfy the requirements of the IR OPS or equivalent OPS regulation in order to avoid incorrect RNP transitions
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Live trials>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0460	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16FC.0100
Requirement	The Flight crew shall conduct CDO in accordance with instructions and/or limitations specified on the relevant arrival chart for a smooth capture of the xLS glideslope at the altitude depicted on the chart.
Title	CDO conducted in accordance with arrival chart
Status	<Validated>
Rationale	CDOs need to be conducted according to instructions and limitations in order to intercept properly the xLS glideslope at the correct point (FAP)
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)><Live trials>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0190	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0430	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0240
Requirement	The Approach Controller shall not provide altitude instructions to aircraft during the RNP transition to xLS approach which might lead to infringing altitude constraints.
Title	Approach Controller instructions during the RNP transition to xLS approach
Status	<Validated>
Rationale	Inadequate altitude instructions just before or during the RNP transition to xLS might lead to infringe altitude constraints
Category	<Safety>
Validation Method	<Live trials><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0190	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AT.0205
Requirement	Procedure design shall ensure the respect of RNP lateral and vertical performance requirements or ensure that the aircraft track remains within the GLS obstacle protection areas before the aircraft is established on the GLS beam.
Title	RNP to XLS procedure design
Status	<Deleted>
Rationale	The procedure design is based on the RNP requirement associated to the trajectory.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	N/A

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.05-OSED-RNPG.0030	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0430	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<ALLOCATED_TO>	<Functional block>	Lateral and Vertical Guidance	N/A

3.1.2.4 RNP to xLS Safety Requirements (Integrity and Continuity)

[REQ]

Identifier	REQ-06.08.08-SPR-16AO.0110
Requirement	The probability of aircraft RNAV system providing an erroneous lateral deviation during the RNP to xLS approach despite a correct defined path shall be no greater than 1x10-5/ Approach.
Title	Wrong lateral deviation during RNP transition to xLS approach despite a correct defined path
Status	<Validated>
Rationale	Aircraft RNAV navigation system needs to provide a high level of integrity in terms of lateral deviation This requirement is established for RNP transitions with RNP ≥ 0.3 NM. Requirements for RNP < 0.3 NM would be more stringent.
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0561	<Partial>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED IN ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED IN ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AO.0120
Requirement	The probability of aircraft xLS system providing an erroneous lateral deviation during the RNP transition to xLS approach shall be no greater than 1x10-5/ Approach.
Title	Erroneous lateral deviation during the RNP transition
Status	<Validated>
Rationale	Aircraft xLS system needs to provide a high level of integrity in terms of lateral deviation
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0561	<Full>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED IN ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED IN ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AO.0140
Requirement	The probability of aircraft control and guidance system providing a wrong lateral guidance during the RNP transition to xLS despite correct defined path and lateral deviation shall be no greater than 1x10-5/ Approach.
Title	Wrong lateral guidance during the RNP transition to xLS despite correct lateral deviation

Status	<Validated>
Rationale	Aircraft control and guidance system needs to provide a high level of integrity in terms of lateral deviation
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0561	<Partial>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED IN ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED IN ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-16AO.0150
Requirement	The probability of the loss of the aircraft RNAV system shall be no greater than 1x10-5/ Approach.
Title	Loss of the aircraft RNAV system during the RNP transition to xLS
Status	<Validated>
Rationale	Aircraft RNAV system needs to provide a high level of continuity This requirement is established for RNP transitions with RNP ≥ 0.3 NM. Requirements for RNP < 0.3 NM would be more stringent.
Category	<Safety>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0561	<Partial>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED IN ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED IN ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

3.2 Performance Requirements

Here below are presented Performance Requirements for Capacity, Predictability and Environmental sustainability KPAs/TA coming from the validation activities reported in D9 - *Enhanced Arrival Procedures Enabled by GBAS - VALR - V2*" and the executed P06.08.08 workshops.

3.2.1 General GBAS

The Performance Requirements which are applicable to all of the three most mature procedures (RNP transition to xLS, IGS and MRAP) have been gathered in this General GBAS section and reported in §. 3.2.1 of both the P6.8.8 SPR documents, OFA 02.01.01 and OFA01.03.01 related.

[REQ]

Identifier	REQ-06.08.08-SPR-21AT.0070

Requirement	RNP to xLS operations should reduce the number of noise affected people at noise affected airport
Title	Airport noise exposure recommendation for RNP to xLS operations
Status	<Validated>
Rationale	Arrival enhanced procedures needs to bring benefits at noise contours areas and maps, number of impacted people, Flight tracks
Category	<Performance>
Validation Method	<Fast Time Simulation><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-FCRW.0030	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

The following General GBAS Performance Requirements have been initially developed within the context of the OSED activities. Hence they have been assessed to be relocated in P6.8.8 SPR, considering their real nature. They are even reported in the OSED Consolidation [58], chapter 6.9, with the OSED IDs and <Deleted> status:

[REQ]

Identifier	REQ-06.08.08-SPR-21AT.0010
Requirement	GBAS enhanced arrival procedures should maintain or improve TMA capacity level within TMA airspace that are capacity constrained
Title	Airspace capacity recommendation of GBAS enhanced arrival procedures
Status	<Validated>
Rationale	There is a need to guarantee that the application of GBAS enhanced arrival procedures don't affect TMA capacity
Category	<Performance>
Validation Method	<Analytical Modelling><Fast Time Simulation><Real Time Simulation><Expert Group (Judgement Analysis)><Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0510	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0350	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-21AT.0020
Requirement	Benefits, performance target and performance requirements of GBAS enhanced arrival procedures may be different according to the operational environment where they are operated. The magnitude of differences shall be defined.
Title	Benefits of GBAS enhanced arrival procedures are dependent on the operational environment
Status	<Validated>
Rationale	Constrained environment target, benefits and performance recommendation of GBAS enhanced arrival procedures could be different compared to the ones of unconstrained environment
Category	<Performance>
Validation Method	<Analytical Modelling><Fast Time Simulation><Real Time

	Simulation><Expert Group (Judgement Analysis)><Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0020	< Partial >
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0140	< Partial >
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0210	< Partial >
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-21AT.0030
Requirement	GBAS enhanced arrival procedures should not negatively impact on equity performances.
Title	Equity recommendation of GBAS enhanced arrival procedures
Status	<Validated>
Rationale	GBAS enhanced arrival procedures shall not negatively impact on equity performances.
Category	<Performance>
Validation Method	<Analytical Modelling><Fast Time Simulation><Real Time Simulation><Expert Group (Judgement Analysis)><Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0040	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-21AT.0040
Requirement	GBAS enhanced arrival procedures may improve airport accessibility.
Title	Accessibility benefits of GBAS enhanced arrival procedures
Status	<Deleted>
Rationale	GBAS enhanced arrival procedures could lead to improved airport accessibility on environmental constrained airports.
Category	<Performance>
Validation Method	<Analytical Modelling><Fast Time Simulation><Real Time Simulation><Expert Group (Judgement Analysis)><Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-APRT.0110	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-21AT.0050
Requirement	Global level of delay should not be increased by implementing GBAS enhanced arrival procedures.
Title	GBAS enhanced arrival procedures predictability performance recommendation
Status	<Validated>
Rationale	There is the need to ensure overall predictability performances are not negatively impacted by the implementation of GBAS enhanced arrival

	procedures
Category	<Performance>
Validation Method	<Analytical Modelling><Fast Time Simulation><Real Time Simulation><Expert Group (Judgement Analysis)><Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-APRT.0040	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-21AT.0060
Requirement	GBAS enhanced arrival procedures should yield benefits in both constrained and unconstrained environments
Title	GBAS enhanced arrival procedures should yield benefits
Status	<Validated>
Rationale	There is the need to ensure that GBAS enhanced arrival operations yields benefit in any traffic situation
Category	<Performance>
Validation Method	<Fast Time Simulation><Real Time Simulation><Live Trial><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0180	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

[REQ]

Identifier	REQ-06.08.08-SPR-21AT.0080
Requirement	The workload impact of the GBAS enhanced arrival procedures shall be acceptable to En-route Executive Controller, Approach Executive Controller, Tower Runway Controller, Tower Ground Controller, Approach Planner Controller, Tower Supervisor and Approach Supervisor.
Title	GBAS Procedures Workload Impact on ATS Actors
Status	<Validated>
Rationale	Challenge with respect to potential negative impact on air traffic controller task / workload.
Category	<Operational>
Validation Method	<Fast Time Simulation><Real Time Simulation><Analytical Modelling>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0040	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA01.03.01	N/A

3.2.2 Performance Requirements for RNP transition to xLS (OFA02.01.01 - AOM-0605)

[REQ]

Identifier	REQ-06.08.08-SPR-26AT.0020
Requirement	Before declaring RNP to xLS arrival procedures are in use, trade-off between airport capacity and noise benefit should be needed
Title	Capacity / Noise benefit trade-off
Status	<Validated>
Rationale	GBAS enhanced arrival procedures may negatively impact runway throughput due to desired KPI balancing/trade off.
Category	<Performance>
Validation Method	<Analytical Modelling><Fast Time Simulation><Real Time Simulation><Expert Group (Judgement Analysis)><Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0130	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0240	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0250	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-26AT.0030
Requirement	RNP to xLS operations may lead to an overall reduction of distance flown.
Title	Environmental sustainability benefit for GBAS Enhanced arrival procedures
Status	<Validated>
Rationale	GBAS enhanced arrival procedures needs to bring benefits on distance flown
Category	<Performance>
Validation Method	<Analytical Modelling><Fast Time Simulation><Real Time Simulation><Expert Group (Judgement Analysis)><Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ACFT.0440	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-26AT.0040

Requirement	RNP to xLS arrival procedures should not negatively affect the airport arrival flow scheduled time of arrival
Title	Predictability recommendation for GBAS enhanced landing procedures
Status	<Validated>
Rationale	GBAS enhanced arrival procedures should not affect airport predictability performances
Category	<Performance>
Validation Method	<Analytical Modelling><Fast Time Simulation><Real Time Simulation><Expert Group (Judgement Analysis)><Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0480	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

[REQ]

Identifier	REQ-06.08.08-SPR-26AT.0050
Requirement	RNP to xLS procedures should not negatively affect the airport departure flow scheduled time of departure
Title	Predictability recommendation for GBAS enhanced landing procedures
Status	<Validated>
Rationale	GBAS enhanced arrival procedures should not affect airport predictability performances
Category	<Performance>
Validation Method	<Analytical Modelling><Fast Time Simulation><Real Time Simulation><Expert Group (Judgement Analysis)><Live Trial>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.08.08-OSED-ATCO.0120	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-OPR1.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0390	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0385	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-6200.0380	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIES_TO>	<Operational Process>	PCS-Surface-In	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Intercontinental Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	European Hub	<Full>
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Primary Node	<Full>

3.3 Information Exchange Requirements (IER)

N/A

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.[1]

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

[7] B.4.3 Architecture Description Document

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

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

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

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

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

[13] WPB.01 Integrated Roadmap Latest version

[14] P06.08.08 D15 INTERIM Version - Enhanced Arrival Procedures Enabled by GBAS - OSED V2

[15] P06.08.08 D03 - Enhanced Arrival Procedures Enabled by GBAS - OSED Initial

[16] P06.08.08 D15 Attachment B

[17] P05.06.03 - SESAR APV SBAS Safety Assessment Report (SAR)- D15 - Edition 00.01.01

[18] OFA 01.03.01 / P6.8.1 TBS for Arrivals - Safety Assessment Report (SAR)- Edition 00.00.05

[1] The EUROCAE ED-78A has been used as an initial guidance material. ED-78A is useful, but is not an applicable document, because it mostly addresses the V4-V5 phases, whilst the SESAR R&D programme is focussed on development (V1-V2-V3, and because of its partial compliance with safety regulatory requirements).

[19]ICAO Document 8168, Aircraft Operations, 2006

[20]ICAO EUR Doc 025, EUR RNP APCH Guidance Material, 2012

[21]ICAO Document 9613, Performance-based Navigation (PBN) Manual, 2013

[22]ICAO Document 4444, Air Traffic Management, 2007

[23]ICAO Document 9643, Manual on Simultaneous Operations on Parallel or Near-Parallel Instrument Runways (SOIR)

[24]WP06.08.05 D55 Approach Procedures Charts and Path Terminators for RNP transition to GLS and Displaced Thresholds (Final version)

[25]WP06.08.05 D42 Concept of GBAS Advanced Operations Document (OSED- V3)

[26]WP06.08.05 D04 Operational Service and Environment Definition (OSED) Displaced Thresholds

[27]WP05.06.03 D08 Advanced Procedures Identification Report (OSED)

[28]EUROCAE ED-114A, Minimum Operational Performance Specification for Global Navigation Satellite Ground Based Augmentation System Ground Equipment to Support Category I Operations, March 2013

[29]WP06.02 - D101 - Airport Detailed Operational Description - STEP 2 - 2014 Update

[30]EUROCONTROL-SPEC-156 Edition:1.0

[31]WP06.08.01 - D05 - Operational Service and Environment Definition (OSED) for Time Based Separation for Arrivals (TBS)

[32]PARC: RNP to ILS Action Team Report, March 28, 2010

[33]PARC: RNP to XLS Recommendations, August 28, 2014

[34]De Smedt, D., Robert, E., Behrend, F.: RNP to Precision Approach Transition Flight Simulations, EUROCONTROL & Technical University Berlin. *Designing an Air Transportation system with Multi-Level Resilience (DASC)*, Colorado Springs, U.S.A, October 5, 2014

[35]Herndon, A., Cramer, M., Miller, S., Rodriguez, L.: Analysis of Advanced Flight Management Systems (FMSs), Flight Management Computer (FMS) Field Observation Trials: Performance Based Navigation to x Landing Systems (PBN to XLS), MITRE. *33rd Digital Avionics Systems Conference*, October 5-9, 2014

[36]Directive 2002/49/EC of 25th June 2002

[37]ICAO ANNEX 14

[38]ICAO ANNEX 10

[39]ICAO ANNEX 11

[40]SESAR ConOps Document Step 2 Edition 2014 v01 00 04

[41]OFA 05.01.01 OSED 00.03.00

[42]P05.06.06 D02 - ASPA-IM-S&M application Operational Service and Environment Definition Ed 00.01.00

[43]RTCA-DO-253C - Minimum Operational Performance Standards for GPS Local Area Augmentation System Airborne Equipment

[44]RTCA-DO-301 - Minimum Operational Performance Standards for Global Navigation Satellite System (GNSS) Airborne Active Antenna Equipment for the L1 Frequency Band

[45]WP06.02 – D101 - Airport Detailed Operational Description - STEP 2 - 2014 Update, version 00.01.00

[46]WP05.02 - D84 - DOD Report – STEP 1 - 2014 Update, version 00.01.01

[47] WP06.02 - D09 - Airport DOD - STEP 2 (Interim), version 00.02.00

[48] SESAR Release 3 Review 3 Report, 13 June 2014, Edition number 00.01.00

[49] Release 3 Close-Out Report, 17-07-2014, Edition number 01.00.00

[50] P06.08.08 D08 - Enhanced arrival procedures enabled by GBAS V2 VALP

[51] P06.08.08 D09 - Enhanced arrival procedures enabled by GBAS V2

[52] P06.08.05 D44 - GBAS Advanced Procedures Concept Validation Report for Displaced Thresholds for V2, Edition 00.01.00, December 2014

[53] ICAO EUR DOC 13 European Guidance Material on All Weather Operations

[54] SESAR Security Risk Assessment of OFA 01.03.01

[55] SESAR 9.9 D25 RNP to XLS functional requirements- Final

[56] SESAR 9.9 D22 Report for the RNP to ILS simulations on Thales bench (VP-800) Ed 00.01.00 dated 25/07/2014

[57] SESAR 9.9 D23 Report for the RNP to precision approach transition flight simulation (VP-801) Ed 00.01.00 dated 09/09/2014

[58] P06 08 08 D07 - Enhanced Arrival Procedures Enabled by GBAS - OSED Consolidation

[59] European Operational Concept Validation Methodology Version 3.0

Appendix A Assessment / Justifications

A.1 Safety and Performance Assessments

A.1.1 Safety assessment

06.08.08 GBAS
enhanced arrival proc

A.2 Security risk assessment

No additional primary and supporting assets have been encountered in the context of this project.

A.3 Environment impact assessment

P06.08.08 D09 VALR V2 report the conducted V2 environment assessment results [51].

A.4 OPA

P06.08.08 D09 VALR V2 report the conducted V2 performance assessment results [51].

-END OF DOCUMENT-