Final Operational Service and Environment Definition for Madrid TMA

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Abstract

This Operational Service and Environment Definition addresses the operational environment for P-RNAV implementation in Madrid-Barajas TMA. It will describe the operational procedures that are intended to support the optimization of the RNP structures with environmental sustainability. Moreover, it addresses also the approach procedures with vertical guidance as well as departure ones. The document will collate and reference all the requirements which will serve as an input to be validated within the scheduled validation plans.

The Use Cases will be based on nominal best case scenarios (B4.2 Conops) and non-nominal scenarios, to take into consideration different technical capabilities during step1 timeframe

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Table of Contents

List of tables

List of figures

Executive summary

P05.07.04 addresses the current limitations in practical implementation of P-RNAV in TMA operations, enabling a move to integrated P-RNAV management in high-density traffic situations, throughout the day.

The project is focused in complex European TMAs, multi-airport TMAs and TMAs with significant aircraft noise constraints, such as densely populated areas where traffic density requires an increment in capacity and P-RNAV procedures are planned or further developed, taking Madrid, Milan and London as reference scenarios and extending the results to generic complex TMAs in Europe.

This OSED describes the implementation of P-RNAV procedures in the Madrid-Barajas TMA in the context of step 1 of the SESAR V&V Storyboard.

The activities will include the **production of Detailed Operational Scenarios and Environment Descriptions, Safety and Performance (Operational) Requirements, Validation Plans (to demonstrate and assess) and results and a final Business Case**. The Project closes out completely at the end of Step 1.

This document serves the optimized RNP structure Operational Focus Area (OFA) within Package 2 (PAC02) of the SESAR V&V Roadmap “Efficient and Green Terminal airspace operations”, however close links have been identified in other OFAs within and outside PAC-2: PAC04 “end to end Traffic Synchronization” and PAC05 “integrated and Collaborative Network Management”.

1 Introduction

1.1 Purpose of the document

The Operational Service and Environment Definition (OSED) describe the operational concept defined in the Detailed Operational Description (DOD) in the scope of its Operational Focus Area (OFA).

It defines the operational services, their environment, scenarios and use cases and requirements.

The OSED is used as the basis for assessing and establishing operational, safety, performance and interoperability requirements for the related systems further detailed in the Safety and Performance Requirements (SPR) document. The OSED identifies the operational services supported by several entities within the ATM community and includes the operational expectations of the related systems.

This OSED is a top-down refinement of the Madrid TMA DOD produced by the federating 05.02 project. It also contains additional information which should be consolidated back into the higher level SESAR concepts using a "bottom up" approach.

The figure below presents the location of the OSED within the hierarchy of SESAR concept documents, together with the SESAR Work Package or Project responsible for their maintenance.

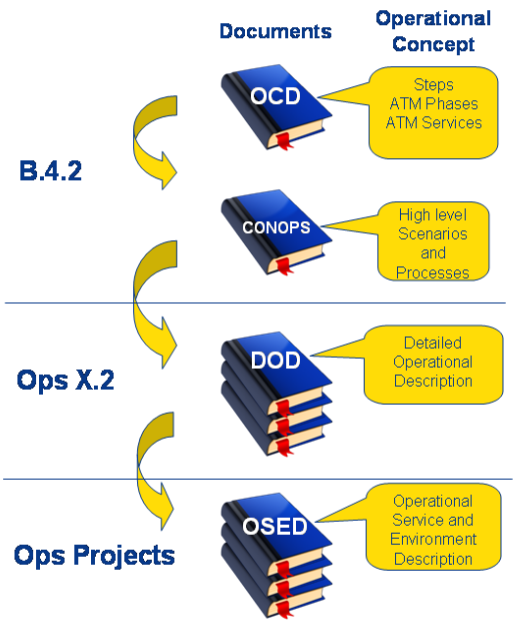

Figure 1: The 4 types of SESAR Operational Concept documents

It is expected that many updates to this OSED will be produced during the lifecycle of the project execution phase.

1.2 Scope

This OSED details the operational concept for the Operational Focus Area (OFA) in the following table:

Operational Package	Operational Sub-Package	*Operational Focus Area (OFA)*
Efficient and Green Terminal Airspace Operations	Enhanced Route structures	Optimized RNP structures

Also, it has been identified additional Operational Focus Areas that this project contributes indirectly and there is no need to consider the elaboration of additional Operational Services and Environment Definitions for the following ones:

Operational Package	Operational Sub-Package	*Operational Focus Area (OFA)*
Efficient and Green Terminal Airspace Operations	Improved Vertical Profiles	Optimized RNP structures
Moving from Airspace to Trajectory Management	Traffic Synchronization	AMAN + Point Merge
Integrated and Collaborative Network Management	Demand and Capacity Balancing En-route	Environmental Sustainability

The P05.07.04 has been allocated in another OFA within the PAC02 regarding the enhancement of en-route structures by the implementation of merging points in complex TMA. This OSED is out of this issue because this is going to be covered by the Operational Services and Environment Definition for Point Merge in London TMA (P574 T005 D05)

Operational Package	Operational Sub-Package	*Operational Focus Area (OFA)*
Efficient and Green Terminal Airspace Operations	Enhanced Route structures	Point Merge in Complex TMA

1.3 Previous R&D Projects

RETACDA: Reduction of Emissions in Terminal Areas using Continuous Descent Approaches

Besides aiming at greater capacity, cost-efficiency and safety levels, one of the primary goals of SESAR is to provide Europe with a re-engineered ATM network that minimizes CO2 emissions.

Within this framework the **RETACDA** project will perform of Integrated Flight Trials and Demonstrations in Terminal Area (TMA) using Continuous Descent Approaches (CDA), with the aim of reduction of CO2 emission and optimization of the fuel consumption in several or all possible segments.

The objective of a CDA is to reduce aircraft noise, fuel burn and emissions by means of a continuous descent, so as to intercept the approach glide path at an appropriate height for the distance to touchdown.

The main requirement for success of CDA implementation is the effective collaboration between the air navigation service provider (ANSP), the aerodrome operator and airspace users/airlines, to be managed through a joint working arrangement.

1.4 Intended audience

Airline, BA, Third Party	Representative
Primary Projects	
Federating Projects	5.2 5.3
Transversal Projects	B4.1 B4.2
Flight Schedule Department/ WingOps (WOC)	Staff Member
Airport Operations Centre / WingOps	Staff Member
ANSP / ATS Unit ACC, APP, TWR (Civ., Mil.)	Air Traffic Controller • Executive Controller • Planning Controller • Ground Controller • Runway Controller
ANSP / ATS Unit ACC, APP, TWR (Civ., Mil.)	ATS Supervisor
AIS Units (Civ., Mil.)	AI Data Manager
National Airspace Policy Body	Airspace Designer
Airspace Management Cell (AMC, Civil-Military Unit)	Civil Airspace Manager Military Airspace Manager

EASA	Regulator, Inspector
Airlines, BA, Military	Flight Crew, Pilot
Airline Operational Control (AOC) / WingOps (WOC)	Staff Member
GA	Flight Crew, Pilot

1.5 Structure of the document

The Final Operational Service and Environment Definition for Madrid TMA – Madrid TMA- is a document that describes the full implementation of P-RNAV procedures in Madrid TMA, contained detailed guidelines and planning criteria about the principles for the establishment of P-RNAV airspace structures, new scenarios developed, the environmental constraints and processes and services associated.

This document is composed of seven chapters and one annex.

- Chapter 1 presents an introduction to the document, the purpose, scope, intended audience, background and a glossary of terms, acronyms and terminology.

- Chapter 2 provides an overview on operational concept from DOD with mapping tables associated processes and services.

- Chapter 3 depicts detailed operational environment with details about analyses to be performed, operational characteristics, roles, responsibilities and constraints.

- Chapter 4 explains the operation method in detail. It analyses the previous operating method the new SESAR operating method and the differences between them and the Environmental analyses to be performed.

- Chapter 5 includes the operational scenario for the project.

- Chapter 6 presents the requirements for processes and services.

- Chapter 7 includes a list of applicable documents and reference documents.

1.6 Background

- Aena. TRABAJOS REALIZADOS PARA EL FUTURO TMA
  - PRNAV DE MADRID-BARAJAS. 20/11/09

- Aena. P-RNAV IMPLEMENTATION IN SPAIN. ANÁLISIS DE LA PROPUESTA DE
  - DISEÑO DEL NUEVO TMA DE PALMA. 08/04/2010

- Aena. DOCUMENTO DE PROYECTO DE NUEVO TMA P-RNAV MADRID:
  - ESTUDIO INICIAL. 13/08/08

•Aena -TMA MADRID PRNAV-“CODIFICACIÓN DE LAS TRANSICIONES EN CONF. NORTE Y SUR PARA EL NUEVO TMA MADRID PRNAV”. 08/09/2008

•Aena. PROYECTO: NUEVO TMA DE MADRID PRNAV. JUSTIFICACIÓN Y PROPUESTA DE DESARROLLO DEL PROYECTO. 12/02/08

•Aena. TMA MADRID 2008. ANÁLISIS DE NUEVOS. PROCEDIMIENTOS DE ENTRADA 08/04/2008

•RETACDA: REDUCTION OF EMISSIONS IN TERMINAL AREAS USING CONTINUOUS DESCENT APPROACHES 30/09/09

1.7 Glossary of terms

This section identifies terms not covered in one or more referenced documents.

1.8 Acronyms and Terminology

This section defines acronyms specific to this document.

Term	Definition
ACAS	Airborne Collision Avoidance System
ADS-B	Automatic Dependent Surveillance - Broadcast
ADS-C	Automatic Dependent Surveillance - Contract
AMAN	Arrival Manager
ANSP	Air Navigation Service Provider
AOC	Aircraft Operations Centre
ASAS	Airborne Separation Assistance Systems
ASEP	Airborne Separation
ASPA	Airborne Spacing
APV	Approach Procedure with Vertical guidance
APW	Air Proximity Warning
ATC	Air Traffic Control
ATFCM	Air Traffic Flow and Capacity Management
ATM	Air Traffic Management
ATOW	Actual Take Off Weight

Term	Definition
ATSU	Air Traffic Service Unit
CCD	Continuous Climb Departure
CDA	Continuous Descent Arrival
CDM	Collaborative Decision Making
CFIT	Controlled Flight Into Terrain
CDTI	Cockpit Display of Traffic Information
CTA	Controlled Time of Arrival
CWP	Controller Working Position
DCT	Direct routing
DMAN	Departure Manager
ENR	Enroute
FIR	Flight Information Region
FMS	Flight Management System
FUA	Flexible Use of Airspace
GNSS	Global Navigation Surveillance System
GPWS	Ground Proximity Warning System
i4D	Initial 4-Dimension trajectory
IFR	Instrument Flight Rules
MAC	Mid-Air Collision
MSAW	Minimum Safe Altitude Warning
NOP	Network Operations Plan
NPA	Non-Precision Approach
OFA	Operational Focus Area
PBN	Performance Based Navigation
PSR	Primary Surveillance Radar
RB/MT	Reference Business/Mission Trajectory
RNAV	Area Navigation
RNP	Required Navigation Performance

Term	Definition
R/T	Radio Telephone (or Radio Telephony)
SB/MT	Shared Business/Mission Trajectory
SID	Standard Instrument Departure
SSR	Secondary Surveillance Radar
STAR	Standard Arrival Route
TCT	Tactical Controller Tools
TMA	Terminal Manoeuvring Area
TP	Trajectory Prediction
VFR	Visual Flight Rules

2 Summary of Operational Concept from DOD

This OSED describes the implementation of P-RNAV procedures in the Madrid-Barajas TMA in the context of step 1 of the SESAR V&V Storyboard.

The aim of this project is the conceptual definition, design and calculation of all the instrumental flight procedures and their validation, as well as the realization of all the necessary activities that could bring us to implement a new TMA based on the application of the P-RNAV procedures, and also determine optimal solutions in terms of safety, capacity, complexity, environment and efficiency to full P-RNAV implementation. Use these to complement EUROCONTROL's 'ANSP common methodology for P-RNAV implementation in ECAC Terminal Airspace.

The solutions will be focused on the main barriers for full P-RNAV implementation in TMAs identified. The barriers (or limitations) are listed below:

The generic issues covered by this project to full P-RNAV implementation are:

- Mixed Mode Operations – Integration of P-RNAV & conventional routes used by a mix of P-RNAV-compliant and conventional aircraft in high traffic density TMAs.
- High Terrain and bad weather – Use of P-RNAV procedures to improve safety of manoeuvres in TMA where high terrain and bad weather conditions cause limitations to use of airspace.

  Controller Mode of Operation – MOPS change for adapting ATCOs to new P-RNAV procedures
- Route Spacing for P-RNAV – Investigation of solutions for optimum route spacing using P-RNAV.
- Maximum capacity of P-RNAV Arrivals/Transitions/SIDs/STARs
- Suitable descent slope for P-RNAV Arrivals in all meteorological conditions.
- P-RNAV CDAs in high density traffic
- Continuous Climb Departures enabled by the enhanced horizontal performance of P-RNAV
- Reducing noise emissions in scenarios where early turns are required in departures (Guidance for early turn departures)
- Impact on preferential noise routes upon transition from conventional to P-RNAV procedures, due to the turning performance linked to each respectively.
- Impact on departure sequencing due to aircraft performance mix (climb rates, turn capability, etc), which creates different departure routes for different performance levels.
- Better traffic management in complex environment (Multiairport-TMA).

The **project** will not cover

- The integration of Point Merge with advanced separation modes and spacing techniques such as ASAS.
- Any relationship with 5.7.3 Controller Team Organisation, Roles and Responsibilities in a Trajectory Based Operation (including Multi-Sector Planner).

The project closes out completely at the end of Step 1.

2.1 Mapping tables

Relevant OI Steps ref. (coming from the definition phase)	Any new / changed Oistep (textual form)	Operational Focus Area name	Story Board Step	Master or Contributing (M or C)	Contribution to the Ois short description
AOM-0601 *Terminal Airspace Organisation Adapted through Use of Best practice, PRNAV and FUA (where suitable)*		*Optimised RNP structures / Point Merge in Complex TMA / Approach procedures with vertical guidance*	*Step 1 (IP1)*	*M*	*Design of terminal airspace structures and ATC sectorisation with a view to evenly distributing ATC and flight crew workload; minimising adverse ATM-related environmental impact.*
AOM 0602 – Enhanced Terminal Airspace with Curved/Segmented Approaches and RNAV Approaches (where suitable)		*Optimised RNP structures / Approach procedures with vertical guidance*	*Step 1 (IP1)*	*M*	*Flight management and guidance to improve lateral navigation (2D RNP).* *Flight management and guidance to perform steep and curved approach (e.g. SBAS)*
AUO-0501 *Visual Contact Approaches when Appropriate Visual Condition prevail*		*Optimised RNP structures*	*Step 1 (IP1)*	*M*	*Visual contact approaches are applied instead of IFR operations when appropriate visual conditions prevail. The legally approval of this type of Visual procedure for IFR traffic in Europe is a prerequisite.* *DFS suggest to interpret this OI step as pan-European introduction of ICAO PANS 1868 (Visual Separation on Approach*
AOM-0404 *Optimised Route Network using advanced RNP1*		*Optimised RNP structures*	*Step 1*	*M*	*With the introduction of advanced RNP1, the advantages gained from P-RNAV will be further enhanced by onboard performance monitoring and alerting and the execution of more predictable aircraft behaviour. This will enable to design better routes and*

					procedures.
AOM-0603 *Enhanced Terminal Airspace for RNP-based Operations*		*Optimised RNP structures*	*Step1*	*M*	*05.02* *10.01.07 ATC System specification*
AO-0703 *Aircraft Noise Management and Mitigation at and around Airports*		*Environmental Sustainability*	*Step 1 (IP1)*	*C*	*To ensure that every opportunity to exploit the noise capabilities for the proposed enhancements in CNS, ATM planning and management, airspace structures or profile selection and aircraft capabilities - to include track adherence improvement, dispersion/respite initiatives/ steeper approaches/ curved approaches /speed or energy management*

Table 1: List of relevant OIs within the OFA

Table 2: List of relevant DOD Scenarios and Use Cases identifies the link with the applicable scenarios and use cases of the DOD.

Advanced RNP1 is implemented and supports enhancements of route structure enabling the design of closely spaced parallel routes and procedures including the turns (fixed radius turns) [AOM-0404]. Terminal Airspace is further enhanced with the use of advanced RNP 1 terminal routes (incl. A-RNP1 SIDs and STARs) [AOM-0603].

A scenario is considered to be a combination of solutions (techniques, tools) through flight/control phases (En Route, TMA), in a given environment (traffic presentation, route structure driving density/complexity). Combination may consist of successive use of solutions for all aircraft across flight phases, or parallel use of solutions for different aircraft (local traffic situation, equipage). A scenario will be built from an ATC perspective but it is expected that an Airspace User's perspective can be easily derived from it.

An use case is considered at a detailed level a description of actors/systems interactions (e.g. operating method for a specific technique/tool); maps onto « atomic » or « single » OFAs

Scenario identification	Use Case Identification	*Reference to DOD section where it is described*
	One line per Use Case	

Table 2: List of relevant DOD Scenarios and Use Cases

An initial work has been taken place to prose how scenarios could be develop and this can be found here as starting point from the scratch. For P574 the scenarios should be like:

Scenario	Environment characteristics	Arrivals processes

	(Complexity/Density)	
	TMA/APP	Implement TMA/APP
1 **MADRID TMA**	High/Med	Tactical: 2D: closed loop (PBN+DCT or PBN) 3D: segmented CDA (possibly level off) 4D: speed control (ATC)
2 **MADRID TMA**	High/High	Tactical: 2D: closed loop (PBN+DCT or PBN) 3D: segmented CDA (possibly level off) 4D: speed control (ATC)

- 2D: PBN+DCT refers to route structure relying on performance based navigation, and operating method relying on ATC closed-loop/close-ended instruction (Direct To)
- 2D: PBN refers to route structure relying on performance based navigation,
- Alternate (e.g. non equipped aircraft, unexpected event) and abnormal (e.g. equipment failure) parts of scenarios also to be developed.

Table 3: List of relevant DOD Environments identifies the link with the applicable environments of the DOD.

Operational Environment	Class of environment	*Reference to DOD section where it is described*
Environmentally Constrained TMA	*Madrid TMA is clearly environmentally constrained in its all departing routes due to the elevated amount of populated areas*	*3.1.1. Environmentally Constrained*
Airspace Constrained TMA	*Madrid TMA is constrained in shape not is size. The new TMA proposal is smaller than the current one but has to be re-shape to fit in the new controlling sector design*	*3.1.2. Airspace Constrained*
Traffic Volume and Variation Constrained TMA	*Madrid TMA is characterised by the complexity of its traffic patters being exacerbated by large volumes of traffic and by the large peaks and troughs within the traffic flow. With the new P-RNAV design this constrain is solved*	*3.1.4. Traffic Volume and Variation Constrained*
Airfield Interaction Constrained	*Madrid TMA is characterised by having Torrejon and Getafe airfields providing a mix of aircraft types*	*3.1.5. Airfield Interaction Constrained*

Table 3: List of relevant DOD Environments

Table 4: List of the relevant DOD Processes and Services identifies the link with the applicable Operational Processes and Services defined in the DOD.

This is the section extracted from 5.2 DOD:
All this section 5 will be further developed in the next issue of this document. It will link to the WPB4.2 Processes and Services. It will provide the main support to describe the concept from the B4.2 point of view and to ensure coherency and integration at the ATM system level. It will be written using guidance from WPB4.2 document "Processes and services guidelines".

DOD Process / Service Title	Process/ Service identification	Process/ Service *short* description	*Reference to DOD section where it is described*
Processes *<x>*	*One line per Operational process*		*N/A*
Services *<y>*	*One line per Operational service*		*N/A*

Table 4: List of the relevant DOD Processes and Services

Table 5: List of the relevant DOD Requirements summarizes the Requirements including Performance (KPA related) requirements relevant of the OSED. This table supports defining the performance objectives in the scope of the addressed OFA. The DOD performance requirements are structured to respond to Key Performance Indicators (PI) targets / decomposed PIs, so this table will support traceability to the performance framework.

[REQ]

Identifier	REQ-05.02-DOD-ENV0.0002
Requirement	OFA "Optimised RNP Route Structures" shall deliver a 5% reduction in fuel burn per flight in the TMA arrival phase of flight
Title	Optimised RNP Route Structures Environment Sustainability
Status	In progress
Importance	Important
Rationale	Target defined by B4.1
Category	Performance

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<KPI>	ENVIRONMENT	<Partial>
<APPLIES_TO>	<Operational Process> or <Operational Service>	OFA02.01.01	N/A

[REQ]

Identifier	REQ-05.02-DOD-CAP0.0003
Requirement	OFA “Optimised RNP Route Structures” shall deliver a 2.5% increase in capacity in respect to Improved Separation Management TMA.
Title	Optimised RNP Route Structures – Separation Management TMA Airspace Capacity
Status	In progress
Importance	Important
Rationale	Target defined by B4.1
Category	Performance

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<KPI>	CAPACITY	<Partial>
<APPLIES_TO>	<Operational Process> or <Operational Service>	OFA02.01.01	N/A

[REQ]

Identifier	REQ-05.02-DOD-CAP0.0004
Requirement	OFA “Optimised RNP Route Structures” shall deliver a 5.0% increase in capacity in respect to Improved Complexity Management TMA.
Title	Optimised RNP Route Structures – Improved Complexity Management TMA Airspace Capacity
Status	In progress
Importance	Important
Rationale	Target defined by B4.1
Category	Performance

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<KPI>	CAPACITY	<Partial>
<APPLIES_TO>	<Operational Process> or <Operational Service>	OFA02.01.01	N/A

[REQ]

Identifier	REQ-05.02-DOD-CEF0.0005
Requirement	OFA “Optimised RNP Structures” shall deliver a 2.5% improvement in predictability in respect to TWR APP Controller Productivity.
Title	Optimised RNP Structures – TWR APP Controller Productivity
Status	In progress
Importance	Important
Rationale	Target defined by B4.1
Category	Performance

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<KPI>	COST EFFECTIVENESS	<Partial>
<APPLIES_TO>	<Operational Process> or <Operational Service>	OFA02.01.01	N/A

[REQ]

Identifier	REQ-05.02-DOD-CEF0.0006
Requirement	OFA “Optimised RNP Structures” shall deliver a 5.0% improvement in predictability in respect to TWR APP Technology related Cost Effectiveness influence factors.
Title	Time Based Separation – TWR APP Technology related Cost Effectiveness influence factors
Status	In progress
Importance	Important
Rationale	Target defined by B4.1
Category	Performance

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<KPI>	COST EFFECTIVENESS	<Partial>

<APPLIES_TO>	<Operational Process> or <Operational Service>	OFA02.01.01	N/A

[REQ]

Identifier	REQ-05.02-DOD-PRED.0005
Requirement	OFA “Optimised RNP Structures” shall deliver a 10.0% improvement in predictability in the TMA Departure phase.
Title	Optimised RNP Structures – TMA Departure
Status	In progress
Importance	Important
Rationale	Target defined by B4.1
Category	Performance

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<KPI>	PREDICTABILITY	<Partial>
<APPLIES_TO>	<Operational Process> or <Operational Service>	OFA02.01.01	N/A

DOD Requirement Identification	DOD requirement title	*Reference to DOD section where it is described*
REQ-05.02-DOD-ENV0.0002	OFA “Optimised RNP Route Structures” shall deliver a 5% reduction in fuel burn per flight in the TMA arrival phase of flight	*6.2 – Performance Requirements*
REQ-05.02-DOD-CAP0.0003	OFA “Optimised RNP Route Structures” shall deliver a 2.5% increase in capacity in respect to Improved Separation Management TMA.	*6.2 – Performance Requirements*
REQ-05.02-DOD-CAP0.0004	OFA “Optimised RNP Route Structures” shall deliver a 5.0% increase in capacity in respect to Improved Complexity Management TMA.	*6.2 – Performance Requirements*
REQ-05.02-DOD-CEF0.0005	OFA “Optimised RNP Structures” shall deliver a 2.5% improvement in predictability in respect to TWR APP Controller Productivity.	*6.2 – Performance Requirements*
REQ-05.02-DOD-CEF0.0006	OFA “Optimised RNP Structures” shall deliver a 5.0% improvement in predictability in respect to TWR APP Technology related Cost Effectiveness influence factors.	*6.2 – Performance Requirements*
REQ-05.02-DOD-PRED.0005	OFA “Optimised RNP Structures” shall deliver a 10.0% improvement in predictability in the TMA Departure phase.	*6.2 – Performance Requirements*

Table 5: List of the relevant DOD Requirements

2.2 Operational Concept Description

In Madrid TMA we expect the following benefits, due to the new design of the TMA and the aircraft capabilities:

- Provide more efficient, trajectories

- Reduce Noise impact by-passing populated areas
- Improve Arrival/Departure sequencing
- Increase the airspace capacity
- Permits segregated arrival and departures streams
- Reduce the need of radar vector usage
- Reduce both pilot and controller workload

2.3 Processes and Services (P&S)

The purpose of this section is to ensure coherence between federating and primary projects regarding the used P&S in the OFA.

Due to the lack of Top Down input coming from the 5.2 DOD, this section has been following a logical approach in order to scope the addressed processes and services linked to Queue Management.

This section will be updated and refined to reflect the concept defined in the 5.2 DOD when it is available.

2.3.1 Process X (repeated)

This section shall be repeated for each Process.

2.3.2 Service X (repeated)

This section shall be repeated for each Service.

2.3.3 List of Application Services, Information services and Systems

This section lists section 5.2 from the DOD, the Application services, Information services and Systems that are invoked or used to achieve the previously defined DOD operational services.

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[2] B4.2 Initial Service Taxonomy document and to **¡Error! No se encuentra el origen de la referencia. ¡Error! No se encuentra el origen de la referencia.***).*

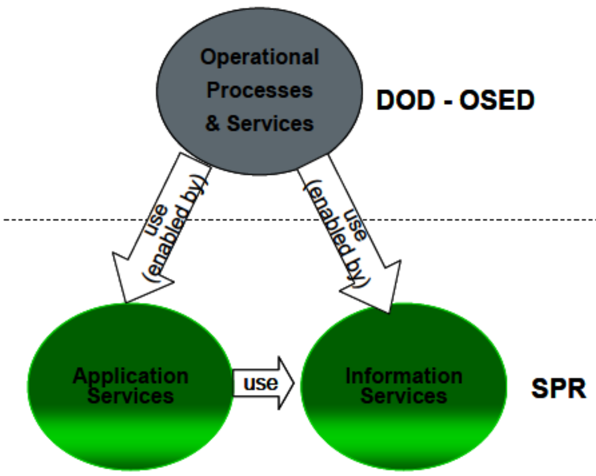


Figure 2: Application services and Information Services dependency to Operational Processes and Services

3 Detailed Operational Environment

3.1 General airport description

Barajas airport is located inside Madrid TMA. It operates H24 with four runways, two 33-15 and two 36-18. Both 33's and 18's are **CAT III approved**. Mainly, the operation is performed in north configuration which means traffic landing in runways 33 left and right and taking-off from runways 36 right and left.
During night period, **between 23:00 and 07:00, in north configuration, landings are permitted only in runway 33 Right and take offs only in runway 36 Left, due to environmental constraints.**

3.2 General Information

The Madrid Barajas airport is placed 13 Km to the Northeast of Madrid, within the "Comunidad Autónoma de Madrid" in the Center of the "Península Ibérica". The airport is located close to the ARP which coordinates are 40º28'20, 0294''N, 3º33'39, 4034''W, 610m (2001 ft.) over the sea level. The "Comunidad de Madrid" south area do not has important terrain obstacles. The main important orographic obstacles are the:

- "Guadarrama", "Somosierra" and "Gredos" mountains which altitudes are over 2000m.
- Guadarrama: "Peñalara, 2428 m (7966 ft), 29 NM far from the airport.
- Somosierra: "Pico Del Lobo, 2274 m (7461 ft), 43 NM far from the airport.
- G redos: "Pico Almanzor, 2592 m (8504 ft), 82 NM far from the airport.

3.3 Airport Characteristics

The Madrid–Barajas (LEMD) Airport, Reference Point (ARP) is located on 40º28'20.0294''N 003º33'39.4034''W coordinates. Elevation: 610 m / 2001 ft.
The Geoid undulation (WGS84) is 51.5 m, and the magnetic variation is 2°W (2005) with an annual change of 8.2'E.The reference temperature is 33°C.

The Madrid-Barajas airport has four Terminal buildings (T-1, T-2, T-3, and T-4) plus a satellite building (T-4S) as it can be seen in the figure.

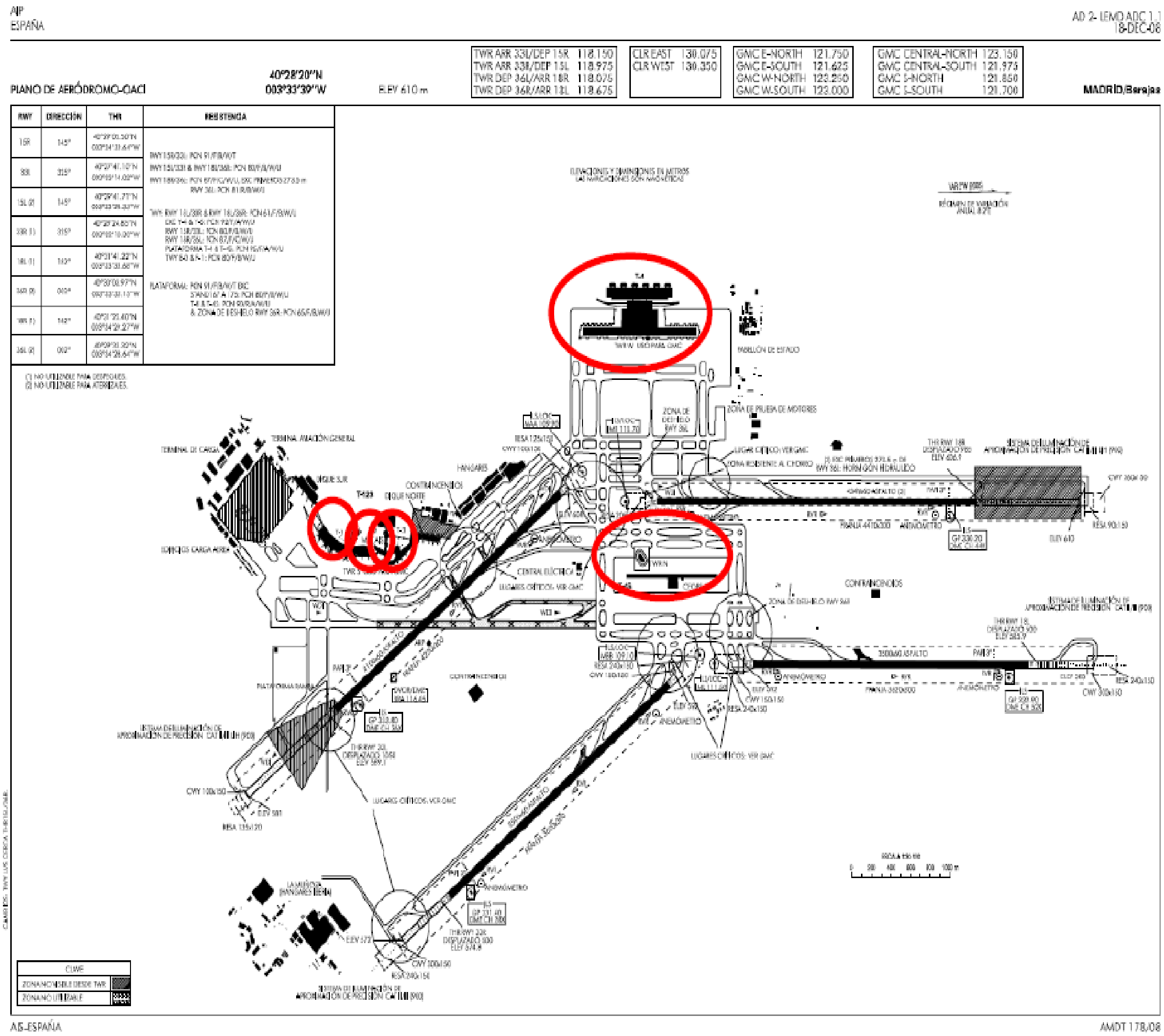


Figure 3: Madrid-Barajas Terminal buildings.

The airport Madrid-Barajas has four runways which physical characteristics are:

RWY	Orientación Direction	DIM (m)	THR PSN	THR ELEV	SWY (m)	CWY (m)	Franja (m) Strip (m)	RESA (m)	RWY SFC PCN
15R	142.20°GEO 145°MAG	4100x60	402905.50N 0033433.64W	608 m 1995 ft	No	100x150	4220x300	135x120	Asfalto/Asphalt PCN 91/F/B/W/T
33L (1)	322.21°GEO 325°MAG	4100x60	402747.10N 0033314.02W	589.1 m 1933 ft	No	100x150	4220x300	125x150 (6)	Asfalto/Asphalt PCN 91/F/B/W/T
18L (2) (7)	179.76°GEO 182°MAG	3500x60	403141.22N 0033333.68W	585.9 m 1922 ft	No	150x150	3620x300	240x150	Asfalto/Asphalt PCN 80F/B/W/U
36R (8)	359.76°GEO 002°MAG	3500x60	403003.97N 0033333.15W	592 m 1942 ft	No	300x150	3620x300	240x150	Asfalto/Asphalt PCN 80F/B/W/U
15L (8)	142.21°GEO 145°MAG	3500x60	402941.71N 0033328.33W	592 m 1942 ft	No	300x150	3620x300	240x150	Asfalto/Asphalt PCN 80F/B/W/U
33R (3) (7)	322.22°GEO 325°MAG	3500x60	402824.85N 0033210.30W	574.8 m 1886 ft	No	150x150	3620x300	240x150 (6)	Asfalto/Asphalt PCN 80F/B/W/U
18R (4) (7)	179.76°GEO 182°MAG	4349x60	403122.40N 0033429.27W	606.9 m 1991 ft	No	No	4470x300	205x120	Asfalto/Asphalt PCN 87/F/C/W/U
36L (8)	359.76°GEO 002°MAG	4349x60	402933.32N 0033428.64W	605 m 1985 ft	No	260x150	4470x300	90x150	Asfalto/Asphalt PCN 87/F/C/W/U (5)

Observaciones: (1) THR RWY 33L desplazado 1050 m.
(2) THR RWY 18L desplazado 500 m.
(3) THR RWY 33R desplazado 500 m.
(4) THR RWY 18R desplazado 984 m.
(5) Primeros 273,5 m RWY 36L de hormigón hidráulico: PCN 81/R/B/W/U.
(6) Ver casilla 23 (EMAS).
(7) No utilizable para despegues.
(8) No utilizable para aterrizajes.

Remarks: (1) THR RWY 33L displaced 1050 m.
(2) THR RWY 18L displaced 500 m.
(3) THR RWY 33R displaced 500 m.
(4) THR RWY 18R displaced 984 m.
(5) First 273.5 m RWY 36L of hydraulic concrete: PCN 81/R/B/W/U.
(6) See item 23 (EMAS).
(7) Not available for take-off.
(8) Not available for landing.

Perfil: *Profile:*

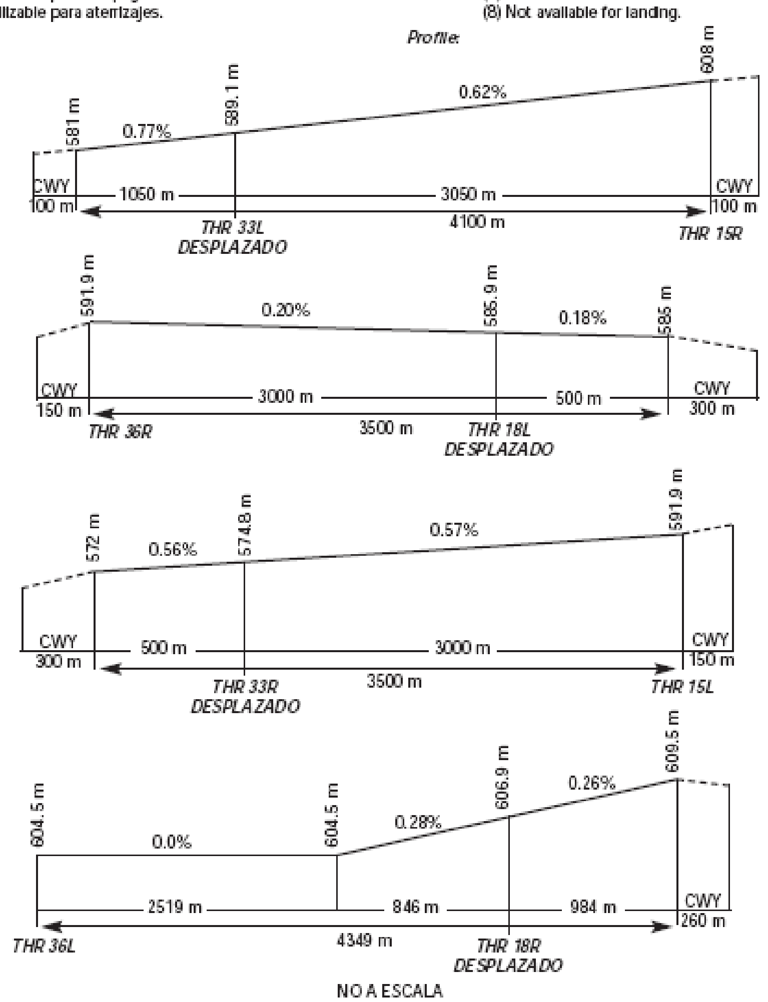


Figure 4: Runways characteristics

3.4 Approach and landing lighting

Runway: **15R.**

- Approach: No.
- VASIS/PAPI: No.
- Threshold: No.
- Touch-down zone: No.
- Runway centre line: 4100 m: 3200 m white+600 m red and white+300 m red.
- Distance between lights: 15 m.
- Runway edge: 4100 m: 3500 m white + 600 m yellow.
- Distance between lights: 60 m.
- Runway end: Red.
- Stopway: No.
- Remarks: None.

Runway: **33L.**

- Approach: Precision CAT II/III, 900 m. LIH.
- PAPI (MEHT): 3° (23.35 m/77 ft).
- Threshold: Green, with wing bars.
- Touch-down zone: 900 m white.
- Runway centre line: 3050 m: 2150 m white+600 m red and white+300 m red.
- Distance between lights: 15 m.
- Runway edge: 4100 m: 1050 m red + 2450 m white + 600 m yellow.
- Distance between lights: 60 m.
- Runway end: Red.
- Stopway: No.
- Remarks: Rapid exit taxiway indicator lights (L-2, L-3, L-4, L-5 and L-7).

Runway: **15L.**

- Approach: No.
- VASIS/PAPI: No.
- Threshold: No.
- Touch-down zone: No.
- Runway centre line: 3500 m: 2600 m white+600 m red and white+300 m red.
- Distance between lights: 15 m.
- Runway edge: 3500 m: 2900 m white + 600 m yellow.
- Distance between lights: 60 m.
- Runway end: Red.
- Stopway: No.
- Remarks: None.

Runway: **33R.**

- Approach: Precision CAT II/III, 900 m.
- PAPI (MEHT): 3° (22.19 m/73 ft).
- Threshold: Green, with wing bars.
- Touch-down zone: 900 m white.
- Runway centre line: 3000 m: 2100 m white+600 m red and white+300 m red.
- Distance between lights: 15 m.
- Runway edge: 3500 m: 500 m red + 2400 m white + 600 m yellow.
- Distance between lights: 60 m.
- Runway end: Red.

- Stopway: No.
- Remarks: Rapid exit taxiway indicator lights (K-4 and K-5).

Runway: **18R.**
- Approach: Precision CAT II/III, 900 m. LIH
- PAPI (MEHT): 3° (20.59 m/68 ft).
- Threshold: Green, with wing bars.
- Touch-down zone: 900 m white.
- Runway centre line: 3365 m: 2465 m white+600 m red and white+300 m red.
- Distance between lights: 15 m.
- Runway edge: 4350 m: 985 m red + 2765 m white + 600 m yellow.
- Distance between lights: 60 m.
- Runway end: Red.
- Stopway: No.
- Remarks: Rapid exit taxiway indicator lights (Z-7, Z-8 and Z-10).

Runway: **36L.**
- Approach: No.
- VASIS/PAPI: No.
- Threshold: No.
- Touch-down zone: No.
- Runway centre line: 4350 m: 3450 m white+600 m red and white+300 m red.
- Distance between lights: 15 m.
- Runway edge: 4350 m: 3750 m white + 600 m yellow.
- Distance between lights: 60 m.
- Runway end: Red.
- Stopway: No.
- Remarks: None.

Runway: **18L.**
- Approach: Precision CAT II/III, 900 m.
- PAPI (MEHT): 3° (22,79 m/75 ft).
- Threshold: Green, with wing bars.
- Touch-down zone: 900 m white.
- Runway centre line: 3000 m: 2100 m white+600 m red and white+300 m red.
- Distance between lights: 15 m.
- Runway edge: 3500 m: 500 m red + 2400 m white + 600 m yellow.
- Distance between lights: 60 m.
- Runway end: Red.
- Stopway: No.
- Remarks: Rapid exit taxiway indicator lights (Y-4 and Y-5).

Runway: **36R.**
- Approach: No.
- VASIS/PAPI: No.
- Threshold: No.
- Touch-down zone: No.
- Runway centre line: 3500 m: 2600 m white+600 m red and white+300 m red.
- Distance between lights: 15 m.
- Runway edge: 3500 m: 2900 m white + 600 m yellow.
- Distance between lights: 60 m.

- Runway end: Red.
- Stopway: No.
- Remarks: None.

3.5 Restrictions to operations

– Aerodrome closed to aircraft without radio communication and helicopters.
– Aerodrome closed to General Aviation and Business aircraft (except cargo aircraft) with a maximum take-off weight (MTOW) lower than 50,000 kg and a capacity less than 70 passengers, in the following hours:

- Summer: 0500 - 2100
- Winter: 0600 - 2200

– If any affected aircraft requires for the use of the airport during these hours it will assume the possible delays, as jets will always have priority.

3.6 Flight Plan

The ARO at Madrid/Barajas shall not accept flight plans with origin or destination Madrid/Barajas or Madrid/Torrejón AD, with an EOBT or ETA which is not in accordance with the airport slot previously allocated (see GEN 1.2-4 item k).

3.7 Preferential runways

Runway in use will be selected by ATC:

– North configuration:
In normal operation conditions, when the tail wind component is not higher than 10 kt (the runway surface is dry or it is wet with good braking action):

- During day time (0700-2300 LT), runways 36L/36R will be used for takeoff and runways 33L/33R for landing.
- During night time (2300-0700 LT) runway 36L will be used for take-off and runway 33R for landing. Runways 15L/15R will not be authorized for takeoff.

– South configuration:
In normal operation conditions (the runway surface is dry or it is wet with good braking action):

- During day time (0700-2300 LT), runways 15L/15R will be used for takeoff and runways 18L/18R for landing.
- During night time (2300-0700 LT) runway 15L will be used for take-off and runway 18L for landing. Runways 33L/33R will not be authorized for takeoff.

3.8 Approach speed limits

- –IAS MAX 250 kt 15 NM before reaching the clearance limit points.
- –IAS MAX 220 kt when leaving the clearance limit points.
- –ATC will request speed reduction to 170/180 kt when starting the turn to intercept ILS/LOC.
- –IAS MAX 160 kt when crossing: 4 DME ILS RWY 33L, 33R, 18L and 18R.

These required speeds are based on ATC procedures to maximize the arrival capacity and need to be flown as accurately as possible.
Aircraft unable to conform to these limitations should notify to ATC.

3.9 Radar presentation system

The use of the radar presentation system installed in Madrid/Barajas control tower is authorized to perform the following functions:

–Radar monitoring of aircraft on final approach.
–Radar monitoring of other aircraft on the vicinity of the aerodrome.
–Establishing radar separation between succeeding departing aircraft.

Figure 5: Madrid-Barajas air view

3.10 Madrid airports facilities

The “Comunidad Autónoma de Madrid” has, beyond the Madrid Barajas airport (LEMD), another three main airports: “Cuatro Vientos” (LECU), and the military air bases of “Torrejón” (LETO) and “Getafe” (LEGT).

Cuatro Vientos: is placed 8.5 km to the Southeast of the Madrid city. It’s a military air base open to the civil air traffic, mainly air academies and general aviation. The airport is open to the VFR flight exclusively. The airplanes take off and landings are done in the runway 10/28, 1500m length. The airport ARP is placed in 40º22’14.4358’’N, 003º47’06.5054’’W coordinates, at 691.52 m (2269 ft) of elevation. It operates: Summer time: 07:00-Sunset; winter time: 08:00-Sunset.

Torrejón: is placed 24km to the Northeast of Madrid. His location (ARP.- 40º29’48.2891’’N, 003º26’45.1569’’W, Elevation 617.6 m/2026 ft) is near to the Madrid Barajas airport (5 Nm), moreover, the center line of the runway 05/23 converge with the Madrid-Barajas approaches to the 33R and 33L runways. The runway 05/23 is 4084m of length and it’s dedicated to the military and civil air traffic, IFR or VFR. It operates: Civil Summer time: 04:00-22:00; winter time: 05:00-23:00, Military H24.

Getafe: is placed 15km to the South-West of Madrid (ARP.- 40º17’38.6407’’N, 003º43’25.4387’’W, Elevation 619 m/2031 ft). It’s dedicated to the military traffics exclusively. It has only one runway 05/23 with 2480m of length. It operates: Summer time: 05:30-19:00; winter time: 06:30-20:00.

	RUNWAY			ELEVATION	CIRCULATION	REMARKS
	DESIGNATION	DIRECTIONN	LENGHT			
CUATRO VIENTOS	10/28	93,78º	1500 m	691,52 m	VFR	Military air base open to the civil traffic
GETAFE	05/23	45,2º	2477 m	619 m	IFR / VFR	Military air base
TORREJÓN	05/23	43,38º	3658 m	617.6 m	IFR / VFR	Military air base open to the civil traffic

Figure 6: Airport Characteristics in Madrid Community

The relative locations among each airport are shown in the following figure

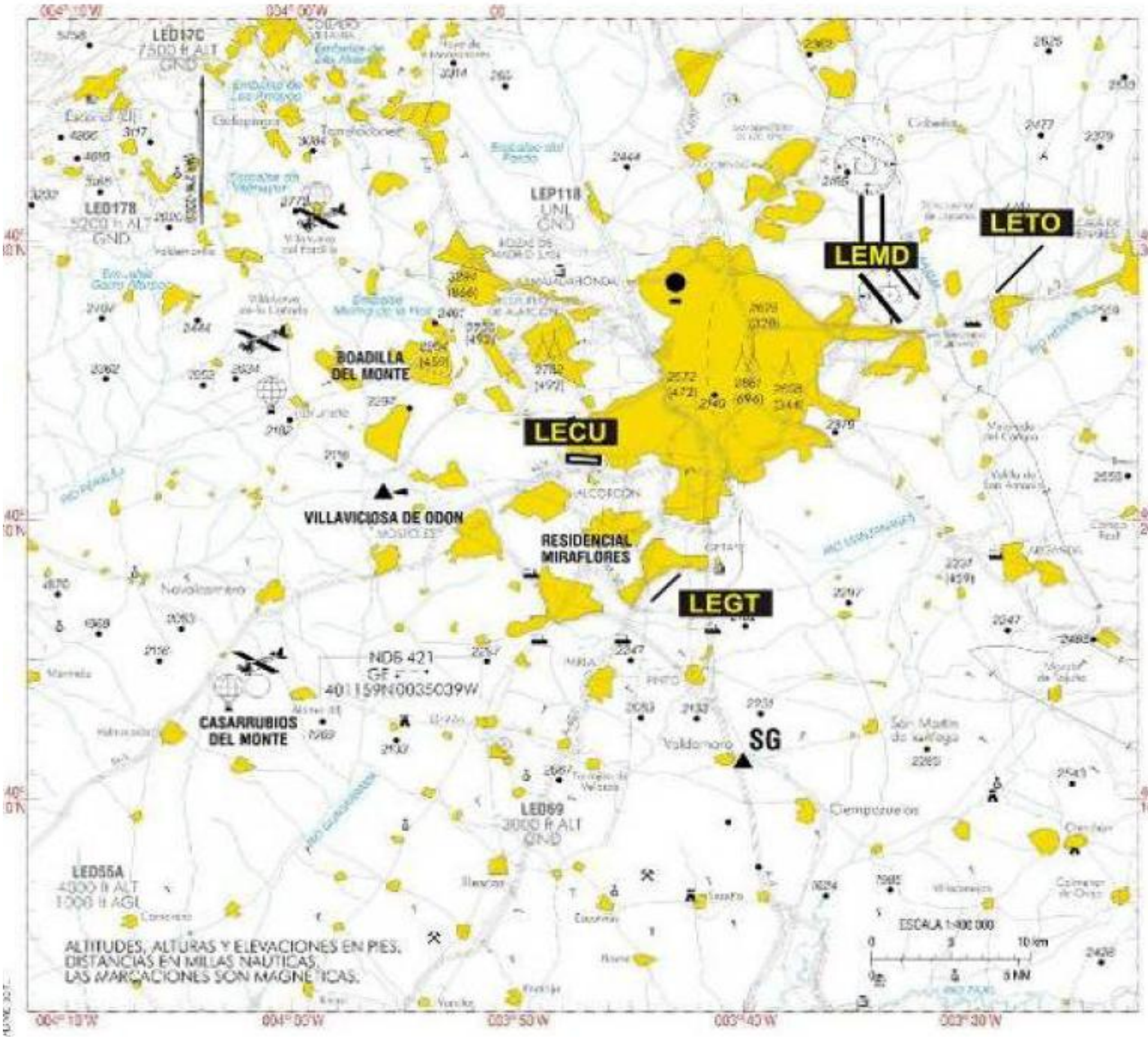


Figure 7: Airports locations

3.11 ATM Organization

The airspace around Madrid Barajas airport is shared between Madrid TMA and the Madrid CTR.

• **TMA:** Covering the airspace from 300m over the ground until FL245. It is a category A airspace apart from the VFR corridors (category C)

• **CTR:** Covering the airspace from the ground until 300m over the ground. This is a category D airspace

• **ATZ:** Covering the airspace controlled by the airport tower. The extension covers 8 km around the airport[1] till 900m over the ground[2].

On the other hand the Airspace is classified as follows:

-FL 245 / FL 195 C
-FL 195 / 300 m AGL A
-Corridors VFR D
-Sectors VFR G

[1] Or the ground visibility, whichever is lower

[2] Or up to the clouds ceiling, whichever is lower.

3.12Actual TMA Characteristics.

The Madrid TMA has been updated in order to allow independent parallel approaches, which limits are shown in the following figure

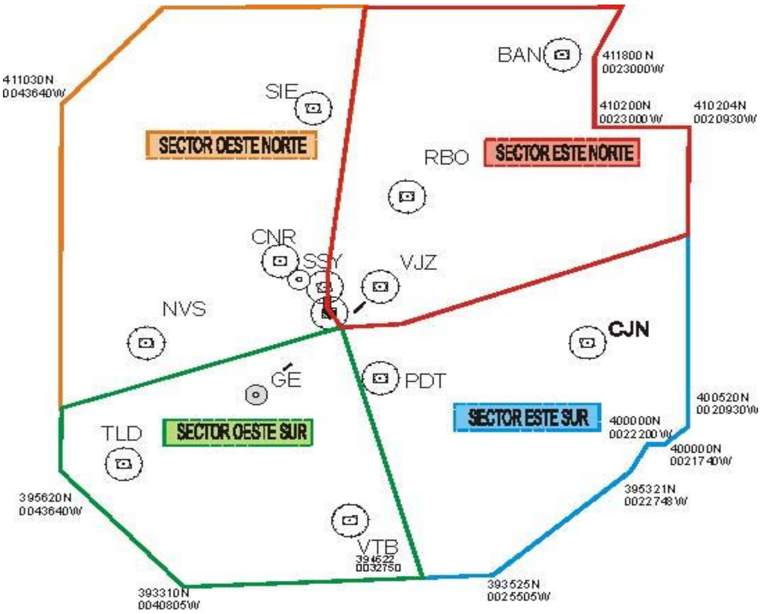


Figure 8: Actual Madrid TMA

The Madrid TMA limits, shown in the previous figure, are defined by the following coordinates:

- •41º30'00''N 004º12'15''W; 41º10'30''N 004º36'40''W;
- •39º56'20''N 004º36'40''W; 39º33'10''N 004º08'05''W;
- •39º35'25''N 002º55'05''W; 39º53'21''N 002º27'48''W;
- •40º00'00''N 002º22'00''W; 40º00'00''N 002º17'40''W;
- •40º05'20''N 002º09'30''W; 41º02'04''N 002º09'30''W;
- •41º02'00''N 002º30'00''W; 41º18'00''N 002º30'00''W;
- •41º30'06''N 002º22'08''W; 41º30'00''N 004º12'15''W.

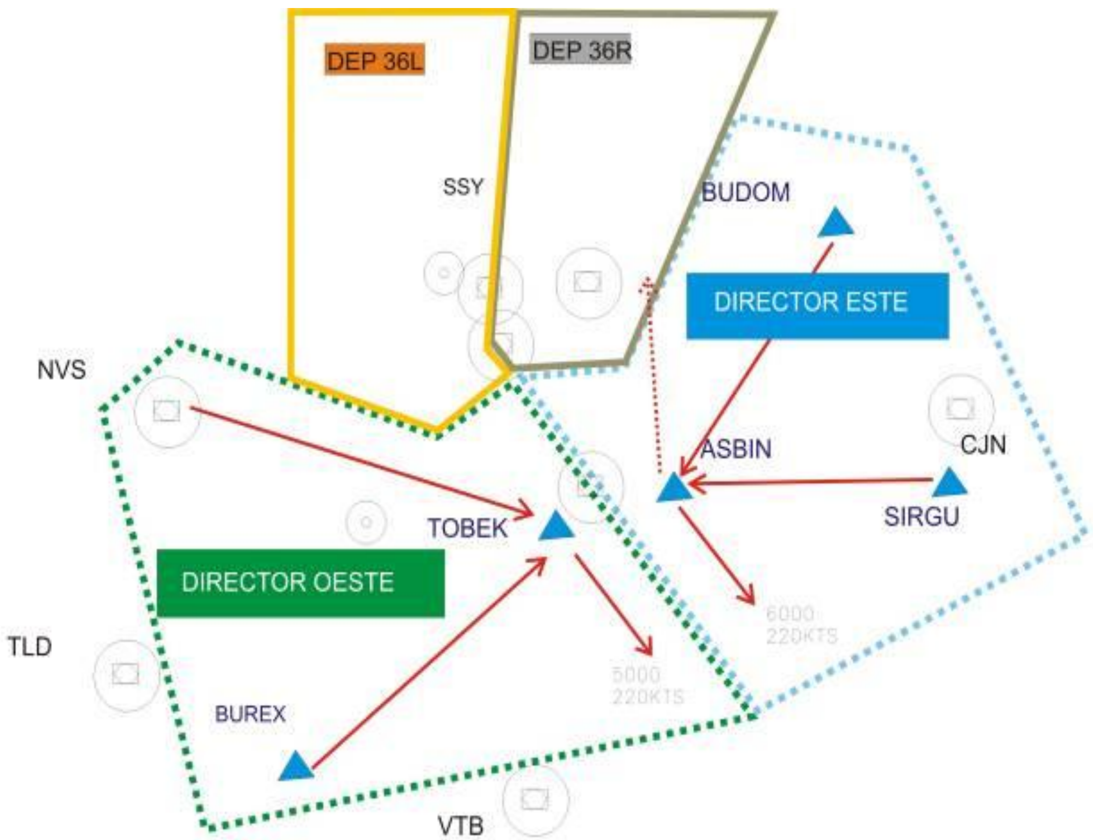


Figure 9: TMA North Configuration. Departure and Director Sectors

These areas make that the procedures be very involved some times, especially the departures.
The airspace closer to the Madrid –Barajas airport, on charge to manage the first phases of the departures and the approach phases of the flight are organized in the airspace sectors as shown above.

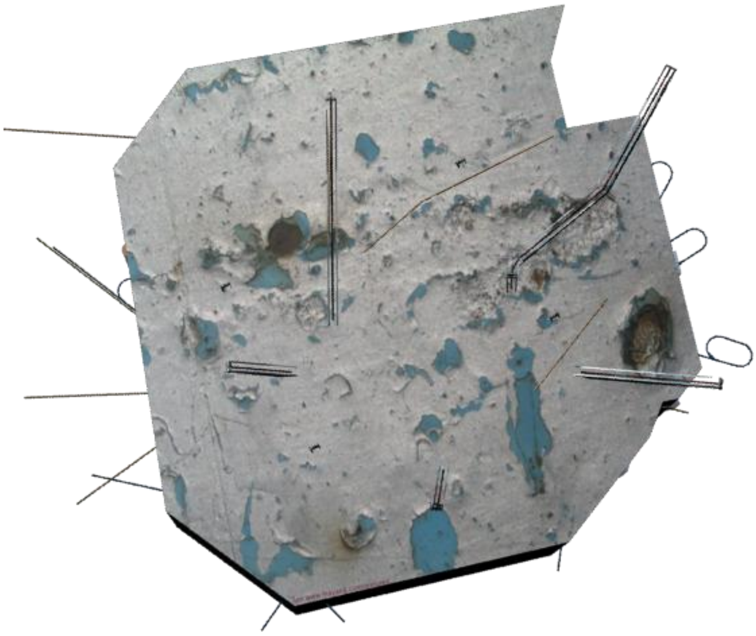


Figure 10: Actual Madrid TMA (3D Representation)

3.13 Actual North Configuration Initial APP sectors

The Runways 33L/33R are provided by Standard Instrument Arrivals (STAR). Note that it is applicable to all the STAR that Descent planning in Madrid TMA (will be only done with prior ATC clearance) to be over the clearance limit points at FL 140 and over established IAF TOBEK and ASBIN at 5000 ft and 6000 ft respectively. **TA 13000 ft (3962 m).**

In Annex 1, all the Madrid TMA STARS in North and South Configuration depending on the traffic origin are deeply explained.

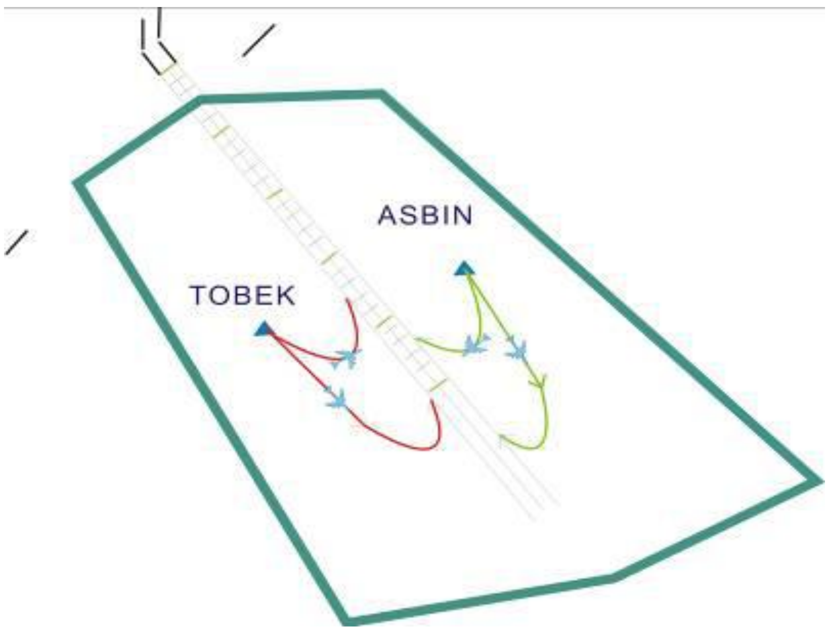
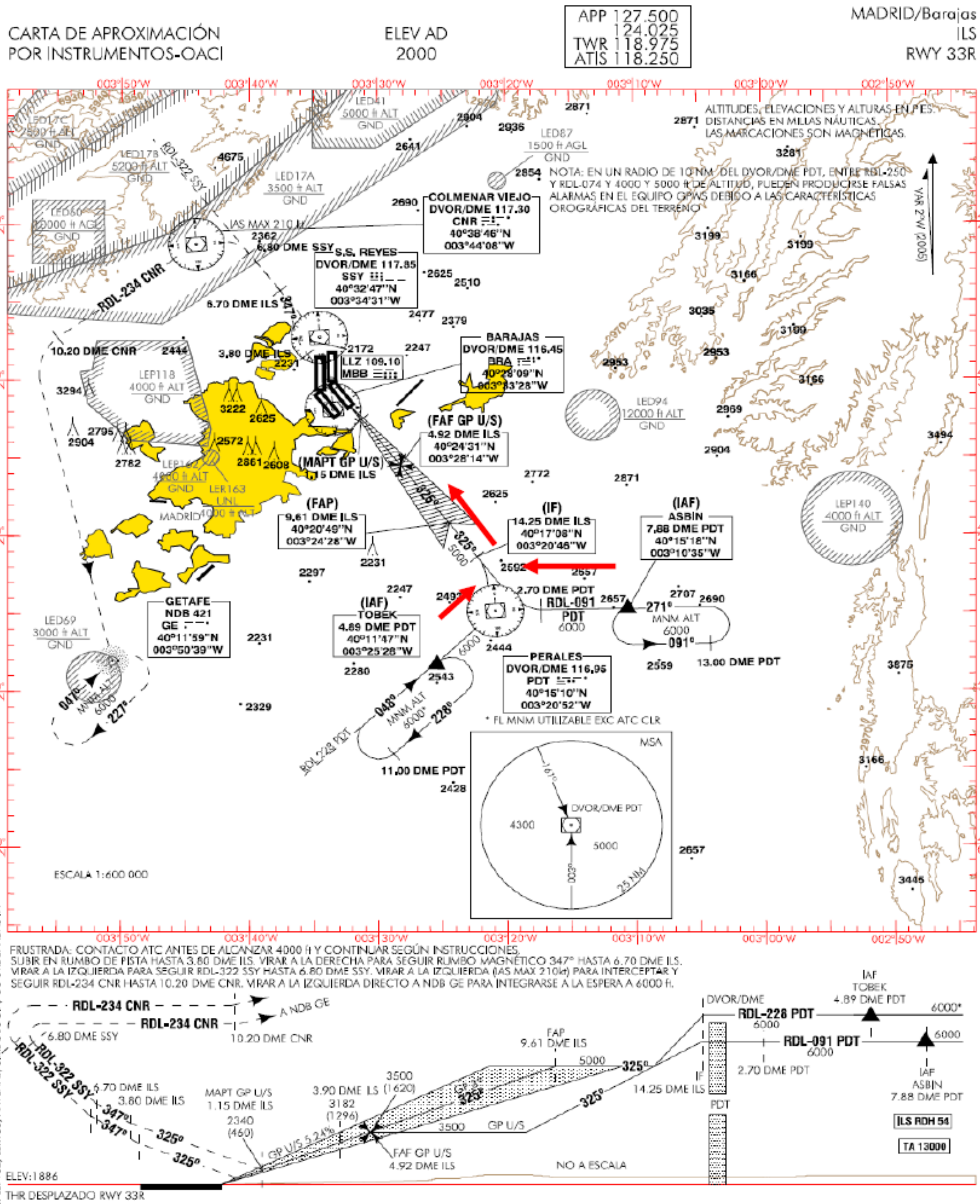


Figure 11: Actual North Initial APP Sectors

7



HGT REF ELEV THR DESPLAZADO RWY 33R

OCA/H		A	B	C	D
STA	CAT I	2074 (188)	2086 (200)	2094 (208)	2105 (219)
	CAT II	(78)	(95)	(107)	(121)
	CAT III	APPROVED			
	GP U/S	2340 (460)			
En circuito (H) sobre 2000		2690 (690)	2760 (760)	3280 (1280)	3620 (1620)

GS	kt	80	100	120	140	160	180
FAP-THR: 9,61 NM	min:s	7:12	5:46	4:48	4:07	3:36	3:12
FAF-MAPT: 3,77 NM	min:s	2:50	2:16	1:53	1:37	1:25	1:15
ROD: 5,24 %	ft/min	425	531	637	743	849	955

ALT/HGT DME (ILS) FNA GP U/S

13 DME	12 DME	11 DME	10 DME	9 DME	8 DME	7 DME	6 DME	5 DME	4 DME	3 DME	2 DME	1 DME
									3220 (1340)	2900 (1020)	2580 (700)	

22-NOV-07 (AMDT 164/07) AIP-ESPAÑA AD 2-LEMD IAC/3

Figure 12: Precision Approach chart. Runway 33R. CDA Tracks.

As mentioned, during the night period, the approaches will be done using the RWY 33R. It has two initial approach tracks. One from TOBEK reference point and another from ASBIN reference point. Both finish in a common intermediate approach track at 5000 ft of altitude, and finally, the final approach track begins in the FAP point at 9.61 DME ILS descending with a 3 degrees glide path.
Both holding patterns (TOBEK and ASBIN) are tactical, and its use is limited to contingency cases.

The Runway 33 R Physical Characteristics are:

•***DIRECTION:*** 322.22ºGEO; 325ºMAG
•***DIM (m):*** 3500x60
•***THR PSN:*** 402824.85N; 0033210.30W
•***THR ELEV*** 574.8 m(1886 ft)
•***SWY(m):*** No
•***CWY(m):*** 150x150
•***Strip(m):*** 3620x300
•***RESA(m):*** 240x150
•***RWY SFC PCN:*** Asphalt; PCN 80F/B/W/U

The RWY 33R Threshold is displaced 500 m.

STAR and ILS Approach Procedures are in compliance with the actual Spanish regulations for environmental protection. Concerning weather constraints, during summer season North configuration is used 90% of the time, as an example, during July 2008 between 00:00 and 08:00 only two days, the 18th and the 23rd, the South configuration was used.

3.14 Operational Characteristics

3.14.1Madrid-Barajas airport scenario overview

Madrid FIR/UIR is managed from Madrid ACC/APP located in Torrejón de Ardoz (Madrid), except the south part of the airspace, from the 39º parallel to the boundary with CasablancaFIR/UIR, which is delegated to Sevilla ACC/APP.

Inside Madrid FIR there are three major TMA's, Madrid TMA (GND/FL245) managed from Madrid APP, Galicia TMA (GND7FL155) managed from Santiago TACC and Zaragoza TMA(GND/FL245) managed from Zaragoza APP (military).

There are also three minor TMA's and 21 controlled aerodromes. Traffic separation both in Madrid ACC and APP is based on the use of radar with a minimum of 8 NM between aircrafts in the ACC, and 5 NM between 30 and 100 NM from the ARP and 3 NM between 0and 30 NM from the ARP in the APP.

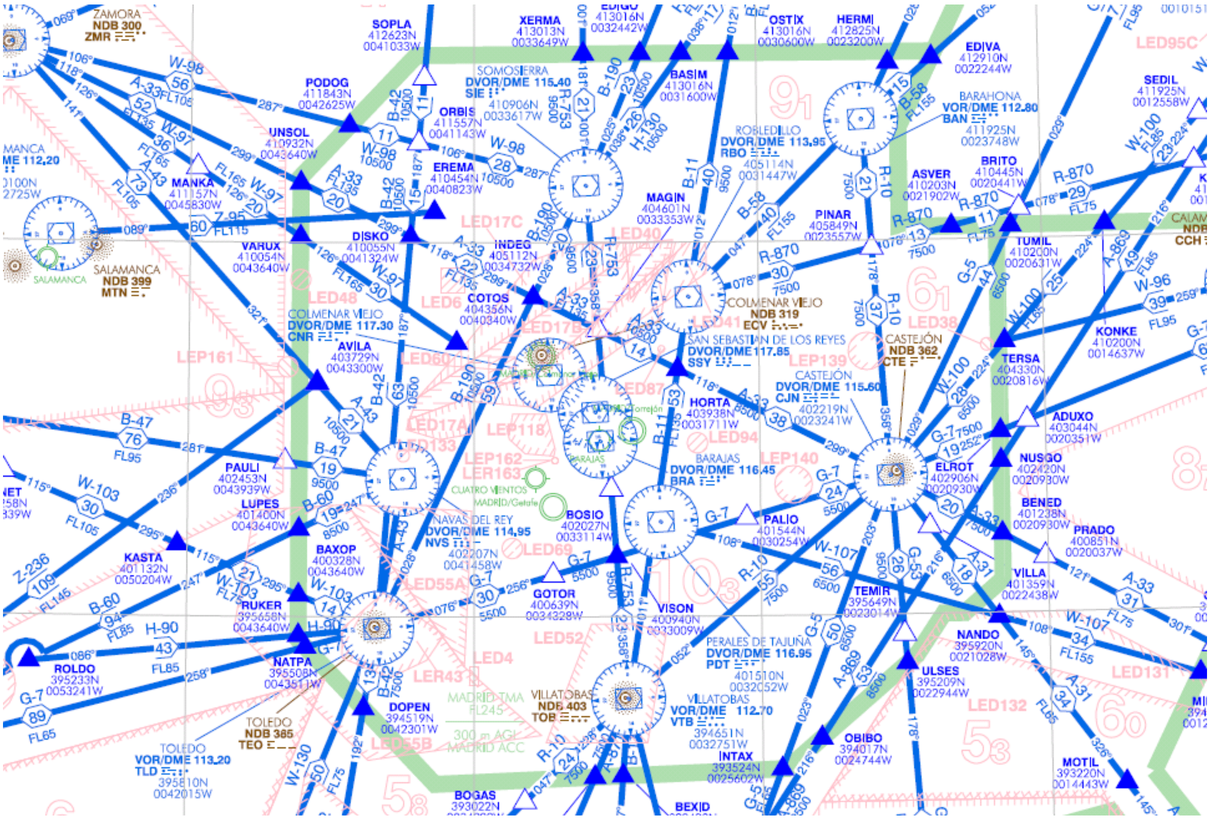


Figure 13: Madrid TMA Chart

3.14.2Actual ATM Organization

Depending on the traffic origin, the Madrid TMA STARS in North Configuration are:
• **ADUXO ONE DELTA ARRIVAL (ADUXO1D). B-RNAV.**

Traffic arriving from the airways: A-869, UN-869, UN-975 and G-7 will proceed by ADUXO reporting point, after MD001 waypoint, following by SIRGU reporting point (clearance limit), to achieve ASBIN reporting point (IAF).
• **BARAHONA THREE DELTA ARRIVAL (BAN3D).**

Traffic arriving from the airways: R-10, UN-10 and UN-857 will proceed by VOR/DME BAN, after PINAR reporting point and following RDL-178 BAN till 29.7 DME BAN and after following RDL-047 PDT they will achieve BUDOM reporting point (clearance limit). Finally, following RDL-047 PDT till 29.5 DME PDT and RDL-030 VTB till 34.2 DME VTB and RDL-091 PDT will achieve ASBIN reporting point (IAF).

• **BARDI ONE CHARLIE ARRIVAL (BARDI1C).**
Traffic arriving from the airways: B-47 and UM-191 will proceed by BARDI reporting point, after they will achieve VOR/DME TLD and following RDL-131 TLD till 15.9 DME TLD and RDL-228 PDT, they will achieve BUREX reporting point (clearance limit) and finally TOBEK reporting point (IAF).

• **MORAL ONE CHARLIE ARRIVAL (MORAL1C).**
Traffic arriving from the airways: B-11, UN-865 will proceed by MORAL reporting point, RDL-149/24.3 DME TLD, RDL-228 PDT, BUREX reporting point (clearance limit) and finally TOBEK reporting point (IAF).

• **NASOS ONE DELTA ARRIVAL (NASOS1D).**
Traffic arriving from the airways: G-5, UL-27 and UN-869 will proceed by NASOS reporting point, SIRGU reporting point (clearance limit) and finally ASBIN reporting point (IAF).

• **ORBIS ONE CHARLIE ARRIVAL (ORBIS1C).**
Traffic arriving from the airways: B-42 and UN-864 will proceed by ORBIS reporting point, DVOR/DME NVS (clearance limit), RDL-110/36.4 DME NVS, RDL-228 PDT and finally TOBEK reporting point (IAF).

• **PRADO ONE DELTA ARRIVAL (PRADO1D).**
Traffic arriving from the airways: A-33 and UN-733 will proceed by PRADO reporting point, RDL-121/13.5 DME CJN, RDL-091 PDT, SIRGU reporting point (clearance limit) and finally ASBIN reporting point (IAF).

• **SOTUK ONE CHARLIE ARRIVAL (SOTUK1C)**
Traffic arriving from the airways: W/UW-130 and UZ-165 will proceed by SOTUK reporting point, BUREX reporting point (clearance limit) and finally TOBEK reporting point (IAF).

• **TERSA ONE DELTA ARRIVAL (TERSA1D).**
Traffic arriving from the airways: W/UW-96 and W/UW-100 will proceed by TERSA reporting point, DVOR/DME CJN, SIRGU reporting point (clearance limit) and finally ASBIN reporting point (IAF).

• **TERSA ONE ZULU ARRIVAL (TERSA1Z).**

Traffic arriving from the airways: W/UW-96 and W/UW-100 will proceed by TERSA reporting point, RDL-101/27.8 DME RBO, RDL-047 PDT, BUDOM reporting point (clearance limit), RDL-047/29.5 DME PDT, RDL-030/34.2 DME VTB, RDL-091 PDT and finally ASBIN reporting point (IAF).

• **TOLEDO ONE CHARLIE ARRIVAL (TLD1C).**
Traffic arriving from the airways: G-7, H/UH-90, UN-858 and W/UW-103 will proceed by VOR/DME TLD, RDL-131/15.9 DME TLD, RDL-228 PDT, BUREX reporting point (clearance limit) and finally TOBEK reporting point (IAF).

• **VILLA ONE DELTA ARRIVAL (VILLA1D).**
Traffic arriving from the airways: A-31 and UL-150 will proceed by VILLA reporting point, RDL-145/8.3 DME CJN, RDL-091 PDT, SIRGU reporting point (clearance limit) and finally ASBIN reporting point (IAF).

• **ZAMORA THREE CHARLIE ARRIVAL (ZMR3C).**
Traffic arriving from the airways: A-33, A-43, G-52, UL-155, UM-30, UN-733, UN-745, UN-873, R-107 and W/UW-106 will proceed by DVOR/DME ZMR, AVILA reporting point, DVOR/DME NVS (clearance limit), RDL-110/36.4 DME NVS, RDL-228 PDT and finally TOBEK reporting point (IAF).

All these STAR procedures are shown in the next page figure:

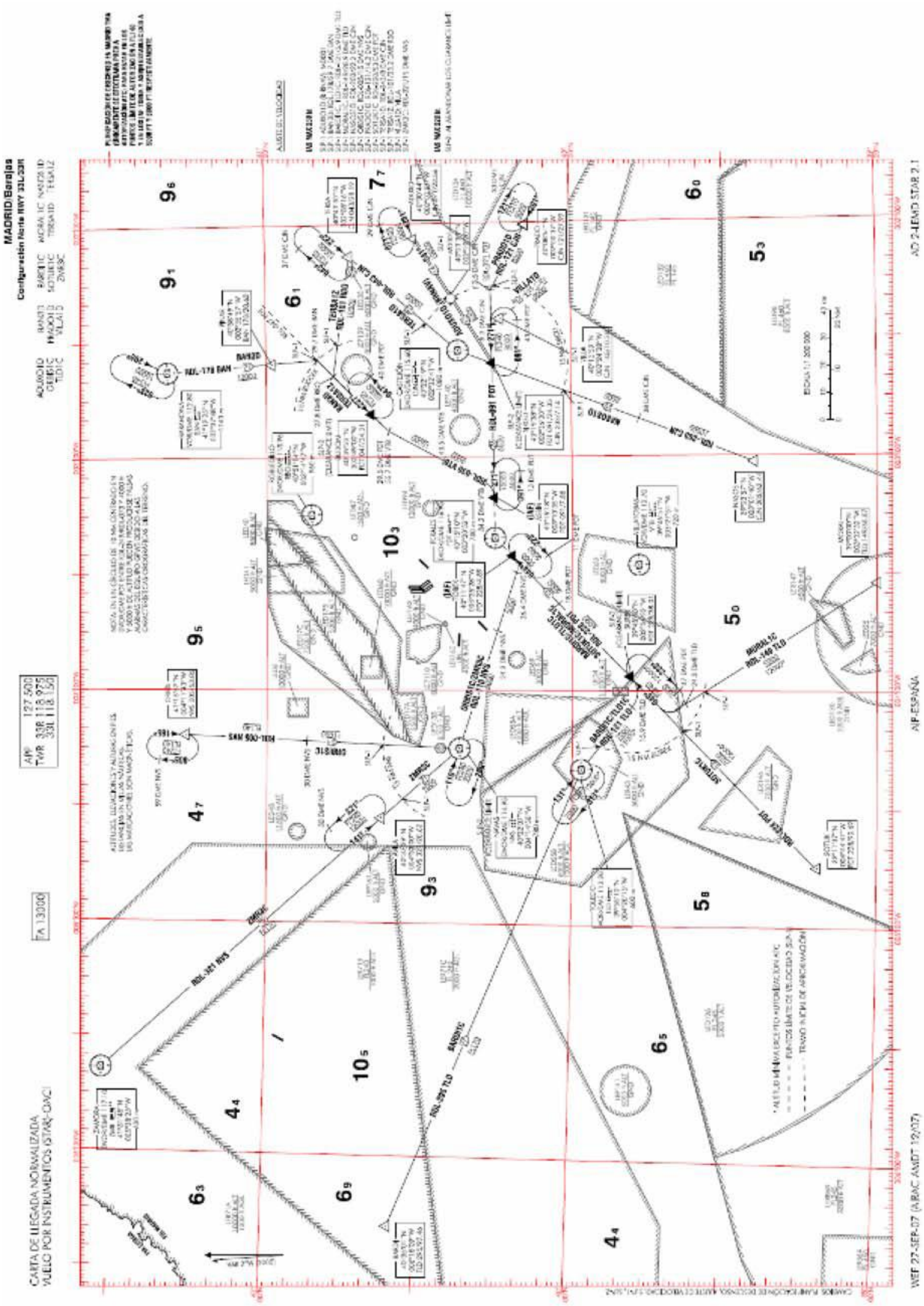


Figure 14: Madrid-Barajas STAR Chart, North Configuration

In the same way, for the **South Configuration**, the airport is provided with Standard Instrument Arrivals (STAR) for Runways 18L/18R.

Note that it is applicable to all the STAR: that the descent planning in Madrid TMA (will be only done with prior ATC clearance) to be over the clearance limit points at FL 160 and over established IAF TAGOM and LALPI at 10000 ft and 11000 ft respectively.

Depending on the traffic origin, the Madrid TMA STARS in South Configuration are:

• **ADUXO ONE BRAVO ARRIVAL (ADUXO1B).**
Traffic arriving from the airways: A-869, UN-869, UN-975 and G-7 will proceed by ADUXO reporting point, RDL-071/11.6 DME CJN, RDL-123 RBO, BUDOM reporting point (clearance limit), DVOR/DME RBO, RDL-333/8.1 DME RBO, RDL-243 BAN and finally TAGOM reporting point (IAF).

• **BARAHONA THREE BRAVO ARRIVAL (BAN3B).**
Traffic arriving from the airways: R-10, UN-10 and UN-857 will proceed by VOR/DME BAN, OBIKI reporting point (clearance limit) and finally TAGOM reporting point (IAF).

• **BARDI ONE ALPHA ARRIVAL (BARDI1A). B-RNAV.**
Traffic arriving from the airways: B-47 and UM-191 will proceed by BARDI reporting point, VOR/DME BBI, MD003 waypoint, EREMA reporting point (clearance limit) and finally LALPI reporting point (IAF).

• **MORAL ONE ALPHA ARRIVAL (MORAL1A). B-RNAV.**
Traffic arriving from the airways: B-11 and UN-865 will proceed by MORAL reporting point, VOR/DME TLD, DVOR/DME NVS, EPINA reporting point (clearance limit) and finally LALPI reporting point (IAF).

• **NASOS ONE ALPHA ARRIVAL (NASOS1A).**
Traffic arriving from the airways: G-5, UL-27 and UN-869 will proceed by NASOS reporting point, DVOR/DME CJN, RDL-331/17.6 DME CJN, RDL-123 RBO, BUDOM reporting point (clearance limit), DVOR/DME RBO, RDL-333/8.1 DME RBO, RDL-243 BAN and finally TAGOM reporting point (IAF).

• **ORBIS FOUR ALPHA ARRIVAL (ORBIS4A). B-RNAV.**
Traffic arriving from the airways: B-42 and UN-864 will proceed by ORBIS reporting point, EREMA reporting point (clearance limit) and finally LALPI reporting point (IAF).

• **ORBIS ONE ZULU ARRIVAL (ORBIS1Z).**
Traffic arriving from the airways: B-42 and UN-864 will proceed by ORBIS reporting point and finally DVOR/DME SIE (IAF) (clearance limit).

• **PRADO ONE ECHO ARRIVAL (PRADO1E).**
Traffic arriving from the airways: A-33 and UN-733 will proceed by PRADO reporting point, DVOR/DME CJN, RDL-331/17.6 DME CJN, BUDOM reporting point (clearance limit), DVOR/DME RBO, RDL-333/8.1 DME RBO, RDL-243 BAN and finally TAGOM reporting point (IAF).

• **SOTUK ONE ALPHA ARRIVAL (SOTUK1A). B-RNAV.**
Traffic arriving from the airways: W/UW-130 and UZ-165 will proceed by SOTUK reporting point, VOR/DME TLD, DVOR/DME NVS, EPINA reporting point (clearance limit) and finally

LALPI reporting point (IAF).

TERSA ONE ECHO ARRIVAL (TERSA1E).
Traffic arriving from the airways: W/UW-96 and W/UW-100 will proceed by TERSA reporting point, RDL-043/10.6 DME CJN, RDL-123 RBO, BUDOM reporting point (clearance limit), DVOR/DME RBO, RDL-333/8.1 DME RBO, RDL-243 BAN and finally TAGOM reporting point (IAF).

• **TOLEDO THREE ALPHA ARRIVAL (TLD3A). B-RNAV.**
Traffic arriving from the airways: G-7, H/UH-90, UN-858 and W/UW-103 will proceed by VOR/DME TLD, DVOR/DME NVS, EPINA reporting point (clearance limit) and finally LALPI reporting point (IAF).

• **TOLEDO ONE ZULU ARRIVAL (TLD1Z).**
Traffic arriving from the airways: G-7, H/UH-90, UN-858 and W/UW-103 will proceed by VOR/DME TLD, DVOR/DME NVS, EPINA reporting point and finally DVOR/DME SIE (IAF) (clearance limit).

• **VILLA ONE ECHO ARRIVAL (VILLA1E).**
Traffic arriving from the airways: A-31 and UL-150 will proceed by VILLA reporting point, DVOR/DME CJN, RDL-331/17.6 DME CJN, RDL-123 RBO, BUDOM reporting point (clearance limit), DVOR/DME RBO, RDL-333/8.1 DME RBO, RDL-243 BAN and finally TAGOM reporting point (IAF).

• **ZAMORA THREE ALPHA ARRIVAL (ZMR3A). B-RNAV.**
Traffic arriving from the airways: A-33, A-43, G-52, UL-155, UM-30, UN-733, UN-745, UN-873, R-107 and W/UW-106 will proceed by DVOR/DME ZMR, MD002 waypoint, EREMA reporting point (clearance limit) and finally LALPI reporting point (IAF).

All these STAR procedures are shown in the following figure:

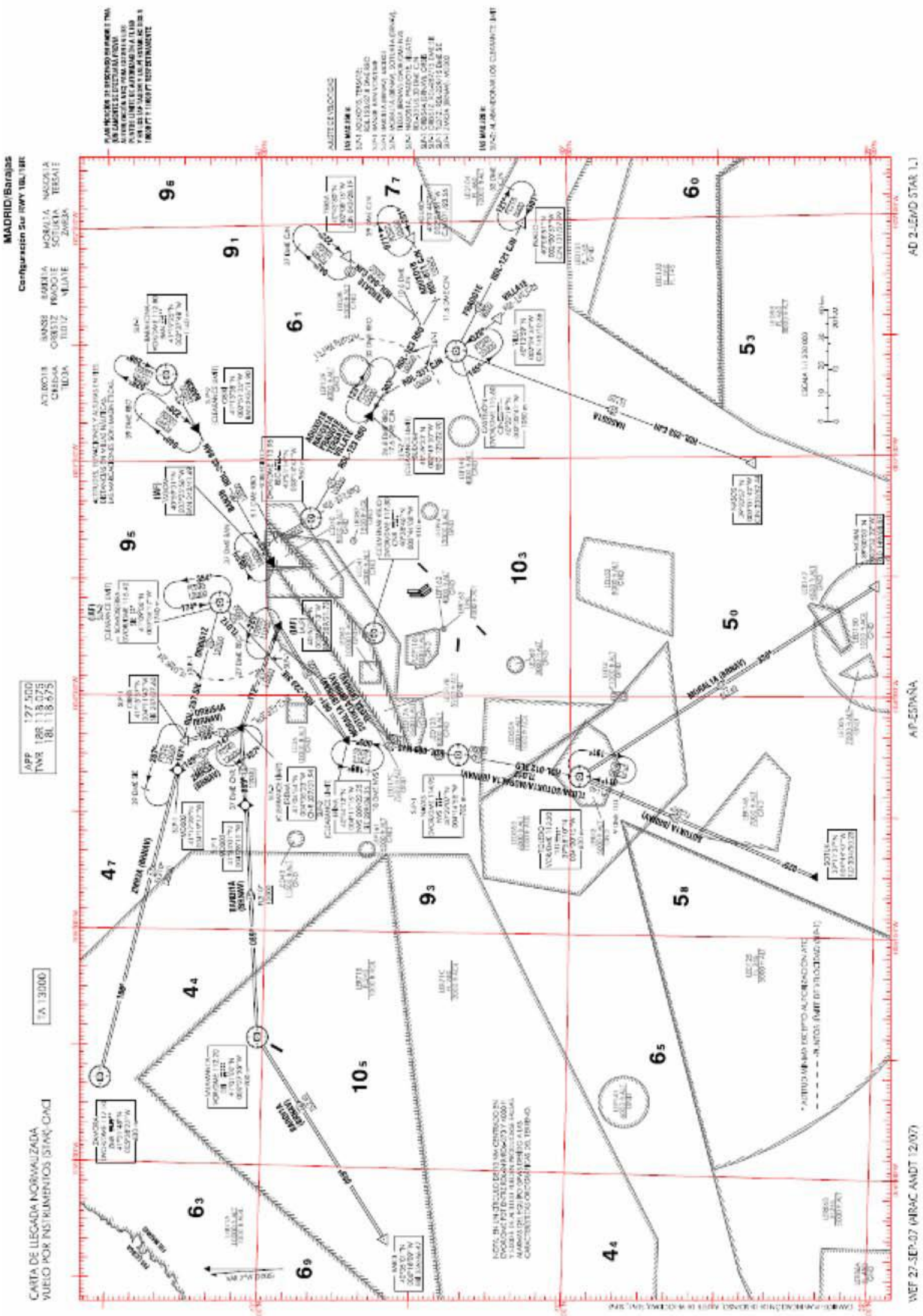


Figure 15: Madrid-Barajas STAR Chart, South Configuration

ATZ Characteristics

The air traffic control for the ATZ at Madrid –Barajas airport is provided through three air control towers giving service to the four RWYs.

The following figure shows the three control towers location in the Madrid airport.

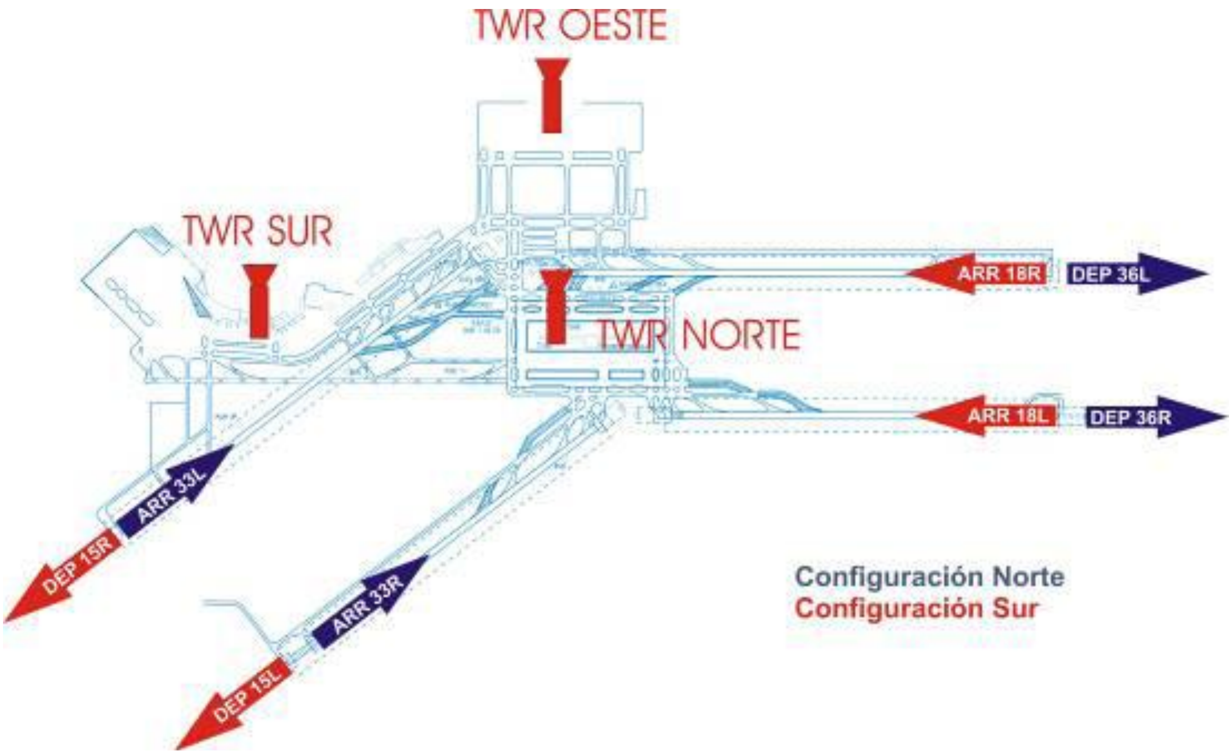


Figure 16: Madrid-Barajas airport layout and Control towers location

Surveillance

The surveillance System is on charge of the detection, tracking and identification of the aircraft in their own trajectories in order to avoid potential conflicts.
The RADAR stations providing the service for the surface surveillance are SMR, model Terma Scanter X installed in 1998
In terms of surveillance the Madrid TMA Radar Network is in accordance with the EUROCONTROL standards (Double SSR coverage and simple PSR). The table 2.3-2 shows the MSSR threefold coverage and double PSR coverage from the 4000 ft. On the other hand the table 2.3-3 shows the Radar stations used in route by the Madrid-Barajas ATC and the minima applicable (MSRH) for the potential use combinations. There is also shown a summary with the RADAR TMA technical characteristics.

SELECTION RADAR	MAIN RADARS			MSRH RANGE		REFRESHING PERIOD
	MODE	TYPE	RANGE	0-30 NM	30-100 NM	
MULTIRADAR	Completo	N/A	N/A	2,9 NM	3,7 NM	3,8 s
	Degradado	N/A	N/A	2,9 NM	3,7 NM	--
MONORADAR	Paracuellos 1	PSR / MSSR	80 / 120 NM	2,8 NM	3,5 NM	3,8 s
	Paracuellos 2	PSR / MSSR	60 / 120 NM	2,8 NM	3,5 NM	5,3 s
	Alcolea	MSSR	250 NM	3,7 NM	3,7 NM	7,6 s

Table A1.1-2. Radar Performances in the Madrid TMA

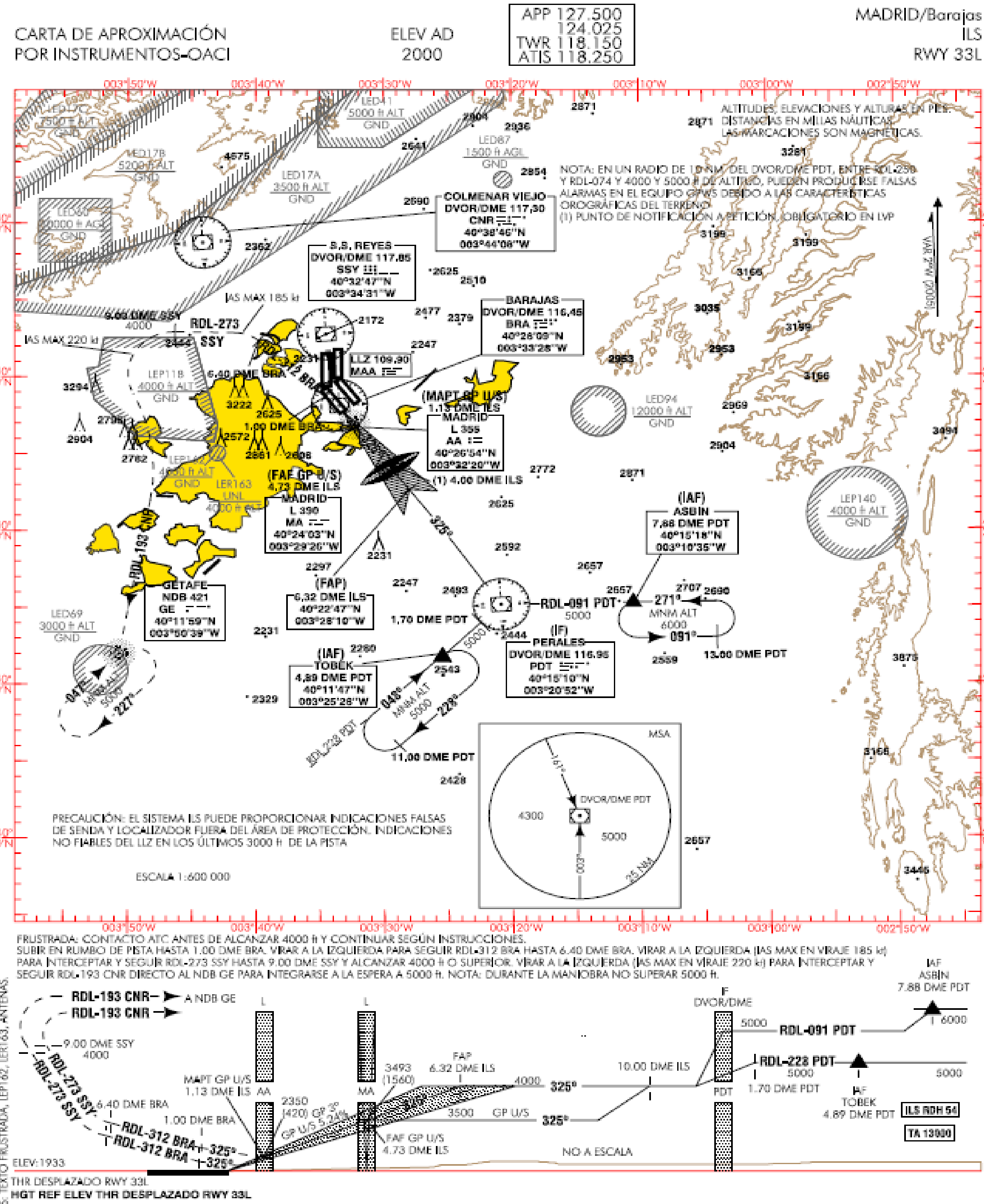
Allocation	Station Type	ATC Service Covered
Paracuellos I	PSR	Madrid ACC Madrid APP Madrid /Barajas TWR
	MSSR	
Paracuellos II	PSR	Madrid ACC Madrid APP Madrid /Barajas TWR
	MSSR	

Figure 17: Route Radar Stations for Madrid / Barajas

3.14.3Instrument Approach Procedures

There are eight approaches charts for the Madrid-Barajas airport, one non precision approach and another precision approach for the runways 18R, 18L, 33R and 33L. The precision approaches are ILS CAT III for all the runways. The non precision approaches are VOR based for all the runways. Holding patterns (TOBEK, ASBIN, LALPI and TAGOM) are tactical, and its use is limited to contingency cases. The charts of these procedures are shown below.

3.14.3.1Precision approach chart. Madrid-Barajas Runway 33L



OCA/H		A	B	C	D
STA	CAT I	2183 (250)	2195 (262)	2203 (270)	2214 (281)
	CAT II	(138)	(155)	(168)	(181)
	CAT III	APPROVED			
	GP U/S	2350 (420)			
En circuito (H) sobre 2000		2690 (690)	2760 (760)	3280 (1280)	3620 (1620)

GS	kt	80	100	120	140	160	180
FAP-THR: 6,32 NM	min:s	4:45	3:48	3:10	2:43	2:22	2:06
FAF-MAPT: 3,60 NM	min:s	2:42	2:10	1:48	1:33	1:21	1:12
ROD: 5,24 %	ft/min	425	531	637	743	849	955

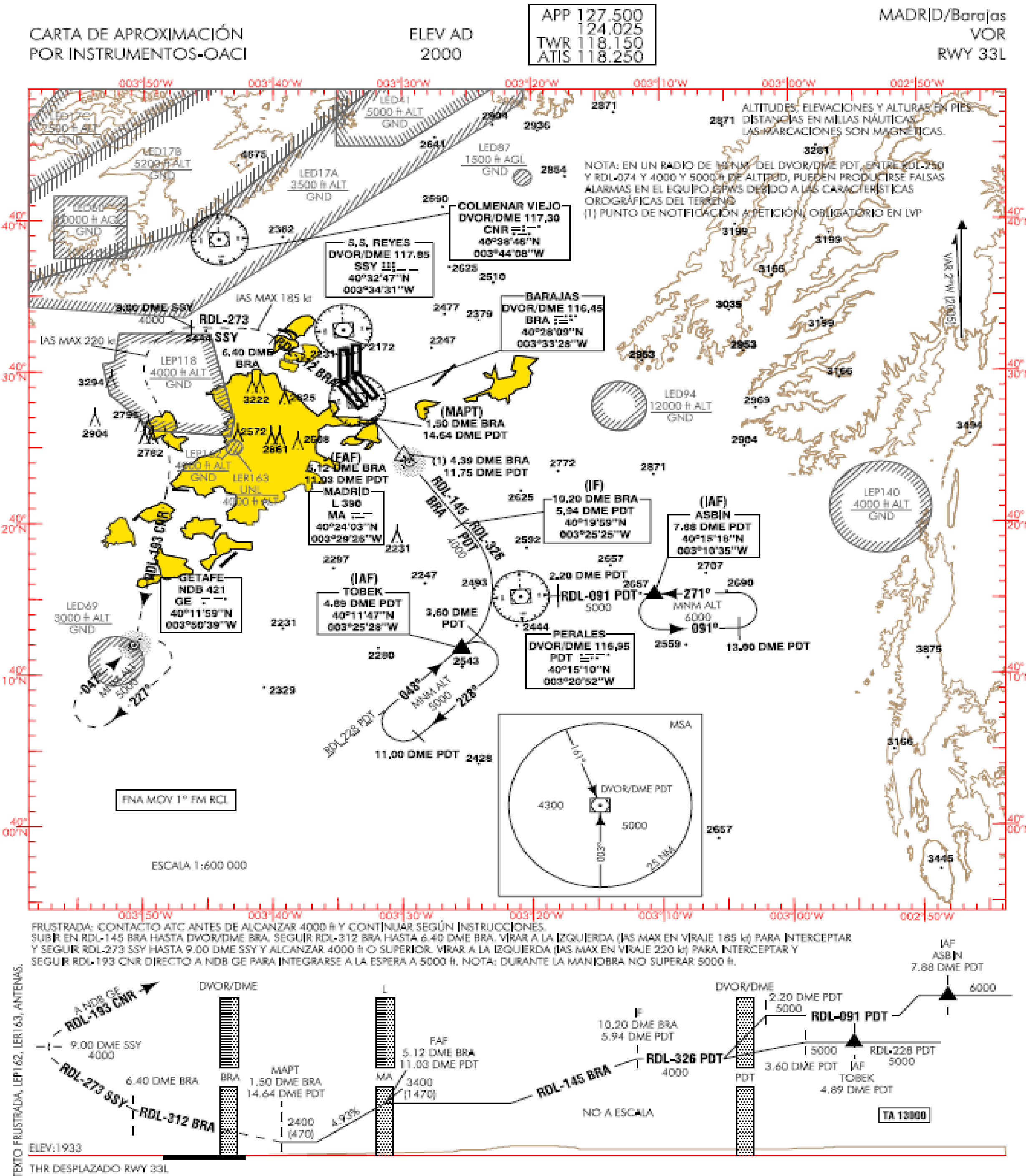
ALT/HGT DME (ILS) FNA GP U/S

13 DME	12 DME	11 DME	10 DME	9 DME	8 DME	7 DME	6 DME	5 DME	4 DME	3 DME	2 DME	1 DME
									3270 (1340)	2950 (1020)	2630 (700)	

22-NOV-07 (AMDT 164/07) AIP-ESPAÑA AD 2-LEMD IAC/1

Figure 18: Precision approach chart. Madrid-Barajas Runway 33L

3.14.3.2Non Precision approach chart. Madrid-Barajas Runway 33L



THR DESPLAZADO RWY 33L
HGT REF ELEV THR DESPLAZADO RWY 33L

OCA/H		A	B	C	D
STA	2.5%	2400 (470)			
En circuito (H) sobre 2000		2690 (690)	2760 (760)	3280 (1280)	3620 (1620)

GS	kt	80	100	120	140	160	180
FAF-THR:	min:s						
FAF-MAPT: 3,62 NM	min:s	2:43	2:10	1:49	1:33	1:21	1:12
ROD: 4,93 %	ft/min	399	499	599	699	799	899

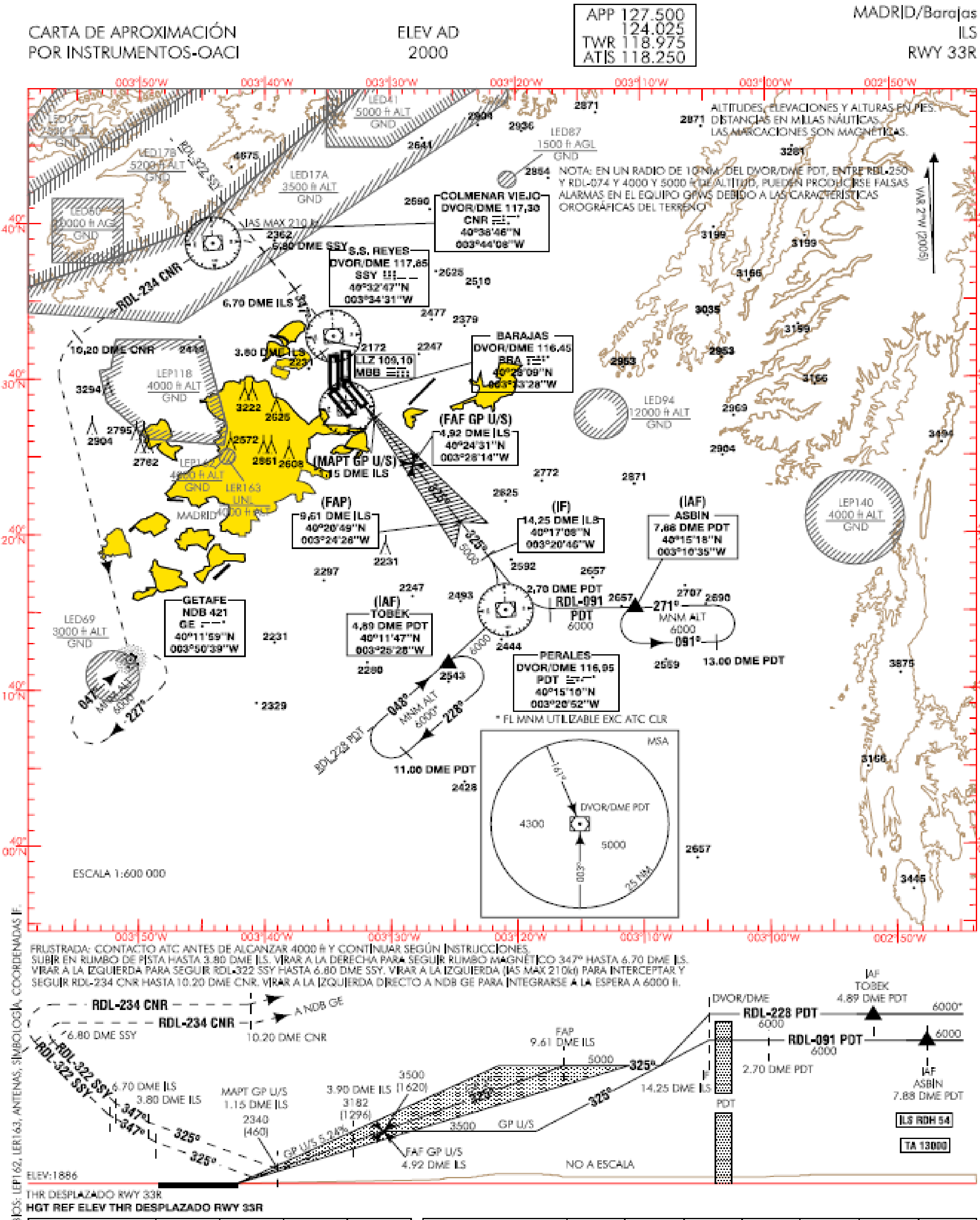
ALT/HGT DME (BRA) FNA

13 DME	12 DME	11 DME	10 DME	9 DME	8 DME	7 DME	6 DME	5 DME	4 DME	3 DME	2 DME	1 DME
								3370 (1440)	3070 (1140)	2770 (840)	2470 (540)	

22-NOV-07 (AMDT 164/07) AIP-ESPAÑA AD 2-LEMD IAC/2

Figure 19: Non Precision approach chart. Madrid-Barajas Runway 33L

3.14.3.3Precision approach chart. Madrid-Barajas Runway 33R



OCA/H		A	B	C	D
STA	CAT I	2074 (188)	2086 (200)	2094 (208)	2105 (219)
	CAT II	(78)	(95)	(107)	(121)
	CAT III	APPROVED			
	GP U/S	2340 (460)			
En circuito (H) sobre 2000		2690 (690)	2760 (760)	3280 (1280)	3620 (1620)

GS	kt	80	100	120	140	160	180
FAP-THR: 9,61 NM	min:s	7:12	5:46	4:48	4:07	3:36	3:12
FAF-MAPT: 3,77 NM	min:s	2:50	2:16	1:53	1:37	1:25	1:15
ROD: 5,24 %	ft/min	425	531	637	743	849	955

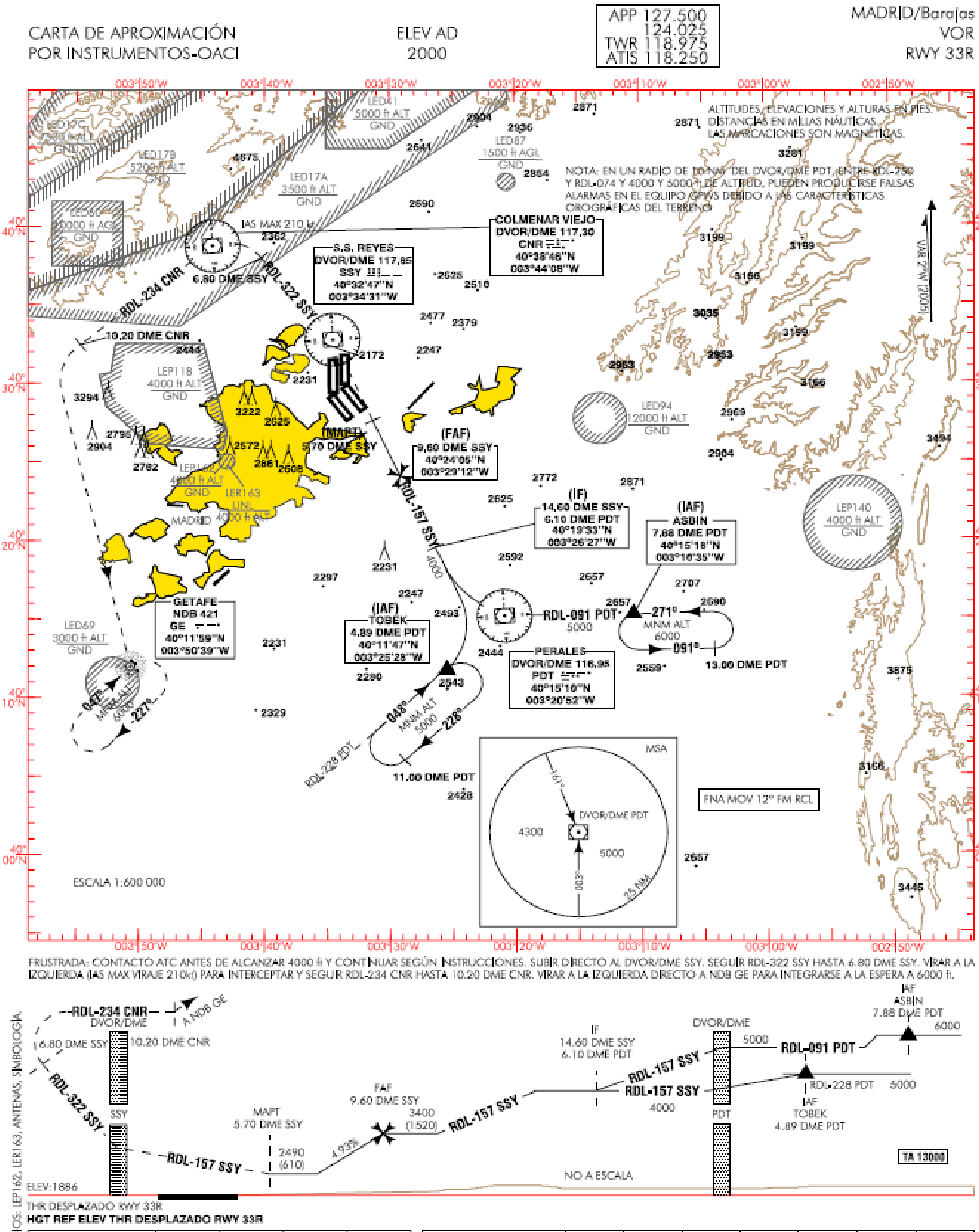
ALT/HGT DME (ILS) FNA GP U/S

13 DME	12 DME	11 DME	10 DME	9 DME	8 DME	7 DME	6 DME	5 DME	4 DME	3 DME	2 DME	1 DME
									3220 (1340)	2900 (1020)	2580 (700)	

22-NOV-07 (AMDT 164/07) AIP-ESPAÑA AD 2-LEMD IAC/3

Figure 20: Precision approach chart. Madrid-Barajas Runway 33R

3.14.3.4 Non Precision approach chart. Madrid-Barajas Runway 33R



HGT REF ELEV THR DESPLAZADO RWY 33R

OCA/H		A	B	C	D
STA	2.5%	2490 (610)			
En circuito (H) sobre 2000		2690 (690)	2760 (760)	3280 (1280)	3620 (1620)

GS	kt	80	100	120	140	160	180
FAP-THR:	min:s						
FAF-MAPT: 3,90 NM	min:s	2:56	2:20	1:57	1:40	1:28	1:18
ROD: 4,93 %	ft/min	399	499	599	699	798	898

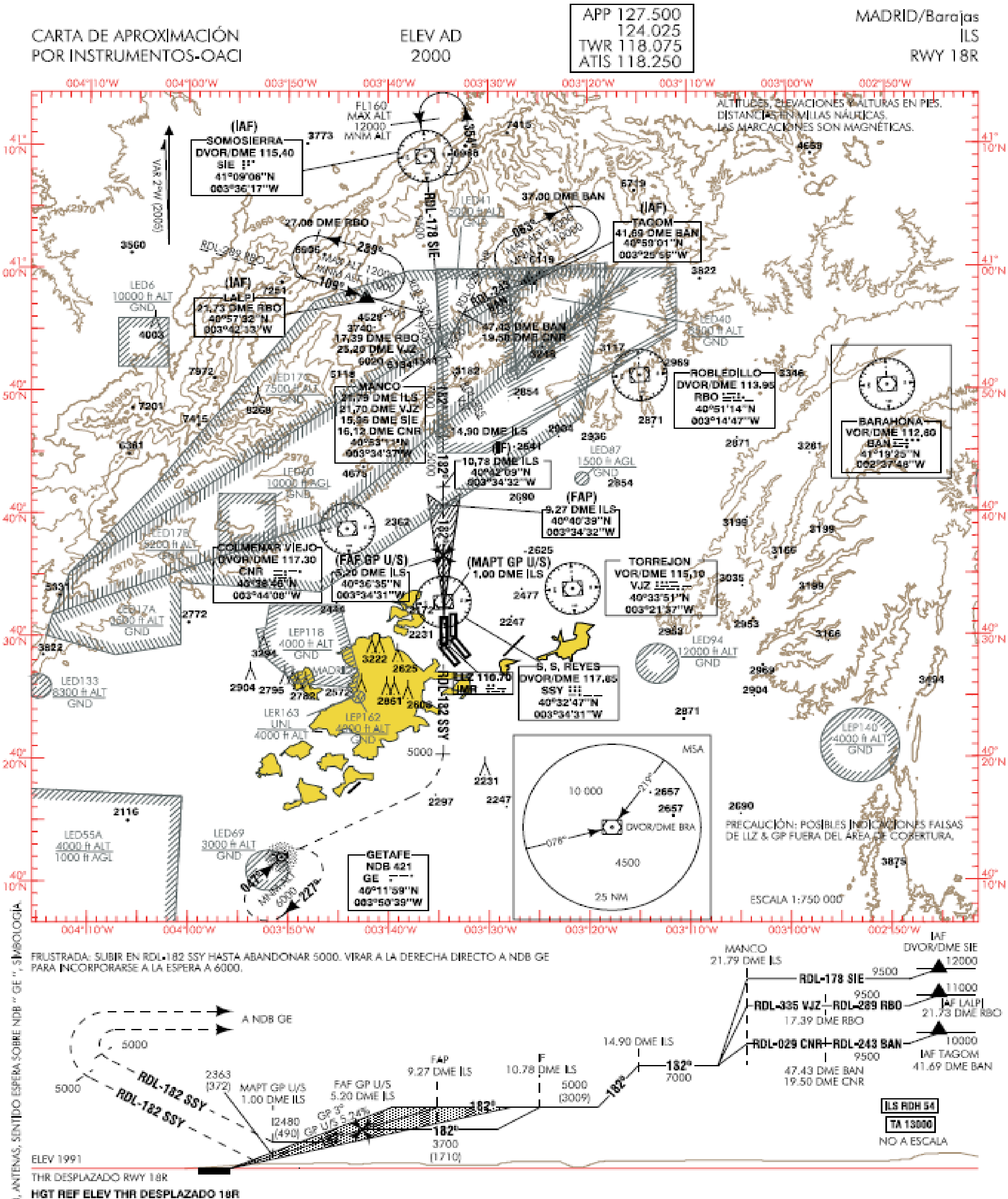
ALT/HGT DME (SSY) FNA

13 DME	12 DME	11 DME	10 DME	9 DME	8 DME	7 DME	6 DME	5 DME	4 DME	3 DME	2 DME	1 DME
				3230 (1350)	2930 (1050)	2630 (750)						

22-NOV-07 (AMDT 164/07) AIP-ESPAÑA AD 2-LEMD IAC/4

Figure 21: Non-Precision approach chart. Madrid-Barajas Runway 33R

3.14.3.5Precision approach chart. Madrid-Barajas Runway 18R



OCA/H		A	B	C	D
STA	CAT I	2149 (158)	2161 (170)	2169 (178)	2179 (188)
	CAT II	(67)	(83)	(95)	(110)
	CAT III	APPROVED			
	GP U/S	2480 (490)			
En circuito (H) sobre 2000		2690 (690)	2760 (760)	3280 (1280)	3620 (1620)

GS	kt	80	100	120	140	160	180
FAP-THR: 9,28 NM	min:s	6:58	5:34	4:38	3:59	3:29	3:06
FAF-MAPT: 4,20 NM	min:s	3:09	2:31	2:06	1:48	1:35	1:24
ROD: 5,24%	ft/min	425	531	637	743	849	955

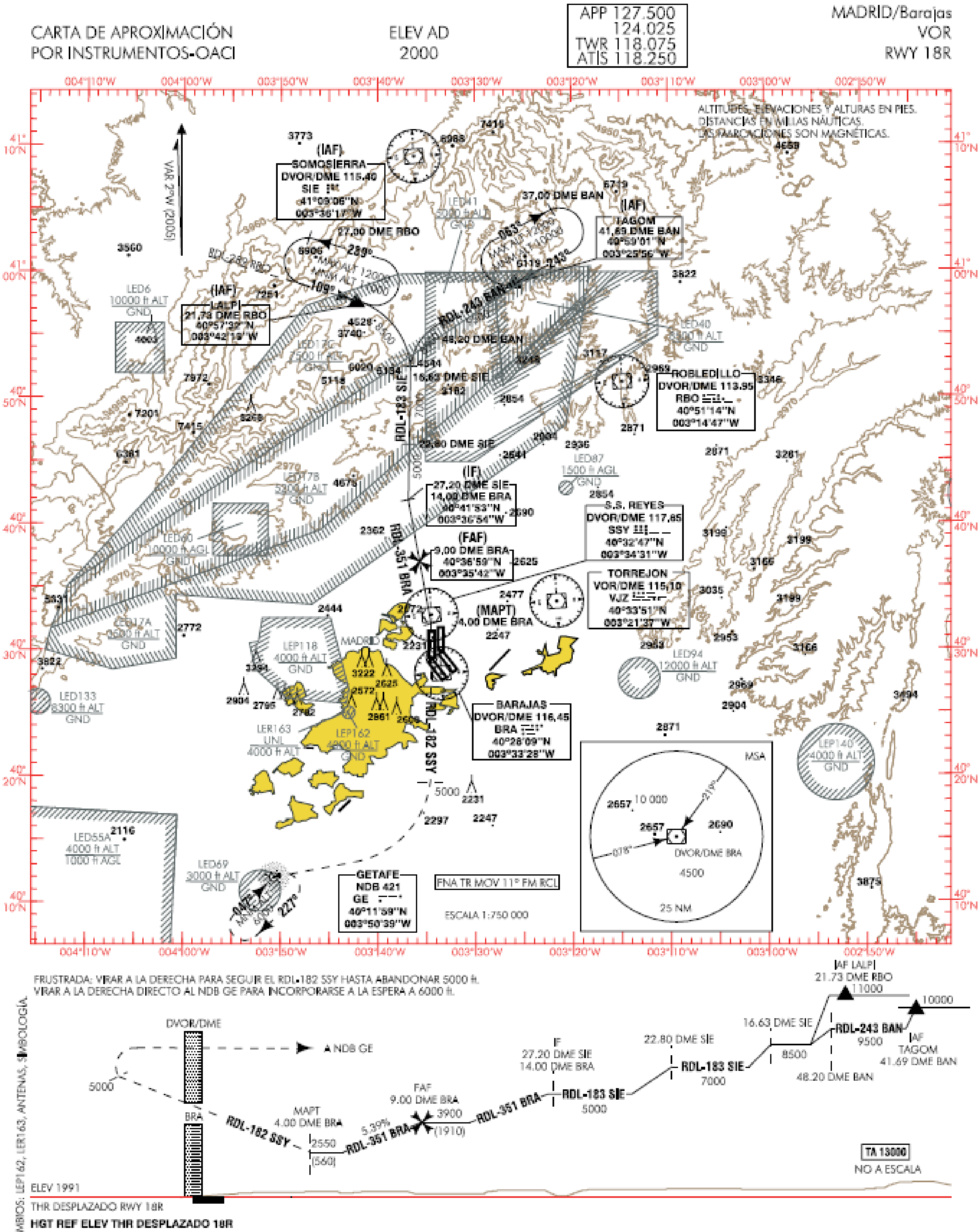
ALT/HGT (ILS) FNA GP U/S

13 DME	12 DME	11 DME	10 DME	9 DME	8 DME	7 DME	6 DME	5 DME	4 DME	3 DME	2 DME	1 DME
								3640 (1650)	3320 (1330)	3010 (1020)	2690 (700)	

20-DEC-07 (AMDT 165/07) AIP - ESPAÑA AD 2- LEMD IAC/5

Figure 22: Precision approach chart. Madrid-Barajas Runway 18R

3.14.3.6 Non Precision approach chart. Madrid-Barajas Runway 18R



HGT REF ELEV THR DESPLAZADO 18R

OCA/H		A	B	C	D
STA	2.5%	2550 (560)			
En circuito (H) sobre 2000		2690 (690)	2760 (760)	3280 (1280)	3620 (1620)

GS	kt	80	100	120	140	160	180
FAP-THR:	min:s						
FAF-MAPT: 5,00 NM	min:s	3:45	3:00	2:30	2:09	1:53	1:40
ROD: 5,39%	ft/min	436	545	655	764	873	982

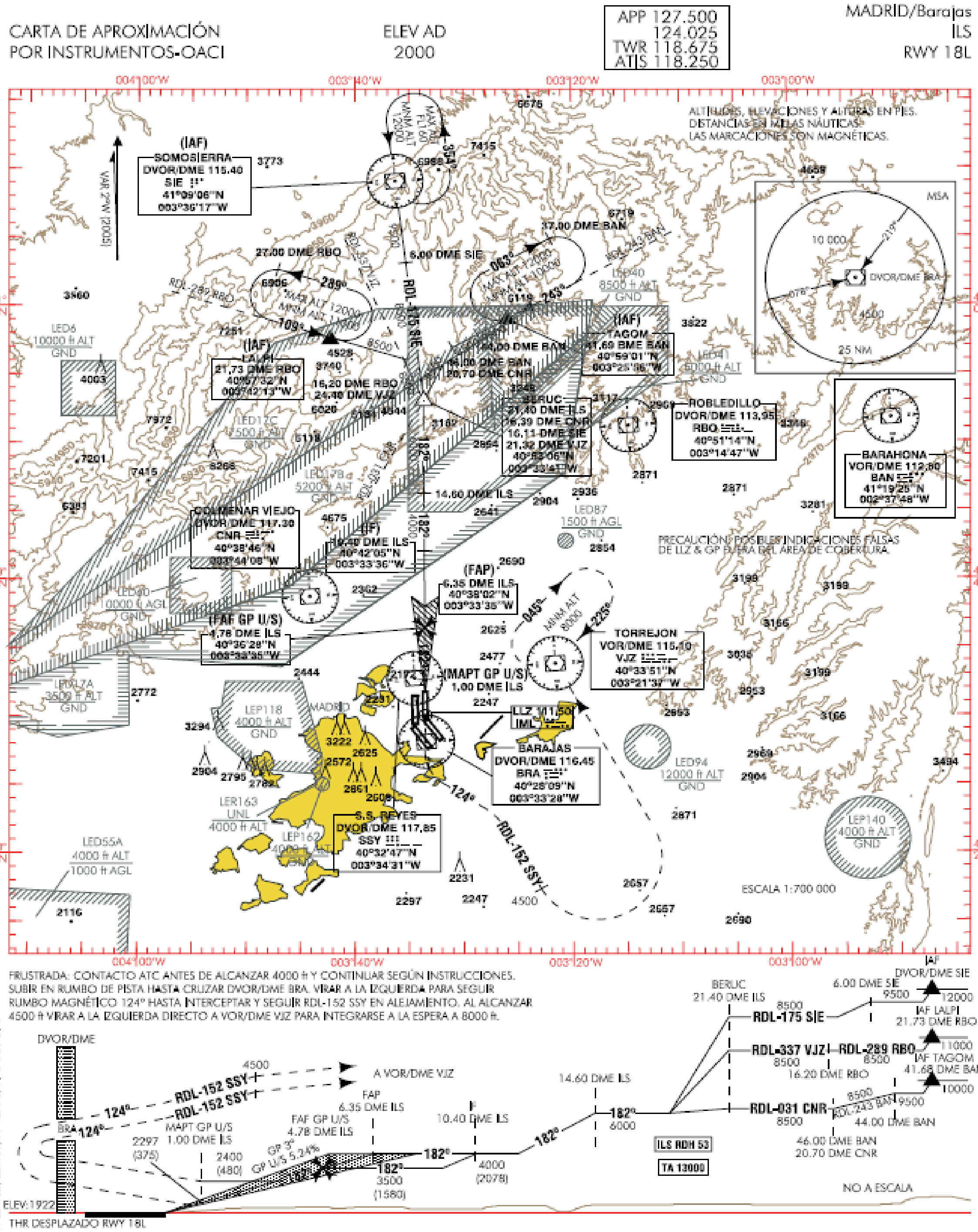
ALT/HGT (BRA) FNA GP U/S

13 DME	12 DME	11 DME	10 DME	9 DME	8 DME	7 DME	6 DME	5 DME	4 DME	3 DME	2 DME	1 DME
					3580 (1590)	3250 (1260)	2920 (930)	2600 (610)				

20-DEC-07 (AMDT 165/07) AIP - ESPAÑA AD 2- LEMD IAC/6

Figure 23: Non-Precision approach chart. Madrid-Barajas Runway 18R

3.14.3.7 Precision approach chart. Madrid-Barajas Runway 18L



THR DESPLAZADO RWY 18L
HGT REF ELEV THR DESPLAZADO RWY 18L

OCA/H		A	B	C	D
STA	CAT I	2091 (169)	2103 (181)	2111 (189)	2122 (200)
	CAT II	(81)	(98)	(110)	(124)
	CAT III	APPROVED			
	GP U/S	2400 (480)			
En circuito (H) sobre 2000		2690 (690)	2760 (760)	3280 (1280)	3620 (1620)

GS	kt	80	100	120	140	160	180
FAP-THR: 6,36 NM	min:s	4:46	3:49	3:11	2:44	2:23	2:07
FAP-MAPT: 3,78 NM	min:s	2:50	2:16	1:53	1:37	1:25	1:16
ROD: 5,24%	ft/min	425	531	637	743	849	955

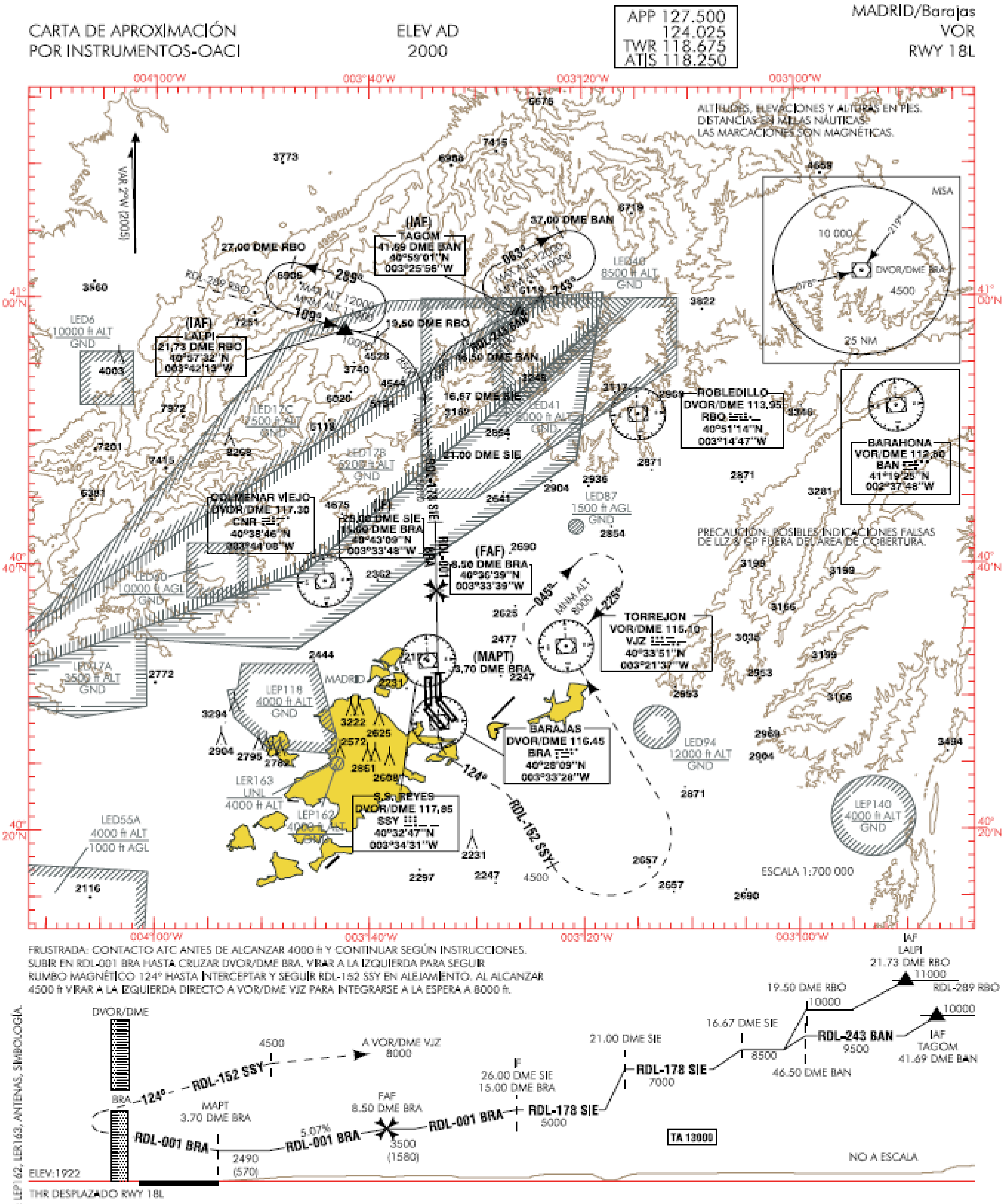
ALT/HGT (ILS) FNA GP U/S

13 DME	12 DME	11 DME	10 DME	9 DME	8 DME	7 DME	6 DME	5 DME	4 DME	3 DME	2 DME	1 DME
									3250 (1330)	2940 (1020)	2620 (700)	

20-DEC-07 (AMDT 165/07) AIP - ESPAÑA AD 2- LEMD IAC/7

Figure 24: Precision approach chart. Madrid-Barajas Runway 18L

3.14.3.8Non Precision approach chart. Madrid-Barajas Runway 18L



THR DESPLAZADO RWY 18L

HGT REF ELEV THR DESPLAZADO RWY 18L

OCA/H		A	B	C	D
STA	2.5%	2490 (570)			
En circuito (H) sobre 2000		2690 (690)	2760 (760)	3280 (1280)	3620 (1620)

GS	kt	80	100	120	140	160	180
FAP-THR:	min:s						
FAP-MAPT: 4,80 NM	min:s	3:36	2:53	2:24	2:03	1:48	1:36
ROD: 5,07%	ft/min	411	513	616	719	821	924

ALT/HGT DME (BRA) FNA

13 DME	12 DME	11 DME	10 DME	9 DME	8 DME	7 DME	6 DME	5 DME	4 DME	3 DME	2 DME	1 DME
					3350 (1430)	3040 (1120)	2730 (810)					

20-DEC-07 (AMDT 165/07) AIP - ESPAÑA AD 2- LEMD IAC/8

Figure 25: Non-Precision approach chart. Madrid-Barajas Runway 18L

3.14.4Populated areas

There are a lot of environmental problems around the Madrid-Barajas airport. A special noise monitoring system of the surrounding areas is used to monitor the excess of noise due to flight operations from Barajas airports. Microphones are placed in several locations to scan the noise performed by the airplanes. The figure below shows the locations of these microphones:

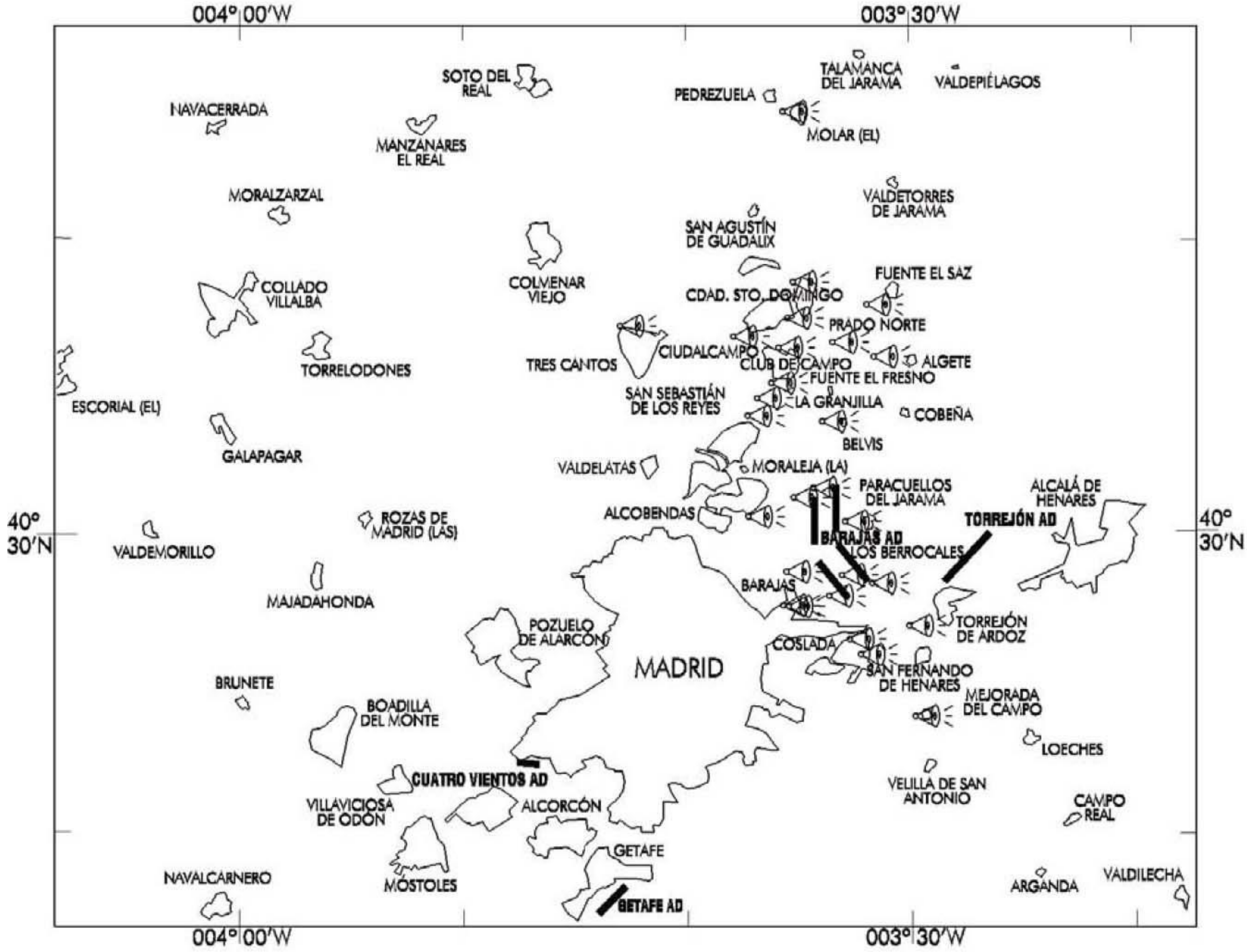


Figure 26: Location of noise sensor system

For this reason, the following **Noise abatement procedures** are put into force:

3.14.5TAKE-OFF:

1.Up to 450 m (1500 ft) above aerodrome elevation:
- Take-off power
- Take-off flaps
- Climb maintaining V2 + 20 to 40 km/h (V2 + 10 to 20 kt) (or limited by fuselage angle).

2. at 450 m (1500 ft):
- Reduce power not less than ascent power.

3. from 450 m (1500 ft) to 900 m (3000 ft):

- Climb maintaining V2 + 20 to 40 km/h (V2 + 10 to 20 kt).

4. at 900 m (3000 ft):
- Accelerate gradually to reach climbing cruising speed with flaps retraction at the propertime.

3.14.6LANDING:

1. The use of reverse thrust above from idle regime is forbidden at night time (2300-0700LT) except for safety reasons; in this case, it must be notified to TWR and the Departamento de Medio Ambiente of the airport.

2. Landing and approach procedures on visual meteorological conditions will be performed with an angle equal to or higher than the ILS GP or PAPI of each runway.

3.14.7Assumptions

Aena will use GENES, NORVASE as FTS (fast time Simulation) platforms. NORVASE will be supported by RTS (Real Time Simulation)

3.14.8Airspace Configuration Characteristics

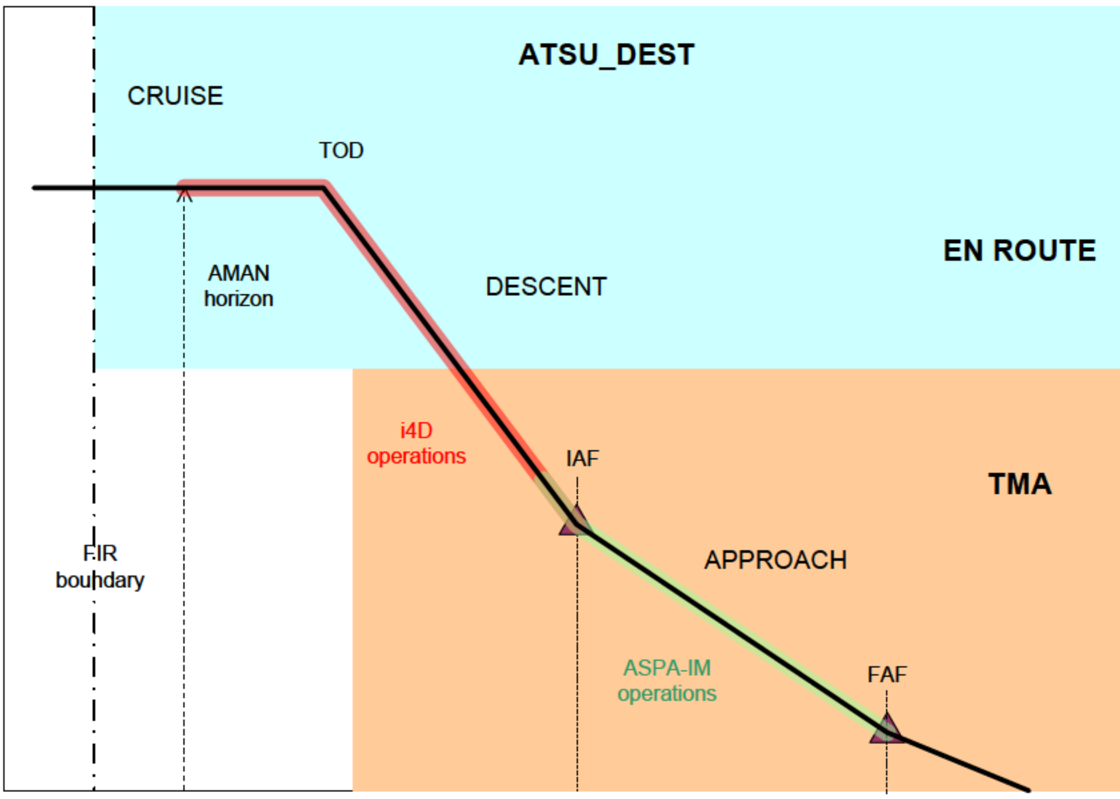


Figure 27: Operational Airspace

3.14.8.1TMA Complexity Case

As an example on how the airspace configuration characteristics is shown below:

	TMA Complexity Case
Environment Characteristic	**High Complexity**
High level characterisation	Maybe capacity constrained for only a short period during the day. At other times there is an environmental driver to provide optimised trajectory profiles where possible. Mainly capacity constrained for large periods throughout the day. May have environmental constraints during quieter periods (e.g. noise pollution during night time operations)
Separation minima (horizontal)	TMA: 3 Nm or wake turbulence separation criteria on approach
Separation minima (vertical)	TMA: 1000 ft
CNS/ATM capabilities	Primary VHF voice communication between ATC and aircraft. Radar controlled airspace. Navigational infrastructure supporting the requirements of the designed procedures.
Airport infrastructure	Multiple major airports within the TMA, at least one of which is operating a single or multiple runways in mixed or segregated mode and identified in the NOP and AIP as 4D operational
Route configuration & complexity	High deployment of RNAV-1 route structures along side more conventional SID, STAR and Approach procedures. The route structure is optimised so as to structurally deconflict arrivals and departures to the maximum extent possible Route complexity is high to the degree that arrivals and departures can interact, as can the arrival streams inbound to different airports. Holding may still be used at peak times (albeit at reduced levels) to maintain runway pressure and avoid losing slots.
Sectorization	Highly sectorized as a result of previous TMA development to handle capacity. The sectors are small and typically have standing agreements to coordinate the presentation of traffic into and out of the sector

Table 6: Airspace Configuration Characteristics

3.14.9Traffic Characteristics

Four scenarios are used to capture four possible futures for aviation.

In 2003 and 2004, EUROCONTROL had a number of discussions with the STATFOR User Group and the steering group for the Challenges to Growth study about scenarios for the future. The main conclusions of these discussions were:

• A single scenario is not sufficient to capture the uncertainty in how the aviation industry will look in 2025;
• Instead, four scenarios drawing on the work of CONSAVE (Ref. 6), ACARE (Ref. 7) and the IPCC (Ref. 8) are more appropriate.

After just two years, these conclusions remain valid, so the structure of the four scenarios in the LTF will be maintained. Each of the four scenarios is a realistic, possible future for the air traffic industry. These futures are qualitatively and quantitatively quite different from each other, but do not represent the most extreme futures in a particular direction. There are two mid-growth scenarios, having different economic circumstances, a high-growth scenario that assumes that few of today's apparent challenges have any real impact on future growth, and a low-growth scenario that explores a less stable World. The four scenarios are:

• Scenario A: Strong economic growth in an increasingly globalised World, with technology used successfully to mitigate the effects of challenges such as the environment and security.
• Scenario B: Moderate economic growth and little change from the status quo, that is, trends continue as currently observed.
• Scenario C: Strong economic growth, but with stronger regulation to address growing environmental challenges for aviation. This means higher costs of travel, so lower demand (than A or B).
• Scenario D: A World with increasing tensions between regions, with knock-on effects of weaker economies, reduced trade and less long-haul travel.

These scenarios are in order from A to D, highest traffic growth (in the 2004 forecast) first. However, this was not an initial assumption; they were simply re-labelled in order once the results were known. As a result, it might be that in the new forecast the scenarios change order: scenarios B and C are the closest, so the most likely to change places.
The following figure gives a qualitative summary of the scenarios.

	ScA	ScB	ScC	ScD
Baseline in 2012 taken from MTF06 scenario				
MTF06 Scenario	↑ High	→ Baseline	→ Baseline	↓ Low
Passenger demand				
Demographics	→ Medium growth	→ Medium growth	→ Medium growth	→ Medium growth
Alternatives to air transport	↓ Slower	↓ Slower	↓ Faster	↓ Faster
Tourism	→ Shift to long-haul	→ No change from trend[2]	→ Shift to short-haul	→ Stronger shift to short haul
Open Skies	↑ EU-N America/Far East Stronger	↑ EU-N America	↑ Within EU	↑ Within EU
Economic factors				
Economy	↑ Highest Growth	↑ Medium Growth	↑ High growth	↑ Low growth
Free Trade	↑ EU-NAFTA/Far East/N Africa Stronger, sooner	↑ EU-NAFTA/Far East	↑ EU- CIS/N Africa Weak effect	→ No change
EU Expansion	→ Very Limited	↑ Fastest	↑ Medium	→ Limited
Price of Travel				
Environmental	↓ Noise costs	↓ Noise & emission costs	↓ Higher noise & emission costs	→ Not significant
Fuel price	→ Neutral	↓ Higher	↓ Higher	↓ Highest
Security	↓ Further cost increases	→ No change	↓ Limited savings	↓ Further cost increases
Other				
Network change	→ No change	→ No change	↑ More hub & spoke	↓ More point-to-point
Market structure	↑ Bizjet growth and larger aircraft.	↑ Some bizjet growth	↓ Larger aircraft Some bizjet growth in long-haul	↑ Smaller aircraft Some bizjet growth
Key: this factor typically will	↑ Add flights	→ Leave Flights unchanged	↓ Reduce flights	

Figure 28: The 4 scenarios for future aviation

Annual traffic in the traffic zone and 2006-2025 average annual growth

		2003	2004	2005	2012	2015	2020	2025	AAGR 2025/ 2005	Traffic Multiple 2025/ 2005
Spain	ScA	.	.	.	2,250	2,557	2,990	3,353	**3.9%**	**2.1**
	ScB	.	.	.	2,098	2,350	2,725	3,055	**3.4%**	**2.0**
	ScC	1,385	1,470	1,561	2,098	2,305	2,687	3,036	**3.4%**	**1.9**
	ScD	.	.	.	2,004	2,193	2,530	2,894	**3.1%**	**1.9**

Table 7: Annual traffic in the traffic zone and 2006-2025 average annual growth

Annual growth rates in the traffic zone and 2006-2025 average annual growth.

		2004	2005	2012	2015	2020	2025	AAGR 2025/ 2005	Traffic Multiple 2025/ 2005
Spain	ScA	.	.	5.4%	4.4%	3.2%	2.3%	**3.9%**	**2.1**
	ScB	.	.	4.3%	3.8%	3.0%	2.3%	**3.4%**	**2.0**
	ScC	6.2%	6.2%	4.3%	3.2%	3.1%	2.5%	**3.4%**	**1.9**
	ScD	.	.	3.6%	3.1%	2.9%	2.7%	**3.1%**	**1.9**

Table 8: Annual growth rates in the traffic zone and 2006-2025 average annual growth.

3.14.10Aircrafts compliant with P-RNAV

3.14.10.1Airbus

All AIRBUS aircraft are P-RNAV compliant, with exception of A300B2-B4 without GNLU.

Flight Manuals are being updated through the issue of Temporary Revision to customers.[1]

[1] (***Note***: *In addition to compliance statements from Original Equipment Manufacturer (OEM), Equipment Installers, Holders of Supplemental Type Certificates (STC), who could be the Operator, may achieve compliance by means of modification to an existing aircraft navigation system. Eurocontrol AFN User Support cell will endeavour to maintain a database, available at P-RNAV Web page, of all P-RNAV Airworthiness compliant & Operational approved aircraft. The value of the database will be dependent on Eurocontrol being kept advised of Approvals by State Authorities or Operators.*)

3.14.10.2ATR

All ATR 42/72 models: 42-200, 42-300, 42-320, 42-400, 42-500, 72-101, 72-201, 72-202, 72-211, 72-212, 72-212A are compliant with P-RNAV according to TGL 10, provided they are equipped with simple or dual GNSS (HT1000) software load -060. Service bulletins are available for retrofit. Visit the ATR websites at: http://www.atr.fr/ or http://www.aerochain.com

3.14.10.3BAe

- **146/RJ**[2]

3.14.10.4Boeing

The following aircraft delivered with Flight Management Computers installed, together with their installed sensors, control display units and navigation displays in their various certified production versions, are considered P- RNAV compliant based on criteria contained in JAA TGL10.

- **B717**
- **B737/300/400/500/600/700/800/900** (***Note***: *The Baseline through U6.2 series FMC's provide the required 21 functions. F or 737 Non-EFIS installation, the airline flight crew procedure must restrict P-RNAV operations to LNAV (Flight Director, or Autopilot command), since P-RNAV accuracy compliance is not assured with just CDI guidance. Update 7,8 or 10 Series FMC installations comply with all 21 required functions and most recommended functions. The ref /E/Boeing Service Bulletin provides for installation of the U10 series FMC for all 737-3/4/5 airplanes. The U10 series FMC is basic on the 737-6/7/8/900 airplanes. Certain RNP procedures may require dual FMC installations and/or GPS sensor installations. Boeing offers retrofit upgrade from single to dual FMC as well as GPS installations for all 737 airplanes delivered with an FMC installed.*)
- **B747 /400**
- **B757/ B767** (***Note***: *All 757/767 airplanes comply with the required P-RNAV functions. A few recommended functions are not supported in some FMC baseline PIP (product improvement package) and non-PIP installations. 757 and 767 airplanes equipped with the Pegasus FMC can be configured to comply with all required and recommended P-RNAV functions.*)
- **B777**
- **MD80** (***Note***: *MD-80 equipped with an FMS comply with the 21 required functions as well as recommended functions 1 through 4 and part of function 6 (RF legs are not supported). Airplanes equipped with the -927 FMC and -906 EFIS will support RNP operation.*)
- **MD90** (***Note***: *MD 90 Requires -921 Pegasus FMC and ACD (Advanced Common Displays). MD-90 airplanes equipped with -901 FMCs comply.*)
- **MD10**
- **MD11**

Boeing Company Service Engineering & Customer Support letter, reference M-7200-01-00803 dated 14 June provides further detail

3.14.10.5Bombardier

The aircraft listed below, delivered with Flight Management System installed, associated sensors, control display unit and navigation displays, are compliant with P-RNAV, based on criteria contained in JAA TGL 10.

[2] (***Note***: *With EFIS & Collins GNLS 910A FMS installed*)

CL-600-2B19	100/200/440
CL-600-2C10	701
CL-600-2D24	900 / 705
CL-600-2B16	-
BD100-1A10	
BD700-1A10	-
BD700-1A11	-
DHC-8 Series 100	Model 102, 103, 106
DHC-8 Series 200	Model 201, 202
DHC-8 Series 300	Model 311, 314, 315 but not 301
DHC-8 Series 400	Model 400, 401, 402
Learjet	Model 60
Learjet	Model 45/40
Learjet	Model 60
Learjet	Model 45/40

Table 9: Bombardier aircrafts compliant with P-RNAV

3.14.10.6Cessna

All current Cessna jets with Flight Management Systems (FMS) as listed are approved to be P-RNAV compliant:

- 510 Mustang with Garmin G1000 FMS
- CJ1+ with Collins FMS-3000
- CJ2+ with Collins FMS-3000
- CJ3 with Collins FMS-3000
- 560+ with Collins FMS-3000
- 560XLS with Honeywell FMZ Series
- 560XLS+ with Collins FMS-3000
- 680 with Honeywell Epic Series
- 750 with Honeywell FMZ Series

3.14.10.7Dassault Falcon Aircraft

If you have any questions regarding the compliance of your aircraft with P-RNAV requirements please contact your Customer Service Manager or your Field Representative.

	Aircraft	Avionics	FMS model		FMS Part Numbers
FALCON	F50EX	Collins Proline 4	Honeywell	NZ-2000	All those FMS models, as installed per Dassault modifications, have been demonstrated and approved to be P-RNAV compliant
			Collins	FMS-6100	
			Universal	UNS-1C	
	F900B	Honeywell / Sperry SPZ-8000	Honeywell	NZ-800	
				NZ-920	
				NZ-2000	
	F900C / F900EX	Honeywell Primus 2000	Honeywell	NZ-2000	
	F900EX EASy	Honeywell Primus Epic	Honeywell	NZ-2000	
	F2000	Collins Proline 4	Honeywell	NZ-2000	
			Collins	FMS-6100	
			Universal	UNS-1C	
	F2000EX	Collins Proline 4	Collins	FMS-6100	
	F2000EX EASy	Honeywell Primus Epic	Honeywell	NZ-2000	

Table 10: Dassult Falcon Aircrafts compliant with P-RNAV

3.14.10.8Embraer

The aircraft listed below, delivered with Flight Management System installed associated sensors, control display unit and navigation displays, are already compliant with P-RNAV, based on criteria contained in JAA TGL 10.

EMBRAER 170 / 175/ 190/ 195 are P-RNAV compliant from initial certification.

ERJ145 / 135 / LEGACY with FMS's Models Honeywell NZ-2000, Universal UNS-1K (SCN 603.X or 604.X), even on a single configuration, are P-RNAV compliant.

EMBRAER LINEAGE 1000 will be P-RNAV compliant from initial certification.

EMBRAER Phenon 100 and Phenon 300 will be P-RNAV compliant after EASA certification.

3.14.10.9Fokker

- F70
- F100

3.14.10.10Gulfstream

The aircraft listed below, delivered with Flight Management System installed, associated sensors, control display units, and navigation displays are compliant with P-RNAV, based on the criteria contained in JAA TGL-10.

AIRCRAFT TYPE	**FMS**
G III (C20 Series)	**Honeywell NZ 2000**
G IV (G IV-SP, G300, G400, C20 Series)	**Honeywell NZ 900/NZ 2000**
G V (C37A, SEMA Series)	**Honeywell NZ 2000**
G IV-X (G350, G450)	**Epic FMS**
G V-SP (G500, G550, C37B, CAEW Series)	**Epic FMS**
G200/G150	**Collins FMS 6000/6100**
Galaxy/G100/Astra/Astra SPX	**UNS-1C (603.X or 604.X)**
Galaxy/G100/Astra/Astra SPX	**UNS-1C (803.X or 903.X)**

Table 11: Gulfstream Aircrafts compliant with P-RNAV

3.14.11 Avionics/Systems compliant with P-RNAV

3.14.11.1 Honeywell

- **GNS-XL/XLS FMS**
- **FMZ-800/900/2000 Flight Management Systems**

3.14.11.2 CMC Electronics Inc.

CMC has addressed compliance with the JAA TGL-10 and FAA AC No: 90-96A (P-RNAV) in Service Information Letter S.I.L. 03-03. A copy of this service information letter is available from a CMC field service representative or from CMC Customer Support at telephone: 1 514-748-3000 ext 4529

The following CMC Electronics Flight Management Systems meet both the intent of the JAA/FAA guidelines for PRNAV operations and data management objectives as outlined in DO-200A/ED-76 documents.

- CMA-900 (-202 and -402 variants)
- CMA-3000 (all FMS variants, but excluding those used for Radio Management only)

3.14.11.3 Garmin International

- Garmin G1000 TGL 10
- GNS 400W-530W TGL10
- Garmin 400 500 Series TGL 10

3.14.11.4General Electrics

OFP Designation	Smiths Model Number	Smiths Software Part Number
A1.0	E13206BA	G2604AAA01, G2604AAA02
A2.0	E13206BA	G2604AAB01, G2604AAC01, G2604AAD01
A2.0	Non Smiths hardware	G2604AAD02
A1A.0	E13206BA	G2604AAE01
E4b.0	2907A4	552710-07-01
E4b.1	2907A4	552710-10-01
E6b.0	2907A4	552642-20-01
G1.0	Non Smiths Hardware	552099-11-01, 552099-20-01, 552099-21-01, 552099-25-01
G2.0	Non Smiths Hardware	552392-10-01
G2.1	Non Smiths Hardware	552099-30-01
G3.0	Non Smiths Hardware	552099-35-01
G3.01	Non Smiths Hardware	552099-40-01
J1.0	2951A	554106-19-01
U1.4	2904A8, 2904A9	549100-03-01
U1.5	2904A10, 2904A11	549397-01-01
U1.6	2904A12, 2904A13	549791-01-01
U5	2904D12, 2904D13, 2904D14, 2904F4, 2904F5, 2904F6	548925-08-01
U6.0	2904D15, 2904D16, 2904D17, 2904D18, 2904D19, 2905F7, 2904F8, 2904F9, 2904F10, 2904F11	548926-17-01
U6.1	2904D20, 2904D21, 2904F12, 2904F13	549260-02-01
U6.2	2904D22, 2904D23, 2904F14, 2904F15	549349-02-01
U7.0	2907A, 2907A3, 2904A4	549297-12-01
U7.1	2907A, 2907A3, 2907A4	549297-34-01
U7.2	2907A, 2907A3, 2907A4	549297-38-01
U7.3	2907A, 2907A3, 2907A4	549297-41-01
U7.4	2907A, 2907A3, 2907A4	549297-45-01
U7.5	2907A, 2907A3, 2907A4	549297-45-01
U8.0	2907A, 2907A3, 2907A4	549250-15-01
U8.1	2907A, 2907A3, 2907A4	549250-19-01
U8.3	2907A, 2907A3, 2907A4	549250-22-01
U8.4	2907A, 2907A3, 2907A4	549250-26-01
U8.5	2907A, 2907A3, 2907A4	549250-26-01
U10.0	2907A4	549849-16-01
U10.1	2907A4	549849-20-01
U10.2	2907A4	549849-27-01, 549849-28-01
U10.3	2907A4	549849-37-01
U10.4	2907A4, 2907C1	549849-44-01, 549849-49-01
U10.5	2907A4, 2907C1	549849-57-01
U10.5a	2907A4, 2907C1	549849-64-01
U10.6	2907A4, 2907C1	549849-71-01
U10.7	2907A4, 2907C1	549849-87-01
V1.0	2907A4	552333-14-01
V1.1	2907A4	552333-17-01

Table 12: General Electrics Systems compliant with P-RNAV

3.14.11.5 Rockwell Collins

The listed Rockwell Collins Flight Management Systems (FMSs) comply with all the required equipment functions of JAA TGL-10 and associated required performance characteristics: [3]

- FMS-3000
- FMS-4200
- AMS-5000
- FMS-5000
- FMS-6000
- FMS-6100

3.14.11.6 Universal Avionics System Corporation (UASC)

Universal Avionics FMS systems with Software Control Number (SCN) versions 405.X/505.X and later 40X/50X, 60X/70X, 80X/90X and 100X/110X comply with most of the objectives of the TGL.

3.14.11.7 Navigation Data Suppliers

EASA, Letters of Acceptance (LOA1)

- EAG
- Lufthansa Flight Nav.
- Jeppesen (Germany).

FAA, Letters of Acceptance (LOA2) & Canadian Acknowledgement Letter

- Garmin
- Jeppesen Sanderson (United States of America)
- Honeywell Aerospace
- Rockwell Collins
- Smiths Aerospace
- CMC (Canada)

Aeronautical data, compliant with TGL10 and AC90-96A can be sourced from these major database Suppliers.

3.15Roles and Responsibilities

Role / Actor	Responsibilities
Human Actors	The Controller mode of operation is expected to change. These procedures have been designed with the goal of replacing open loop vectors in Approach for Arrivals.
En-Route Planning Controller (ENR_PLC) TMA Planning Controller (TMA_PLC)	The principal tasks of the Planning Controller are: Planning head conflicts. Coordinate with other sectors or collaterals Follow the executive Controller orders. Improved situational awareness through the common view Reduced workload in terms of need for coordination with other stakeholders Reduced workload through resolution advisories.
En-Route Executive Controller (ENR_EXC) TMA Executive Controller (TMA_EXC) PIR 565	The principal tasks of the Executive Controller are: To make decisions on traffic separation. The En-Route EXC controller will be responsible for The traffic management within his area. The TMA EXC controller will be responsible for The traffic management within his area. The main interactions of the Executive Controller are: with the traffic, with other ATCs and with the system Improved situational awareness though the common view Reduced workload in terms of number of instructions to pilots needed on average Reduced workload in terms of need for verbal coordination with Planning Controller and Complexity Manager.
Sequence Manager a.k.a. Approach Coordinator (APP_SEQ) PIR 565	**The principal task of the Sequence Manager is**…. Queue management processes will act up to the horizon of the AMAN or DMAN. This project will affect the period where these processes interact. Implementation of Point Merge in a multi-airport TMA cannot maximise customer benefit without integration with some form of queue management. These operations will be in managed airspace and specifically to runways located in terminal areas with high complexity operations. Arrival, departure and surface management tools will be used on queue management. **The sequence Manager is responsible for…** SESAR will introduce additional constraints in the form of AMAN-derived target times, more sophisticated trajectory manipulation to fine tune complex bunches. **The main interactions of the Sequence Manager are…**

Role / Actor	Responsibilities
Traffic Complexity Manager (TCM) PIR 4.7.1. PIR 565	The principal task of the Traffic Complexity Manager are Complexity prediction and assessment of the level of complexity of any airspace volume. The TCM is responsible for assures human capabilities are not exceeded The main interactions of the TCM are ATC Collaterals. Coordination procedures and information exchange requirements. Improved situational awareness though the common view Reduced workload in terms of need for coordination with other stakeholders Reduced workload through resolution advisories.
Flight Crew (FC)	The principal task of the Flight Crew are Navigate the aircraft. The Flight Crew is responsible for Navigate the aircraft. The main interactions of the Flight Crew are With the Systems of the aircraft. With the ATC. With the Airport and company staff.
ADDITIONAL HUMAN ACTORS	
System Actors	
Ground System (GD)	
Aircraft System (AC)	
ADDITIONAL SYSTEM ACTORS	
Organisational Actors	
ATSU_DEST	Is the ATSU to which the aircraft is destined. For the scope of this OSED in Step1, the ATSU_DEST includes the whole AMAN Time Horizon as well as the fix which is used by the AMAN to establish the time constraints
AOC	Is the Airline Operation Centre which is operating the aircraft
WOC	Is the Military Operation Centre responsible for the military flights using Military Mission Systems (MMS)
ADDITIONAL ORGANISATIONAL ACTORS	

3.16 Constraints

Lack of effective P-RNAV operations across all European TMAs will affect arriving and departing aircraft, particularly commercial flights.
Consequential safety constraints may also have a knock-on effect to GA traffic to which the TMA is also providing a service. This may result in periods of high density, which introduces additional complexity to the operation. Also the growing environmental constraints will have a difficult solution without the implementation of P-RNAV operations.
Environmental constraints, especially those related to departure noise nuisance, are still an issue in most European airports. The opportunity to automatically fly departure profiles and tailored trajectories as early as possible can help tackle this issue.

To determine optimal solutions in Madrid TMA which provide a guideline for full P-RNAV implementation in other complex TMAs throughout Europe. The solutions will be focused on the main barriers for full P-RNAV implementation in Madrid TMA The barriers (or limitations) are listed below:

(i) Mixed Mode Operations: Integration of P-RNAV & conventional routes used by a mix of P-RNAV-compliant and Conventional aircraft in high traffic density TMAs.
(ii) High Terrain and bad weather
(iii) Controller Mode of Operation: MOPS change
(iv) Route Spacing for P-RNAV
(v) Maximum capacity of P-RNAV Arrivals/Transitions/SIDs/STARs
(vi) Suitable descent slope for P-RNAV Arrivals in all meteorological conditions.
(vii) P-RNAV CDAs in high density traffic
(viii) Continuous Climb Departures enabled by the enhanced horizontal performance of P-RNAV
(ix) Reducing noise emissions in scenarios where early turns are required in departures (Guidance for early turn departures) (J08)
(x) Impact on preferential noise routes upon transition from conventional to P-RNAV procedures, due to the turning performance linked to each respectively.
(xi) Impact on departure sequencing due to aircraft performance mix (climb rates, turn capability, etc), which creates different departure routes for different performance levels.

Route complexity is high to the degree that arrivals and departures can interact, as can the arrival streams inbound to different airports.
Determine optimal solutions in terms of safety, capacity, complexity, environment and efficiency to full P-RNAV implementation. Use these to complement EUROCONTROL's 'ANSP common methodology for P-RNAV implementation in ECAC Terminal Airspace'.

Better traffic management in complex environment (Multiairport-TMA).

Efficient traffic management under mixed mode conditions.

Mainly capacity constrained for large periods throughout the day. May have environmental constraints during quieter periods (e.g. noise pollution during night time operations)

Achieve an efficient flight execution and traffic management allowing for CCD and CDA as long as possible.

3.16.1Aircraft Technical Capabilities

Most modern aircraft can meet the airworthiness requirements for P-RNAV based on the criteria of TGL10.
The Aircraft Flight Manual may already contain the required statements of accuracy, integrity and Continuity required for P-RNAV operation

Operators will need to provide pilot training, review Standard Operating Procedures, and may need to update aircraft MELs to accommodate additional features of P-RNAV procedures.

See Chapter 3.1.4. Most Aircraft are P_RNAV compliant

Limitations are

- Route changes with a large set of available waypoints may require lengthy manipulation in the cockpit, possibly resulting in a long reaction time when a route change is instructed, and risk of confusion/errors.
- Some FMS don't have enough memory storage capacity and will lead to future problems of processing procedures and databases

3.16.1.1FMS capabilities

3.16.1.1.1FMS – 3000 (ROCKWELL COLLINS)

The Rockwell Collins FMS-3000 Flight Management System provides advanced flight planning and navigation capability designed specifically for the short-range business aircraft. The system, comprised of the FMS-3000 and the advanced GPS-4000S WAAS-enabled Global Positioning System sensor, offers ease of operation in today's complex and demanding operating environment. The functionality available with the FMS-3000 extends operational flexibility and enhances situational awareness by offering such capabilities as full flight phase, multiple waypoint vertical navigation; time/fuel planning and predictions based on the airplane's flight manual data; databased Departure Procedures (DPs), Standard Terminal Arrival Routes (STARs) and approaches; and integrated Electronic Flight Instrument System (EFIS) and radar control. The GPS-4000S (specific details on the GPS-4000S are covered in the GPS-4000S section of this book) provides the required level of integrity and monitoring to operate in today's airspace and supports growth to precision approach certification.

Figure 29: FMS-3000

The FMS-3000 provides navigation situation information and steering guidance that relates navigation positioning to the flight plan intent. The system makes optimal use of the available sensor input, weighting GPS to the highest possible degree, to continuously determine accurate airplane position and velocity. Sensor usage is automatically managed by the FMC and requires no pilot interaction, including automatic position initialization; however, it is always possible for the crew to deselect a sensor or reconfigure sensor usage if necessary.

The system enables the pilot to enter waypoints into the flight plan and create additional flight plan legs (100 maximum). Two types of waypoints may be entered into the flight plan: waypoints stored in the navigation database and pilot-defined waypoints (e.g., identifier, bearing and distance).

Up to 100 pilot-defined waypoints may be created. As waypoints are entered into the flight plan, the FMS automatically computes and displays the intervening great circle paths and distances. For routes that are frequently traveled, the pilot has the flexibility to store/recall flight plans in a pilot-defined route database (100 maximum).

Performance Characteristics	
Control Display Unit	
Line Select Keys	
	12
Function Keys	
	16
Scratchpad	
	Yes
Display (Lines/characters per line)	
	15/24
Color	
	Yes
Display Size	
	5.0" Diagonal

Display Dimming	
	Yes
Active Flight Plan	
Number of WPTS	
	99
GPS C-129 Capability	
	B2
Holding Patterns	
	Yes (4)
Pilot-defined Waypoints	
□	
Use in a Single Flight Plan Only	
	50
Auto ILS Capture	
	Yes
Trip Planning	
Load Prestored Company Routes - Not Editable by pilot	
	No
Stored Pilot-created Routes (number of waypoints/number of routes/total waypoints)	
	99/100/9900
Database	
NDB Memory Size	
	18 Mb
Lateral Steering Guidance	
SID/STAR (Number Leg Types, 23 max)	
	23 All
VNAV	
Multi-waypoint VNAV	
	Coupled or Advisory
Interface	
Sensor (max number)	
	8
IRS	
	2
GPS	
	2
VOR	
	2
DME	
	2

Table 13: FMS performance characteristics

As SIDs, STARs and approaches are assigned and entered in the flight plan, the corresponding procedural tracks are automatically flown by the FMS. The system gives access to the terminal and approach procedures and transitions via a top-level dedicated function key on the CDU, thereby increasing the pilot's eyes forward time. Once inserted into the flight plan, these procedures, which include all ARINC 424-specified leg types, can be modified in response to real-time air traffic instructions.

The system is designed to automatically execute nonprecision GPS approaches, GPS overlay approaches and multisensor RNAV and VOR approaches, as well as to provide missed approach guidance. The navigation database contains the approach definition and corresponding procedures, including the missed-approach procedures. For added flexibility in the heavy workload environment of the terminal area, the system accommodates the use of ATC radar vectors, which may be issued prior to or during an approach.

FMS-3000 Single			
Type	**Qty**	**Description**	**Part Number**
FMC-3000	1	Flight Management Computer	822-0883-704
CDU-3000	2	Control Display Unit	822-0884-198
DBU-5000	1	Database Unit (without AFIS)	822-2215-101

FMS-3000 Single with GPS			
Type	**Qty**	**Description**	**Part Number**
FMC-3000	1	Flight Management Computer	822-0883-704
CDU-3000	2	Control Display Unit	822-0884-198
DBU-5000	1	Database Unit (without AFIS)	822-2215-101
GPS-4000S	1	Global Positioning Sensor	822-2189-002
ANT-4010	1	GPS Antenna	822-2437-010

FMS-3000 Dual			
Type	**Qty**	**Description**	**Part Number**
FMC-3000	2	Flight Management Computer	822-0883-704
CDU-3000	2	Control Display Unit	822-0884-198
DBU-5000	1	Database Unit (without AFIS)	822-2215-101

FMS-3000 Dual with GPS			
Type	**Qty**	**Description**	**Part Number**
FMC-3000	2	Flight Management Computer	822-0883-704
CDU-3000	2	Control Display Unit	822-0884-198
DBU-5000	1	Database Unit (without AFIS)	822-2215-101
GPS-4000S	2	Global Positioning Sensor	822-2189-002
ANT-4010	2	GPS Antenna	822-2437-010

Table 14: FMS-3000 versions

Provided by the system is multiple waypoint Vertical Navigation (VNAV) for each phase of flight - climb, cruise and descent. The VNAV ensures altitude and speed constraints at waypoints are met, speed limits at altitudes are honored and the vertical flight profile, as specified by the pilot, is followed. The system will automatically command the autopilot to sequence modes and set target speeds and target altitudes to ensure the flight plan requirements are met within the constraints of the preselect altitude setting. By integrating the vertical navigation with the autopilot, the pilot has full command of the normal autopilot modes (pitch, flight level change, vertical speed and altitude hold) while maintaining VNAV in an active state. If the pilot commands the airplane to violate a VNAV constraint, the appropriate alerting annunciations are provided to the pilot by the vertical navigation function.

During the various phases of flight, the VNAV follows the script of the flight plan. It levels the aircraft once the preselected altitude is captured and begins descent at a planned location. VNAV cruise mode commands the autopilot to capture and maintain a desired cruise altitude. During the descent mode, the VNAV computes a geographical path to each waypoint and provides guidance relative to that path, ensuring that the descent altitude constraints are honored. As the approach segment and corresponding procedures are entered, vertical navigation is fully integrated, providing smooth transitions and easing pilot workload.

Rockwell Collins FMS-3000 is able to display 99 waypoints in active flight plan and 4 holding patterns. A flight plan including Madrid LEMD as final destination contains at least 3 holding stacks (CLs, MONTE/BENJI and/or IAF) and 16 waypoints until reach IF ready to intercept ILS signal. This implies a usage of almost 20% of RAM capacity memory only for approach to Madrid-Barajas airport. It's good enough for a single transition procedure. Concerning database, 18 MB of capacity memory database is worrying taking into consideration the future implementation of P-RNAV and/or RNP navigation all over Europe in every single airport (311 airports – see table below). In a basic .gpx file containing 25 waypoints and 11 routes, the file size is about 48.5 KB. If we think about future SESAR ATM concept in which every single European airport takes part of a big network (SWIM) able to calculate routes point-2-point based on satellite technology, we can make a first calculation only in TMA, supposing an average of 2 Runways per airport and an average of 8 Waypoints to perform either a P-RNAV arrival or departure:

- Number of waypoints: (311 airports x (8 arrivals waypoints /runway&procedure + 8 departures waypoints/runway&procedure) x 2 RWYs x (X arrival procedures + Y departures procedures) = 59712 pre-defined Waypoints.
- TMA procedures: 311 airports x (X arrival procedures + Y departures procedures) x 2 RWYs = 3732 routes
- Database file size = Working-Lesel Function (Number of waypoints, Number of routes) = K x N_{Wxs}^{a} x N_{routes}^{b}

Country	Airports
Albania	Tirana (Rinas Mother Teresa) (TIA)
Austria	Graz (Thalerhof) Airport (GRZ)
	Innsbruck Airport (INN)
	Klagenfurt (Kärnten) Airport (KLU)
	Linz (Blue Danube) Airport (LNZ)
	Salzburg (W. A. Mozart) (SZG)
	Vienna (VIE)
Belarus	Minsk International Airport (MSQ)
Belgium	Antwerp (Deurne) (ANR)
	Brussels (BRU)
	Charleroi (Brussels South) (CRL)
Bosnia	Sarajevo Internationa Airport (SJJ)
Bulgaria	Bourgas (Burgas) International (Sarafovo) (BOJ)
	Dubrovnik (DBV)
	Pula (PUY)
	Rijeka Airport (RJK)
	Split (SPU)
	Zadar (ZAD)
	Zagreb (ZAG)
Croatia	Dubrovnik (DBV)
	Pula (PUY)
	Rijeka Airport (RJK)
	Split (SPU)
	Zadar (ZAD)
	Zagreb (ZAG)
Cyprus	Ercan (Lefkosa) (ECN)
	Larnaca (LCA)
	Paphos (Pafos) (PFO)
Czech Republic	Brno-Turany Airport (BRQ)
	Prague Ruzyně (PRG)
Denmark	Aalborg Airport (AAL)
	Aarhus (AAR)
	Billund Airport (BLL)
	Bornholm Airport (RNN)
	Copenhagen (Kastrup) (CPH)
	Karup Airport (KRP)
	Sonderborg Airport (SGD)
Estonia	Tallinn (Ulemiste) Airport (TLL)

Finland	Helsinki-Vantaa (HEL)
	Tampere-Pirkkala Airport (TMP)
France	Ajaccio (Corsica) Airport (CCI)
	Avignon Airport (AVN)
	Bergerac-Roumaniere (EGC)
	Beziers (Cap d Agde) (BZR)
	Biarritz Airport (BIQ)
	Bordeaux (Merignac) Airport (BOD)
	Brest Bretagne Airport (BES)
	Brive (Vallee de la Dordogne) Airport (BVE)
	Carcassonne Salvaza (CCF)
	Chambery-Savoie (Aix-Les-Bains) Airport (CMF)
	Clermont-Ferrand (Aulnat or Auvergne) Airport (CFE)
	Deauville (St. Gatien) Airport (DOL)
	Dijon Airport (DIJ)
	Dinard (Pleurtuit) Airport (DNR)
	Figari (Corsica) Airport (FSC)
	Grenoble (St. Geoirs) Airport (GNB)
	La Rochelle (LRH)
	Limoges (Bellegarde) (LIG)
	Lorient (South Brittany) Airport (LRT)
	Lourdes (Tarbes-Lourdes-Pyrenees) Airport (LDE)
	Lyon (Saint-Exupéry International) Airport (LYS)
	Marseille/Provence (Marignane) Airport (MRS)
	Montpellier (Mediterranee) Airport (MPL)
	Mulhouse (Basle-Mulhouse-Freiburg) Airport (MLH)
	Nantes (Atlantique) (NTE)
	Nice (Cote D Azure International) Airport (NCE)
	Nímes-Arles-Camargue (Garons) Airport (FNI)
	Paris (Charles de Gaulle) (CDG)
	Paris (Orly) Airport (ORY)
	Paris-Beauvais-Tillé Airport (BVA)
	Pau Pyrénées Airport (PUF)
	Perpignan (Rivesaltes) (PGF)
	Poitiers-Biard Airport (PIS)
	Poretta (Corsica) (Bastia) Airport (BIA)
	Rennes (St. Jacques) Airport (RNS)
	Rodez Marcilla Airport (RDZ)
	Toulon St. Tropez (Hyéres Le Palyvestre) Airport (TLN)
	Toulouse (Blagnac) Airport (TLS)
	Tours Loire Valley Airport (TUF)
Germany	Berlin (Schoenefeld) (SXF)
	Berlin (Tegel) Airport (TXL)
	Bremen Airport (BRE)
	Cologne-Bonn (CGN)
	Dortmund (Wickede) Airport (DTN)
	Dresden (Klotzsche) Airport (DRS)
	Dusseldorf Airport (DUS)
	Erfurt Airport (ERF)
	Frankfurt Hahn (HHN)
	Frankfurt/Main (Rhein-Main) (FRA)
	Friedrichshafen (FDH)
	Hamburg Airport (HAM)
	Hanover (Langenhagen) Airport (HAJ)
	Karlsruhe (Baden-Baden) Airport (FKB)
	Leipzig Altenburg (Altenburg-Nobitz) Airport (AOC)
	Leipzig-Halle (Schkeuditz) Airport (LEJ)
	Lubeck (Lubeck Blankensee) (LBC)
	Memmingen Airport (FMM)
	Munich (Franz Josef Strauss International) (MUC)
	Munster-Osnabruck Airport (FMO)
	Nuremberg (Nurnberg) Airport (NUE)
	Paderborn-Lippstadt (PAD)

	RostockLaage Airport (RLG)
	Saarbrucken Airport (SCN)
	Stuttgart (Echterdingen) Airport (STR)
	Sylt Airport (GWT)
	Weeze (NRN)
Gibraltar	Gibraltar (GIB)
Greece	Athens (Fleftherios Venizelos) (ATH)
	Chania (Souda AB) (CHQ)
	Corfu International (Kerkyra) (CFU)
	Heraklion (Nikos Kazantzakis) (HER)
	Kalamata (KLX)
	Kavala (Megas Alexandros) Airport (KVA)
	Kefalonia (EFL)
	Kos Island International (Hippocrates) (KGS)
	Limnos (Lemnos) Airport (LXS)
	Mitilini (Mytilini)Lesvos (Odysseas Elytis) (MJT)
	Mykonos Airport (JMK)
	PrevezaLefkas (PVK)
	Rhodes (Diagoras) (RHO)
	Samos Airport (SMI)
	Santorini (Thira) Airport (JTR)
	Skiathos Airport (JSI)
	Thessaloniki (Macedonia) Airport (SKG)
	Volos (Nea Anchialos) (VOL)
	Zakynthos (Zante) (Dionysios Solomos) (ZTH)
Hungary	Budapest Ferihegy (Ferenc Liszt) (BUD)
Iceland	Reykjavik (Keflavik) Airport (KEF)
Ireland	Cork Airport (ORK)
	Donegal Airport (CFN)
	Dublin Airport (DUB)
	Galway (Carnmore) Airport (GWY)
	Ireland West (Knock) Airport (NOC)
	Kerry (Farranforce) Airport (KIR)
	Shannon Airport (SNN)
	Sligo Airport (SLX)
	Waterford Airport (WAT)
Italy	Abruzzo International (Pescara) (PSR)
	Alghero (Fertilia) Airport (AHO)
	Ancona (Falconara) Airport (AOI)
	Bari (Karol Wojtyla) Airport (BRI)
	Bergamo (Orio Al Serio) Airport (BGY)
	Bologna G. Marconi (Borgo Panigale) Airport (BLQ)
	Brindisi (BDS)
	Cagliari (CAG)
	Catania-Fontanarossa Airport (CTA)
	Cuneo (Levaldigi) Airport (CUF)
	Florence (Peretola) Airport (FLR)
	Genoa / Genova (Cristoforo Colombo) Airport (GOA)
	Lamezia Terme Airport (SUF)
	Milan (Linate) Airport (LIN)
	Milan (Malpensa) Airport (MXP)
	Naples (Capodichino Mil) Airport (NAP)
	Olbia (Costa Smeralda) Airport (OLB)
	Palermo (Falcone-Borsellino) (PMO)
	Parma (Giuseppe Verdi) Airport (PMF)
	Perugia (San Egidio) (PEG)
	Pisa (Galileo Galilei) (PSA)
	Rimini (Federico Fellini International) (RMI)
	Rome (Ciampino) (CIA)
	Rome Fiumicino (Leonardo da Vinci International) (FCO)
	Trapani-Birgi (Vincenzo Florio) (TPS)
	Treviso-San Angelo (Treviso) Airport (TSF)
	Trieste (Ronchi dei Legionari) Airport (TRS)

	Turin (Caselle) (TRN)
	Venice (Marco Polo) Airport (VCE)
	Verona (Valerio Catullo) Airport (VRN)
Latvia	Riga International (RIX)
Lithuania	Kaunas (KUN)
	Vilnius Airport (VNO)
Luxembourg	Luxembourg (Findel) Airport (LUX)
Macedonia	Skopje (Petrovec) (SKP)
Malta	Malta International (Luga) Airport (MLA)
Moldova	Chişinău (KIV)
Montenegro	Podgorica (TGD)
Netherlands	Amsterdam (Schiphol) (AMS)
	Eindhoven (EIN)
	Rotterdam The Hague Airport (RTM)
Norway	Alesund (Vigra) (AES)
	Bergen (Flesland) Airport (BGO)
	Fagernes Airport (VDB)
	Haugesund Airport (HAU)
	Oslo (Gardermoen) Airport (OSL)
	Rygge (Moss) Airport (RYG)
	Sandefjord (Torp) Airport (TRF)
	Stavanger Airport (SVG)
	Trondheim (Vaernes) (TRD)
Poland	Bydgoszcz Airport (BZG)
	Gdańsk Lech Walesa Airport (GDN)
	Katowice (Pyrzowice) (KTW)
	Kraków-Balice (John Paull II International) (KRK)
	Lodz Lublineck Airport (LCJ)
	Poznan Lawica (POZ)
	Rzeszów-Jasionka (RZE)
	Szczecin-Goleniów Airport (SZZ)
	Warsaw (Frederic Chopin) Airport (WAW)
	Wroclaw (Copernicus) (WRO)
Portugal	Faro (FAO)
	Lisbon (Portela) (LIS)
	Madeira (Funchal) (FNC)
	Porto (Fracisco Sa Carneiro) (OPO)
Romania	Bacau (George Enescu) (BCM)
	Bucharest Aurel Vlaicu (Baneasa) (BBU)
	Bucharest Henri Coanda (Bucharest Otopeni) (OTP)
	Cluj-Napoca (Someseni) Airport (CLJ)
	Targu Mures Airport (TGM)
	Timisoara (Traian Vuia) (TSR)
Serbia	Belgrade (Nikola Tesla) (BEG)
	Pristina Airport (PRN)
Slovakia	Bratislava (M. R. Štefánika) (BTS)
Slovenia	Ljubljana (Brnik) (LJU)
Spain	Alicante (ALC)
	Almeria (LEI)
	Asturias (Oviedo) Airport (OVD)
	Barcelona (El Prat) (BCN)
	Bilbao (BIO)
	Fuerteventura (FUE)
	Girona (Gerona) (Costa Brava) (GRO)
	Gran Canaria (Las Palmas) (LPA)
	Ibiza Airport (IBZ)
	Jerez Airport (XRY)
	La Coruna Airport (LCG)
	La Palma Airport (SPC)
	Lanzarote (Arrecife) (ACE)
	Madrid (Barajas) (MAD)
	Mahon (Menorca) (MAH)
	Malaga (AGP)

	Murcia (San Javier) (MJV)
	Palma de Mallorca Airport (PMI)
	Reus Airport (REU)
	Santander (SDR)
	Santiago de Compostela (SCQ)
	Seville (Sevilla) (San Pablo) Airport (SVQ)
	Tenerife South (Reina Sofia) (TFS)
	Valencia (VLC)
	Valladolid Airport (VLL)
	Vigo Airport (VGO)
	Zaragoza Airport (ZAZ)
Sweden	Gothenburg City (GSE)
	Gothenburg-Landvetter Airport (GOT)
	Luleå Airport (LLA)
	Norrkping Airport (NRK)
	Ostersund Airport (OSD)
	StockholmVasteras Airport (VST)
	Stockholm-Arlanda (ARN)
	Stockholm-Skavsta Airport (NYO)
Switzerland	Basel (Basel-Mulhouse-Freiburg) (BSL)
	Bern-Belp (BRN)
	Geneva-Cointrin (GVA)
	Sion Airport (SIR)
	Zurich (ZRH)
Turkey	Ankara (Esenboga) Airport (ESB)
	Antalya Airport (AYT)
	Dalaman (Mugla) Airport (DLM)
	Istanbul (Ataturk) (IST)
	Izmir (Adnan Menderes) (ADB)
	Milas-Bodrum (BJV)
	Sabiha Gökçen (Istanbul) Airport (SAW)
Ukraine	Kiev (Boryspil) (KBP)
	Kiev (Zhuliany) (IEV)
United Kingdom	Aberdeen (Dyce) Airport (ABZ)
	Alderney Airport (ACI)
	Anglesey (Valley) Airport (VLY)
	Barra (Eoligarry) Airport (BRR)
	Belfast (Aldergrove) Airport (BFS)
	Belfast City (George Best Airport) Airport (BHD)
	Benbecula Airport (BEB)
	Birmingham Airport (BHX)
	Blackpool Airport (BLK)
	Bournemouth Airport (BOH)
	Bristol Airport (BRS)
	Campbeltown Airport (CAL)
	Cardiff Airport (CWL)
	City of Derry Airport (LDY)
	Dundee Airport (DND)
	Durham Tees Valley (Teeside) Airport (MME)
	East Midlands Airport (EMA)
	Edinburgh (Turnhouse) Airport (EDI)
	Exeter Airport (EXT)
	Glasgow Airport (GLA)
	Glasgow Prestwick Airport (PIK)
	Gloucestershire Airport (GLO)
	Guernsey Airport (GCI)
	Humberside Airport (HUY)
	Inverness Airport (INV)
	Islay (Glenegedale) Airport (ILY)
	Isle of Man (Ronaldsway) Airport (IOM)
	Jersey Airport (JER)
	Kent International (Manston) Airport (MSE)
	Kirkwall Airport (KOI)

	Lands End Airport (LEQ)
	Leeds-Bradford Airport (LBA)
	Liverpool (John Lennon) Airport (LPL)
	London City Airport (LCY)
	London Gatwick Airport (LGW)
	London Heathrow Airport (LHR)
	London Luton Airport (LTN)
	London Southend Airport (SEN)
	London Stansted Airport (STN)
	Manchester Airport (MAN)
	Newcastle Airport (NCL)
	Newquay Airport (NQY)
	Norwich Airport (NWI)
	Plymouth Airport (PLH)
	Robin Hood (Doncaster-Sheffield) Airport (DSA)
	Shetland Islands (Sumburgh) Airport (LSI)
	Southampton Airport (SOU)
	St Marys Airport (ISC)
	Stornoway Airport (SYY)
	Tiree Airport (TRE)
	Wick Airport (WIC)

Table 15: Airports in all over Europe

Supposing an average of 8 Waypoints to define each either arrival or departure procedure in a 2 runways airport, it appears:

		Number of Waypoints								
		19904	**29856**	**39808**	**49760**	**59712**	**69664**	**79616**	**89568**	**99520**
Number of Arrivals & Departures procedures in Europe	**1244**	102453	137705	169851	199868	228292	255455	281584	306841	331348
	1866	130079	174836	215650	253762	289850	324338	357512	389580	420695
	2488	154089	207107	255454	300601	343350	384203	423501	461488	498346
	3110	175725	236187	291323	342808	391559	438149	482965	526285	568318
	3732	195639	262953	324337	381656	**435933**	487802	537697	585926	632723
	4354	214226	287936	355152	417918	477351	534148	588783	641595	692838
	4976	231750	311489	384202	452102	516397	577840	636944	694075	749510
	5598	248392	333857	411793	484568	553480	619336	682684	743918	803334
	6220	264289	355224	438148	515581	588903	658974	726376	791530	854748

Table 16: .glx file size

Almost 436 MB of memory storage capacity necessary to store only TMA procedures all over Europe. In 574 case only for arrivals and taking account the 2 configurations and every transition leg to be performed (102 Waypoints), the file size only for P-RNAV arrivals to Madrid-Barajas airport is over 190 KB. Each Waypoint introduced in the file includes the following information:

- Latitude and longitude (WGS84)
- Elevation (ft. or m.)
- Time (ETA)[4]
- Name
- Runway associated
- Fly-by or Fly-Over
- Waypoint, threshold, Airport, TMA boundaries… etc.

[4] This parameter is going to be calculated in this project manually, but it could be considered an automated estimated time of arrival calculator at the end of the project. For the moment is only consider for simulation purpose and project showtime.

- 2D or 3D point

3.16.1.2REGIONAL FMS FLEET

REGIONAL airline have confirmed recently their problem with FMS memory capacity. Many pilots don't have all the procedures upload in their databases, having to introduce it manually. The problem will be discussed with Embraer and avionics suppliers this year in order to solve this problem as soon as possible. For REGIONAL their fleet is P-RNAV compliant with 2 types of FMS in their Embraer aircrafts:

- EJET(Honeywell Primus Epic FMS) and
- ERJ Honeywell Primus 1000 and Universal (UNS 1 K) FMS

3.16.1.3UNIVERSAL database solutions (SSDTU)

Universal, a company that provides among many other avionics solutions, they have in their array of products a Solid-State Data Transfer Unit able to transfer and upload databases from any solid memory storage device (SD Card or USB Flash Memory through bi-directional data transfer via 10/100 Mb Ethernet). Nowadays, the market of SD cards offers 32 GB of Memory at a very affordable price and hard disks up to 1 TB of memory, enough to storage maps and procedures all over the world.

Universal's Solid-State Data Transfer Unit (SSDTU) represents the next generation of data upload and download equipment for your aircraft. Interfacing with other Line Replaceable Units (LRU), the SSDTU features flash memory technology that adds speed and ease of use to your data transfers. The SSDTU will replace the floppy and ZIP disks of the DTU and DTU-100, as well as the CD/DVD-ROM of the Accessible Data Unit (ADU). This all-in-one unit facilitates centralized uploading/downloading for FMS, TAWS and Vision-1® databases and for Application Server Unit (ASU) charts, checklists and E-DOCS.

Supporting Universal Serial Bus (USB) and Secure Digital (SD) mass storage devices, the SSDTU incorporates high-speed USB and SD media ports directly in the faceplate. These media ports support and function as disk drives. The SSDTU appears as a network file server to other interfaced LRUs, and transfers data files between the media ports and the LRU using a high-speed Ethernet data bus connection. Up to eight compatible products are supported simultaneously, including Universal's FMS, TAWS, Vision-1®, UniLink®, ASU and Universal Cockpit Display (UCD) systems.

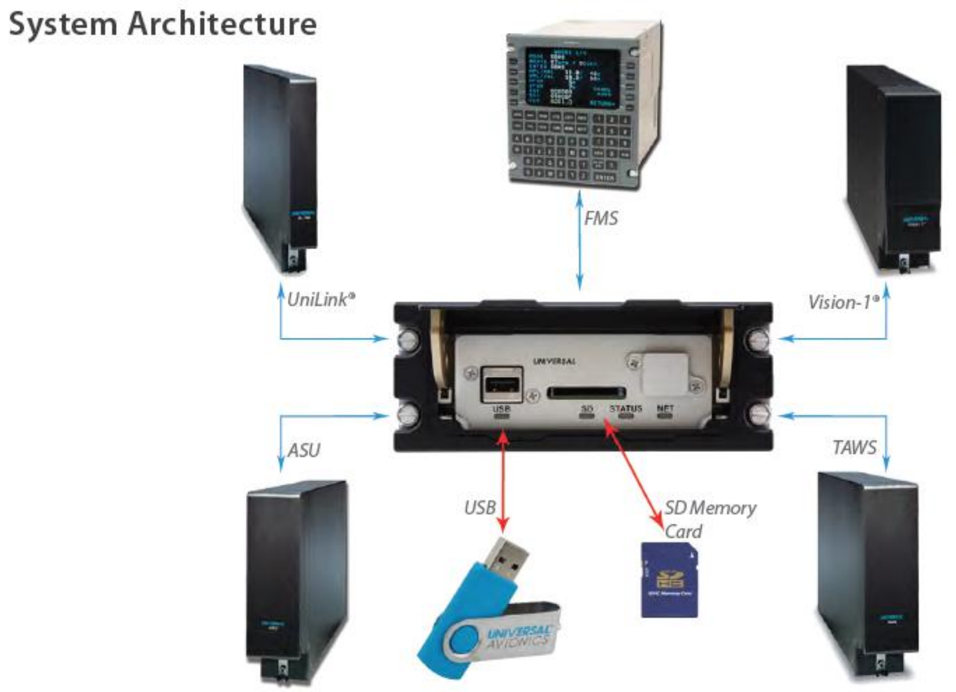


Figure 30: UNIVERSAL Solid-State Data Transfer Unit (SSDTU)

Lighter and smaller than the DTU-100, the SSDTU measures 2.25 inches high, 5.75 inches wide, and 7.76 inches deep and weighs just 2.4 lbs. To accommodate a variety of uses, the SSDTU is available in fixed-mount and portable versions.
The SSDTU is certified to FAA TSO-C109 and meets EASA ETSO-C109 certification criteria.

Universal sales this product as accessory in their website for more information:

http://www.uasc.com/products/ssdtu.aspx

3.16.2Ground Technical Capabilities

3.16.2.1Conventional navaids

This section shows a summary of the current estate of the conventional navaids VOR, DME, NDB/L and ILS used and operated in Madrid-Barajas by Aena
Aena currently use a VOR net (with DME associate all of it), which give service to the conventional ATS airways structure in the lower and higher airspace, holding patterns and arrival procedures, approaches and departures of the national airports.
The pictures included in figure 2.3-7 shows the locations of the main navaids available in the Madrid TMA and specifically, the Madrid-Barajas ones.

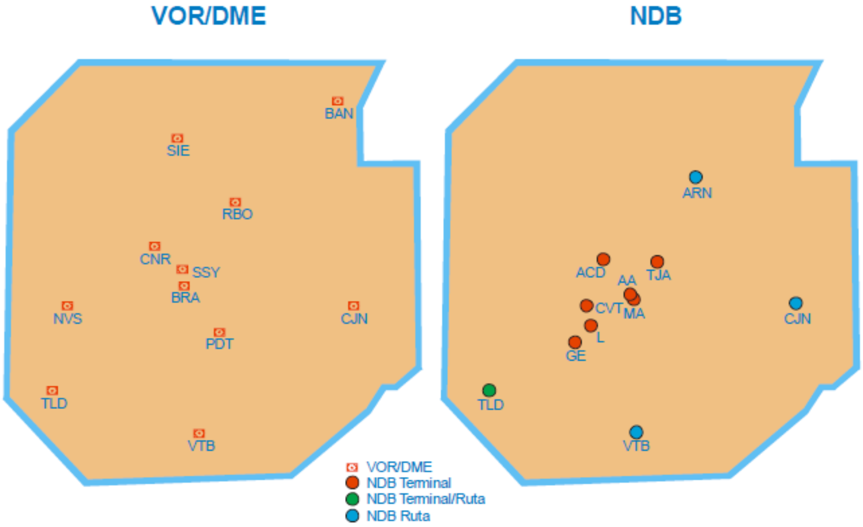


Figure 31: Available navaids

4 Detailed Operating Method

The operation in the new Madrid TMA will be following the P-RNV criteria, including the developing of new SIDs and STARs compliant with P-RNAV procedures, as well as the introduction of P-RNAV transitions to the localizer from IAFs until the interception of the localizer. All the airspace within the New TMA will be PNB offering more accurate navigation performances and also avoiding the dispersion of the trajectories in the SIDs procedures, thus making easier to design accurate trajectories able to compliant with noise abatement procedures, and in this way creating a better environment for the airport and the urban areas around it.

This two are the main objectives: the operational and environmental improvements, looking forward to obtain the maximum benefits in the following issues:

- Improved ATC operations reducing ATCO workload by reducing the scenario complexity.
- High specialized skills for the ATCOs working on this area.
- Aircrafts operation improvement, including GA traffic to which the TMA is also providing a service
- To simplify in number and profile the SIDs, STARs and Approaches maneuvers.
- Reducing noise emissions by the opportunity to automatically fly departure profiles and tailored trajectories as early as possible that can help avoiding the growing environmental constraints, especially those related to departure noise nuisance
- Reducing fuel burning and CO2 emissions

The design will be based on the following principles:

- The design of the TMA as a whole, avoiding partial solutions.
- The system must have Common Clearance Limits for both configurations, with the aim of reducing the operational complexity, having a common basic operational procedure for North / south configurations, thus reducing the impact of the runways changing making them faster and easier.
- P-RNAV procedures to provide enhance capacity.
- Simultaneous independent approaches to parallel runways.
- Approaching maneuvers based on “Transitions” to intercept the localizer.
- Similar capacity for managing traffic in both configurations North / South.
- Take in to account the existence of VFR flights in the TMA.
- Consider that there are Danger, Restricted and Prohibited areas in the area.

4.1 Previous Operating Method

Nowadays there is a mix-mode operation, there are SIDs and STARs of both systems Conventional and P-Rnav, but the approach procedures are open loops providing vectors to intercept the ILS localizer.

The main Characteristics of the airspace operating method are the following bellow:

Radar controlled airspace.

Separation minima (horizontal), TMA: 3 Nm or wake turbulence separation criteria on approach. Separation minima (vertical), TMA: 1000 ft.

Mainly capacity constrained for large periods throughout the day. May have environmental constraints during quieter periods (e.g. noise pollution during night time operations)

Multiple major airports within the TMA,

Single airport, operating a single or multiple runways in mixed or segregated mode. The airport is published in the NOP and AIP as a 4D operational airport

High deployment of RNAV-1 route structures alongside more conventional SID, STAR and Approach procedures.
Route complexity is high to the degree that arrivals and departures can interact, as can the arrival streams inbound to different airports.

Holding may still be used at peak times (albeit at reduced levels) to maintain runway pressure and avoid losing slots.

Highly sectorized as a result of previous TMA development to handle capacity. The sectors are small and typically have standing agreements to coordinate the presentation of traffic into and out of the sector.
CNS/ATM capabilities, Primary VHF voice communication between ATC and aircraft.

Navigational infrastructure supporting the requirements of the designed procedures.

4.2 New SESAR Operating Method

The operation in the new Madrid TMA will be following the P-RNV criteria, including the developing of new SIDs and STARs compliant with P-RNAV procedures, as well as the introduction of P-RNAV transitions to the localizer from the IAFs until the interception of the localizer. All the airspace within the New TMA will be PNB offering more accurate navigation performances and also avoiding the dispersion of the trajectories in the SIDs procedures, thus making easier to design accurate trajectories able to compliant with noise abatement procedures, and in this way creating a better environment for the airport and the urban areas around it.

The principal operational and environmental improvement features in the new Airspace scenario will be:

Procedures, optional features in addition to the nominal features, required inputs and outputs:

- The main consideration to define the transitions to the ILS was the symmetry between north and south configuration.
- In the transitions to runway 18R, intermediate waypoints were introduced to establish in an accurate mode the altitude to overfly this points
- The distance flown between the IF and the first waypoint in the base leg are equal (25NM.). With the aim of reducing the operational complexity, having a common basic operational procedure for North / south configurations, thus reducing the impact of the runways changing making them faster and easier.
- Holding patterns must be convenient for P-RNAV and conventional traffic to facilitate the mix-mode operation. P-rnav regulations do not prescribe the obligation of defining a waypoint as a fix for the holding pattern.
- Holding patterns shall be located in the first feeders points and in the IAWP.
- The new dimension for the TMA Airspace will be based on the buffer area of the holding pattern as well as its orientation for conventional navigation in some cases.
- Respect to all the airspace users, civil, military and G.A. giving greater freedom to those who don't require separation service like General Aviation.
- Ensure general aviation needs are correctly captured.
- P-RNAV will permit the liberation of airspace for GA utilisation.
- (PI: Shared use of airspace and airports by different classes of airspace users)
- The flow of the departing traffic shall be implemented well separated from the feeders or overflying the lowest part of the transitions. The new P-RNAV SID will create different departure routes for different performance levels

Triggering events (including initiation):

- Mixed Mode Operations – Integration of P-RNAV & conventional routes used by a mix of P-RNAV-compliant and conventional aircraft in high traffic density TMAs.

- High Terrain and bad weather – Use of P-RNAV procedures to improve safety of manoeuvres in TMA where high terrain and bad weather conditions cause limitations to use of airspace.
- Controller Mode of Operation – MOPS change for adapting ATCOs to new P-RNAV procedures.
- Route Spacing for P-RNAV – Investigation of solutions for optimum route spacing using P-RNAV.
- Maximum capacity of P-RNAV Arrivals/Transitions/SIDs/STARs
- Suitable descent slope for P-RNAV Arrivals in all meteorological conditions.
- P-RNAV CDAs in high density traffic
- Continuous Climb Departures enabled by the **enhanced horizontal performance of P-RNAV**
- Reducing noise emissions in scenarios where early turns are required in departures (Guidance for early turn departures)
- Impact on preferential noise routes upon transition from conventional to P-RNAV procedures, due to the turning performance linked to each respectively.
- Impact on departure sequencing due to aircraft performance mix (climb rates, turn capability, etc), which creates different departure routes for different performance levels.

Actors: operator and automatic actions:

Air Traffic Controller, Executive Controller, Planning Controller, ATS Supervisor.

- Controller Mode of Operation, Route Spacing for P-RNAV and Mixed Mode Operation (PI: Separation minima infringement).
- Full P-RNAV implementation pursues the elimination of radar vectoring, thus avoiding open loop instructions, which will have a positive effect on safety and in Controller workload reduction through the use.
- Reduction of air-ground communications.
- reducing radar vectoring for traffic sequencing

Flight Crew, Pilot,

- Exploitation of aircraft P-RNAV capabilities will optimize the placement of SIDs/STARS and instrument approach procedures.
- (PI: Increment in the hourly number of IFR flights able to enter the airspace volume)

- Full P-RNAV implementation pursues the elimination of radar vectoring based procedures by allowing the aircraft to fly defined precision SIDs and STARs, thus minimizing the variability of the deviation between the actually flown trajectories of aircraft in relationship to the RBT.

4.3 Differences between new and previous Operating Methods

Lack of effective P-RNAV operations across all European TMAs will affect arriving and departing aircraft, particularly commercial flights.
Consequential safety constraints may also have a knock-on effect to GA traffic to which the TMA is also providing a service. This may result in periods of high density, which introduces additional complexity to the operation. Also the growing environmental constraints will have a difficult solution without the implementation of P-RNAV operations.

Environmental constraints, especially those related to departure noise nuisance, are still an issue in most European airports. The opportunity to automatically fly departure profiles and tailored trajectories as early as possible can help tackle this issue.

Several airports are characterized by a seasonal demand (summer and holidays peaks), with an extremely wide range of aircraft with different navigation capabilities including a significant percentage that are not P-RNAV compliant.

Multiairport TMAs, usually characterized by strong interacting traffic flows.

All European TMAs where the possibility still exists to achieve an improvement of current operations through the implementation of full P-RNAV scenarios including optimum design criteria and route separation.
Most of the problems mentioned above already exist at various European locations. The problem of complexity at some of the busier TMAs in Europe provides a safety and capacity constraint on further utilisation.
Although traffic levels are currently down on recent years, they are predicted to increase in the long-term. As the traffic levels in Europe increase, TMAs will have to improve their capability in order to meet SESAR objectives. In addition, implementing operational solutions in periods of low traffic demand is easier and will give the opportunity of testing without significant impact on capacity.
Although 3D and 4D RNAV are expected to be available in 2013, the solutions provided by this project will pave the way for the transition from 2D to 3D and 4D.

Furthermore based on the implementation of full P-RNAV, capacity problems in high density TMAs will be resolvable.

Generally speaking, the P-RNAV concept is quite mature (V5). Task 1 will take advantage of the methods and guidance available and will complete phase V3 by delivering a Full P-RNAV Implementation Plan in a complex TMA including all instrumental, legal and operational activities, and Safety, Business and Human Factor Cases, To reach this goal, there are some less mature elements (identified as limitations to practical full P-RNAV implementation, see section 1.3) which should be brought to the global maturity level, so that the concept is ready for full implementation in complex TMAs.

The solutions will be focused on the main barriers for full P-RNAV implementation in TMAs identified. The barriers (or limitations) are listed below:

- Mixed Mode Operations: Integration of P-RNAV & conventional routes used by a mix of P-RNAV-compliant and Conventional aircraft in high traffic density TMAs.

- High Terrain and bad weather
- Controller Mode of Operation: MOPS change
- Route Spacing for P-RNAV
- Maximum capacity of P-RNAV Arrivals/Transitions/SIDs/STARs
- Suitable descent slope for P-RNAV Arrivals in all meteorological conditions.
- P-RNAV CDAs in high density traffic
- Continuous Climb Departures enabled by the enhanced horizontal performance of P-RNAV
- Reducing noise emissions in scenarios where early turns are required in departures (Guidance for early turn departures) (J08)
- Impact on preferential noise routes upon transition from conventional to P-RNAV procedures, due to the turning performance linked to each respectively.
- Impact on departure sequencing due to aircraft performance mix (climb rates, turn capability, etc), which creates different departure routes for different performance levels.

5 Detailed Operational Scenarios / Use Cases

This section contains a detailed description of all scenarios / use cases identified 5.7.4 project

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6 Detailed Operational Scenarios / Use Cases

This section contains a detailed description of all scenarios / use cases identified 5.7.4 project

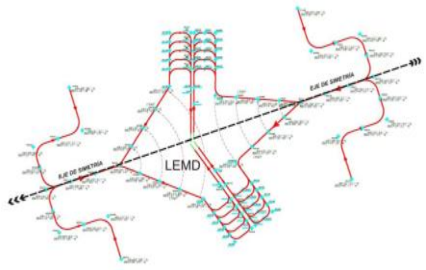
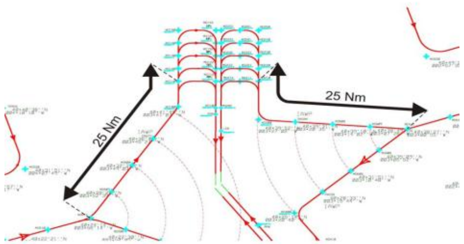
TASK	ATCO	FLIGHT CREW	NOTES	PREPARING THE SEQUENCE
1	Check/Comfirm sequence order, before the aircraft enters the sequencing leg.		This can be done with a graphical tool, Waypoints in the trombone shaped patterns, and transitions to the localizer. And also adding the support of an AMAN.	
2	Check entry conditions (altitude, speed, separation) and issue instructions as required, before the aircraft enters the sequencing leg.	Execute instruction. Comply with speed reductions instructions, to achieve an homogeneous flows, or to absorb delays in case of high traffic loads.		

Table 17: Example of Operating Method

6.1 Operational Scenario 1: Madrid Barajas Arrivals

Every P-RNAV STAR will be codified for every different FMS model and aircraft type.

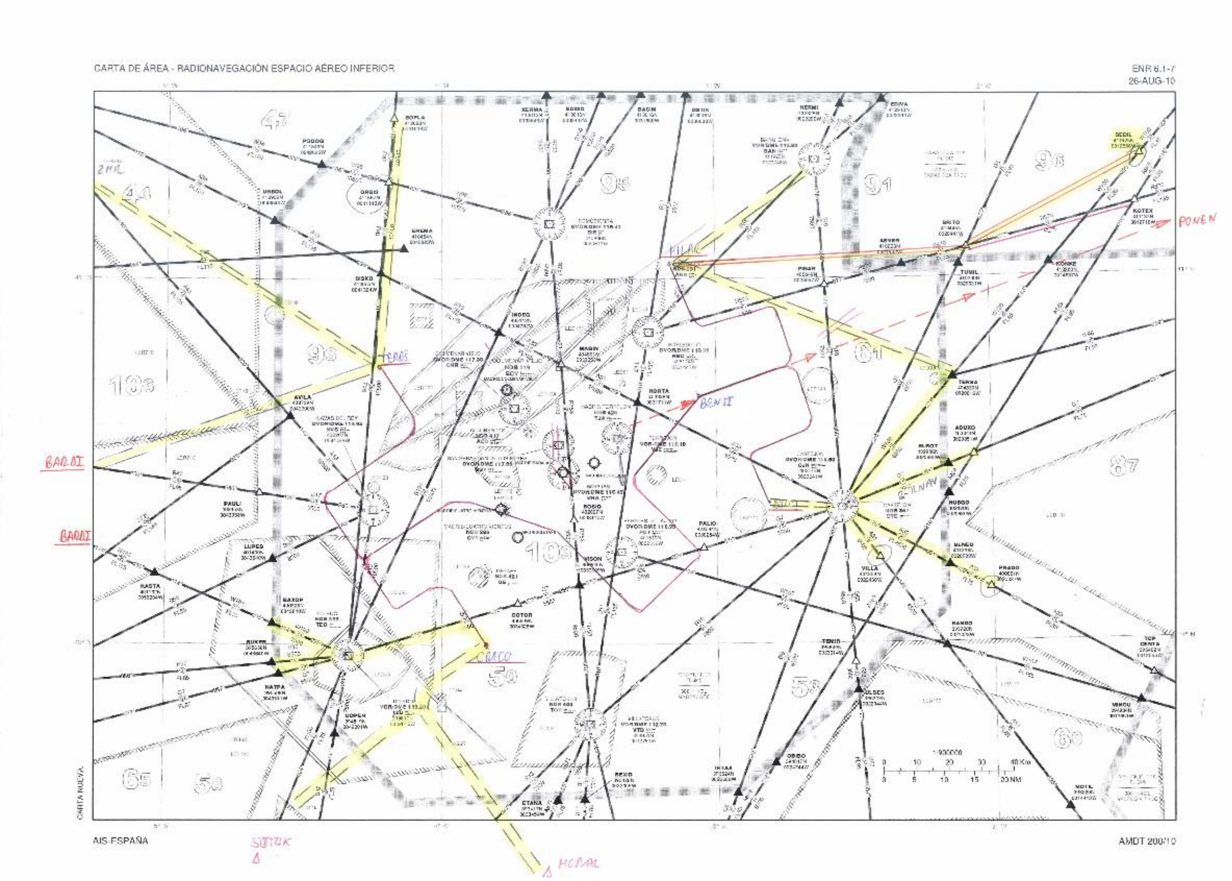


Figure 32: En-Route Connectors

6.1.1 INSTRUMENTAL ARRIVALS

We maintain practically all the previous inbound routes except in the arrivals via TERSA (The traffic will proceed via airway A869).

The new "Clearance Limits" for the P-RNAV arrivals will be: TERES, GRECO (for the inbound traffic entering from the North and South). DULCI and PILAR (for traffic coming from the East and North east)

The four points will be the same for both configurations north and south.

6.1.1.1Route Connectors

6.1.1.1.1 Inbound routes to TERES:

- VÍA ORBIS (B-42, UN-864) – TERES. (C.L)

- VÍA ZMR – TERES. (C.L)
- VÍA BARDI (B-47) – TERES (alternativa). (C.L)

(This Arrival should be used only in case that the Salamanca restricted areas are not in force)

If the Salamanca restricted areas are in force the traffic must proceed via: BARDI- TLD-GRECO

6.1.1.1.2 Inbound routes to GRECO:

- VÍA BARDI (B-47, UM-191) – TLD – GRECO. (C.L)
- VÍA CCS o RAKOD (G-7, H/UH-90, UN-858, W/W-103) – TLD – GRECO. (C.L)
- VÍA SOTUK (W/UW-130, UZ-165) – GRECO. (C.L)
- VÍA MORAL (B-11, UN-865)- GRECO. (C.L)

6.1.1.1.3 Inbound routes to PILAR:

- VÍA BAN (R-10, UN-10, UN-857) – PILAR. (C.L)
- VÍA SEDIL (W/UW-100, W/UW-96) – BRITO/200FL. – PILAR. (C.L)
- VÍA TERSA (W/UW-96) – PILAR (alternativa). (C.L) TERSA/ 200FL.
- KOTEX- BRITO- PILAR

Check the best solution that allows the en-route sector to descend the traffic to 210FL. without interfering the Zaragoza TMA.

This should be the route for the traffic that at present proceed via TERSA to SIRGU (via A869)

6.1.1.1.4 Inbound routes to DULCI:

- VÍA TERSA /200FL. (W/UW-96) - CJN – DULCI. (C.L)
- VÍA ADUXO (A869, G-7, UN-869, UN-975)- ELROT/200FL. – CJN – DULCI. (C.L)
- VÍA PRADO (A33, UN-733) - BENED/200FL. - CJN – DULCI. (C.L)
- NANDO/200FL- VÍA VILLA (A31, UL-150) - CJN – DULCI. (C.L)

6.1.1.2 Merging Segments (trombones)

6.1.1.2.1 North Configuration via TERES and GRECO (33L)

The following Waypoints define the merging segment until IAF from the Clearance Limit:

Id	Latitude	Longitude	Altitude
TERES	40º41'20.5323''N	004º11'58.2167''W	Alt.- FL150
MD520	40º31'50.7613''N	004º07'49.1128''W	Alt (ft).- 11000

MD521	40º29'56.7556''N	004º15'17.0092''W	Alt (ft).- 11000
MD522	40º28'02.2738''N	004º22'44.4726''W	Alt (ft).- 11000
MD523	40º23'17.5993''N	004º20'39.4514''W	Alt (ft).- 11000
MD512	40º18'32.8789''N	004º18'34.7301''W	Alt (ft).- 11000
MD511	40º20'27.0817''N	004º11'08.1822''W	Alt (ft).- 11000
MD510	40º22'20.8104''N	004º03'41.2067''W	Alt (ft).- 11000
MONTE	**40º24'14.0634''N**	**003º56'13.8045''W**	**Alt (ft).- 11000**
MD506	40º22'29.7933''N	003º50'05.4897''W	Alt (ft).- 9000
MD505	**40º20'45.1935''N**	**003º43'57.4860''W**	**Alt (ft).- 9000**
IAWP BRUNO	40º19'00.2658''N	003º37'49.7942''W	Alt (ft).- 9000

Table 18: Merging Sequence North Configuration via TERES

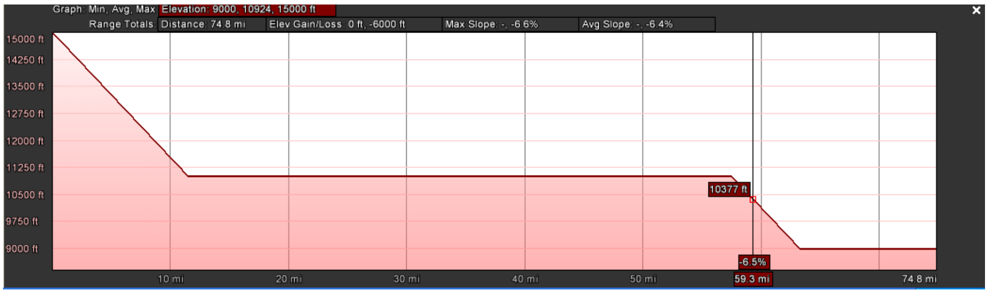


Figure 33: Merging Sequence North Configuration via TERES (Vertical Profile)

Id	Latitude	Longitude	Altitude
GRECO	40º03'20.3802''N	003º55'28.9317''W	Alt.- FL150
MD530	40º12'50.6825''N	003º59'34.4839''W	Alt (ft).- 11000
MD531	40º10'57.2279''N	004º07'00.5445''W	Alt (ft).- 11000
MD532	40º09'03.3013''N	004º14'26.1823''W	Alt (ft).- 11000
MD533	40º13'48.1128''N	004º16'30.3075''W	Alt (ft).- 11000
MD512	40º18'32.8789''N	004º18'34.7301''W	Alt (ft).- 11000
MD511	40º20'27.0817''N	004º11'08.1822''W	Alt (ft).- 11000
MD510	40º22'20.8104''N	004º03'41.2067''W	Alt (ft).- 11000
MONTE	40º24'14.0634''N	003º56'13.8045''W	Alt (ft).- 11000
MD506	40º22'29.7933''N	003º50'05.4897''W	Alt (ft).- 9000
MD505	**40º20'45.1935''N**	**003º43'57.4860''W**	**Alt (ft).- 9000**
IAWP BRUNO	40º19'00.2658''N	003º37'49.7942''W	Alt (ft).- 9000

Table 19: Merging Sequence North Configuration via GRECO

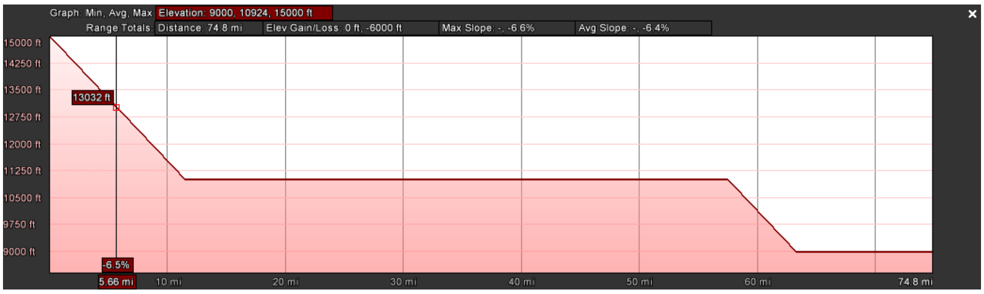


Figure 34: Merging Sequence North Configuration via GRECO (Vertical Profile)

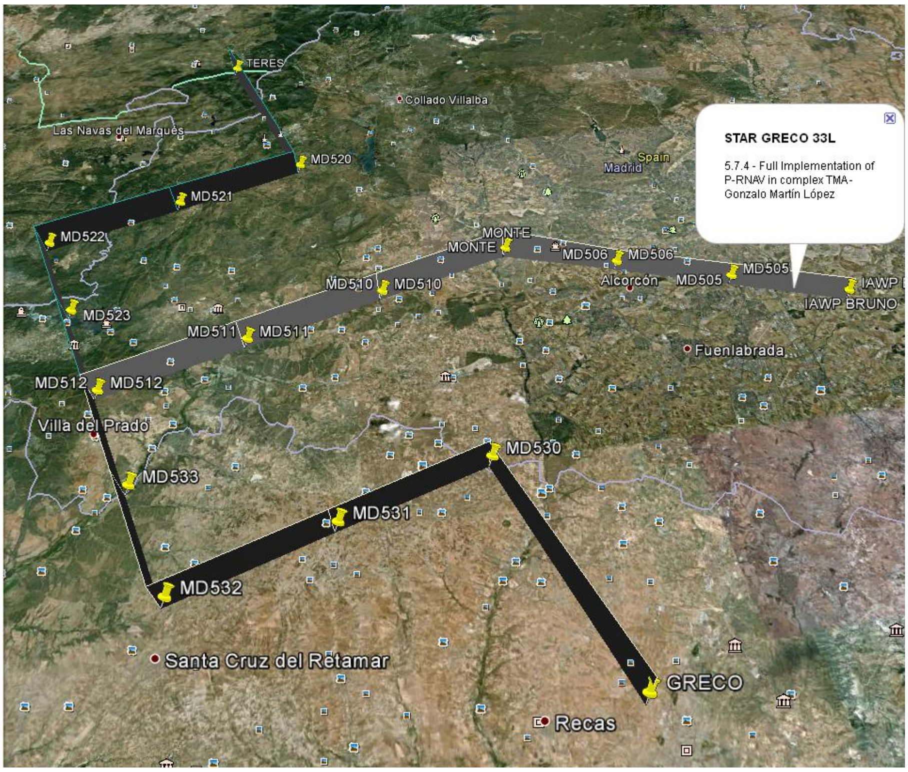


Figure 35: Merging Sequence North Configuration

6.1.1.2.2 North Configuration via DULCI and PILAR (33R)

The following Waypoints define the merging segment until IAF from the Clearance Limit:

Id	Latitude	Longitude	Altitude
DULCI	40º21'20.5188''N	002º45'10.8585''W	Alt.- FL150
MD630	40º30'50.7386''N	002º49'17.9028''W	Alt (ft).- 10000
MD631	40º32'43.8884''N	002º41'49.4748''W	Alt (ft).- 10000
MD632	40º34'36.5523''N	002º34'20.6314''W	Alt (ft).- 10000
MD633	40º39'21.8627''N	002º36'23.6409''W	Alt (ft).- 10000
MD612	40º44'07.1341''N	002º38'26.9395''W	Alt (ft).- 10000
MD611	40º42'14.2103''N	002º45'56.7336''W	Alt (ft).- 10000
MD610	40º40'20.7984''N	002º53'26.1070''W	Alt (ft).- 10000

BENJI	40º38'26.9000''N	003º00'55.0581''W	Alt (ft).- 10000
MD606	40º35'09.2181''N	003º05'51.7276''W	Alt (ft).- 7500
MD605	40º31'51.3235''N	003º10'47.9119''W	Alt (ft).- 7500
IAWP PACOS	40º28'33.2176''N	003º15'43.6125''W	Alt (ft).- 7500

Table 20: Merging Sequence North Configuration via DULCI

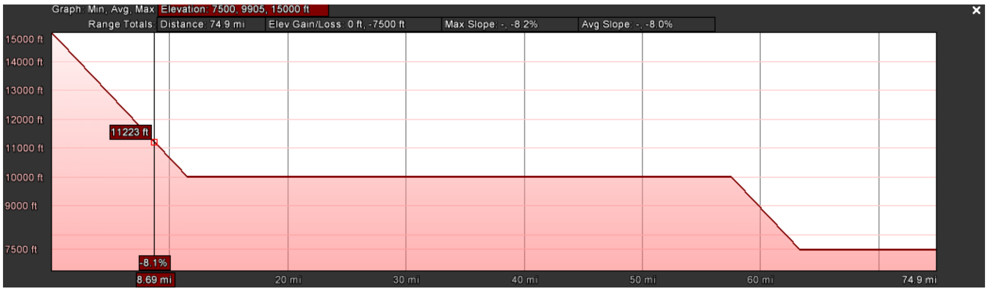


Figure 36: Merging Sequence North Configuration via DULCI (Vertical Profile)

Id	Latitude	Longitude	Altitude
PILAR	40º59'20.4257''N	003º01'46.0537''W	Alt.- FL150
MD620	40º49'50.6949''N	002º57'35.4864''W	Alt (ft).- 10000
MD621	40º51'44.3716''N	002º50'05.1615''W	Alt (ft).- 10000
MD622	40º53'37.5581''N	002º42'34.4109''W	Alt (ft).- 10000
MD623	40º48'52.3657''N	002º40'30.5292''W	Alt (ft).- 10000
MD612	40º44'07.1341''N	002º38'26.9395''W	Alt (ft).- 10000
MD611	40º42'14.2103''N	002º45'56.7336''W	Alt (ft).- 10000
MD610	40º40'20.7984''N	002º53'26.1070''W	Alt (ft).- 10000
BENJI	40º38'26.9000''N	003º00'55.0581''W	Alt (ft).- 10000
MD606	40º35'09.2181''N	003º05'51.7276''W	Alt (ft).- 7500
MD605	40º31'51.3235''N	003º10'47.9119''W	Alt (ft).- 7500
IAWP PACOS	40º28'33.2176''N	003º15'43.6125''W	Alt (ft).- 7500

Table 21: Merging Sequence North Configuration via PILAR

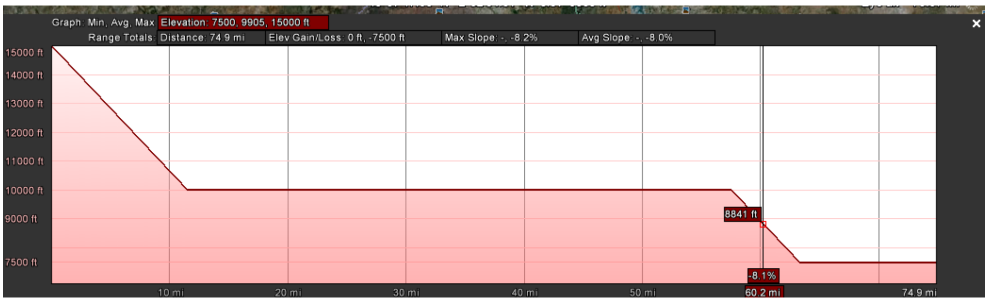


Figure 37: Merging Sequence North Configuration via PILAR (Vertical Profile)

Figure 38: Merging Sequence North Configuration 2

6.1.1.2.3 South Configuration via TERES and GRECO (18R)

The following Waypoints define the merging segment until IAF from the Clearance Limit:

Id	Latitude	Longitude	Altitude
TERES	40º41'20.5323''N	004º11'58.2167''W	Alt.- FL150
MD520	40º31'50.7613''N	004º07'49.1128''W	Alt (ft).- 11000
MD521	40º29'56.7556''N	004º15'17.0092''W	Alt (ft).- 11000
MD522	40º28'02.2738''N	004º22'44.4726''W	Alt (ft).- 11000
MD523	40º23'17.5993''N	004º20'39.4514''W	Alt (ft).- 11000
MD512	40º18'32.8789''N	004º18'34.7301''W	Alt (ft).- 11000
MD511	40º20'27.0817''N	004º11'08.1822''W	Alt (ft).- 11000
MD510	40º22'20.8104''N	004º03'41.2067''W	Alt (ft).- 11000
MONTE	40º24'14.0634''N	003º56'13.8045''W	Alt (ft).- 11000
MD509	40º28'25.4009''N	003º52'38.6973''W	Alt (ft).- 9000
MD508	40º32'36.6287''N	003º49'03.1468''W	Alt (ft).- 9000
IAWP CANTO	40º36'47.7455''N	003º45'27.1510''W	Alt (ft).- 9000

Table 22: Merging Sequence South Configuration via TERES

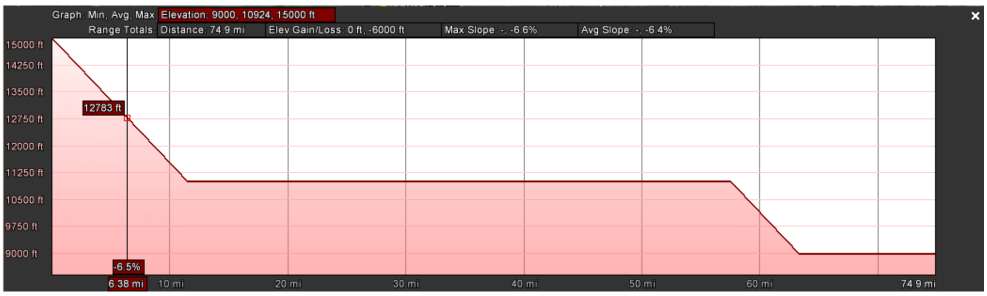


Figure 39: Merging Sequence South Configuration via TERES (Vertical Profile)

Id	Latitude	Longitude	Altitude
GRECO	40º03'20.3802''N	003º55'28.9317''W	Alt.- FL150
MD530	40º12'50.6825''N	003º59'34.4839''W	Alt (ft).- 11000
MD531	40º10'57.2279''N	004º07'00.5445''W	Alt (ft).- 11000
MD532	40º09'03.3013''N	004º14'26.1823''W	Alt (ft).- 11000
MD533	40º13'48.1128''N	004º16'30.3075''W	Alt (ft).- 11000
MD512	40º18'32.8789''N	004º18'34.7301''W	Alt (ft).- 11000
MD511	40º20'27.0817''N	004º11'08.1822''W	Alt (ft).- 11000
MD510	40º22'20.8104''N	004º03'41.2067''W	Alt (ft).- 11000
MONTE	40º24'14.0634''N	003º56'13.8045''W	Alt (ft).- 11000
MD509	40º28'25.4009''N	003º52'38.6973''W	Alt (ft).- 9000
MD508	40º32'36.6287''N	003º49'03.1468''W	Alt (ft).- 9000
IAWP CANTO	40º36'47.7455''N	003º45'27.1510''W	Alt (ft).- 9000

Table 23: Merging Sequence South Configuration via GRECO

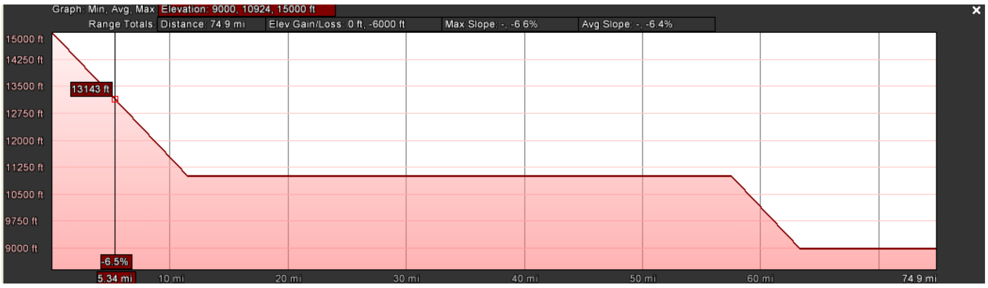


Figure 40: Merging Sequence South Configuration via GRECO (Vertical Profile)

Figure 41: Merging Sequence South Configuration

6.1.1.2.4 South Configuration via DULCI and PILAR (18L)

The following Waypoints define the merging segment until IAF from the Clearance Limit:

Id	Latitude	Longitude	Altitude
DULCI	40º21'20.5188''N	002º45'10.8585''W	Alt.- FL150
MD630	40º30'50.7386''N	002º49'17.9028''W	Alt (ft).- 10000
MD631	40º32'43.8884''N	002º41'49.4748''W	Alt (ft).- 10000
MD632	40º34'36.5523''N	002º34'20.6314''W	Alt (ft).- 10000
MD633	40º39'21.8627''N	002º36'23.6409''W	Alt (ft).- 10000
MD612	40º44'07.1341''N	002º38'26.9395''W	Alt (ft).- 10000
MD611	40º42'14.2103''N	002º45'56.7336''W	Alt (ft).- 10000
MD610	40º40'20.7984''N	002º53'26.1070''W	Alt (ft).- 10000
BENJI	40º38'26.9000''N	003º00'55.0581''W	Alt (ft).- 10000
MD609	40º38'48.7129''N	003º07'28.2798''W	Alt (ft).- 8000
MD608	40º39'10.1540''N	003º14'01.5715''W	Alt (ft).- 8000
IAWP DAGAN	40º39'31.2224''N	003º20'34.9303''W	Alt (ft).- 8000

Table 24: Merging Sequence South Configuration via DULCI

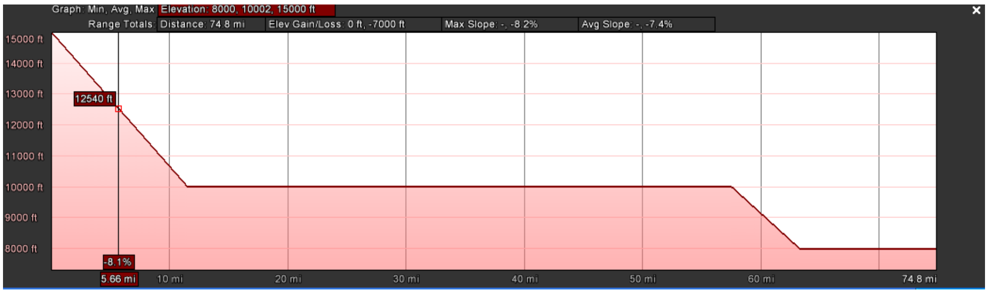


Figure 42: Merging Sequence South Configuration via DULCI (Vertical Profile)

Id	Latitude	Longitude	Altitude
PILAR	40º59'20.4257''N	003º01'46.0537''W	Alt.- FL150
MD620	40º49'50.6949''N	002º57'35.4864''W	Alt (ft).- 10000
MD621	40º51'44.3716''N	002º50'05.1615''W	Alt (ft).- 10000
MD622	40º53'37.5581''N	002º42'34.4109''W	Alt (ft).- 10000
MD623	40º48'52.3657''N	002º40'30.5292''W	Alt (ft).- 10000
MD612	40º44'07.1341''N	002º38'26.9395''W	Alt (ft).- 10000
MD611	40º42'14.2103''N	002º45'56.7336''W	Alt (ft).- 10000
MD610	40º40'20.7984''N	002º53'26.1070''W	Alt (ft).- 10000
BENJI	40º38'26.9000''N	003º00'55.0581''W	Alt (ft).- 10000
MD609	40º38'48.7129''N	003º07'28.2798''W	Alt (ft).- 8000
MD608	40º39'10.1540''N	003º14'01.5715''W	Alt (ft).- 8000
IAWP DAGAN	40º39'31.2224''N	003º20'34.9303''W	Alt (ft).- 8000

Table 25: Merging Sequence South Configuration via PILAR

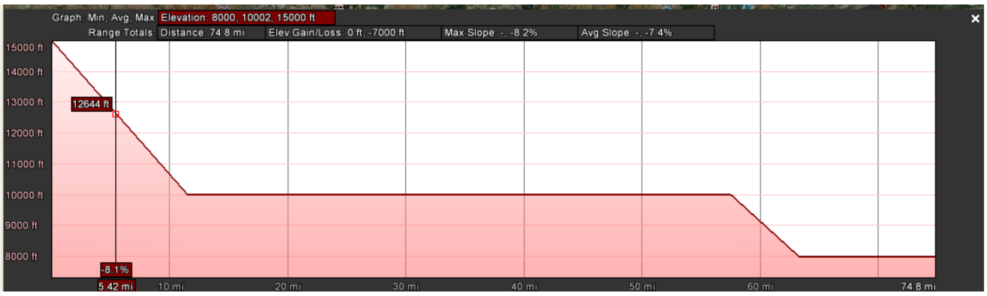


Figure 43: Merging Sequence South Configuration via PILAR (Vertical Profile)

Figure 44: Merging Sequence South Configuration 2

6.1.1.3 Sequencing Segments (Transition Legs)

6.1.1.3.1 North Configuration 1st transition (33L)

Id	Latitude	Longitude	Altitude
IAWP BRUNO	40º19'00.2658''N	003º37'49.7942''W	Alt (ft).- 9000
MD300	40º16'53.9203''N	003º30'28.9773''W	Alt (ft).- 7500
MD310	40º13'43.9203''N	003º27'17.0324''W	Alt (ft).- 6000
MD312	40º16'47.5622''N	003º22'06.8622''W	Alt (ft).- 5000
MD302	40º19'29.1782''N	003º24'49.9061''W	Alt (ft).- 5000
LN8	40º20'16.8975''N	003º25'38.1013''W	Alt (ft).- 5000
THR33L	40º27'47.1004''N	003º33'14.0167''W	Alt (ft).- 1932.74

Table 26: 1st transition 33L

Figure 45: 1st transition 33L

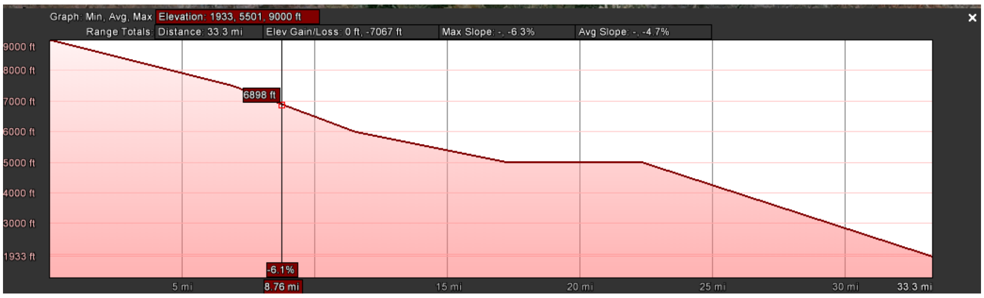


Figure 46: 1st transition 33L (Vertical Profile)

6.1.1.3.2 North Configuration 2nd transition (33L)

Id	Latitude	Longitude	Altitude
IAWP BRUNO	40º19'00.2658''N	003º37'49.7942''W	Alt (ft).- 9000
MD300	40º16'53.9203''N	003º30'28.9773''W	Alt (ft).- 7500
MD310	40º13'43.9203''N	003º27'17.0324''W	Alt (ft).- 6000
MD320	40º12'08.8860''N	003º25'41.1719''W	Alt (ft).- 6000
MD322	40º15'12.4572''N	003º20'31.0491''W	Alt (ft).- 5000
MD312	40º16'47.5622''N	003º22'06.8622''W	Alt (ft).- 5000
MD302	40º19'29.1782''N	003º24'49.9061''W	Alt (ft).- 5000
LN8	40º20'16.8975''N	003º25'38.1013''W	Alt (ft).- 5000
THR33L	40º27'47.1004''N	003º33'14.0167''W	Alt (ft).- 1932.74

Table 27: 2nd transition 33L

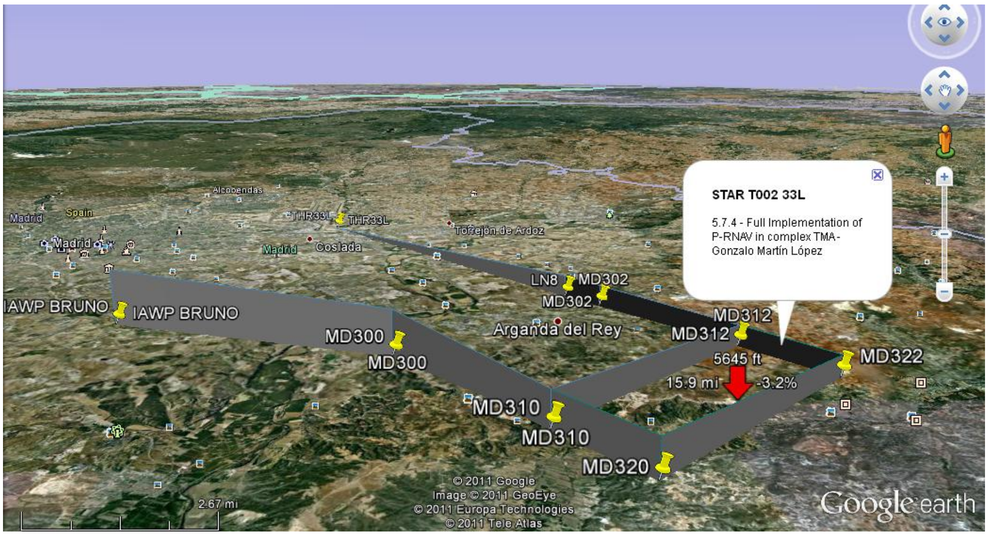


Figure 47: 2nd transition 33L

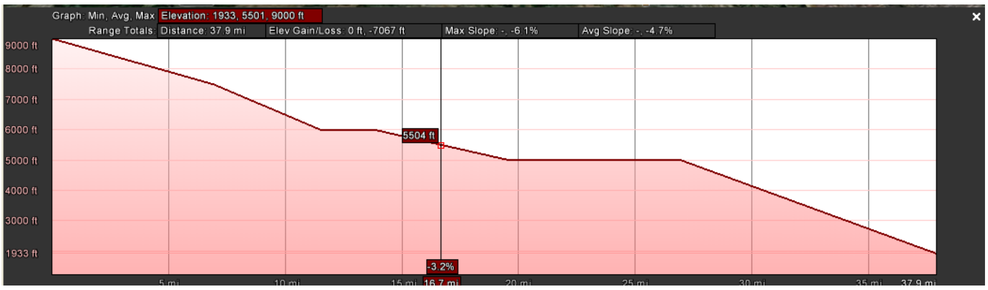


Figure 48: 2nd transition 33L (Vertical Profile)

6.1.1.3.3 North Configuration 3rd transition (33L)

Id	Latitude	Longitude	Altitude
IAWP BRUNO	40º19'00.2658''N	003º37'49.7942''W	Alt (ft).- 9000
MD300	40º16'53.9203''N	003º30'28.9773''W	Alt (ft).- 7500
MD310	40º13'43.9203''N	003º27'17.0324''W	Alt (ft).- 6000
MD320	40º12'08.8860''N	003º25'41.1719''W	Alt (ft).- 6000
MD330	40º10'33.8286''N	003º24'05.3859''W	Alt (ft).- 6000
MD332	40º13'37.3291''N	003º18'55.3107''W	Alt (ft).- 5000
MD322	40º15'12.4572''N	003º20'31.0491''W	Alt (ft).- 5000
MD312	40º16'47.5622''N	003º22'06.8622''W	Alt (ft).- 5000
MD302	40º19'29.1782''N	003º24'49.9061''W	Alt (ft).- 5000
LN8	40º20'16.8975''N	003º25'38.1013''W	Alt (ft).- 5000
THR33L	40º27'47.1004''N	003º33'14.0167''W	Alt (ft).- 1932.74

Table 28: 3rd transition 33L

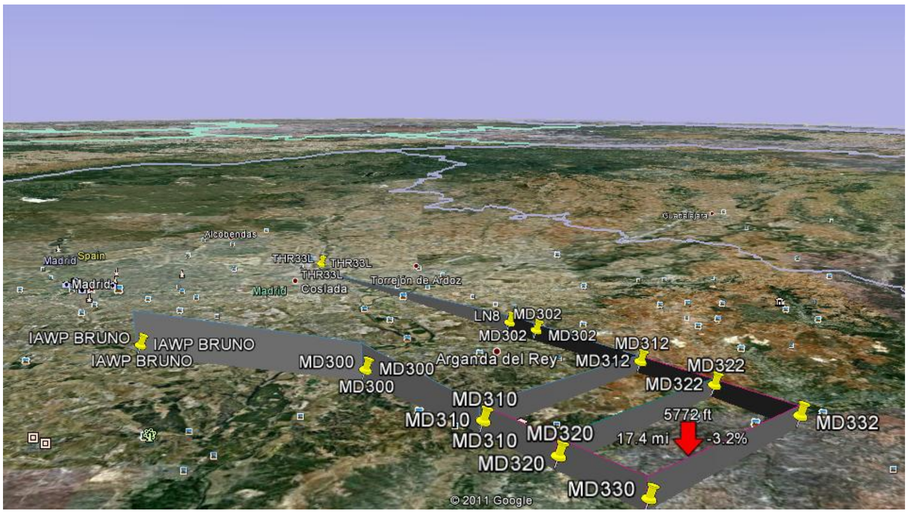


Figure 49: 3rd transition 33L

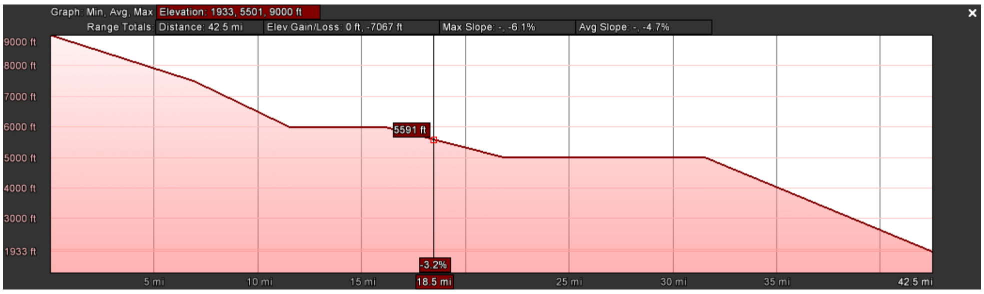


Figure 50: 3rd transition 33L (Vertical Profile)

6.1.1.3.4 North Configuration 4th transition (33L)

Id	Latitude	Longitude	Altitude
IAWP BRUNO	40º19'00.2658''N	003º37'49.7942''W	Alt (ft).- 9000
MD300	40º16'53.9203''N	003º30'28.9773''W	Alt (ft).- 7500
MD310	40º13'43.9203''N	003º27'17.0324''W	Alt (ft).- 6000
MD320	40º12'08.8860''N	003º25'41.1719''W	Alt (ft).- 6000
MD330	40º10'33.8286''N	003º24'05.3859''W	Alt (ft).- 6000
MD340	40º08'58.7487''N	003º22'29.6742''W	Alt (ft).- 6000
MD342	40º12'02.1786''N	003º17'19.6467''W	Alt (ft).- 5000
MD332	40º13'37.3291''N	003º18'55.3107''W	Alt (ft).- 5000
MD322	40º15'12.4572''N	003º20'31.0491''W	Alt (ft).- 5000
MD312	40º16'47.5622''N	003º22'06.8622''W	Alt (ft).- 5000
MD302	40º19'29.1782''N	003º24'49.9061''W	Alt (ft).- 5000
LN8	40º20'16.8975''N	003º25'38.1013''W	Alt (ft).- 5000
THR33L	40º27'47.1004''N	003º33'14.0167''W	Alt (ft).- 1932.74

Table 29: 4th transition 33L

Figure 51: 4th transition 33L

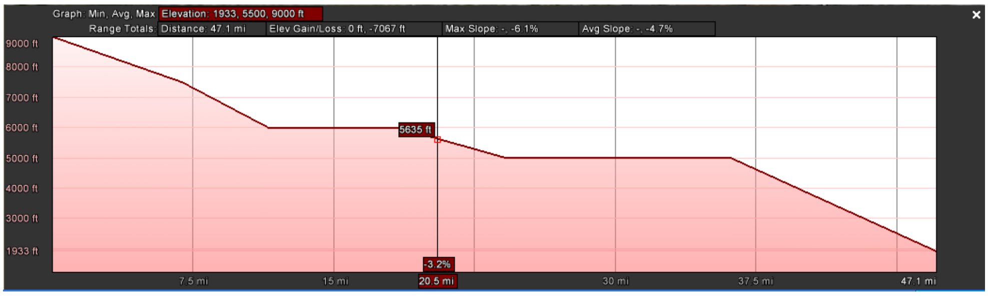


Figure 52: 4th transition 33L (Vertical Profile)

6.1.1.3.5 North Configuration 5th transition (33L)

Id	Latitude	Longitude	Altitude
IAWP BRUNO	40º19'00.2658''N	003º37'49.7942''W	Alt (ft).- 9000
MD300	40º16'53.9203''N	003º30'28.9773''W	Alt (ft).- 7500
MD310	40º13'43.9203''N	003º27'17.0324''W	Alt (ft).- 6000
MD320	40º12'08.8860''N	003º25'41.1719''W	Alt (ft).- 6000
MD330	40º10'33.8286''N	003º24'05.3859''W	Alt (ft).- 6000
MD340	40º08'58.7487''N	003º22'29.6742''W	Alt (ft).- 6000
MD350	40º07'23.6463''N	003º20'54.0368''W	Alt (ft).- 6000
MD352	40º10'27.0059''N	003º15'44.0570''W	Alt (ft).- 5000
MD342	40º12'02.1786''N	003º17'19.6467''W	Alt (ft).- 5000
MD332	40º13'37.3291''N	003º18'55.3107''W	Alt (ft).- 5000
MD322	40º15'12.4572''N	003º20'31.0491''W	Alt (ft).- 5000
MD312	40º16'47.5622''N	003º22'06.8622''W	Alt (ft).- 5000
MD302	40º19'29.1782''N	003º24'49.9061''W	Alt (ft).- 5000
LN8	40º20'16.8975''N	003º25'38.1013''W	Alt (ft).- 5000
THR33L	40º27'47.1004''N	003º33'14.0167''W	Alt (ft).- 1932.74

Table 30: 5th transition 33L

Figure 53: 5th transition 33L

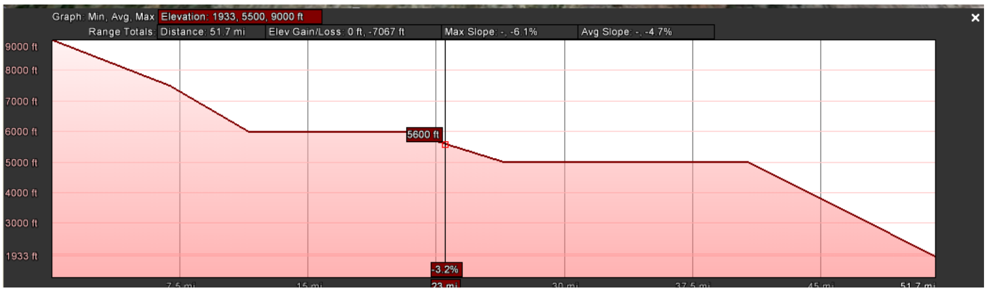


Figure 54: 5th transition 33L (Vertical Profile)

6.1.1.3.6 North Configuration 1st to 5th transition (33R)

Id	Latitude	Longitude	Altitude
IAWP PACOS	40º28'33.2176''N	003º15'43.6125''W	Alt (ft).- 7500
MD400	40º25'13.9799''N	003º20'40.2000''W	Alt (ft).- 6000
MD410	40º20'28.5367''N	003º15'52.4993''W	Alt (ft).- 5000
MD411	40º18'56.8837''N	003º18'27.9240''W	Alt (ft).- 4000
MD412	40º17'25.1731''N	003º21'03.2323''W	Alt (ft).- 4000
MD420	40º18'53.3435''N	003º14'16.7490''W	Alt (ft).- 5000
MD421	40º17'21.7259''N	003º16'52.1495''W	Alt (ft).- 4000
MD422	40º15'50.0507''N	003º19'27.4337''W	Alt (ft).- 4000
MD430	40º17'18.1276''N	003º12'41.0734''W	Alt (ft).- 5000
MD431	40º15'46.5454''N	003º15'16.4496''W	Alt (ft).- 4000
MD432	40º14'14.9055''N	003º17'51.7097''W	Alt (ft).- 4000
MD440	40º15'42.8892''N	003º11'05.4725''W	Alt (ft).- 5000
MD441	40º14'11.3422''N	003º13'40.8243''W	Alt (ft).- 4000
MD442	40º12'39.7377''N	003º16'16.0602''W	Alt (ft).- 4000
MD450	40º14'07.6282''N	003º09'29.9461''W	Alt (ft).- 5000
MD451	40º12'36.1165''N	003º12'05.2734''W	Alt (ft).- 4000
MD452	40º11'04.5472''N	003º14'40.4851''W	Alt (ft).- 4000
MD402	40º20'06.8138''N	003º23'46.2595''W	Alt (ft).- 4000
RN8	40º23'16.8048''N	003º26'58.2140''W	Alt (ft).- 4000

THR33R	40º28'24.8516''N	003º32'10.3032''W	Alt (ft).- 1885.83

Table 31: 1st to 5th transitions 33R

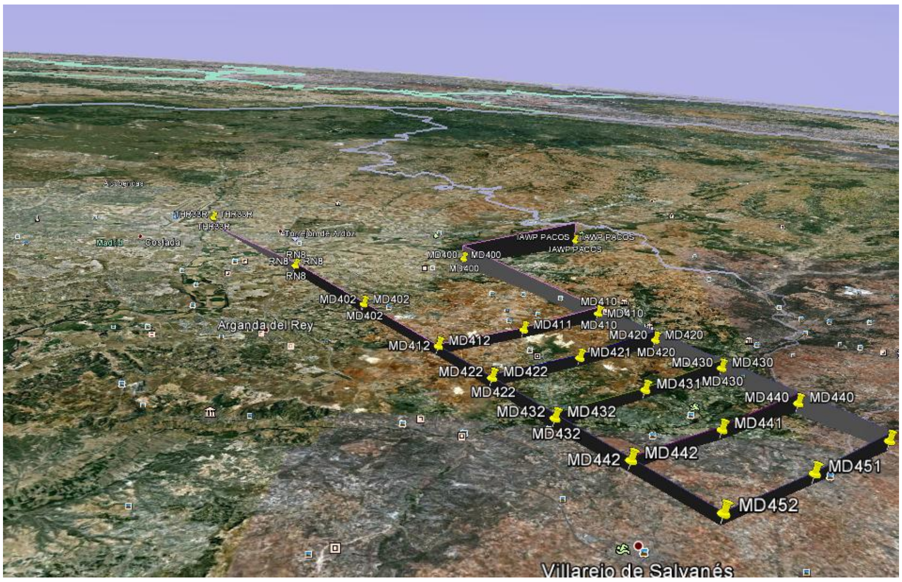


Figure 55: 1st to 5th transitions 33R

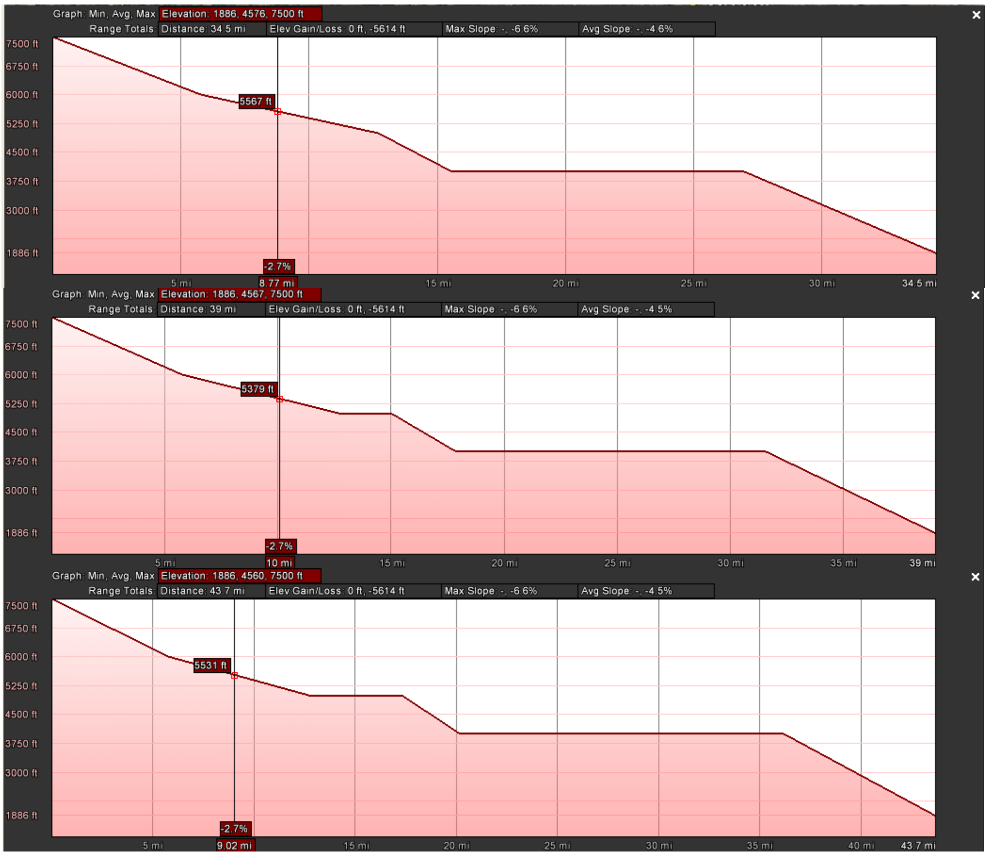


Figure 56: 1st to 5th transitions 33R (Vertical Profiles)

The 3rd transition is this configuration entering point of the sequencing leg passes over a populated area which is going to be affected: Orusco de Tajuña; and a potential noise assessment is needed in the vicinity of this area. The same happens when, in this same sequencing leg, the aircraft turns off to intercept the ILS: Tielmes populated area.

Figure 57: 3rd transition potential noise assessment

6.1.1.3.7 South Configuration 1st to 5th transition (18R)

Id	Latitude	Longitude	Altitude
IAWP CANTO	40º36'47.7455''N	003º45'27.1510''W	Alt (ft).- 9000
MD100	40º41'48.9386''N	003º41'07.3655''W	Alt (ft).- 7100
MD110	40º45'48.8411''N	003º41'09.1490''W	Alt (ft).- 7100
MD111	40º45'49.9767''N	003º37'52.1116''W	Alt (ft).- 5500
MD112	40º45'50.6879''N	003º34'34.1984''W	Alt (ft).- 5500

MD120	40º47'49.2954''N	003º41'09.2911''W	Alt (ft).- 7100
MD121	40º47'49.8239''N	003º37'53.2531''W	Alt (ft).- 6000
MD122	40º47'50.8072''N	003º34'34.8965''W	Alt (ft).- 5500
MD130	40º49'48.8850''N	003º41'10.9402''W	Alt (ft).- 7100
MD131	40º49'50.2144''N	003º37'53.2704''W	Alt (ft).- 6500
MD132	40º49'50.9258''N	003º34'35.5960''W	Alt (ft).- 6000
MD140	40º51'49.2869''N	003º41'11.8413''W	Alt (ft).- 7100
MD141	40º51'50.3311''N	003º37'54.0712''W	Alt (ft).- 7100
MD142	40º51'51.0438''N	003º34'36.2969''W	Alt (ft).- 6500
MD150	40º53'49.6393''N	003º41'12.7437''W	Alt (ft).- 7100
MD151	40º53'50.4465''N	003º37'54.9961''W	Alt (ft).- 7100
MD152	40º53'51.1610''N	003º34'36.9992''W	Alt (ft).- 7100
MD102	40º41'40.4028''N	003º34'32.7484''W	Alt (ft).- 5000
RS8	40º40'40.7766''N	003º34'32.4040''W	Alt (ft).- 5000
THR 18R	40º31'22.4008''N	003º34'29.2663''W	Alt (ft).- 1991.14

Table 32: 1st to 5th transitions 18R

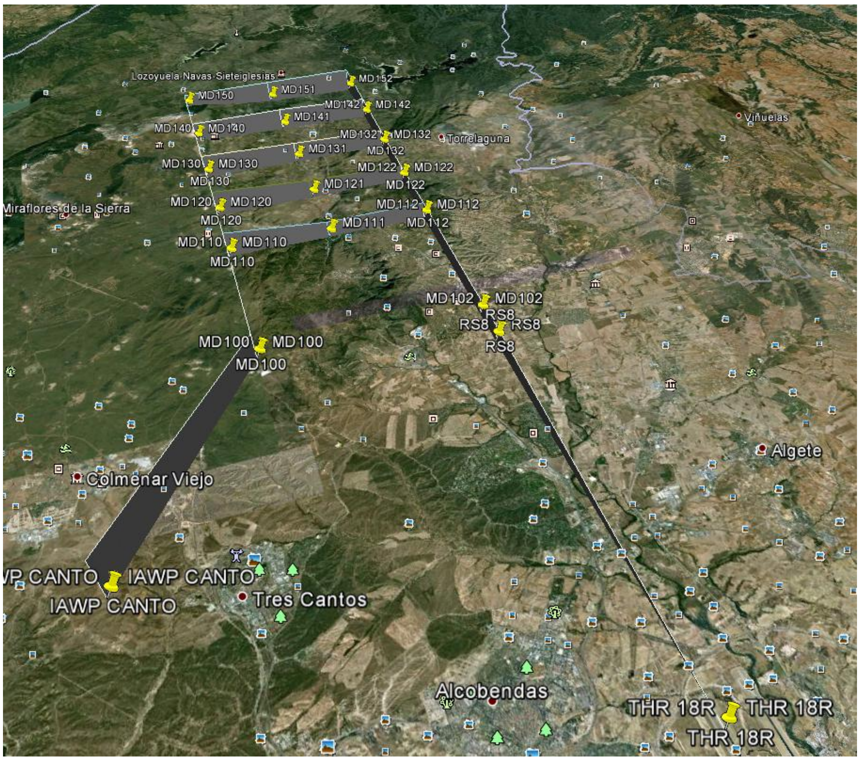


Figure 58: 1st to 5th transitions 18R

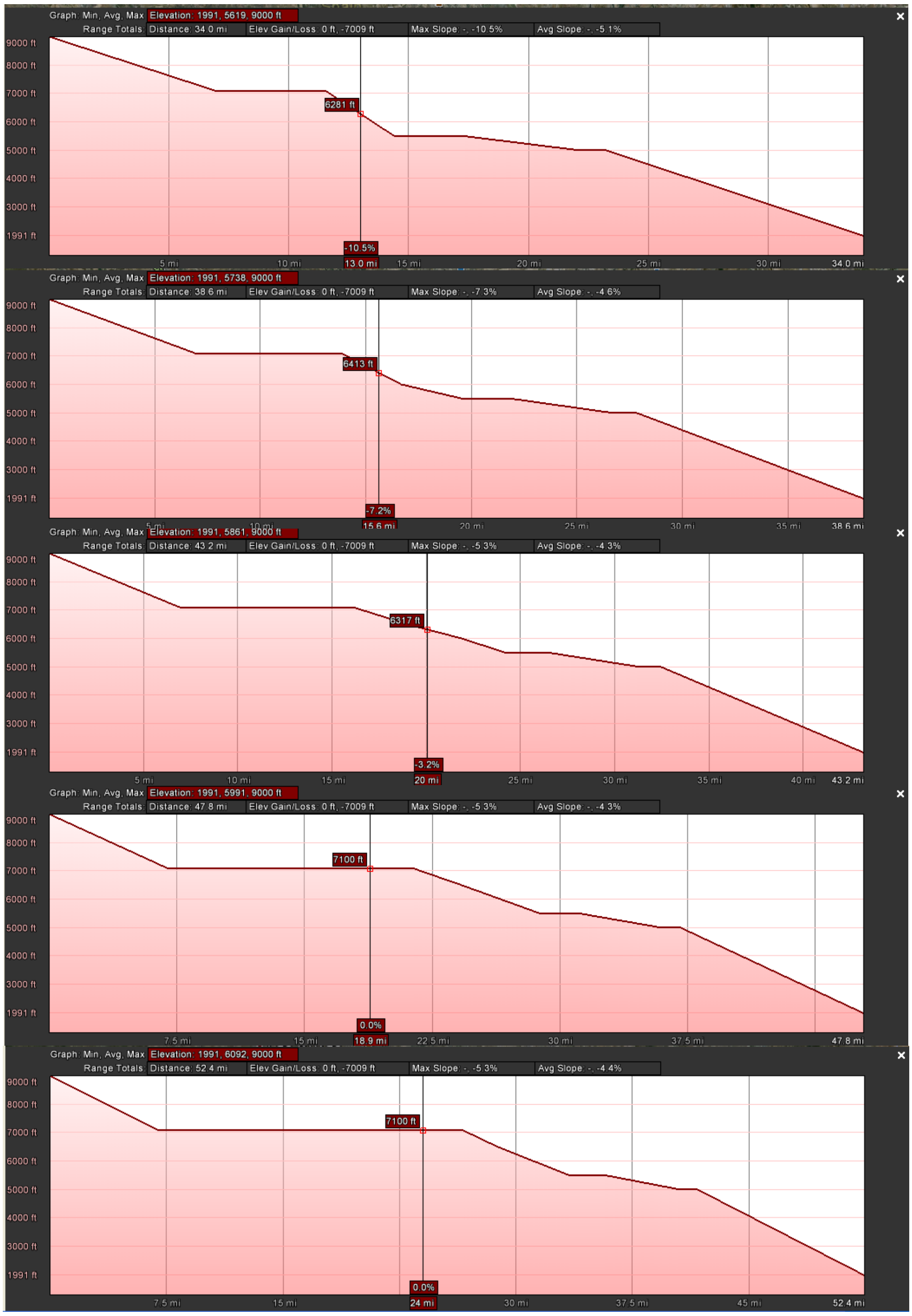


Figure 59: 1st to 5th transitions 18R (Vertical Profiles)

The 4th transition is this configuration the sequencing leg passes over a populated area which is going to be affected: Cabrera; and a potential noise assessment is needed in the vicinity of this area.

Figure 60: 4th transition potential noise assessment

The main potential risk in this configuration is about the 5th transition which passes very near from the ground due to terrain elevation profile. In bad weather and turbulence conditions, this transition should be avoided:

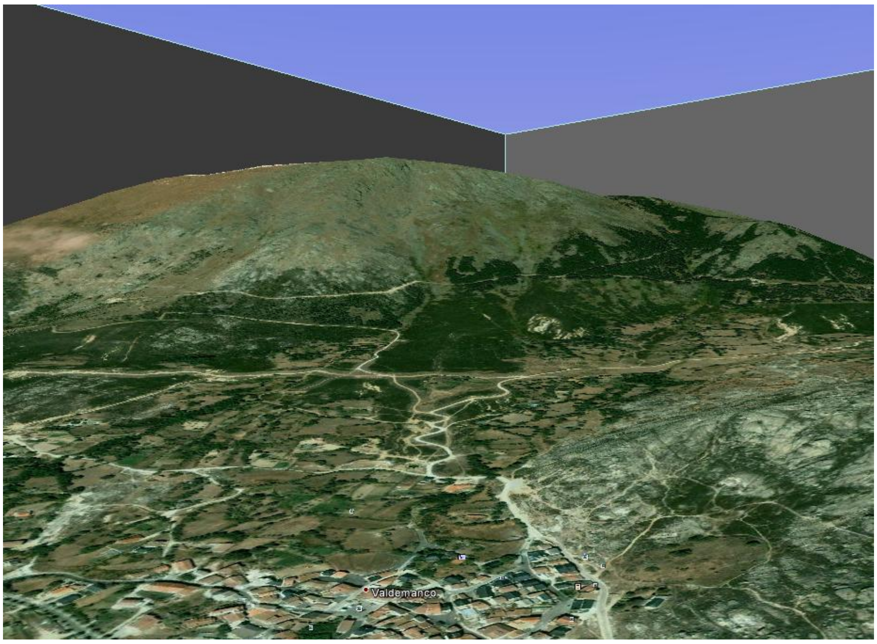


Figure 61: 5th transition main terrain risk

6.1.1.3.8 South Configuration 1st to 5th transition (18L)

Id	Latitude	Longitude	Altitude
IAWP DAGAN	40º39'31.2224''N	003º20'34.9303''W	Alt (ft).- 8000
MD200	40º39'51.5876''N	003º27'02.0078''W	Alt (ft).- 6500
MD210	40º45'51.9557''N	003º27'03.4174''W	Alt (ft).- 5300
MD211	40º45'51.4605''N	003º30'20.9002''W	Alt (ft).- 4100
MD212	40º45'50.8713''W	003º33'38.3807''W	Alt (ft).- 4000
MD220	40º47'52.0770''N	003º27'03.8899''W	Alt (ft).- 5300
MD221	40º47'51.5810''N	003º30'21.4716''W	Alt (ft).- 4500
MD222	40º47'50.9910''N	003º33'39.0509''W	Alt (ft).- 4500
MD230	40º49'52.1977''N	003º27'04.3630''W	Alt (ft).- 5300
MD231	40º49'51.7008''N	003º30'22.0436''W	Alt (ft).- 5000
MD232	40º49'51.1099''N	003º33'39.7224''W	Alt (ft).- 5000
MD240	40º51'52.3176''N	003º27'04.8371''W	Alt (ft).- 5300
MD241	40º51'51.8199''N	003º30'22.6169''W	Alt (ft).- 5300
MD242	40º51'51.2281''N	003º33'40.3949''W	Alt (ft).- 5300
MD250	40º53'52.4368''N	003º27'05.3127''W	Alt (ft).- 5300
MD251	40º53'51.9383''N	003º30'23.1918''W	Alt (ft).- 5300
MD252	40º53'51.3456''N	003º33'41.0691''W	Alt (ft).- 5300
MD202	40º41'40.5861''N	003º33'36.9889''W	Alt (ft).- 4000
LS8	40º38'03.8703''N	003º33'35.7887''W	Alt (ft).- 4000
THR18L	40º31'41.2179''N	003º33'33.6809''W	Alt (ft).- 1922.24

Table 33: 1st to 5th transitions 18L

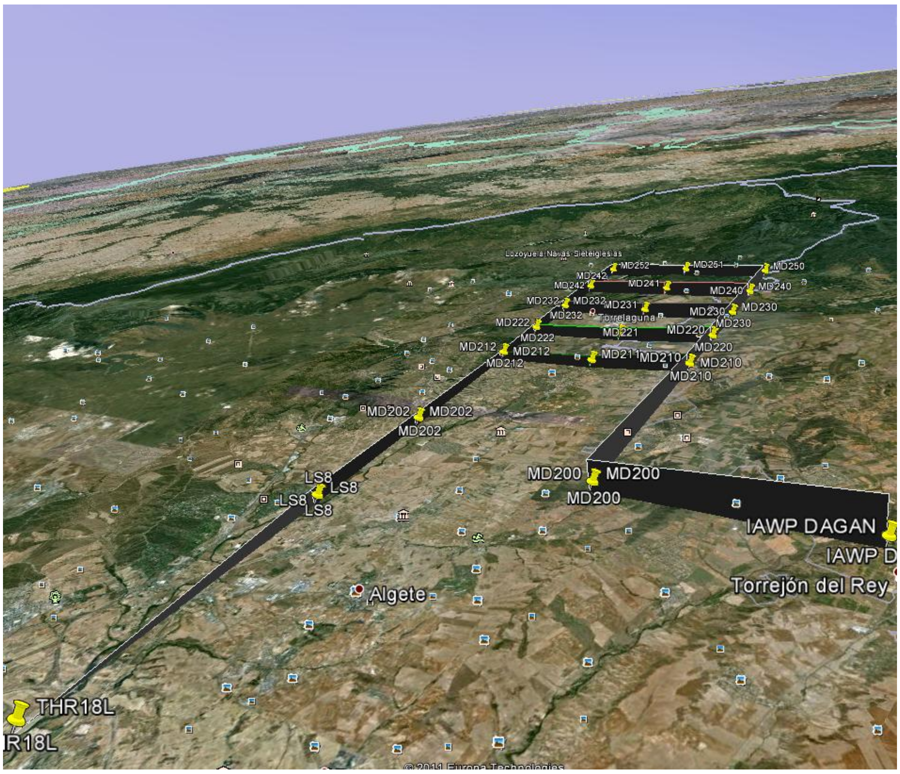
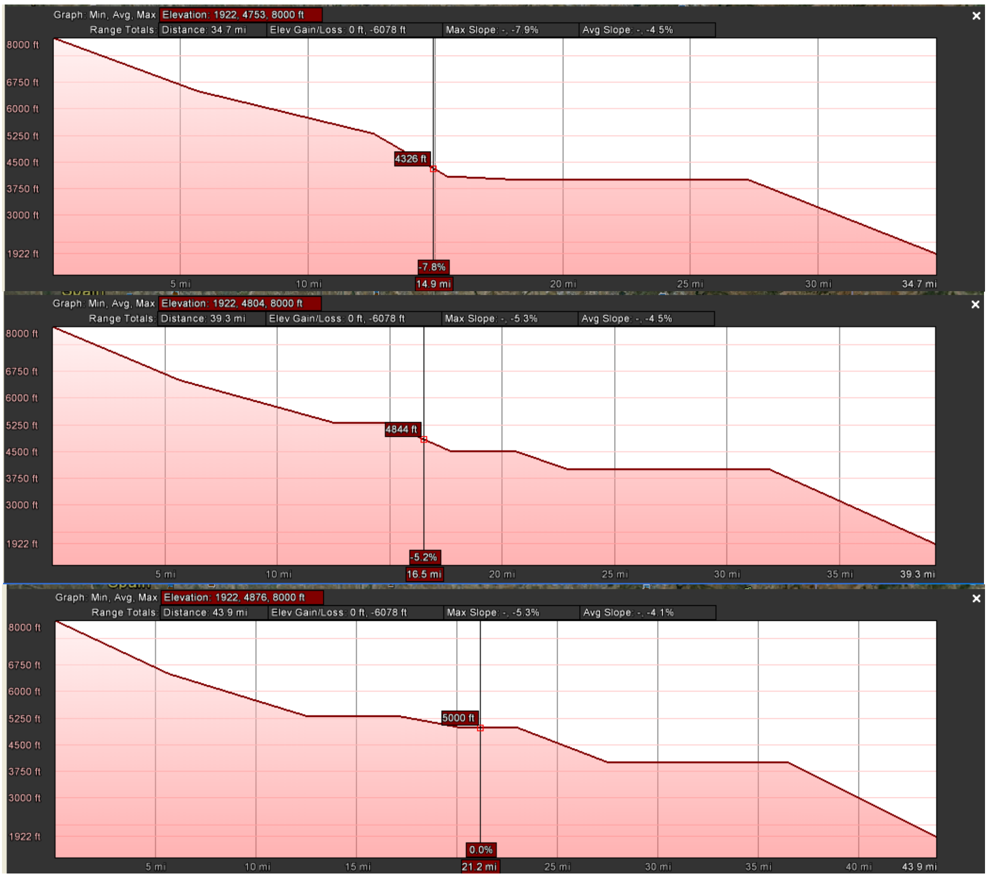


Figure 62: 1st to 5th transitions 18L



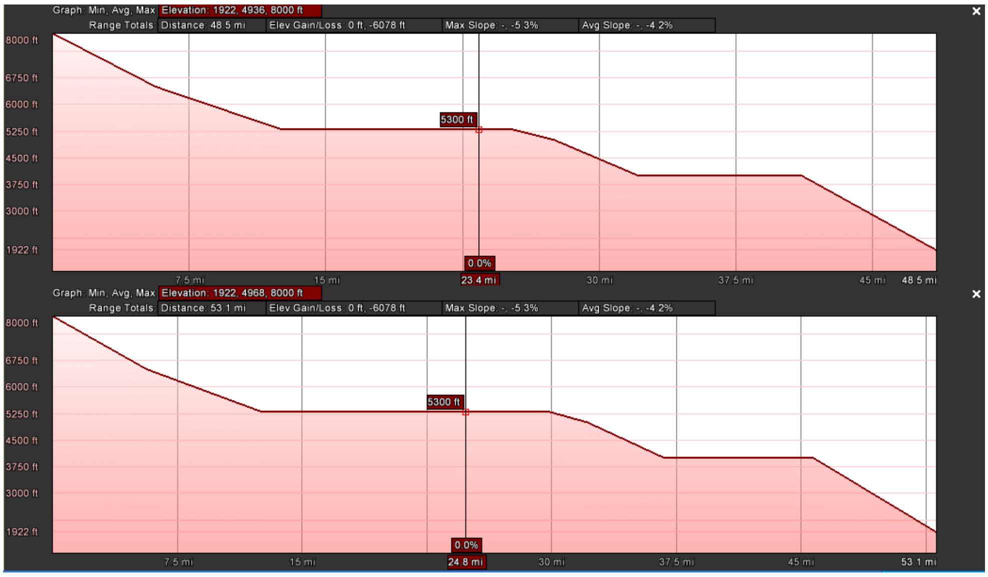


Figure 63: 1st to 5th transitions 18L (Vertical Profiles)

The 5th transition is this configuration the sequencing leg passes over a populated area which is going to be affected: El Berrueco; and a potential noise assessment is needed in the vicinity of this area.

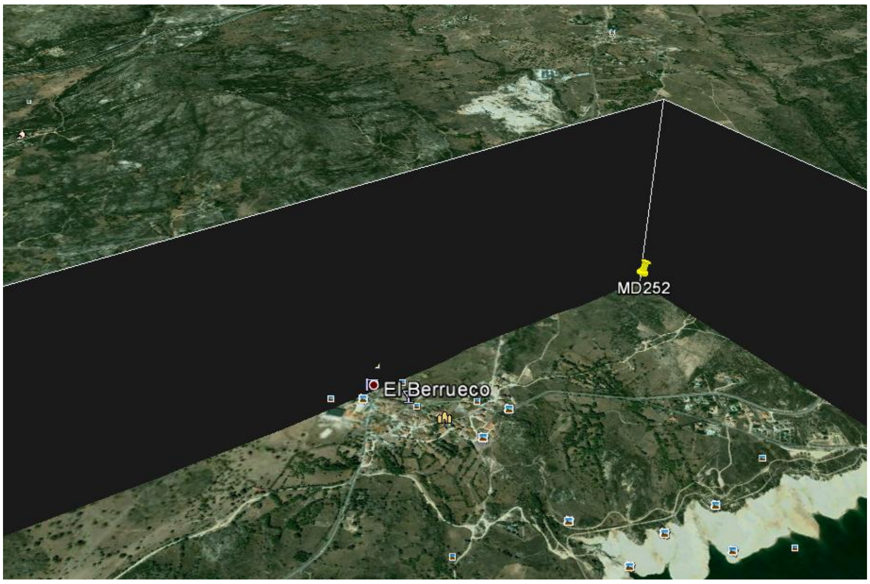


Figure 64: 4th transition potential noise assessment

6.1.2 CONVENTIONAL ARRIVALS

To study the possibility to place an IAF for each runway, as close as possible to the localizer, in a way that allows designing an instrumental maneuver for every runway in case of radio failure, or a single IAF for every two runways.

In north configuration we have to keep in mind that PDT VOR could be the IAF maintaining altitudes above the arrivals ones.

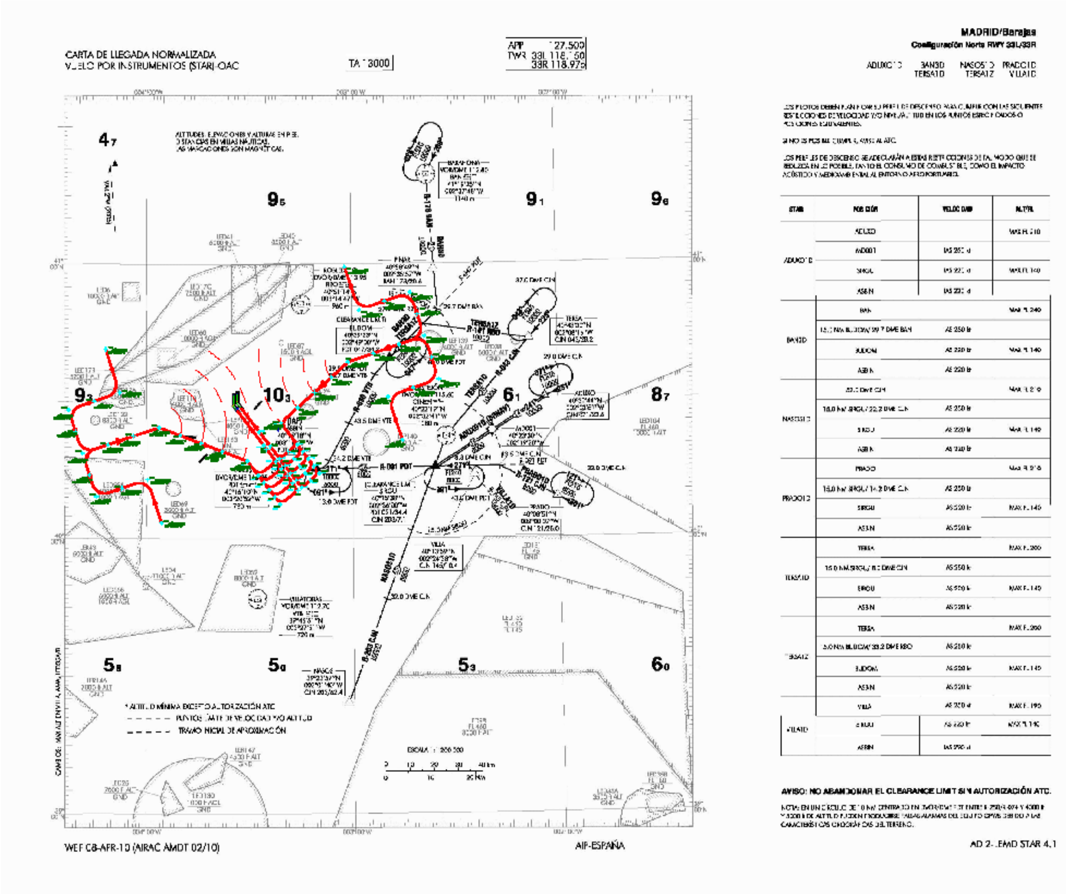


Figure 65: Conventional Arrivals for North Configuration

6.1.2.1 Conventional STARs North Configuration

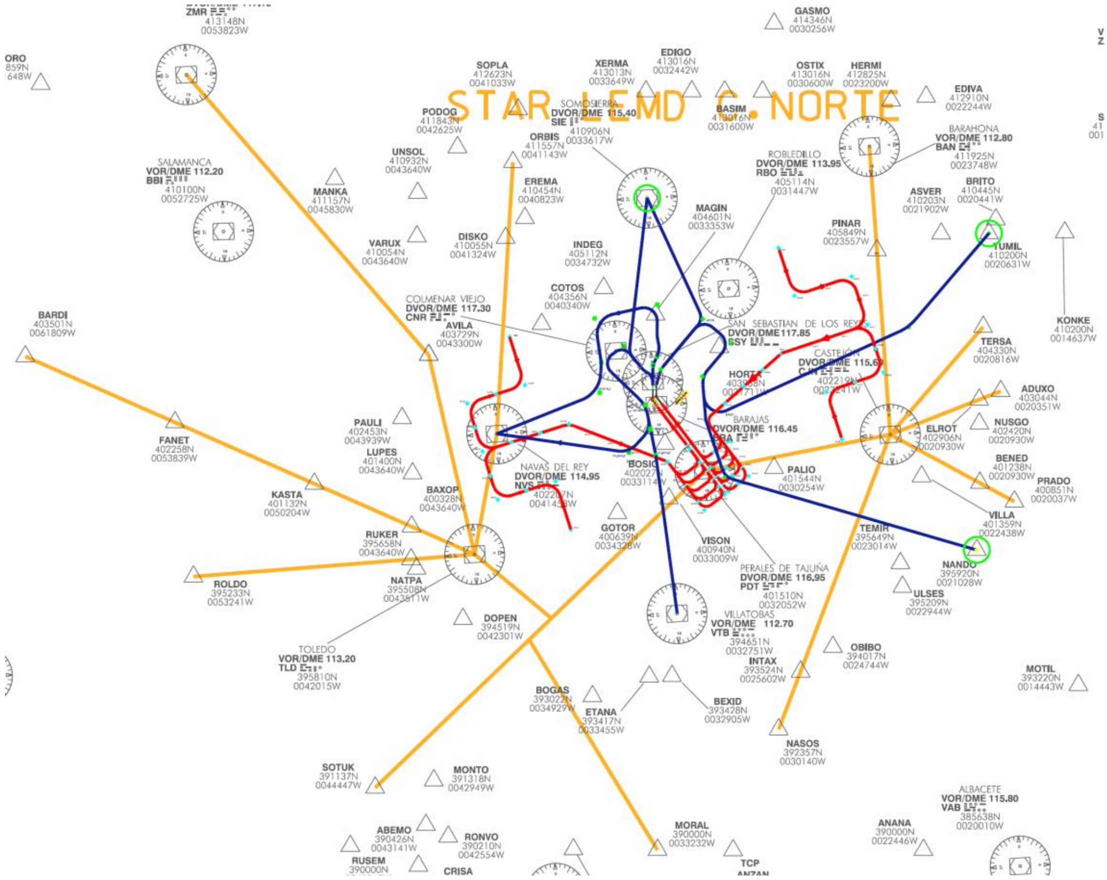


Figure 66: New Conventional Arrivals for North Configuration

6.1.2.2 Conventional STARs South Configuration

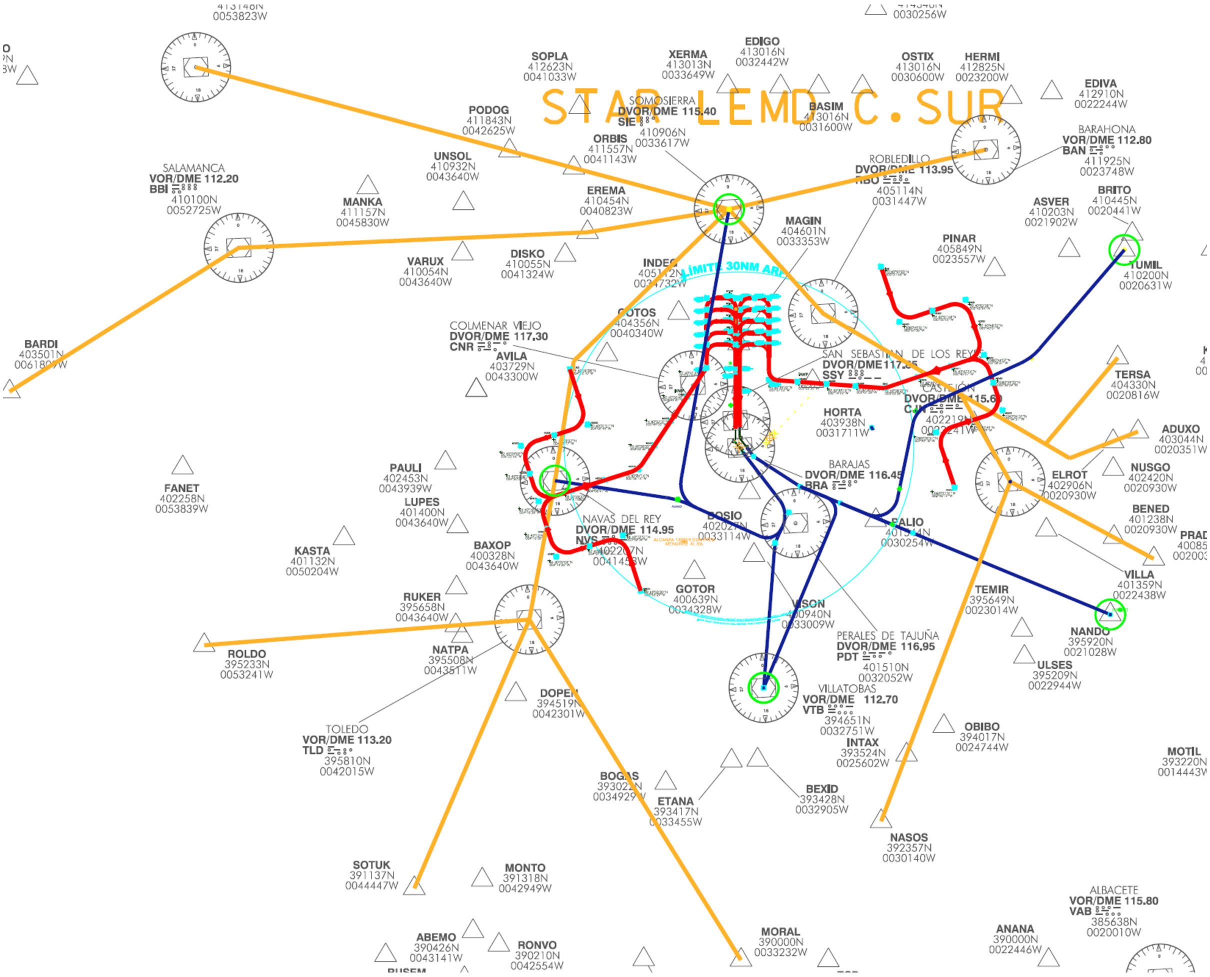


Figure 67: New Conventional Arrivals for South Configuration

6.1.3 SCOPE OF THE SCENARIO

The criterion to define transitions to ILS was:

Symmetry between North / South configuration

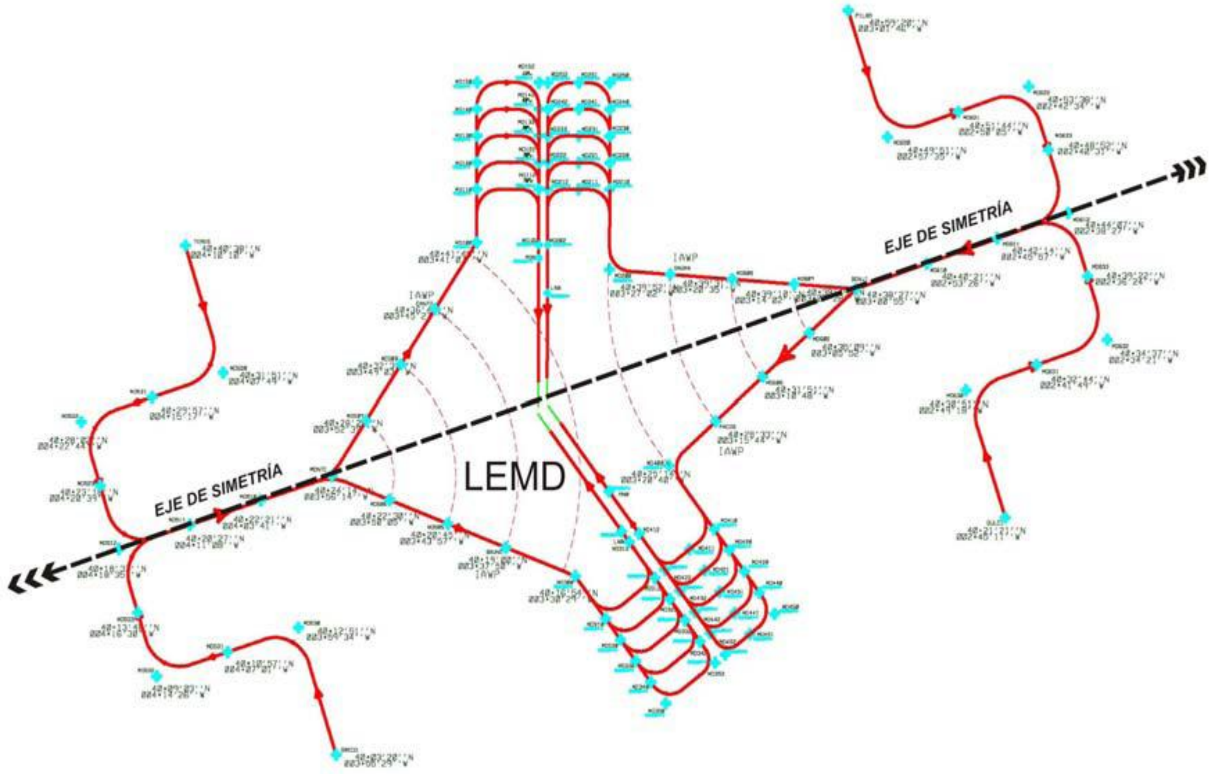


Figure 68: Design Simetry

6.1.4 AIRSPACE ORGANIZATION

6.1.4.1 LATERAL LIMITS OF THE TMA

It is necessary to widen the TMA, in order to include the protection areas of the holding pattern and a Minimum lateral separation of 5 NM. From the Star´s.

Vertically the limits will be from the ground up to FL. 205.

En-route sectors will transfer the traffic before crossing the limits, en course to the "Clearance limits" TERES, GRECO, DULCI, o PILAR, descending to FL. 210.

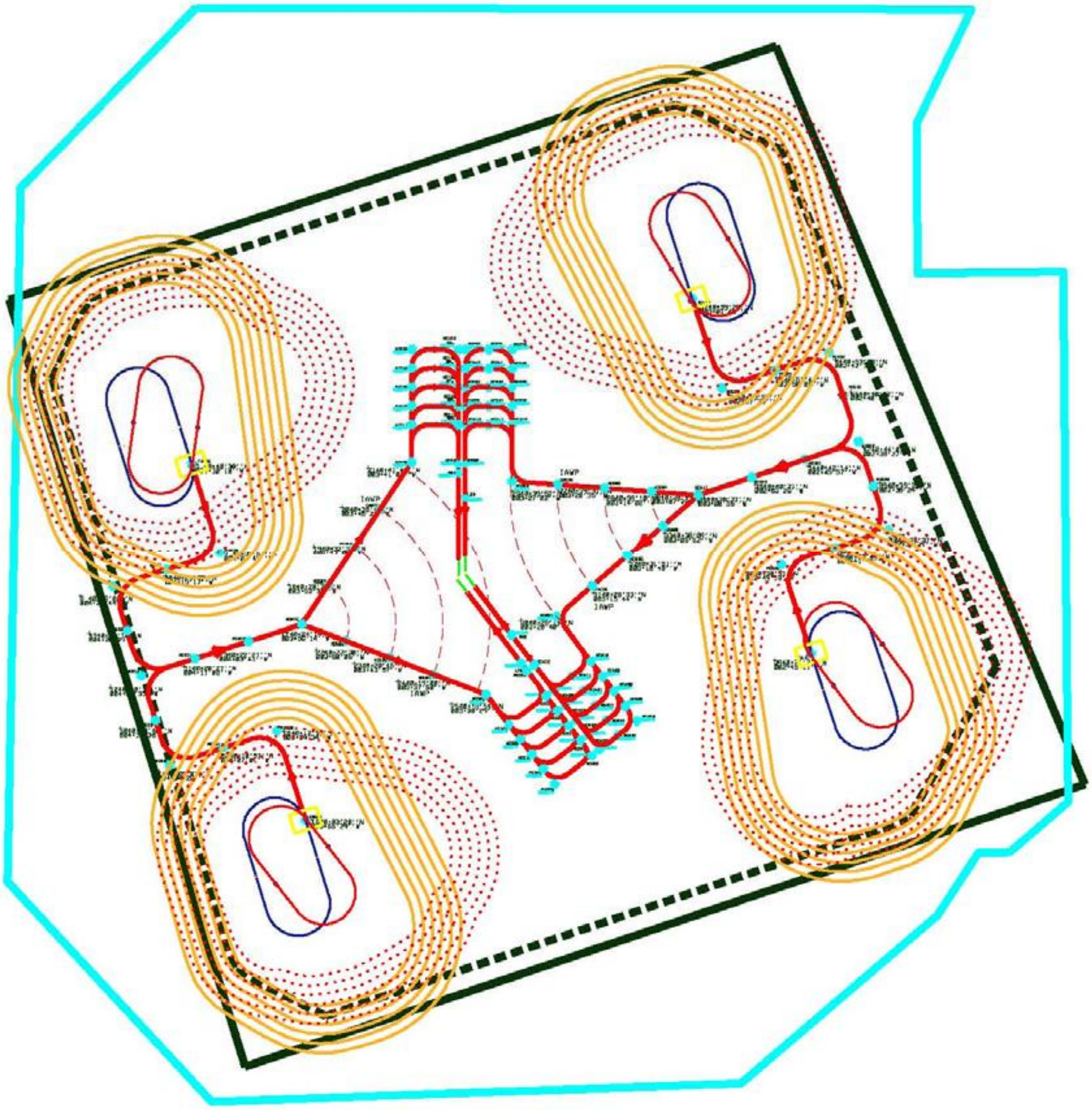


Figure 69: TMA lateral limits

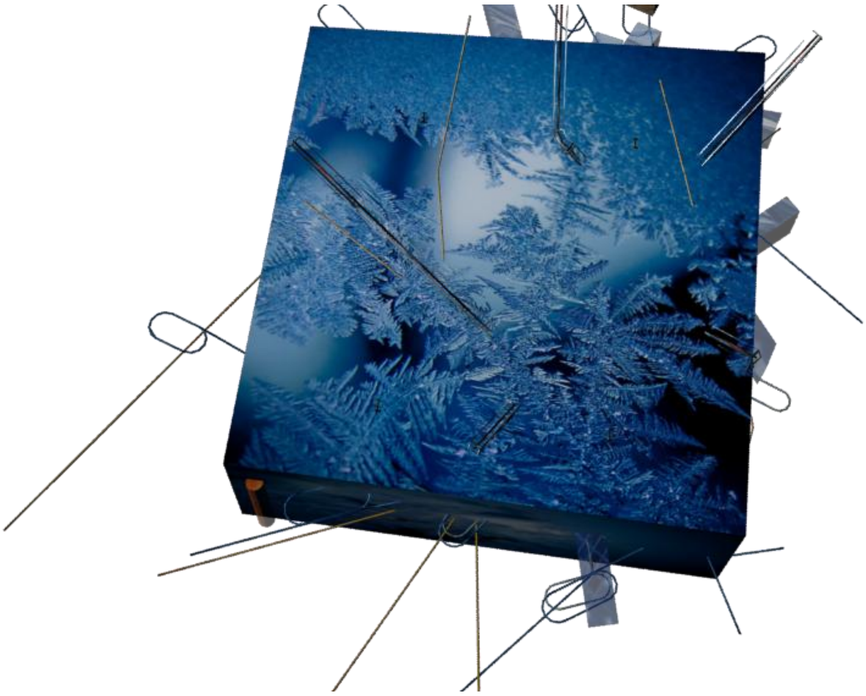


Figure 70: New TMA lateral limits (3D Representation)

6.1.4.2 Holdings patterns proposal:

Holding patterns shall meet P-RNAV conditions and also must fit conventional procedures.

P-RNAV regulations does not consider the obligation of defining a "waypoint" as a holding fix.

Holdings patterns must be located in the first points of the feeders, and also in the IAWPs.

TMA shall contain, at least, the protection areas of the holding patterns, for R-NAV navigation as well as for conventional and also the primary areas of the transitions legs to the ILS.

The new dimension of the TMA will be conditioned by the protection areas of the holding patterns and in some cases, by the orientation of those circuits for conventional navigation.

IT is shown in the following figure as a first draft.

6.1.4.3 HOLDING PATTERNS.CLEARANCE LIMITS (North and South configuration)

Conventional Holding Patterns must be designed for the P-RNAV nom approved traffic or in case of radio communications failure. Every Clearance Limit will have its corresponding Holding Pattern suitable for conventional and P-Rnav traffic. These circuits will serve for both configurations.

The TMA has enough VOR/DME Radioaid available; this will allow placing conventional holding patterns in the same position as P-RNAV Holding Patterns. Previous investigation has demonstrated that the entrance in the Holding Pattern fits for both cases.

6.1.4.3.1 Holdings in MONTE/BENJI (North and South configurations)

In the event that any problem arise with the traffic – Contingency- (runway closed, complex MAP, etc), or because a saturation it´s very convenient to have a holding pattern in points MONTE and BENJI, within the airspace of the director sectors East and West.

MONTE in the west sector ¿Maximum altitude 11000FT, turns to the left, inbound track 075º?

BENJI in the East sector ¿maximum altitude 11000FT, turns to the right, inbound track 255º?

The inbound tracks are approximate.

6.1.4.3.2 Holdings Patterns in the IAWP. North configuration

It is convenient that the Air Space department looks into the possibility of having such a holdings patterns in the IAWP in the Final sector of the north configuration, if the LED94 was in force. We still don´t know if somebody takes into account such a delta area for designing the trajectory of the star´s via PACOS
Final sectors should have to have a holding pattern in each IAWP: BRUNO in the West: ¿Maximum altitude 9000FT., All turns to the left, inbound track 300º?
PACOS in the East ¿Maximun altitude 10000FT., all turns to the left, inbound track 040º?
The direction of the turnings and altitudes have been calculated, taking into account that a possible holding don´t interfere with the traffic of the aerodromes in the vicinity. The maximum altitudes should avoid that the traffic enters in the collateral sectors. It´s still unresolved the minimum altitude that must be calculated by the department of Air Space.

6.1.4.3.3 Holdings Patterns in the IAWP. South configuration

Final sectors should have to have a holding pattern in each IAWP:
CANTO in the West sector ¿Maximun altitude 10000FT., inbound track 030º, all turnings to the left? This holding will be located in the airspace between Director Sector and Departure West sector; there must be an efficient coordination between them (The communications procedures must be carried out by the director sector).
IAWP: DAGAN by the East ¿Maximun altitude 10000FT., inbound track 280º, all turns to the right? Located in the airspace of AFES, but next to Director. Communications procedures shall be carried out by Director East.

The directions of turns and altitudes have been calculated taking into account that a possible Holding doesn't affect the traffic on the adjacent airfield. The maximum altitudes should avoid that the traffic enters into the adjacent sectors.

6.1.4.3.4 Airspace Routes

Model B: Pre- sequence mode defined by waypoints located in the bisectriz of the angle between the Clearance Limits and their respective holding pattern is the same for both configurations. That is shown in the next figure.

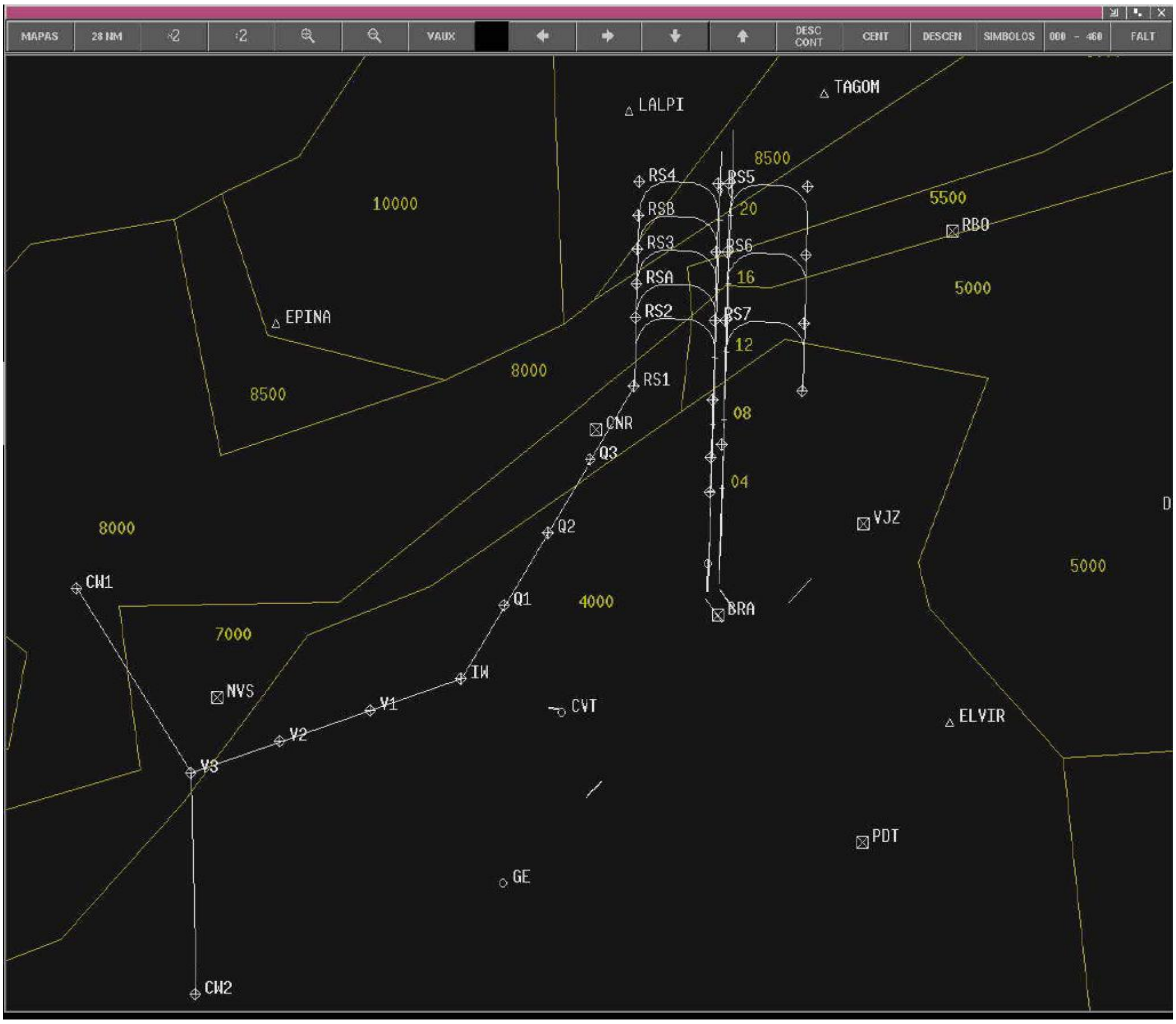


Figure 71: ATC P-RNAV Radar Screen

6.1.5 AIRCRAFT APPROACH PER STEPS

- Separation between “turning base” legs to allow alternate between parallel runways.
- Five transitions at least, in order to have enough space to maneuver.
- Five NM. Separation between “down wind” leg and the approach leg.

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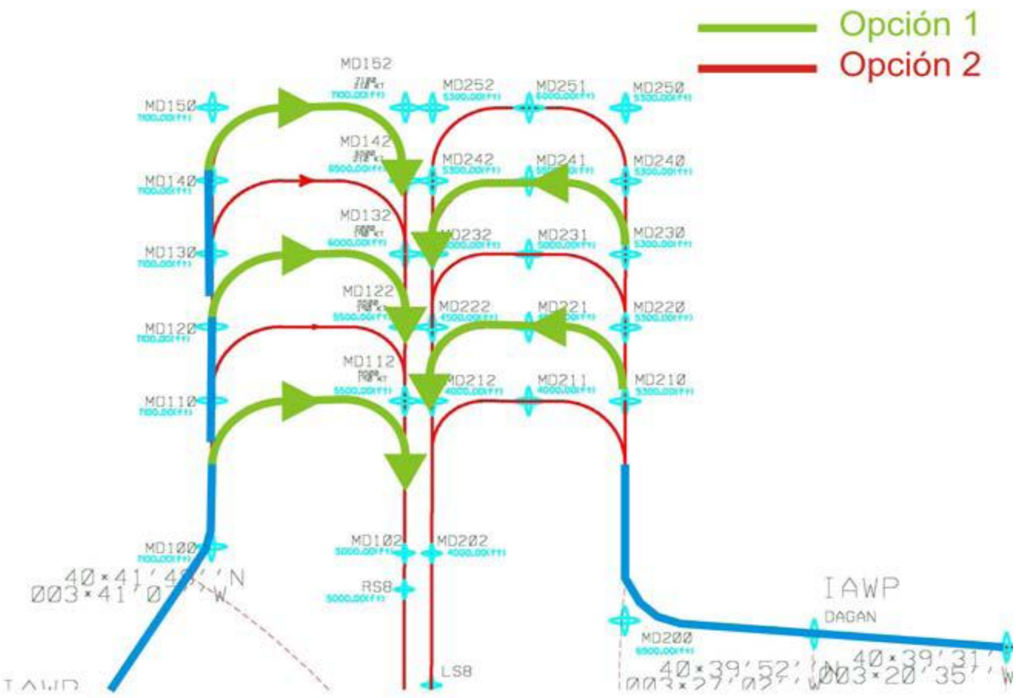

Figure 72: Usage of sequencing legs (Dependent Approaches)

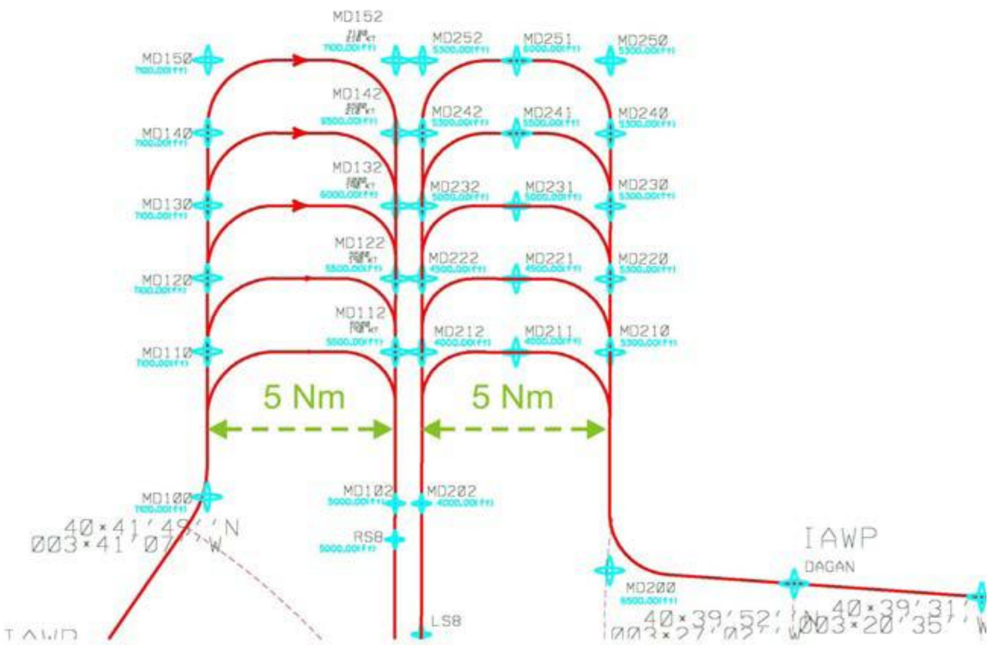

Figure 73: 5NM distance separation between down-wind leg and up-wind leg

In the transition to runway 18, it has been considered to introduce intermediate waypoints inside the turning base legs, to define (in a more accurate way) the passing altitudes over those points. The final establishment of those points is subject to the possibility of codifying them for the different types of aircrafts and FMS, taking into account that the distances between consecutives waypoints could not be enough.

The distances flown between the bifurcation in the feeders and the first waypoint in the turning base leg are equal.

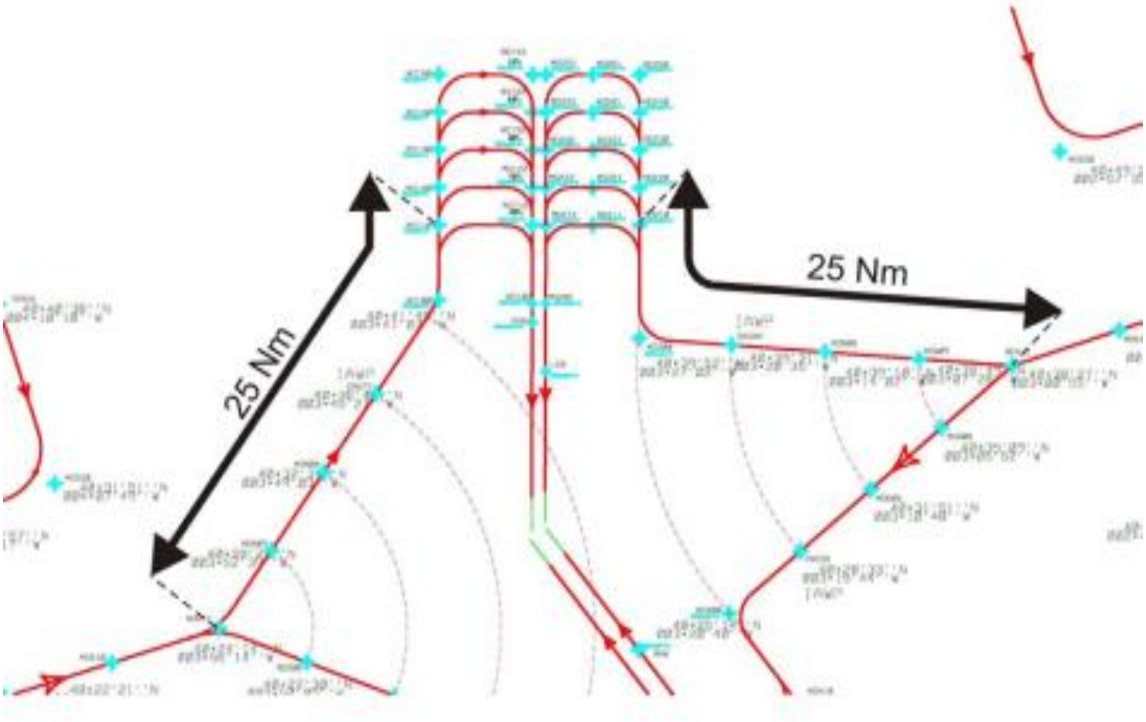

Figure 74: 25NM between BENJI/MONTE and first transition legs

6.1.6 Controlling Sectors

It has been defined new sectors for each configuration taking into account altitudes and lateral limits to balance traffic between traffic coming from Eastbound and Westbound, departures and arrivals, Getafe, Barajas and Torrejón airports traffic:

North Configuration		South Configuration	
AFEN	10500	AFES	11500
AFWN	10500	AFWS	11500
DEN	13500	DES	13500
DIN	7500	DWS	13500
DWN	13500	DIS	7500
DWN B	9500	ENS	20500

ENN	20500	ESS	20500
ESN	20500	WNS	20500
REN	14500	WSS	20500
RWN	14500	RES	14500
WNN	20500	RWS	14500
WSN	20500		
	* All units are in feet		

Table 34: Sector Altitudes

6.1.6.1 North Configuration

6.1.6.1.1 External Sectors (feeders)

With a vertical limit of 20 500 ft, these sectors are in charge of managing traffic coming into and going out of TMA boundaries.

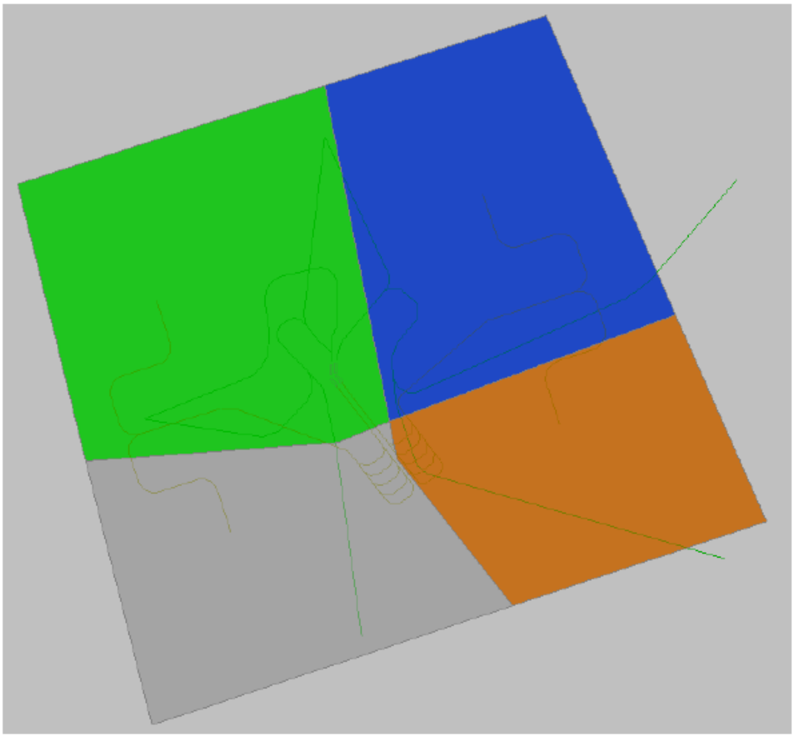

Figure 75: External Sectors for North Configuration

They are also in charge of over-flying traffic below 205 FL. The indicated velocities in this airspace area is about 300 NM/h and they are adjusted in order to enter in the TMA to approximately 250 Kts. The horizontal separation is adjusted to 5-7 NM with 3NM of radar separation minima. The controllers in charge of these feeder sectors, they transfer the traffic to the director sectors, having handled the first approach sequence (20 500 ft. –> 15 000 ft.).

6.1.6.1.2 Director Sectors

With a vertical limit of 14 500 ft, these sectors are in charge of merging the traffic coming from external sectors (arrivals) and in charge of Torrejón (North Configuration) and Getafe.

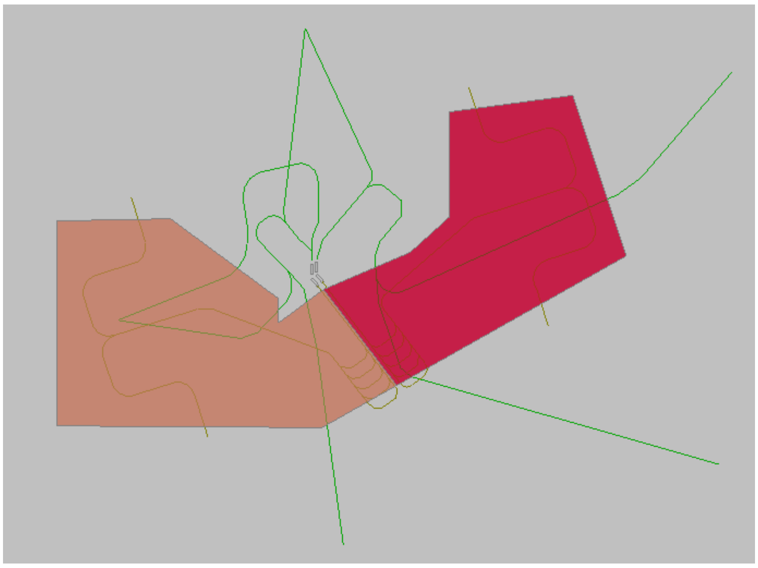

Figure 76: Director Sectors for North Configuration

The indicated velocities in this airspace area is about 200 – 220 NM/h. The horizontal separation is adjusted to 5 NM with 3NM of radar separation minima. The controllers in charge of these directors sectors, they transfer the traffic to the final approach sectors, having handled the second approach sequence (14 500 ft. –> 9 000 ft. (West) or 7 500 ft.(East)). Before reaching the respective IAF, they have to assigned a sequencing leg and clear it to transfer it to the final approach.

6.1.6.1.3 Final Approach Sectors

With a vertical limit of 10 500 ft, these sectors are in charge of the final sequencing of the traffic coming from the director sectors (arrivals).

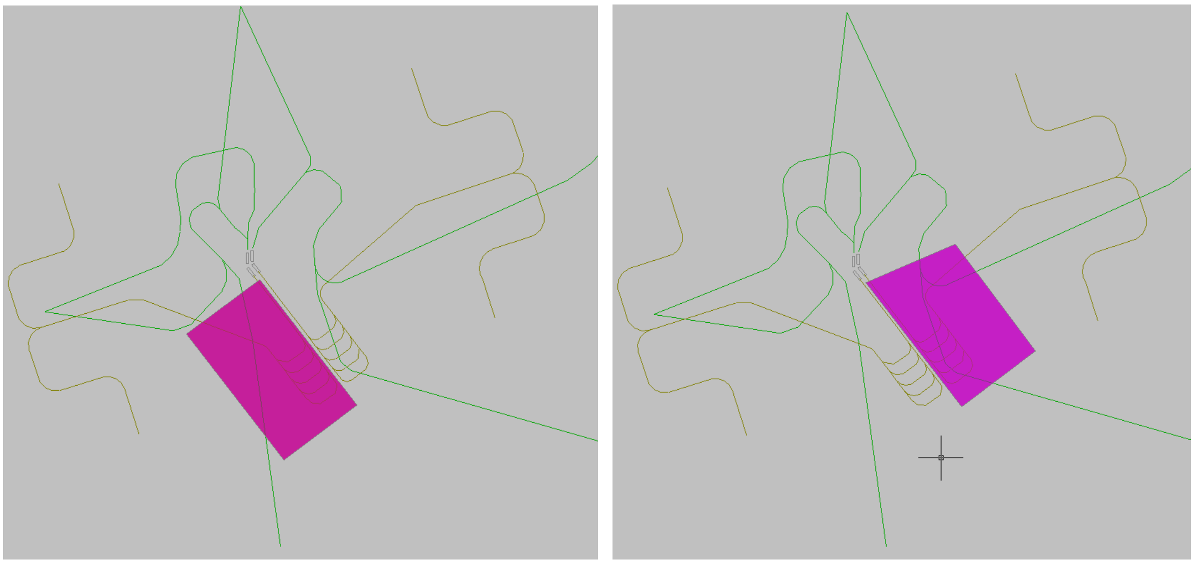

Figure 77: AFEN and AFWN for North Configuration

The indicated velocities in this airspace area is about 160 – 180 NM/h. The horizontal separation is adjusted to 3 NM as radar separation minima. The controllers in charge of deciding whenever the aircraft turns of to intercept the ILS localizer, then they transfer the traffic to the tower (TWR APP) sector, having handled the final approach sequence (9 000 ft. - 7 500 ft. –> 5 000 ft. – 4 000 ft.).

6.1.6.1.4 NTZ Sector

There is a small sector for independent arrivals called No Transgression Zone in charge of the surveillance of the area located between the 2 ILS in the final approach segment. No aircraft can fly over this area in order to establish the safety criteria for independent arrivals. The communication in this area is mandatory and stands over other type of communication. In case this safety zone is violated, the following aircraft ready to land has to proceed to missed approach procedures.

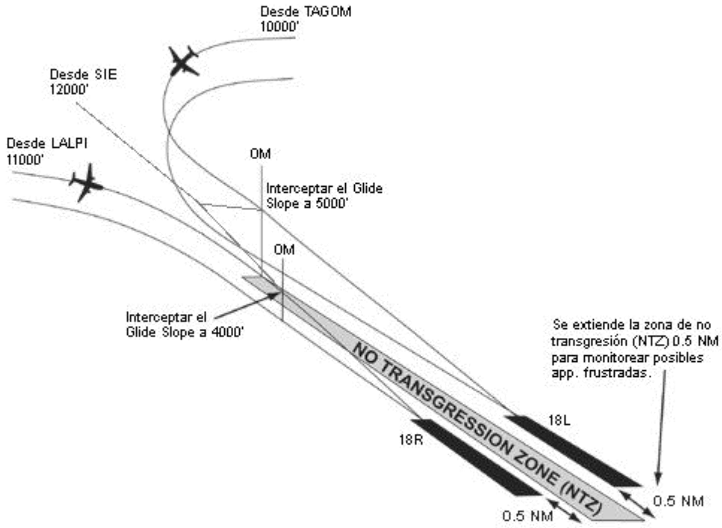

Figure 78: NTZ Sector

6.1.6.1.5 Departure Sectors

These sectors are in charge of the departures sequencing. It is divided in an initial sequence until 7 500 ft. (DIN), transfer to a second sequence until 9 500 ft. (or 13 500 ft.) to a final transfer to route (or direct-to instructions above 10 000 ft.)

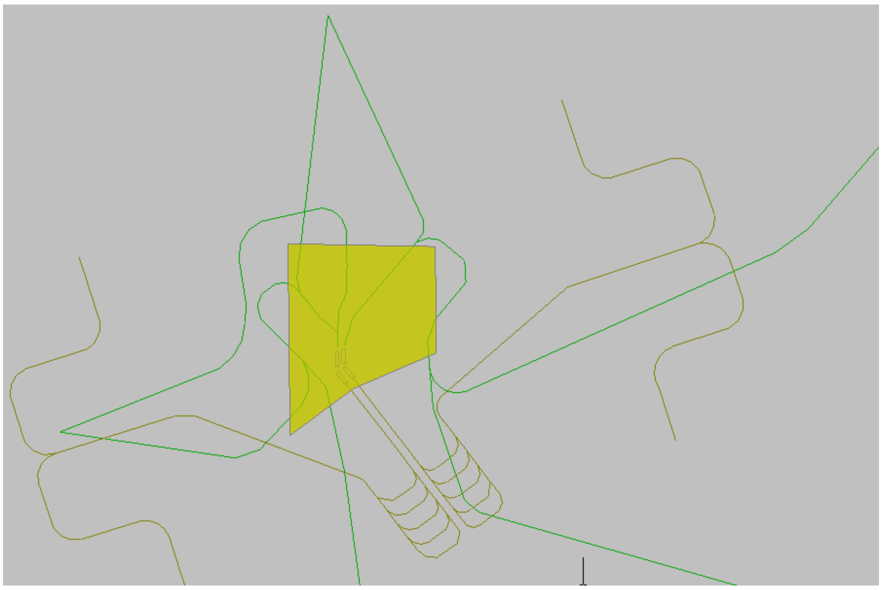

Figure 79: DIN Sector

Figure 80: DEN, DWN and DWN B Sector

6.1.6.2 South Configuration

6.1.6.2.1 External Sectors (feeders)

With a vertical limit of 20 500 ft, these sectors are in charge of managing traffic coming into and going out of TMA boundaries.

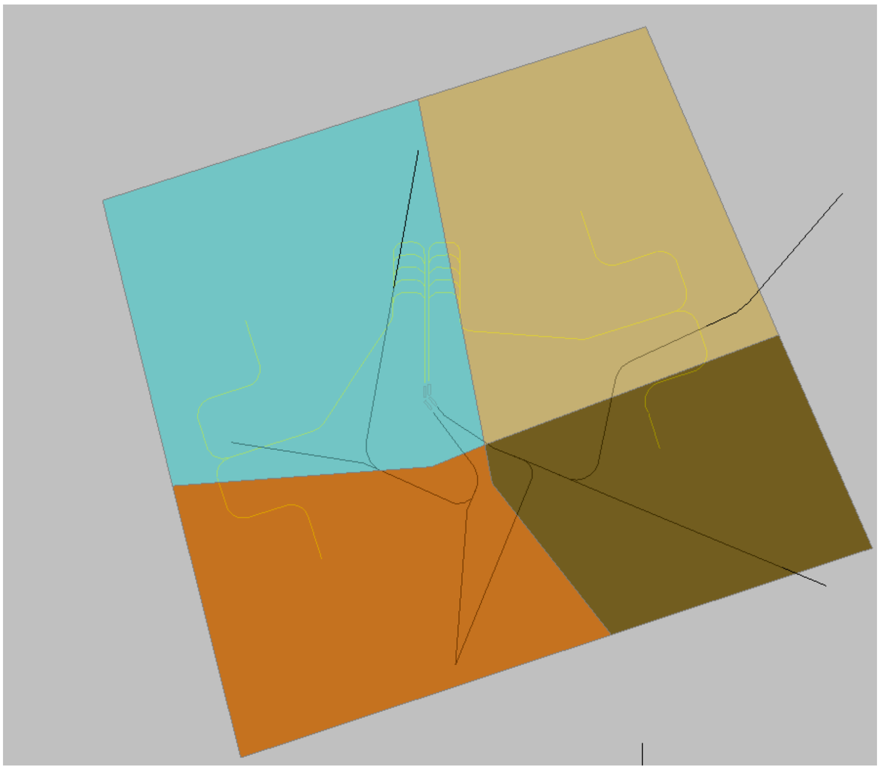

Figure 81: External Sectors for South Configuration

They are also in charge of over-flying traffic below 205 FL. The indicated velocities in this airspace area is about 300 NM/h and they are adjusted in order to enter in the TMA to approximately 250 Kts. The horizontal separation is adjusted to 5-7 NM with 3NM of radar separation minima. The controllers in charge of these feeder sectors, they transfer the traffic to the director sectors, having handled the first approach sequence (20 500 ft. –> 15 000 ft.).

6.1.6.2.2 Director Sectors

With a vertical limit of 14 500 ft, these sectors are in charge of merging the traffic coming from external sectors (arrivals) and in charge of Torrejón (North Configuration) and Getafe.

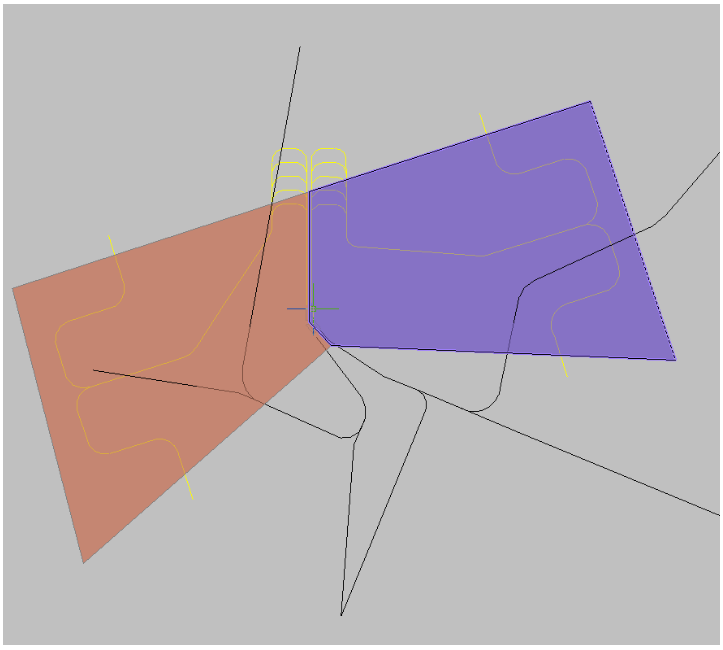

Figure 82: Director Sectors for South Configuration

The indicated velocities in this airspace area is about 200 – 220 NM/h. The horizontal separation is adjusted to 5 NM with 3NM of radar separation minima. The controllers in charge of these directors sectors, they transfer the traffic to the final approach sectors, having handled the second approach sequence (14 500 ft. –> 9 000 ft. (West) or 8 000 ft.(East)). Before reaching the respective IAF, they have to assigned a sequencing leg and clear it to transfer it to the final approach.

6.1.6.2.3 Final Approach Sectors

With a vertical limit of 10 500 ft, these sectors are in charge of the final sequencing of the traffic coming from the director sectors (arrivals).

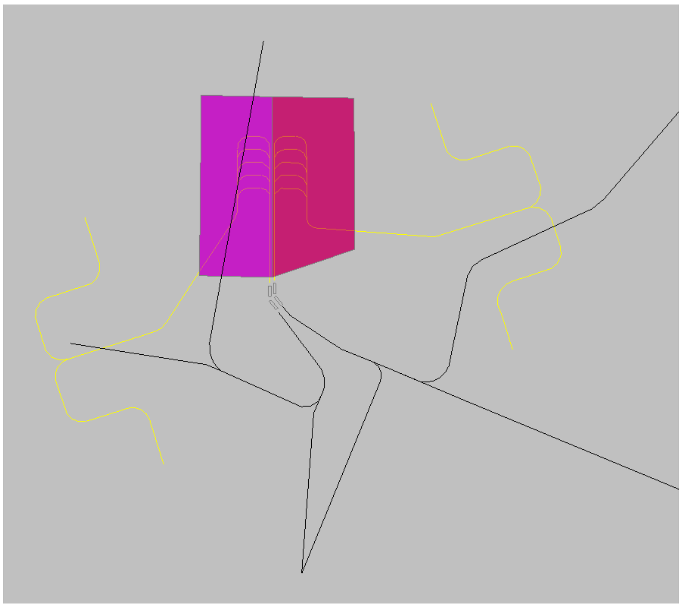

Figure 83: AFES and AFWS for South Configuration

The indicated velocities in this airspace area is about 160 – 180 NM/h. The horizontal separation is adjusted to 3 NM as radar separation minima. The controllers in charge of deciding whenever the aircraft turns of to intercept the ILS localizer, then they transfer the traffic to the tower (TWR APP) sector, having handled the final approach sequence (9 00 ft. - 8 000 ft. –> 5 000 ft. – 4 000 ft.).

6.1.6.2.4 Departure Sectors

These sectors are in charge of the departures sequencing. It is divided in an initial sequence until 7 500 ft. (DIS), transfer to a second sequence until 13 500 ft. to a final transfer to route (or direct-to instructions above 10 000 ft.)

Figure 84: DIS Sector (with final approach sectors)

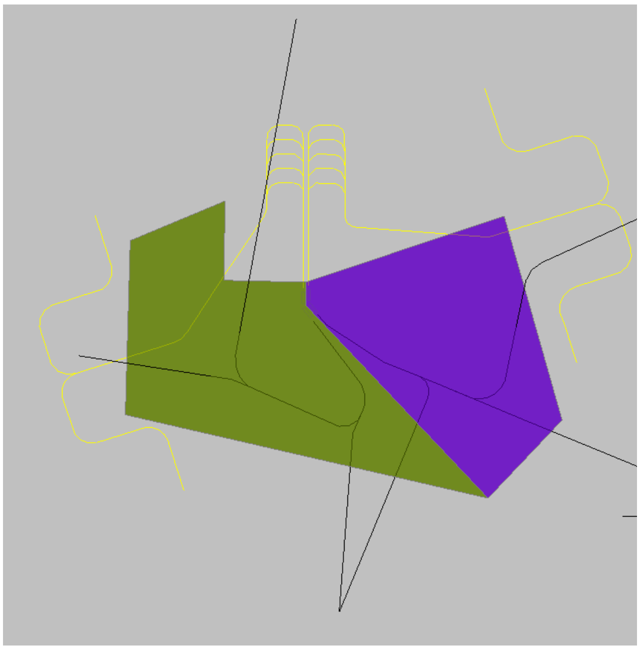

Figure 85: DES and DWS Sectors

6.1.7 MISSED APROACHES PROCEDURES

North Configuration

There is a need to maintain the initial and intermediate segments in the North configuration missed approaches that are calculated to cause the least possible impact on surrounding populations and in addition there are no more options because of the characteristics of the TMA.

In the event of a MAP the traffic, will proceed by the R-234 of CNR, when turning at 10.2 DME CNR will proceed to BRUNO climbing to 6000' FT. when the MAP is in the RWY33L and for the MAPs of RWY 33R the climbing will be to 7000'FT. (this will also keep the initial and intermediate stages prior to proceed to BRUNO).

South Configuration

We need to maintain the initial and intermediate segments in the South configuration missed approaches that are calculated to cause the least possible impact on surrounding populations.

RWY 18R. - Extend the intermediate leg of the MAP to avoid passing through the city of Madrid, R182 DME distance dialing from SSY. Then turn right direct to MONTE climbing to 6000

RWY 18L. - Maintain current MAP procedures until VJZ, then turn to Dagan climbing to 8000 '.

6.2 Operational Scenario 2: Madrid Barajas Departures

6.2.1 SID PROCEDURES PROPOSAL

The SIDs has been established, outside of the feeders areas or overflying the lowest part of the transitions.
The main difficulty arises from the need of introducing a crossing point between the short and the long SIDs from the runway 36L, because it can generate problems for the ATC.As a previous condition, that crossing point must be established providing a great difference (in terms of the length) between the trajectories of both SYDs, keeping in mind that the short departure does not climb too much, meanwhile the long one, has enough time to do it. Another aspect we have to consider is the different rate of climb of the aircrafts involved.

6.2.2 NORTH CONFIGURATION NEW SIDs

6.2.2.1 DEPARTURES RWY 36L:

6.2.2.1.1 Departures P-RNAV RWY 36L

4 P-RNAV departures: SID NVS (Long), SID SIE, SID NVS (Short) and SID VTB

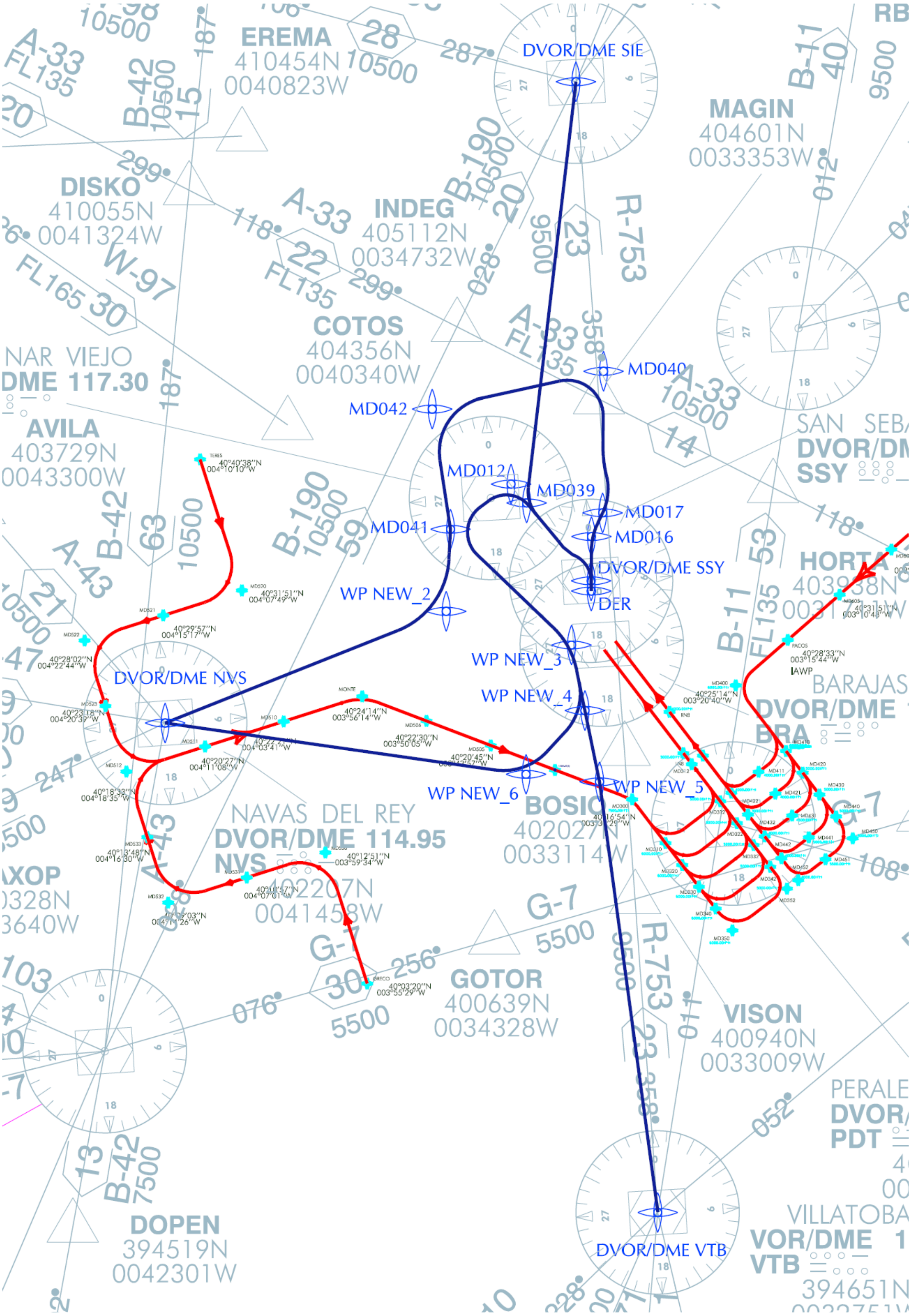

Table 35: P-RNAV SIDs 36L

6.2.2.1.1.1 P-RNAV.- SID NVS (Long)

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
THR 18R	40º31'22.4008''N	003º34'29.2663''W	1991,14
MD016	40º36'00.4850''N	003º34'30.8205''W	3213
MD017	40º37'44.5729''N	003º33'27.1281''W	3789
MD040	40º48'02.4958''N	003º33'27.5277''W	6657
MD042	40º45'11.5795''N	003º49'49.7934''W	10023
MD041	40º36'27.6675''N	003º47'58.2296''W	12486
WP NEW_2	40º30'29.3738''N	003º48'18.8208''W	14147
DVOR/DME NVS	40º22'07.2000''N	004º14'57.9000''W	20727

Table 36: P-RNAV SID NVS (Long)

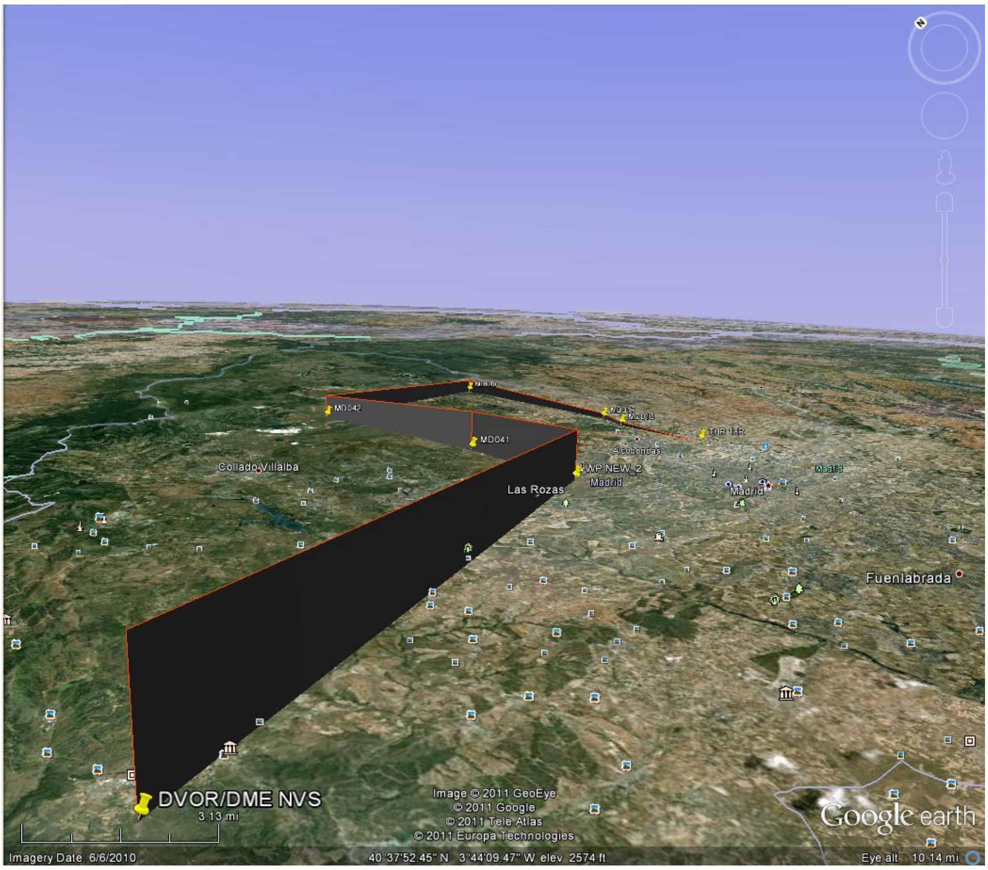

Figure 86: P-RNAV SID NVS (Long)

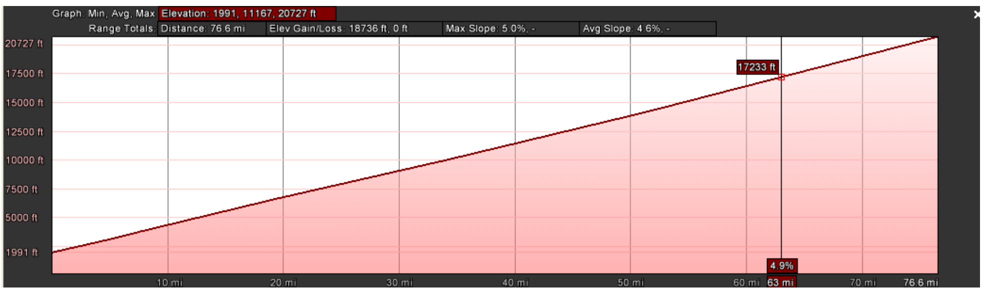

Figure 87: P-RNAV SID NVS (Long) – Vertical Profile

6.2.2.1.1.2 P-RNAV.- SID SIE

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
THR 18R	40º31'22.4008''N	003º34'29.2663''W	1991,14
DVOR/DME SSY	40º32'47.1000''N	003º34'30.7000''W	2241
MD039	40º38'25.5697''N	003º40'43.6159''W	4509
DVOR/DME SIE	41º09'06.1000''N	003º36'16.8000''W	10445

Table 37: P-RNAV SID SIE

Figure 88: P-RNAV SID SIE

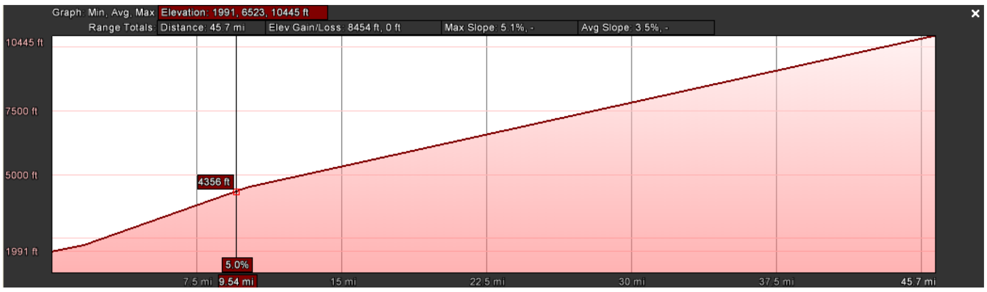

Figure 89: P-RNAV SID SIE – Vertical Profile

This SID passes over La Cabrera saving it with vertical separation but it has to be taking into account if this procedure wants to be implemented:

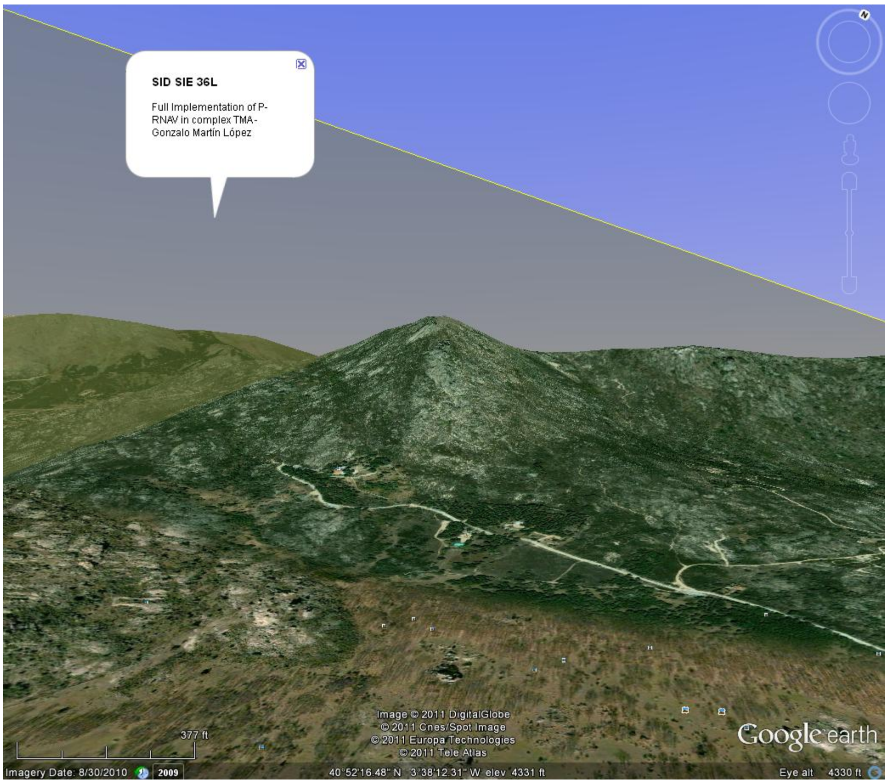

Figure 90: P-RNAV SID SIE – La Cabrera

6.2.2.1.1.3 P-RNAV.- SID NVS (Short)

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
THR 18R	40º31'22.4008''N	003º34'29.2663''W	1991,14
DVOR/DME SSY	40º32'47.1000''N	003º34'30.7000''W	2241
MD012	40º39'47.1355'N	003º42'13.8894''W	4944
MD041	40º36'27.6675''N	003º47'58.2296''W	6272
WP NEW_3	40º28'06.4192''N	003º36'20.6057''W	9736
WP NEW_4	40º23'20.9498''N	003º35'01.3516''W	11147
New_6 (corta)	40º18'40.3464''N	003º40'35.0786W	12962
DVOR/DME NVS	40º22'07.2000''N	004º14'57.9000''W	20961

Table 38: P-RNAV SID NVS (Short)

Figure 91: P-RNAV SID NVS (Short)

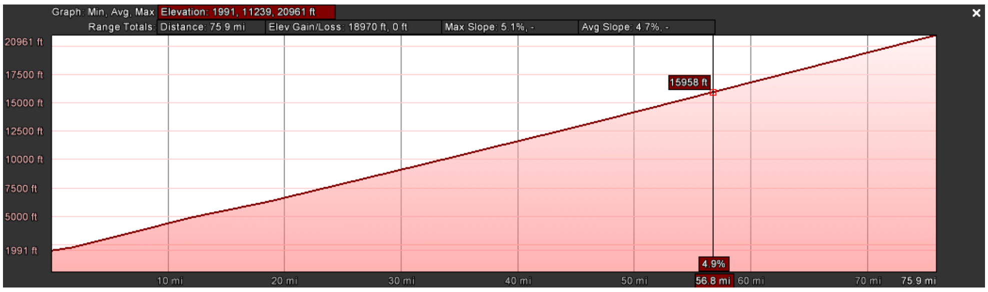

Figure 92: P-RNAV SID NVS (Short)– Vertical Profile

This SID doesn't affect main populated areas, passing next to main buildings constructed recently in the vicinity of Chamartín District (4 towers):

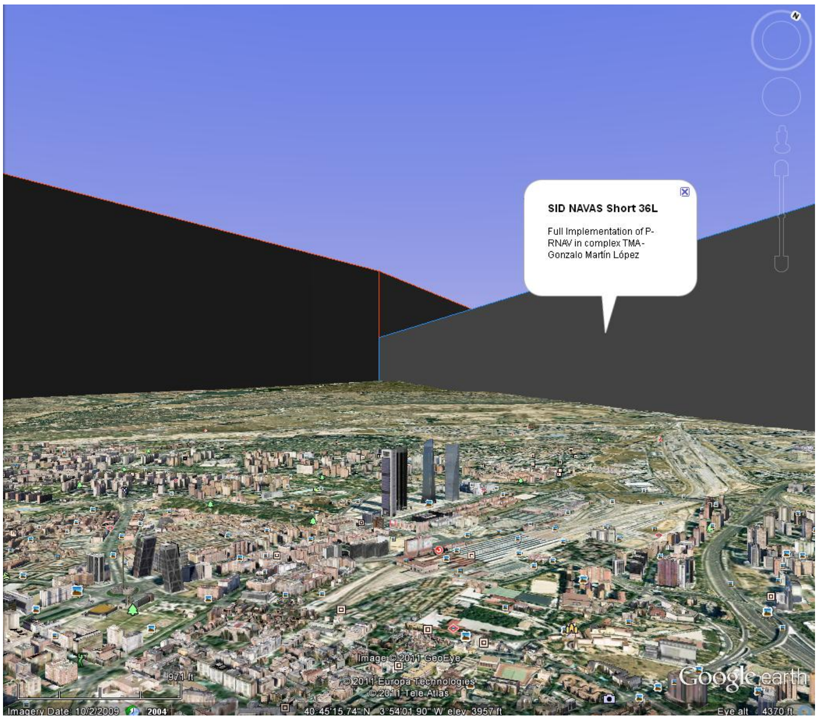

Figure 93: P-RNAV SID NVS (Short)– 4 towers

6.2.2.1.1.4 P-RNAV.- SID VTB

Procedural description: It will be maintained departures via VTB1AX (long) and VTB1AY (short) as they are today, after VTB the traffic will be distributed to MONTO or NASOS. For the traffic that leaves the FIR via CCS or BARDI, the traffic proceed direct to a new intersection named PEPIN located in the airway G7 at the west of TLD, from there direst to CCS or direct to BARDI.

Id	Latitude	Longitude	Altitude (ft)
THR18L	40º31'41.2179''N	003º33'33.6809''W	1922,24
DVOR/DME SSY	40º32'47.1000''N	003º34'30.7000''W	2241
MD012	40º39'47.1355'N	003º42'13.8894''W	4944
MD041	40º36'27.6675''N	003º47'58.2296''W	6272
WP NEW_3	40º28'06.4192''N	003º36'20.6057''W	9736
WP NEW_4	40º23'20.9498''N	003º35'01.3516''W	11147
WP NEW_5	40º18'09.9097''N	003º33'35.2201''W	12700
VOR/DME VTB (sur)	39º46'50.7000''N	003º27'50.5000''W	22299

Table 39: P-RNAV SID VTB

Figure 94: P-RNAV SID NVS (Short)

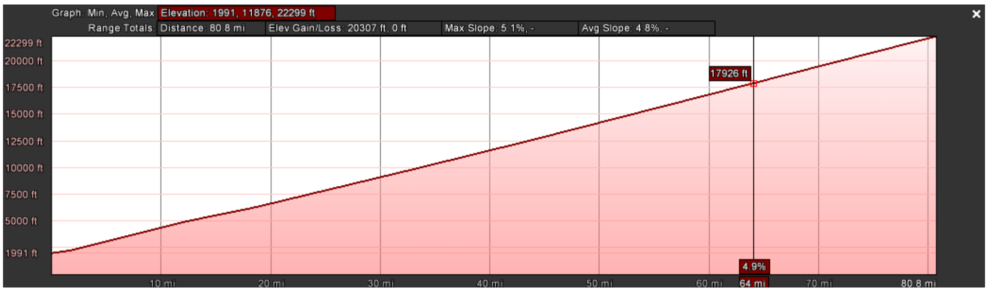

Figure 95: P-RNAV SID NVS (Short)– Vertical Profile

6.2.2.1.2 Conventional departures RWY 36L

Departures via SIE: maintain current SIE1X; from SIE distribute the traffic to DGO, BGS or ZMR.

6.2.2.1.2.1 Departures via VTB

Maintain departures VTB1XE y VTB1YD, from VTB proceed direct to PEPIN for traffic to CCS or BARDI. For traffic bound south, proceed VTB- MONTO or VTB-NASOS.

6.2.2.1.2.2 Departures via SIE

TBC

6.2.2.1.2.3 Departures via

TBC

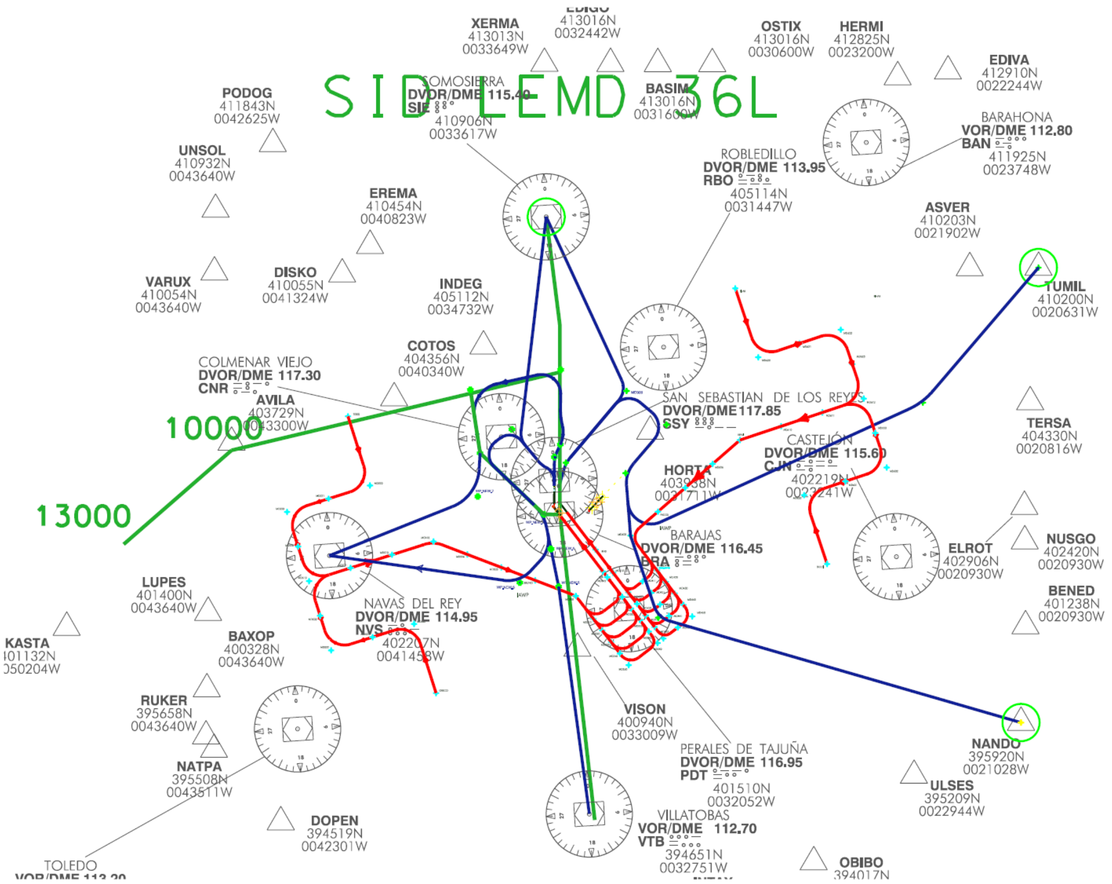

Figure 96: Conventional SIDs 36L

6.2.2.2 DEPARTURES RWY 36R:

6.2.2.2.1 DEPARTURES P-RNAV RWY 36R

3 P-RNAV departures: SID SIE, SID TML & SID NND

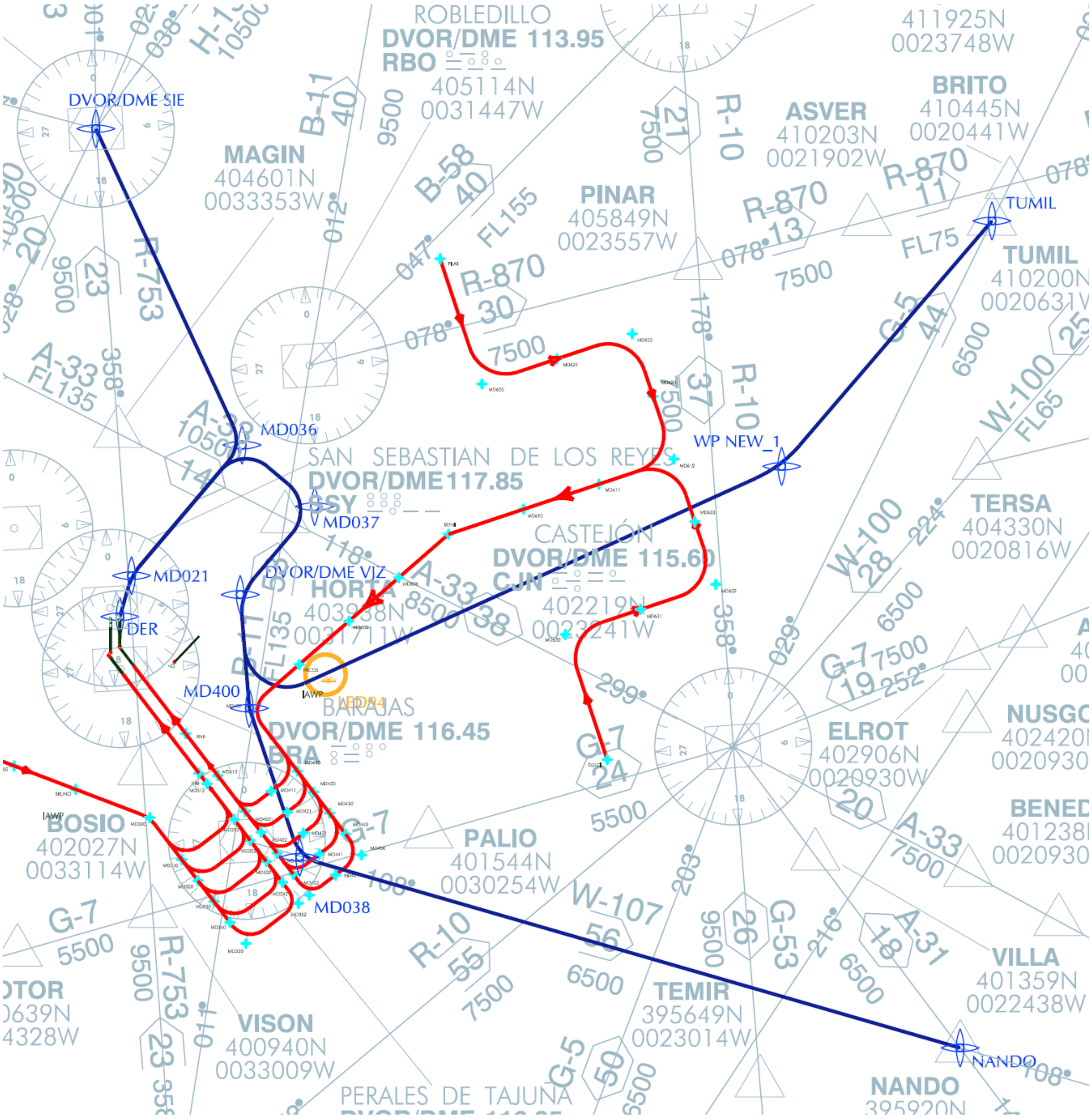

Figure 97: P-RNAV SIDs 36R

6.2.2.2.1.1 P-RNAV.- SID SIE 36R

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
THR18L	40º31'41.2179''N	003º33'33.6809''W	1922,24
MD021	40º35'13.9628''N	003º32'25.9683''W	2911
MD036	40º45'10.7431''N	003º21'29.4763''W	6790
DVOR/DME SIE	41º09'06.1000''N	003º36'16.8000''W	14755

Table 40: P-RNAV SID SIE 36R

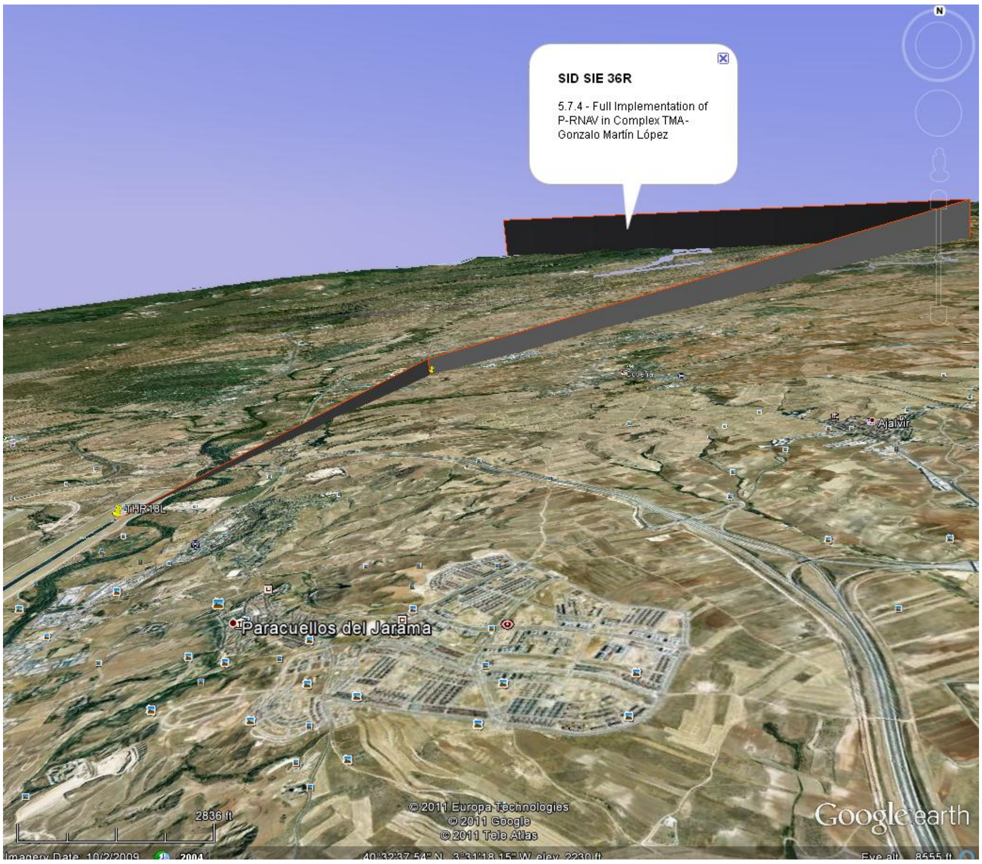

Figure 98: P-RNAV SID NVS (Short) 36R

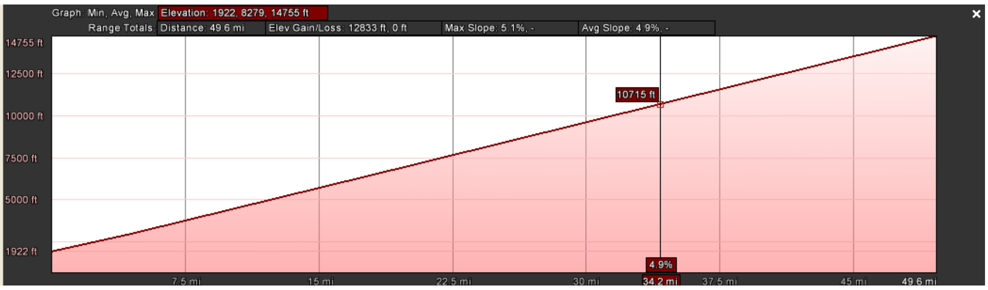

Figure 99: P-RNAV SID NVS (Short)– Vertical Profile 36R

6.2.2.2.1.2 P-RNAV.- SID TML 36R

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
THR18L	40º31'41.2179''N	003º33'33.6809''W	1922,24
MD021	40º35'13.9628''N	003º32'25.9683''W	2911
MD036	40º45'10.7431''N	003º21'29.4763''W	6678
MD037	40º40'32.3367''N	003º14'14.1716''W	8530
VOR/DME VJZ	40º33'50.7000''N	003º21'37.2000''W	10986

MD400	40º25'13.9799''N	003º20'40.2000''W	13126
WP NEW_1	40º43'31.1344''N	002º27'43.0439''W	26111
TUMIL	41º02'00.0003''N	002º06'30.7659''W	33540

Table 41: P-RNAV SID TML 36R

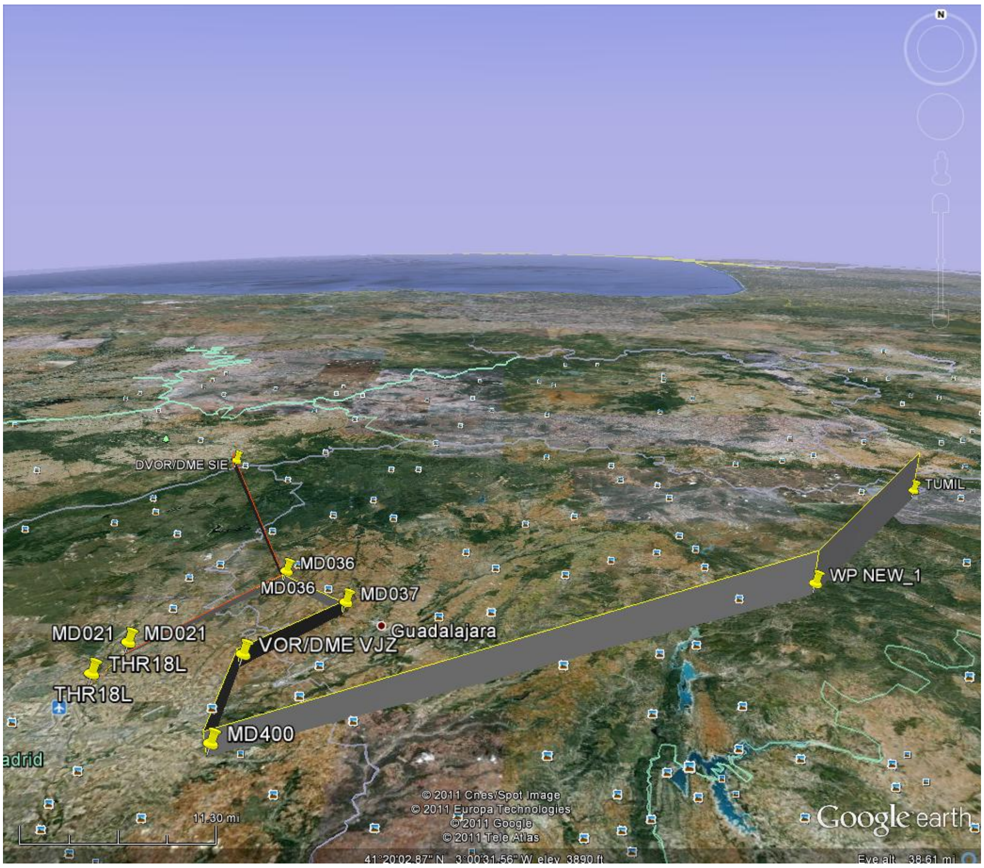

Figure 100: P-RNAV SID TML 36R

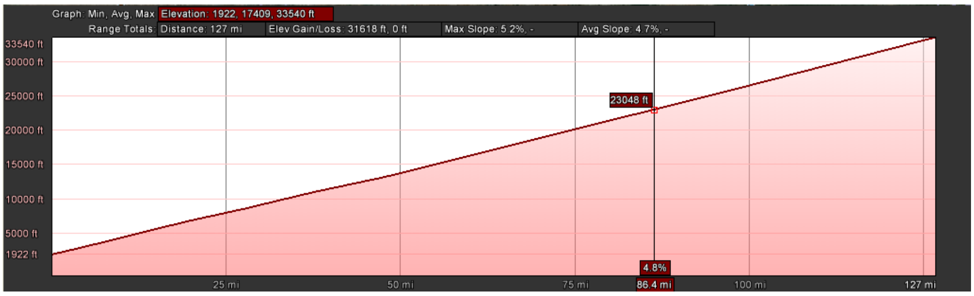

Figure 101: P-RNAV SID TML 36R - Vertical Profile

6.2.2.2.1.3 P-RNAV. - SID NND 36R

Procedural description: Maintain NANDO 1AR (cross VJZ at 11000´o +), after NANDO, proceed direct to CLS or PONEN.

Id	Latitude	Longitude	Altitude (ft)

THR18L	40º31'41.2179''N	003º33'33.6809''W	1922,24
MD021	40º35'13.9628''N	003º32'25.9683''W	2911
MD036	40º45'10.7431''N	003º21'29.4763''W	6678
MD037	40º40'32.3367''N	003º14'14.1716''W	8530
VOR/DME VJZ	40º33'50.7000''N	003º21'37.2000''W	10986
MD400	40º25'13.9799''N	003º20'40.2000''W	13582
MD038	40º13'56.6036''N	003º15'37.6281''W	17164
NANDO	39º59'19.8750''N	002º10'28.4090''W	32941

Table 42: P-RNAV SID NND 36R

Figure 102: P-RNAV SID NND 36R

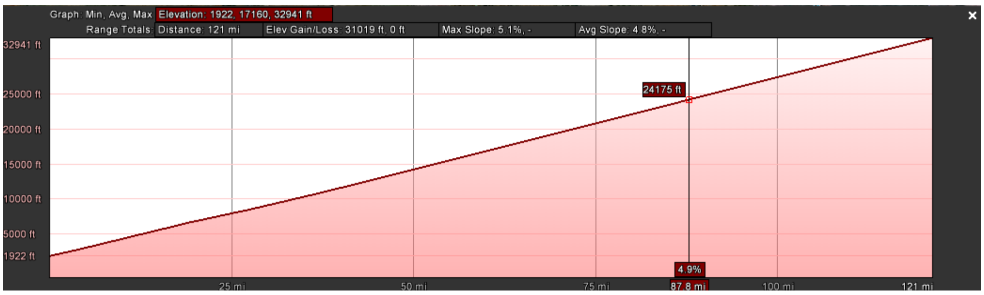

Figure 103: P-RNAV SID NND 36R - Vertical Profile

6.2.2.2.2 Conventional Departures RWY 36R

6.2.2.2.2.1 Via SIE:

Maintain current departure SIE 1W, Then proceed to DGO, BGS, or ZMR.

6.2.2.2.2.2 Via NANDO:

Maintain current departure NANDO3R, from NANDO direct to CLS or PONEN

6.2.2.2.2.3 Via VTB:

For traffic bound south, departure VTB2W, from there direct to MONTO or NASOS, or from VTB to PEPIN, for traffics to CCS, BARDI or ZMR

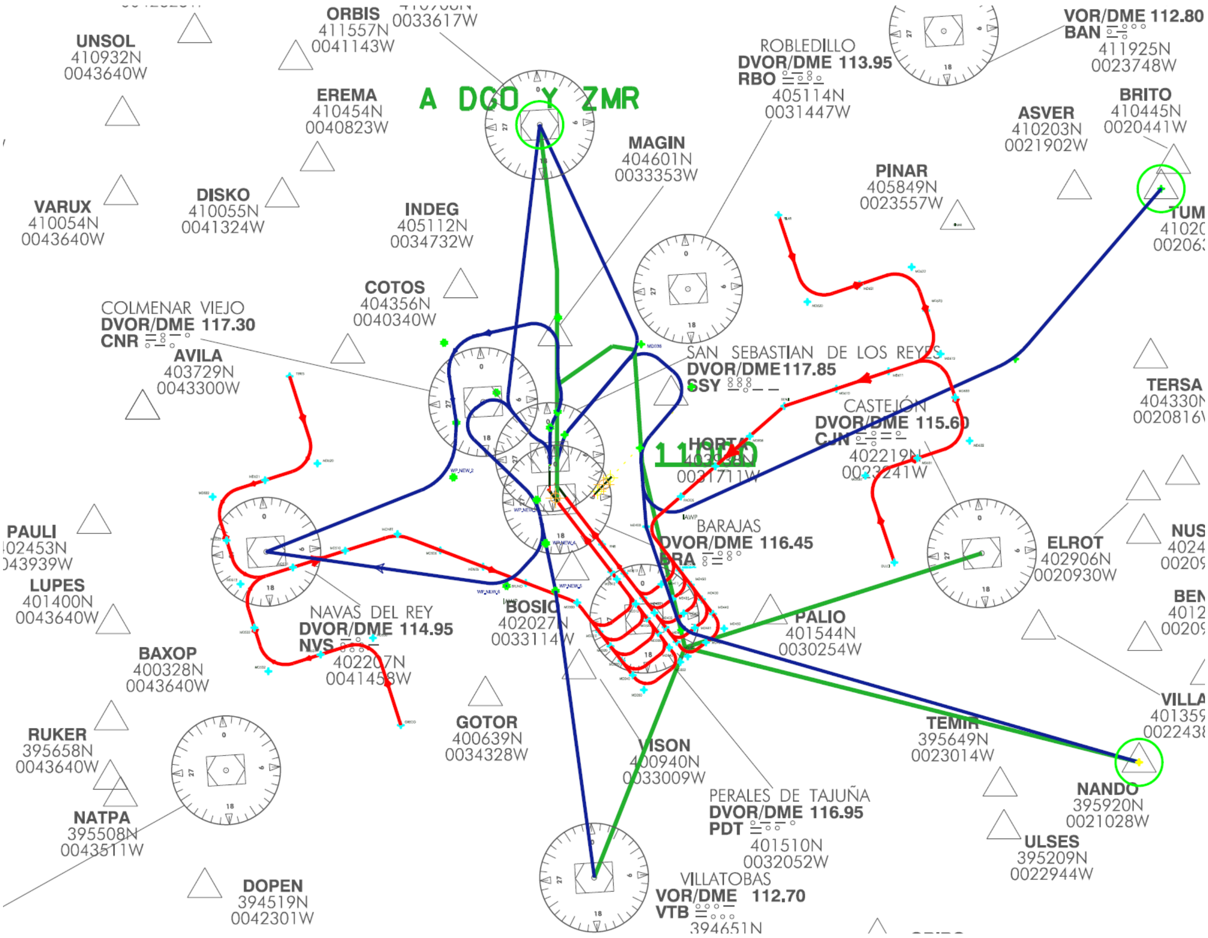

Figure 104: Conventional SIDs 36R

6.2.3 SOUTH CONFIGURATION NEW SIDs

6.2.3.1 DEPARTURES RWY 15R:

6.2.3.1.1 DEPARTURES P-RNAV RWY 15R

3 P-RNAV departures: SID SIE, SID NVS and SID VTB

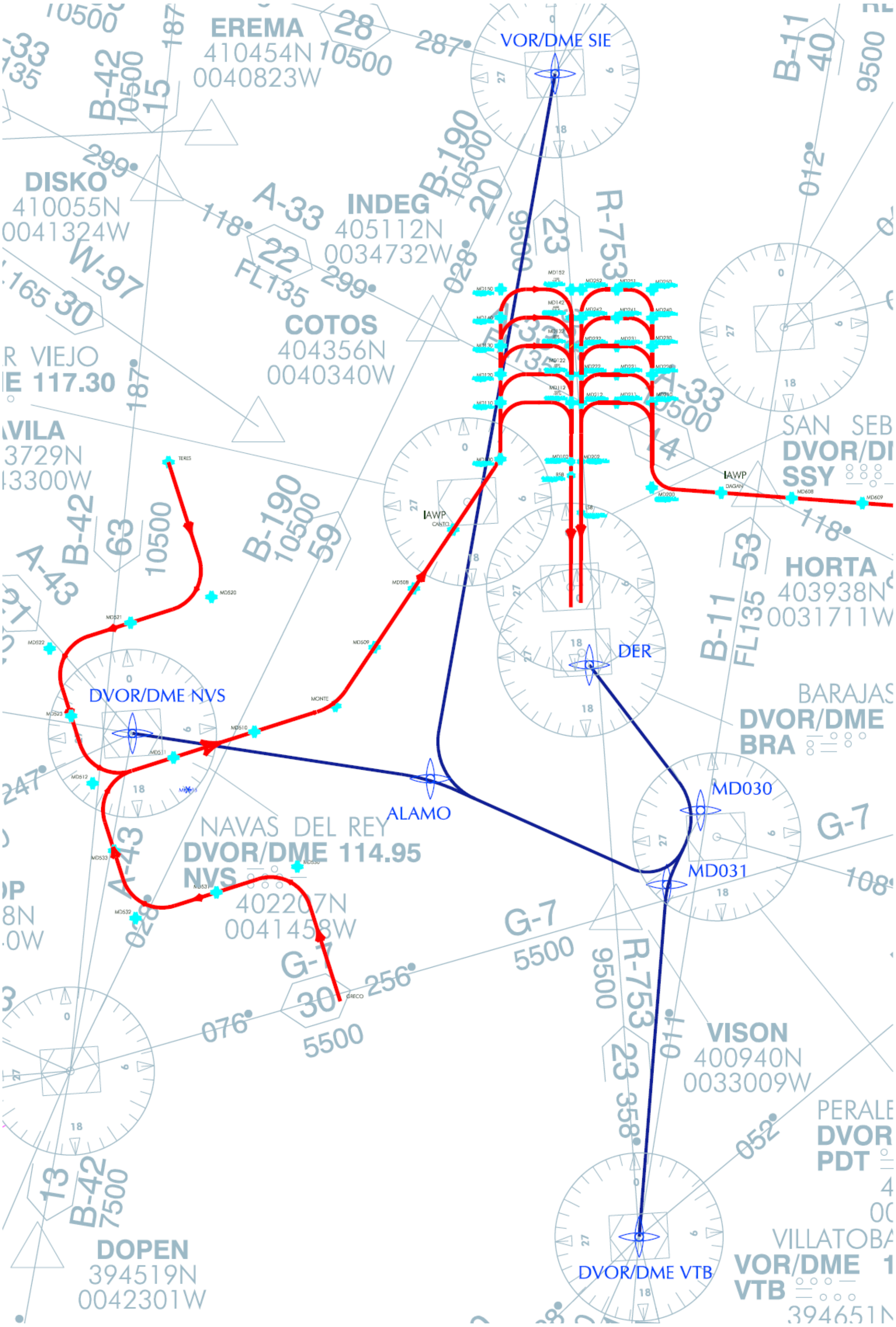

Figure 105: P-RNAV SIDs 15R

6.2.3.1.1.1 P-RNAV. – SID SIE 15R

Procedural description: Maintain current departure until MD031 of SIE1AS departure, then direct to BRA (fly over 9000 ft or more) and then direct to SIE. Traffic going to DGO, BGS o ZMR.

Id	Latitude	Longitude	Altitude (ft)
THR33L	40º27'47.1004''N	003º33'14.0167''W	1932,74
MD030	40º17'02.7047''N	003º22'22.1727''W	5776
MD031	40º11'46.6570''N	003º25'28.0410''W	7272
ALAMO	40º19'09.4428''N	003º47'22.1295''W	12498
DVOR/DME SIE	41º09'06.1000''N	003º36'16.8000''W	27713

Table 43: P-RNAV SID SIE 15R

Figure 106: P-RNAV SID SIE 15R

Figure 107: P-RNAV SID SIE 15R - Vertical Profile

6.2.3.1.1.2 P-RNAV. – SID NVS 15R

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
THR33L	40º27'47.1004''N	003º33'14.0167''W	1932,74
MD030	40º17'02.7047''N	003º22'22.1727''W	5776
MD031	40º11'46.6570''N	003º25'28.0410''W	7272
ALAMO	40º19'09.4428''N	003º47'22.1295''W	12649
DVOR/DME NVS	40º22'07.2000''N	004º14'57.9000''W	19119

Table 44: P-RNAV SID NVS 15R

Figure 108: P-RNAV SID NVS 15R

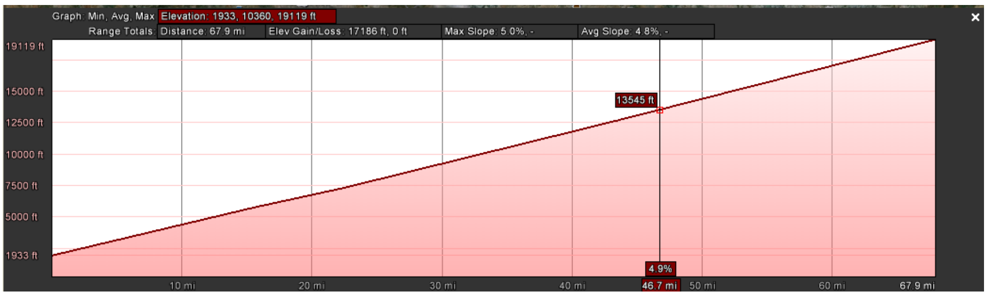

Figure 109: P-RNAV SID NVS 15R - Vertical Profile

6.2.3.1.1.3 P-RNAV. – SID VTB 15R

Procedural description: Maintain current departure VTB1AS, then direct to PEPIN and then direct to BARDI or CCS. For south bounding traffic, after VTB, proceed to MONTO o NANSOS

Id	Latitude	Longitude	Altitude (ft)
THR33L	40º27'47.1004''N	003º33'14.0167''W	1932,74
MD030	40º17'02.7047''N	003º22'22.1727''W	5776
MD031	40º11'46.6570''N	003º25'28.0410''W	7447
VOR/DME VTB	39º46'50.7000''N	003º27'50.5000''W	15031

Table 45: P-RNAV SID VTB 15R

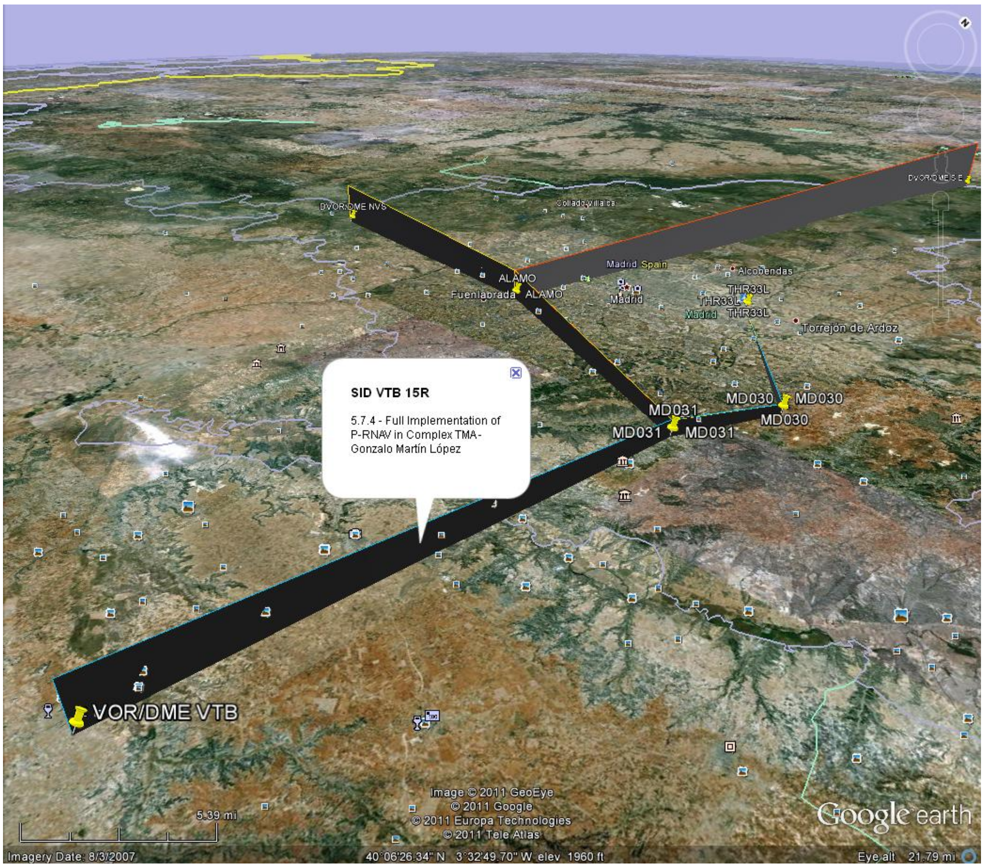

Figure 110: P-RNAV SID VTB 15R

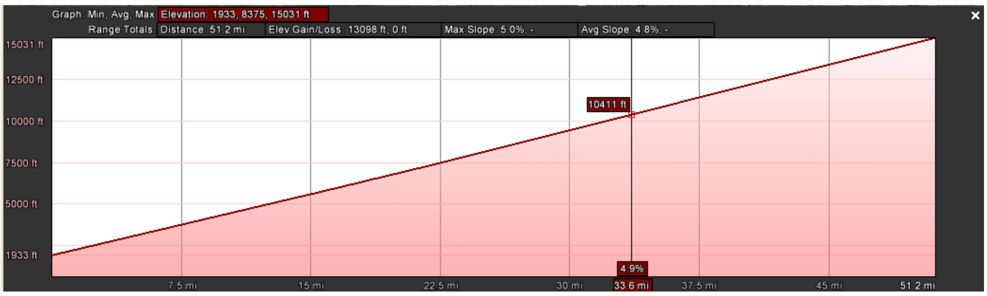

Figure 111: P-RNAV SID VTB 15R - Vertical Profile

6.2.3.1.2 Conventional Departures RWY 15R

6.2.3.1.2.1 Via SIE.

After departure and previous airspace calculus, right-turn direct to BRA (fly-over 9000 ft or more), direct to SIE. Then direct to DGO, BGS or ZMR.

6.2.3.1.2.2 Via VTB.

Actual departure VTB2S, from VTB direct to MONTO o NASOS for south bounding traffic. For West bounding, after VTB, direct to PEPIN, then direct to BARDI, CCS or ZMR.

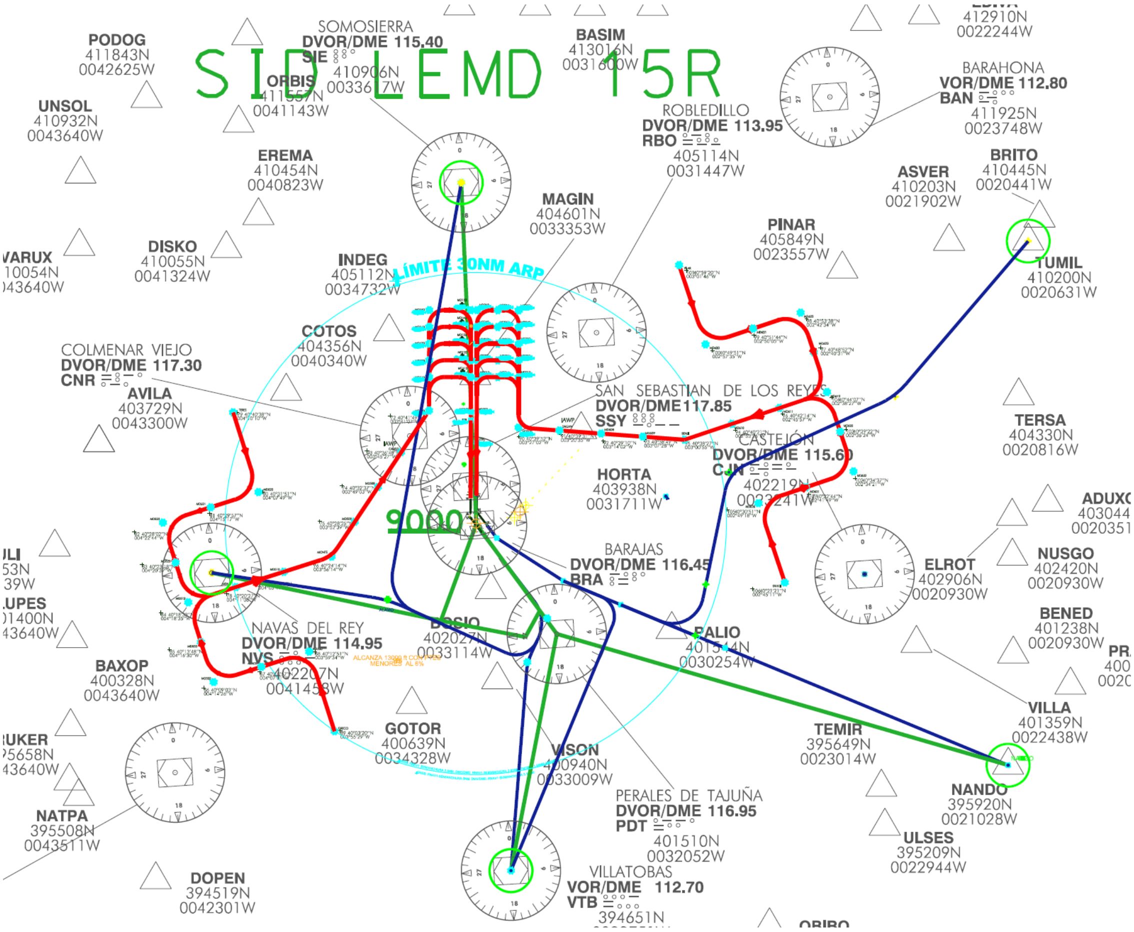

Figure 112: Conventional SIDs 15R

6.2.3.2 DEPARTURES RWY 15L:

6.2.3.2.1 DEPARTURES P-RNAV RWY 15L

3 P-RNAV departures: SID TML, SID NND and SID VTB

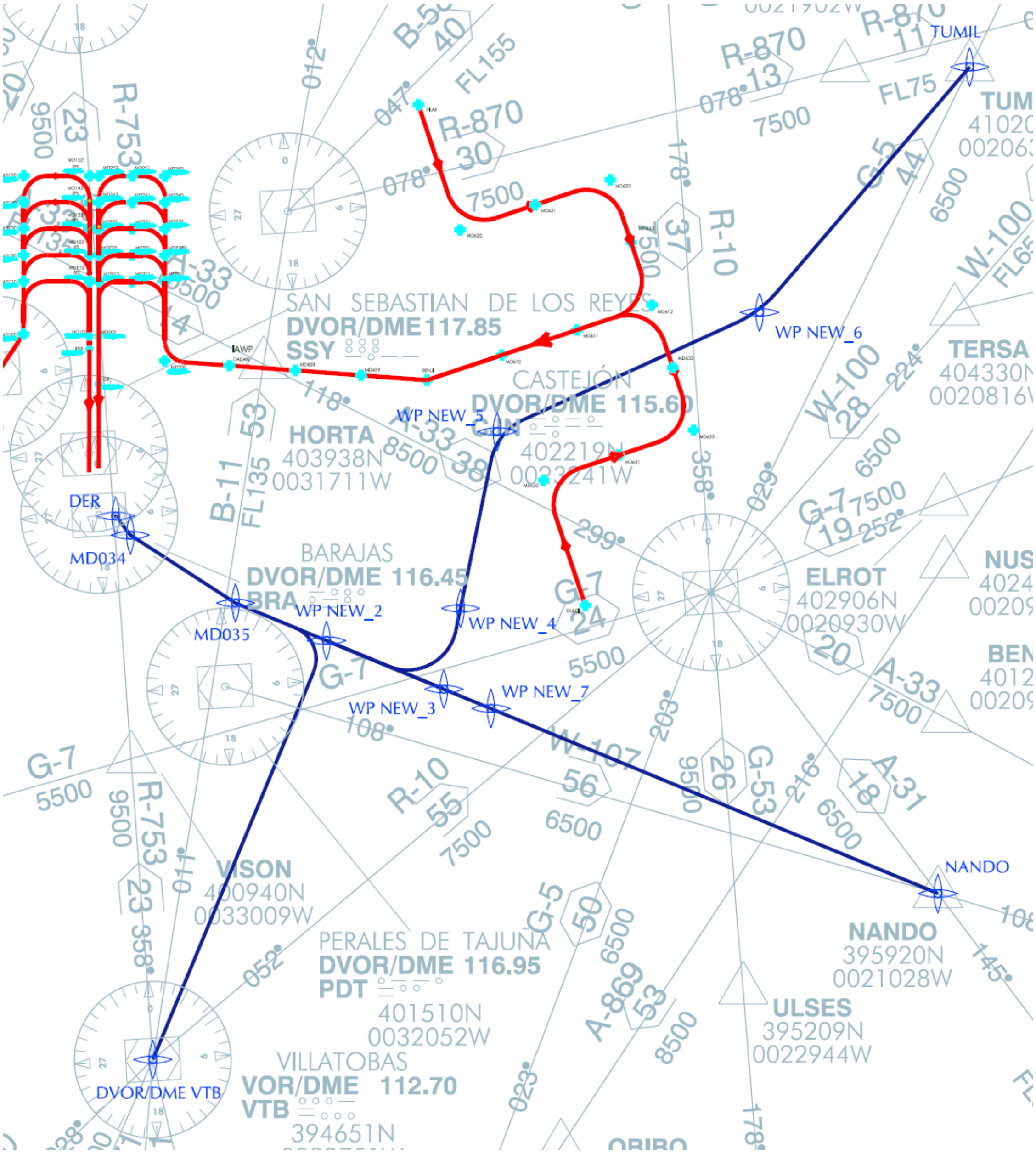

Figure 113: P-RNAV SIDs 15L

6.2.3.2.1.1 P-RNAV. – SID TML 15L

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
THR33R	40º28'24.8516''N	003º32'10.3032''W	1885,83
MD034	40º26'37.3164''N	003º30'21.2360''W	2450
MD035	40º21'30.9920''N	003º19'52.5450''W	5332

WP NEW_2	40º18'41.0017''N	003º10'50.8542''W	7598
WP NEW_3	40º15'00.6592''N	002º59'13.1491''W	10146
WP NEW_4	40º21'08.4000''N	002º57'33.5894''W	11670
WP NEW_5	40º34'32.6660''N	002º53'54.7650''W	15773
WP NEW_6	40º43'31.1344''N	002º27'43.0439''W	22350
TUMIL	41º02'00.0003''N	002º06'30.7659''W	29766

Table 46: P-RNAV SID TML 15L

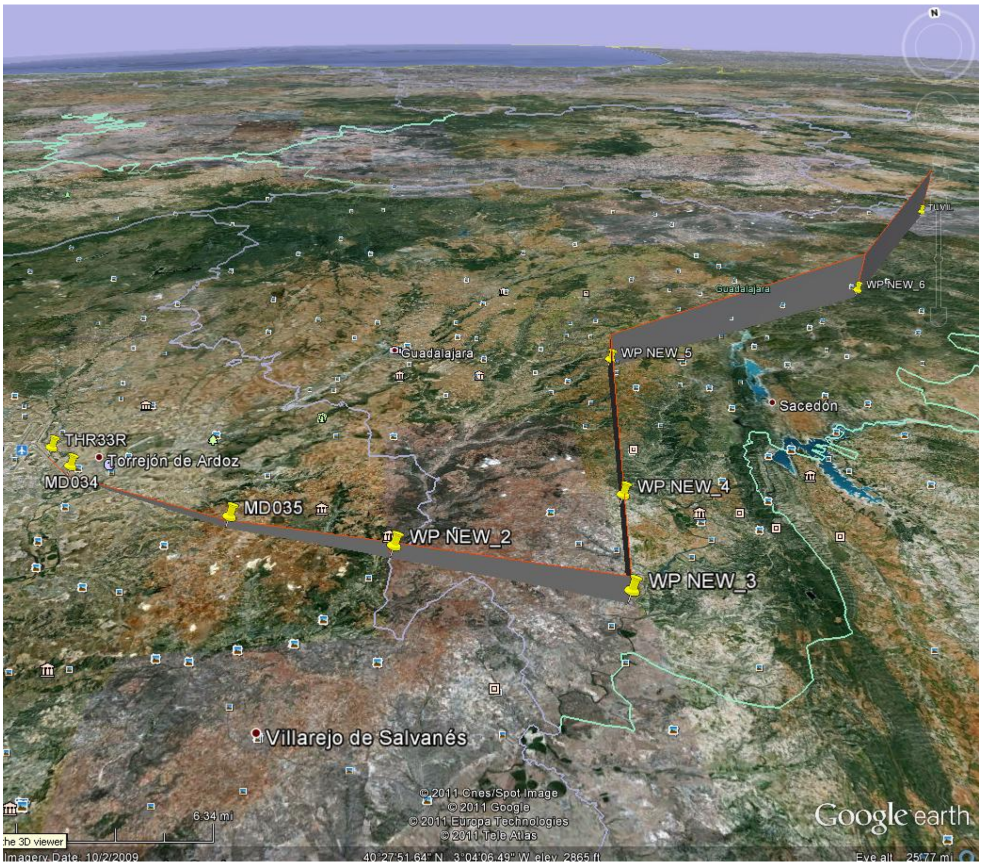

Figure 114: P-RNAV SID TML 15L

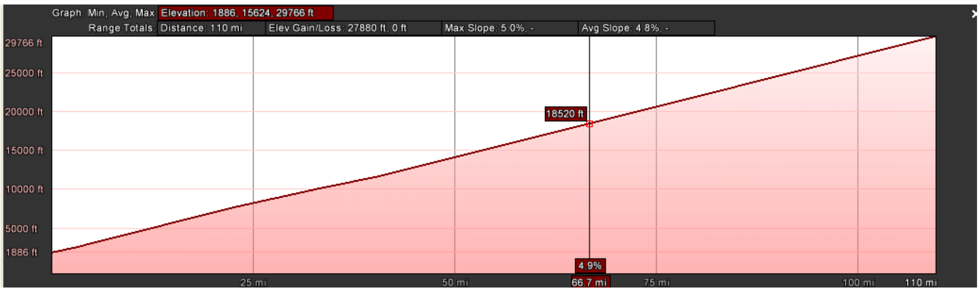

Figure 115: P-RNAV SID TML 15L - Vertical Profile

6.2.3.2.1.2 P-RNAV. – SID NND 15L

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
THR33R	40º28'24.8516''N	003º32'10.3032''W	1885,83
MD034	40º26'37.3164''N	003º30'21.2360''W	2450
MD035	40º21'30.9920''N	003º19'52.5450''W	5332
WP NEW_2	40º18'41.0017''N	003º10'50.8542''W	7598
WP NEW_3	40º15'00.6592''N	002º59'13.1491''W	10522
WP NEW_7	40º13'31.8176''N	002º54'33.2332''W	11696
NANDO	39º59'19.8750''N	002º10'28.4090''W	22835

Table 47: P-RNAV SID NND 15L

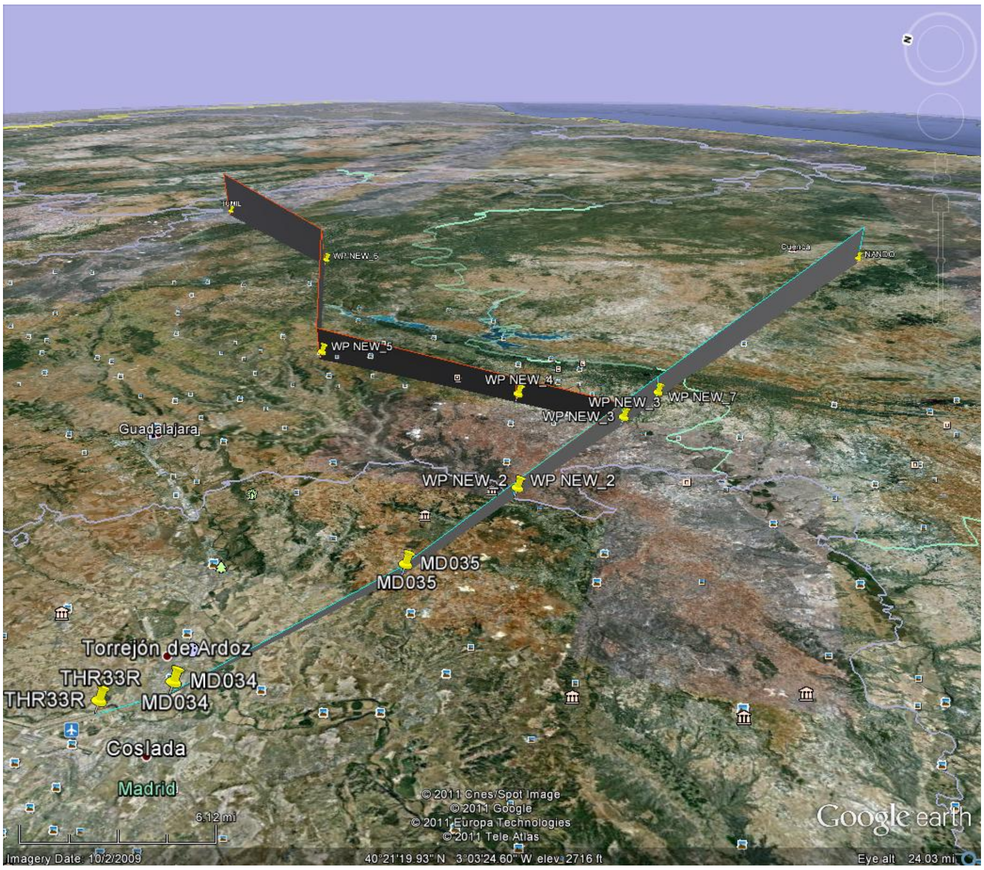

Figure 116: P-RNAV SID NND 15L

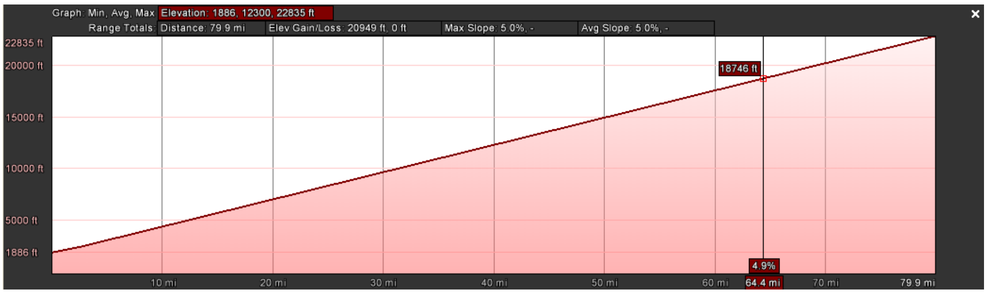

Figure 117: P-RNAV SID NND 15L - Vertical Profile

6.2.3.2.1.3 P-RNAV. – SID VTB 15L

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
THR33R	40º28'24.8516''N	003º32'10.3032''W	1885,83
MD034	40º26'37.3164''N	003º30'21.2360''W	2450
MD035	40º21'30.9920''N	003º19'52.5450''W	5332
WP NEW_2	40º18'41.0017''N	003º10'50.8542''W	7430
VOR/DME VTB	39º46'50.7000''N	003º27'50.5000''W	17706

Table 48: P-RNAV SID VTB 15L

Figure 118: P-RNAV SID VTB 15L

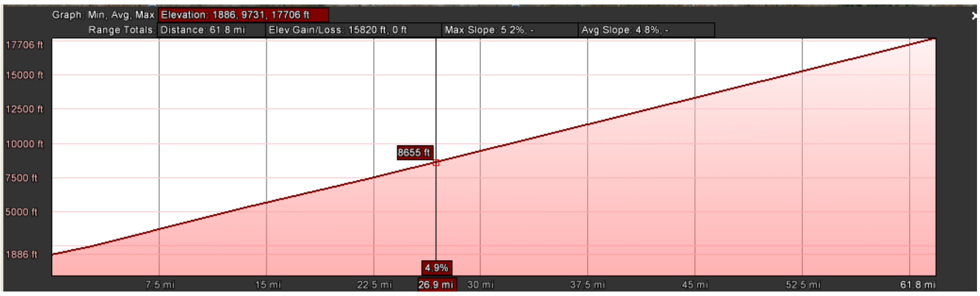

Figure 119: P-RNAV SID VTB 15L - Vertical Profile

6.2.3.2.2 Conventional Departures RWY 15L

6.2.3.2.2.1 Via

6.2.3.2.2.2 Via

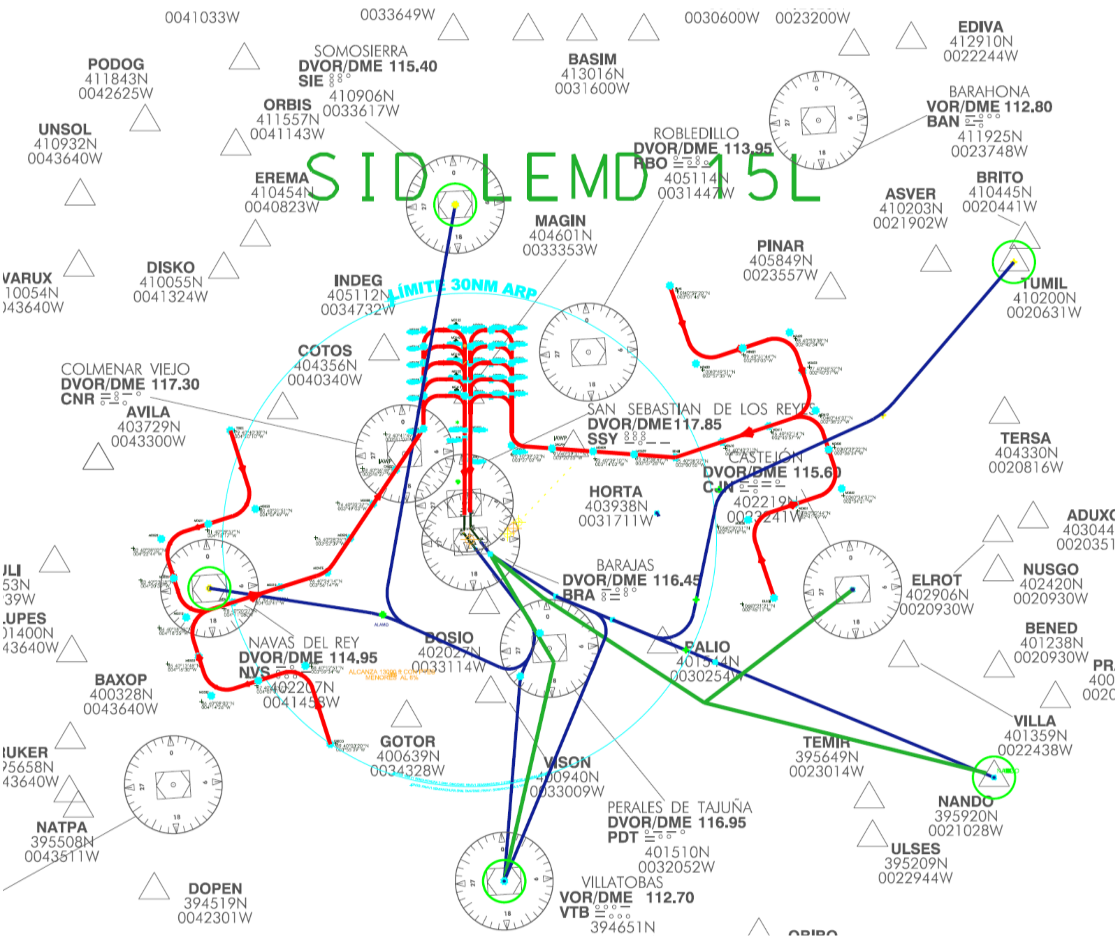

Figure 120: Conventional SIDs 15L

6.3 Operational Scenario 3: Torrejón Departures

6.3.1 LEMD NORTH CONFIGURATION LETO NEW SIDs

6.3.1.1 DEPARTURES RWY 23:

6.3.1.1.1 SID BARAHONA RWY 23

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º29'05.1800"N	003º27'38.5200"W	1971

GT009	40º27'19.2100"N	003º29'49.5900"W	2780,5
GT010	40º33'17.9100"N	003º36'54.2700"W	5811,9
GT003	40º59'35.2800"N	003º05'52.4200"W	16415,5
BARAHONA	41º19'24.5000"N	002º37'47.6000"W	25194,9

Table 49: P-RNAV SID BAR 23

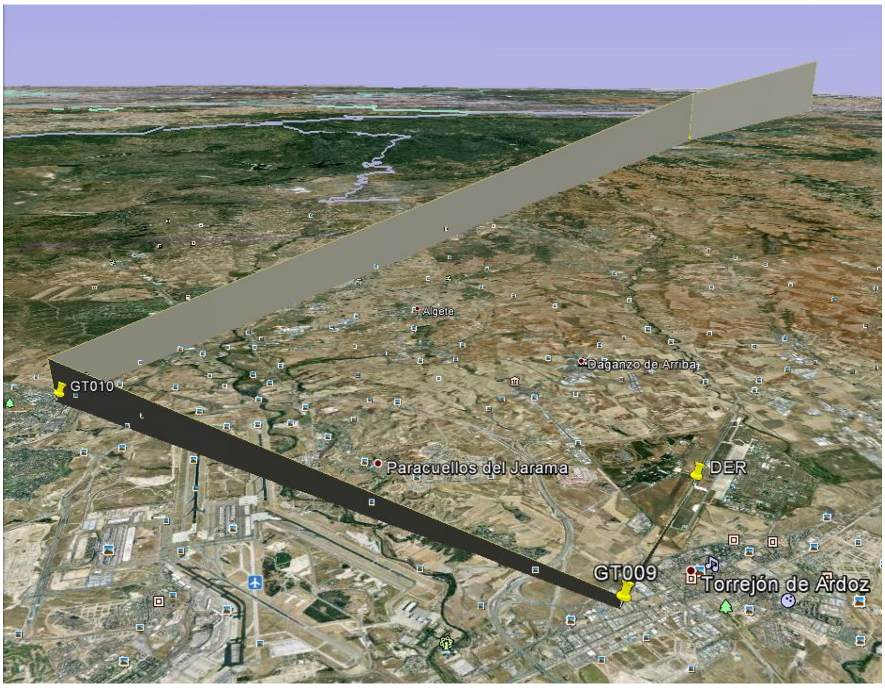

Figure 121: P-RNAV SID BAR 23

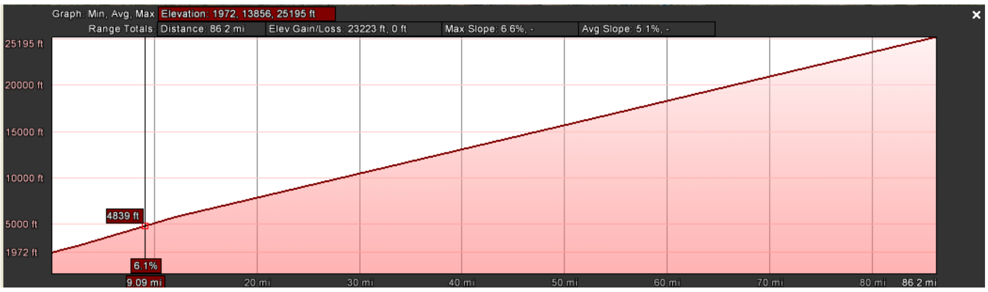

Figure 122: P-RNAV SID BAR 23 - Vertical Profile

6.3.1.1.2 SID NAVAS RWY 23

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º29'05.1800"N	003º27'38.5200"W	1971
GT009	40º27'19.2100"N	003º29'49.5900"W	2780,5
GT010	40º33'17.9100"N	003º36'54.2700"W	5811,9
GT003	40º59'35.2800"N	003º05'52.4200"W	16415,5
SOMOSIERRA	41º09'06.0000"N	003º36'17.5000"W	22957,4
NAVAS	40º22'06.8000"N	004º14'57.7000"W	39300,7

Table 50: P-RNAV SID NVS 23

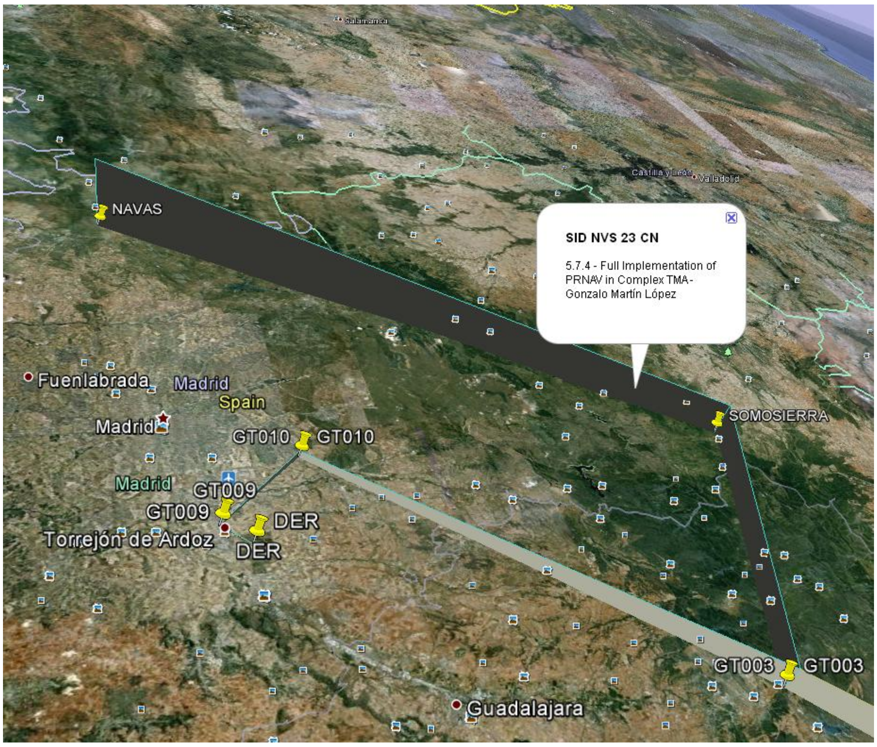

Figure 123: P-RNAV SID NVS 23

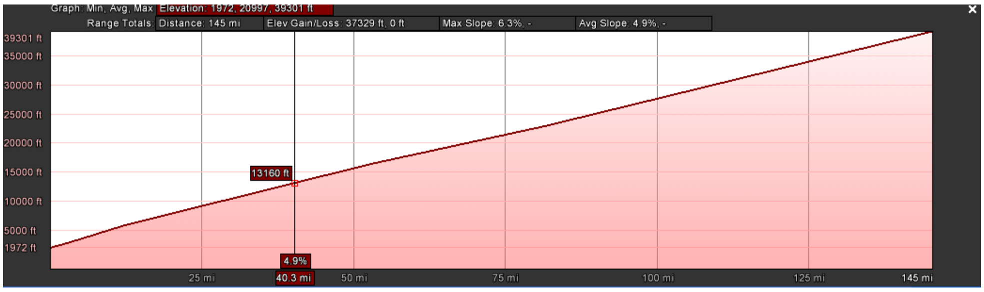

Figure 124: P-RNAV SID NVS 23- Vertical Profile

6.3.1.1.3 SID SOMOSIERRA RWY 23

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º29'05.1800"N	003º27'38.5200"W	1971
GT009	40º27'19.2100"N	003º29'49.5900"W	2780,5
GT010	40º33'17.9100"N	003º36'54.2700"W	5811,9
GT003	40º59'35.2800"N	003º05'52.4200"W	16415,5
SOMOSIERRA	41º09'06.0000"N	003º36'17.5000"W	22957,4

Table 51: P-RNAV SID SIE 23

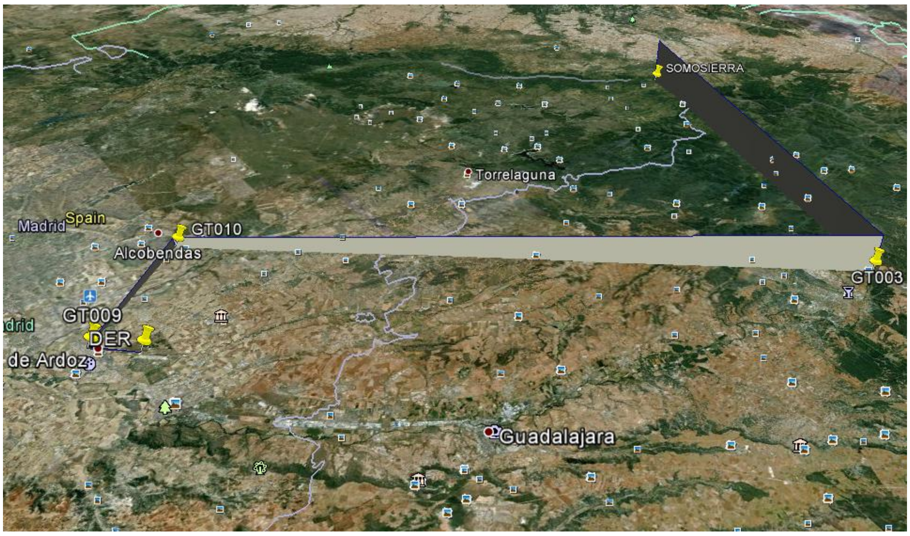

Figure 125: P-RNAV SID SIE 23

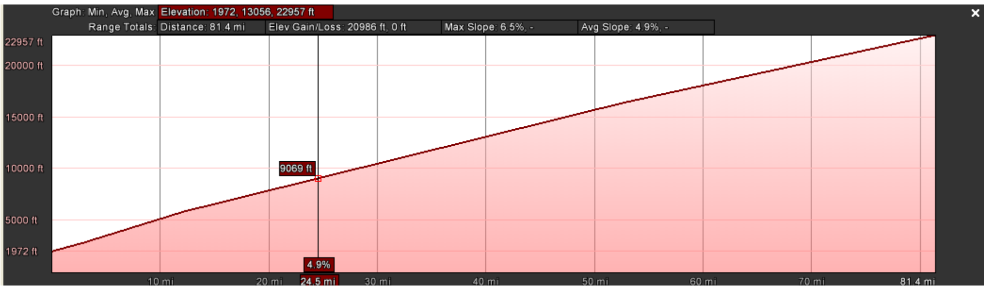

Figure 126: P-RNAV SID SIE 23 - Vertical Profile

6.3.1.1.4 SID PINAR RWY 23

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º29'05.1800"N	003º27'38.5200"W	1971
GT009	40º27'19.2100"N	003º29'49.5900"W	2780,5
GT010	40º33'17.9100"N	003º36'54.2700"W	5811,9
GT003	40º59'35.2800"N	003º05'52.4200"W	16415,5
PINAR	41º58'49.1000"N	002º35'57.0000"W	23210,0

Table 52: P-RNAV SID PNR 23

Figure 127: P-RNAV SID PNR 23

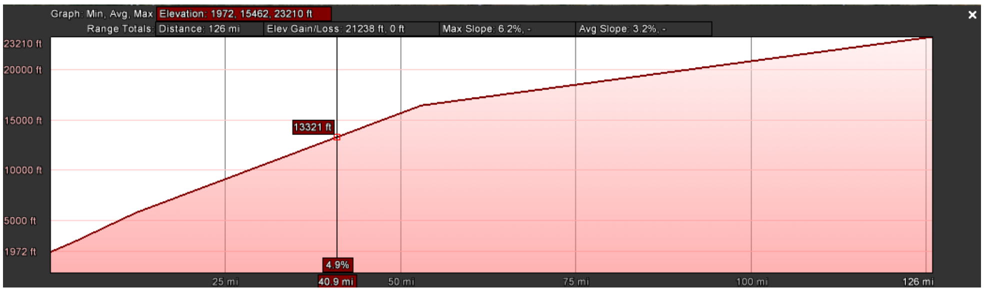

Figure 128: P-RNAV SID PNR 23- Vertical Profile

6.3.1.1.5 SID NANDO RWY 23

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º29'05.1800"N	003º27'38.5200"W	1971
GT009	40º27'19.2100"N	003º29'49.5900"W	2780,5
GT010	40º33'17.9100"N	003º36'54.2700"W	5811,9
GT003	40º59'35.2800"N	003º05'52.4200"W	16415,5
PINAR	41º58'49.1000"N	002º35'57.0000"W	23210,0
NANDO	39º59'19.9000"N	002º10'28.4000"W	41982,8

Table 53: P-RNAV SID NND 23

Figure 129: P-RNAV SID NND 23

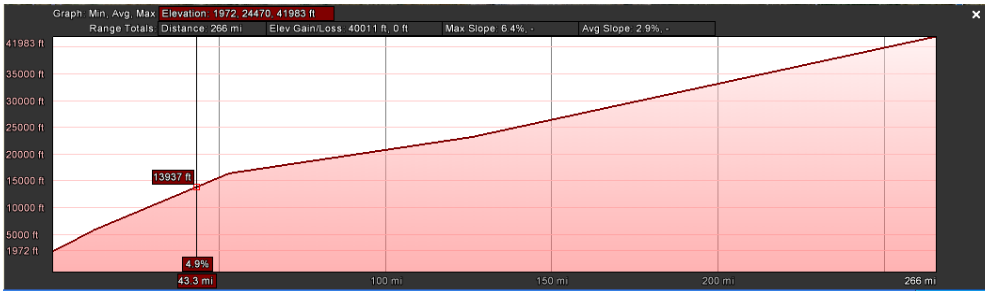

Figure 130: P-RNAV SID NND 23 - Vertical Profile

6.3.1.1.6 SID NANDO RWY 23

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º29'05.1800"N	003º27'38.5200"W	1971
GT009	40º27'19.2100"N	003º29'49.5900"W	2780,5
GT010	40º33'17.9100"N	003º36'54.2700"W	5811,9
GT003	40º59'35.2800"N	003º05'52.4200"W	16415,5
PINAR	41º58'49.1000"N	002º35'57.0000"W	23210,0
GT008	40º25'04.1300"N	002º22'03.8900"W	33716,8
VTB	39º46'50.6000"N	003º27'51.1000"W	52694,6

Table 54: P-RNAV SID NND 23

Figure 131: P-RNAV SID NND 23

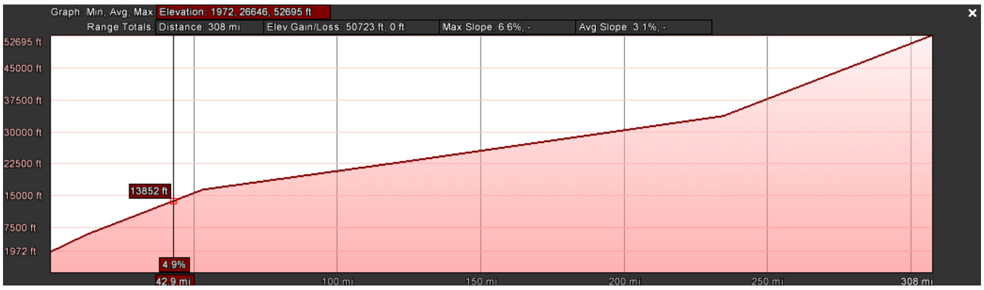

Figure 132: P-RNAV SID NND 23 - Vertical Profile

6.3.1.2 DEPARTURES RWY 05:

6.3.1.2.1 SID NVS RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º30'31.3900"N	003º25'51.7700"W	1971
GT001	40º33'50.7000"N	003º21'37.2000"W	3449,8
ROBLEDILLO	40º51'13.9000"N	003º21'37.2000"W	8941,8
GT003	40º59'35.2800"N	003º05'52.4200"W	12191,5
SOMOSIERRA	41º09'06.0000"N	003º36'17.5000"W	19071,3
NAVAS	40º22'06.8000"N	004º14'57.7000"W	35358,8

Table 55: P-RNAV SID NVS 05

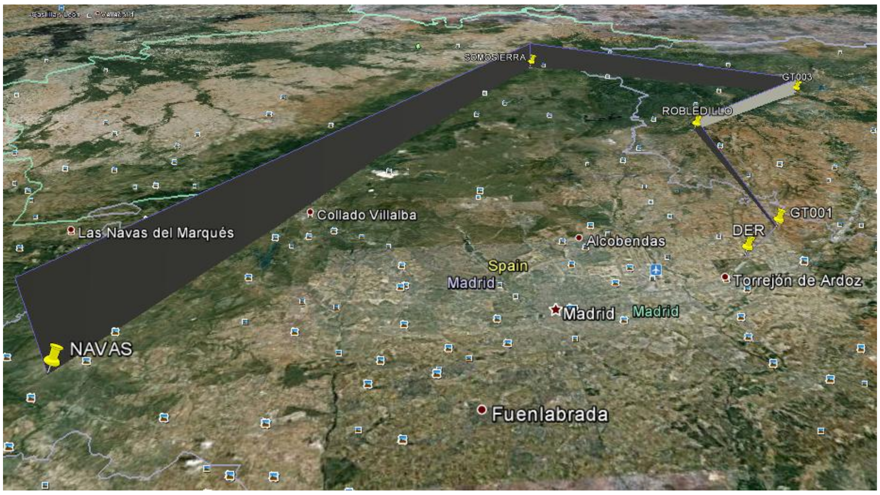

Figure 133: P-RNAV SID NVS 05

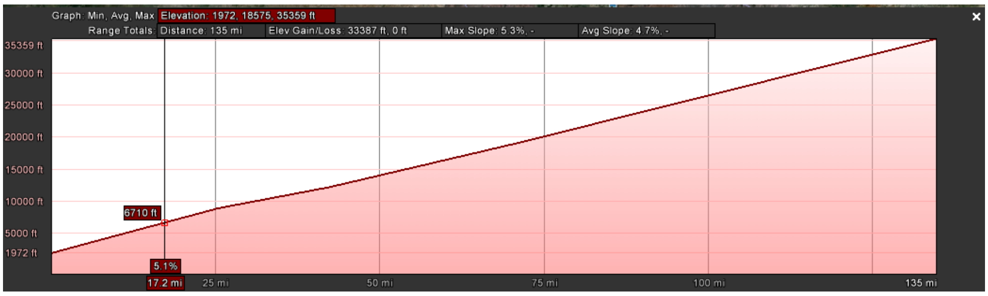

Figure 134: P-RNAV SID NVS 05 - Vertical Profile

6.3.1.2.2 SID SIE RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º30'31.3900"N	003º25'51.7700"W	1971
GT001	40º33'50.7000"N	003º21'37.2000"W	3449,8
ROBLEDILLO	40º51'13.9000"N	003º21'37.2000"W	8941,8
GT003	40º59'35.2800"N	003º05'52.4200"W	12191,5
SOMOSIERRA	41º09'06.0000"N	003º36'17.5000"W	19071,3

Table 56: P-RNAV SID SIE 05

Figure 135: P-RNAV SID NVS 05

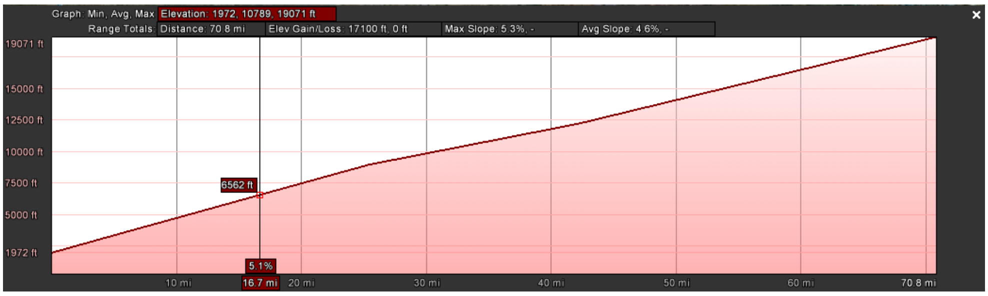

Figure 136: P-RNAV SID NVS 05 - Vertical Profile

6.3.1.2.3 SID PINAR RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º30'31.3900"N	003º25'51.7700"W	1971
GT001	40º33'50.7000"N	003º21'37.2000"W	3449,8
ROBLEDILLO	40º51'13.9000"N	003º21'37.2000"W	8941,8
GT003	40º59'35.2800"N	003º05'52.4200"W	12191,5
PINAR	41º58'49.1000"N	002º35'57.0000"W	19017,2

Table 57: P-RNAV SID PNR 05

Figure 137: P-RNAV SID PNR 05

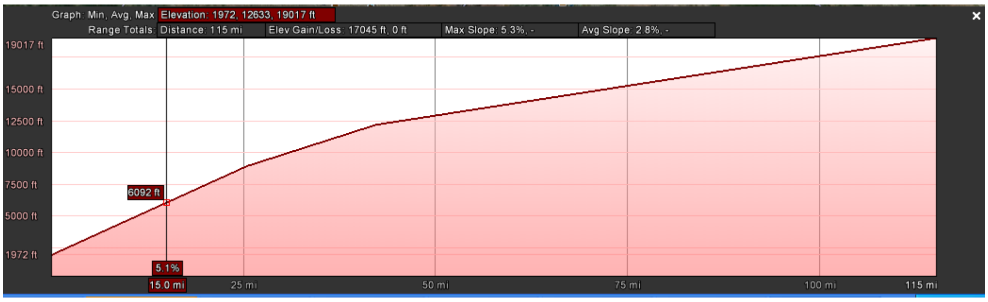

Figure 138: P-RNAV SID PNR 05 - Vertical Profile

6.3.1.2.4 SID NANDO RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º30'31.3900"N	003º25'51.7700"W	1971
GT001	40º33'50.7000"N	003º21'37.2000"W	3449,8
ROBLEDILLO	40º51'13.9000"N	003º21'37.2000"W	8941,8
GT003	40º59'35.2800"N	003º05'52.4200"W	12191,5
PINAR	41º58'49.1000"N	002º35'57.0000"W	19017,2
NANDO	39º59'19.9000"N	002º10'28.4000"W	37862,1

Table 58: P-RNAV SID NND 05

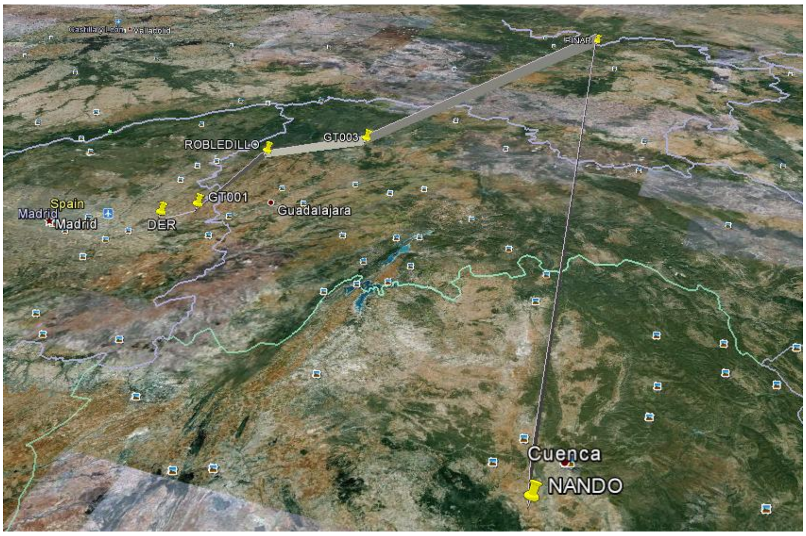

Figure 139: P-RNAV SID NND 05

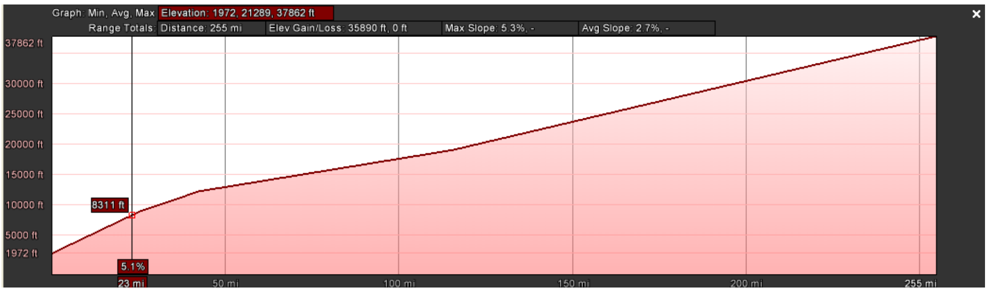

Figure 140: P-RNAV SID NND 05 - Vertical Profile

6.3.1.2.5 SID VILLATOBAS RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º30'31.3900"N	003º25'51.7700"W	1971
GT001	40º33'50.7000"N	003º21'37.2000"W	3449,8
ROBLEDILLO	40º51'13.9000"N	003º21'37.2000"W	8941,8
GT003	40º59'35.2800"N	003º05'52.4200"W	12191,5
PINAR	41º58'49.1000"N	002º35'57.0000"W	19017,2
GT008	40º25'04.1300"N	002º22'03.8900"W	29594,5
VTB	39º46'50.6000"N	003º27'51.1000"W	48354,1

Table 59: P-RNAV SID VTB 05

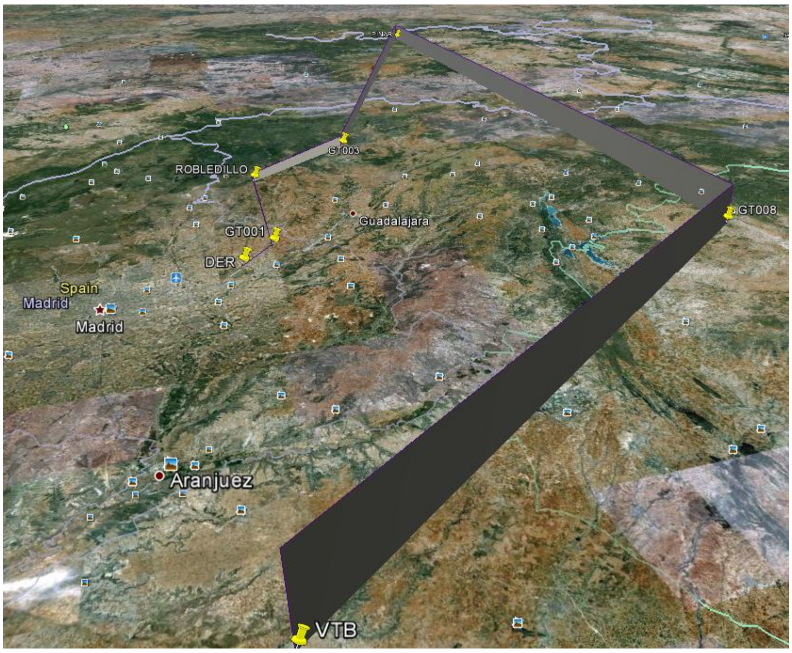

Figure 141: P-RNAV SID VTB 05

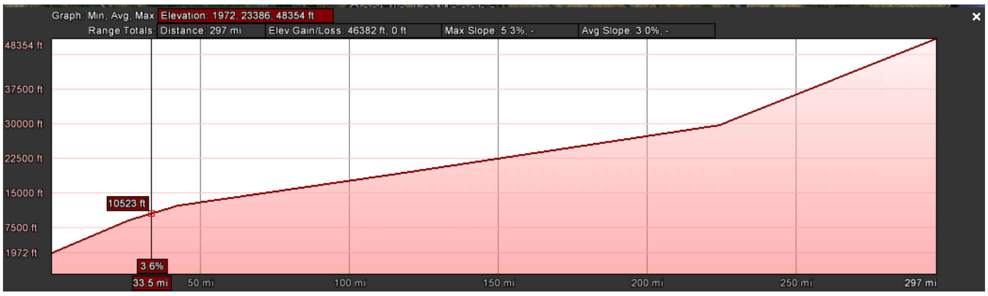

Figure 142: P-RNAV SID VTB 05- Vertical Profile

6.3.2 LEMD SOUTH CONFIGURATION LETO NEW SIDs

6.3.2.1 DEPARTURES RWY 23:

6.3.2.1.1 SID SOMOSIERRA RWY 23

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º29'05.1800"N	003º27'38.5200"W	1971
GT009	40º27'19.2100"N	003º29'49.5900"W	2780,5
GT011	40º22'39.7300"N	003º18'52.1100"W	6415,6
GT012	40º20'57.6800"N	003º01'17.3900"W	10528,1
GT003	40º59'35.2800"N	003º05'52.4200"W	21740,2
SOMOSIERRA	41º09'06.0000"N	003º36'17.5000"W	29168,0

Table 60: P-RNAV SID SIE 23

Figure 143: P-RNAV SID SIE 23

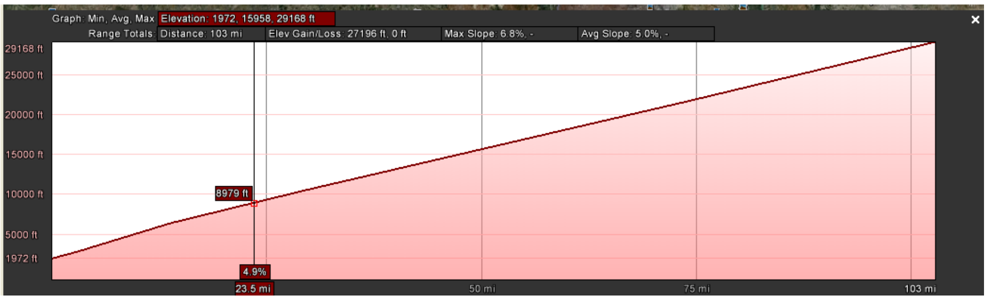

Figure 144: P-RNAV SID SIE 23 - Vertical Profile

6.3.2.1.2 SID BARAHONA RWY 23

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º29'05.1800"N	003º27'38.5200"W	1971
GT009	40º27'19.2100"N	003º29'49.5900"W	2780,5
GT011	40º22'39.7300"N	003º18'52.1100"W	6415,6
GT012	40º20'57.6800"N	003º01'17.3900"W	10528,1
GT003	40º59'35.2800"N	003º05'52.4200"W	21740,2
BARAHONA	41º19'24.5000"N	002º37'47.6000"W	30531,1

Table 61: P-RNAV SID BAR 23

Figure 145: P-RNAV SID BAR 23

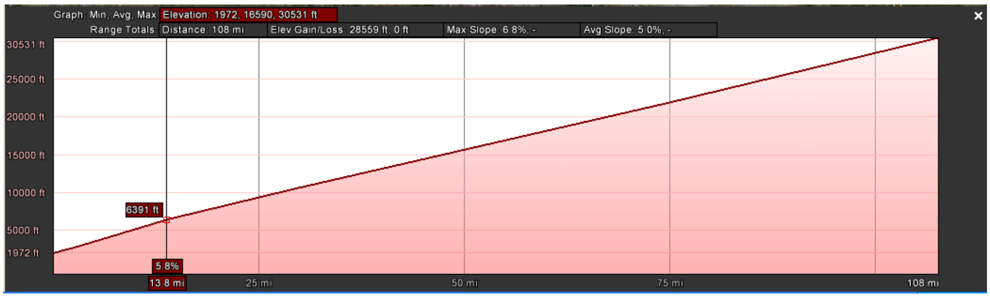

Figure 146: P-RNAV SID BAR 23 - Vertical Profile

6.3.2.1.3 SID NANDO RWY 23

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º29'05.1800"N	003º27'38.5200"W	1971
GT009	40º27'19.2100"N	003º29'49.5900"W	2780,5
GT011	40º22'39.7300"N	003º18'52.1100"W	6415,6
GT012	40º20'57.6800"N	003º01'17.3900"W	10528,1
NANDO	39º59'19.9000"N	002º10'28.4000"W	24056,5

Table 62: P-RNAV SID VTB 23

Figure 147: P-RNAV SID VTB 23

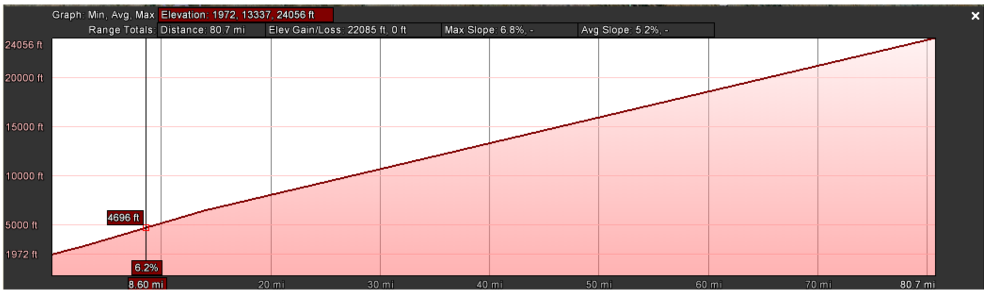

Figure 148: P-RNAV SID VTB 23 - Vertical Profile

6.3.2.1.4 SID VILLATOBAS RWY 23

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º29'05.1800"N	003º27'38.5200"W	1971
GT009	40º27'19.2100"N	003º29'49.5900"W	2780,5
GT013	40º01'25.8300"N	003º50'56.0800"W	12043,8
TOLEDO	39º58'10.1000"N	004º20'14.6000"W	18889,2

Table 63: P-RNAV SID TOL 23

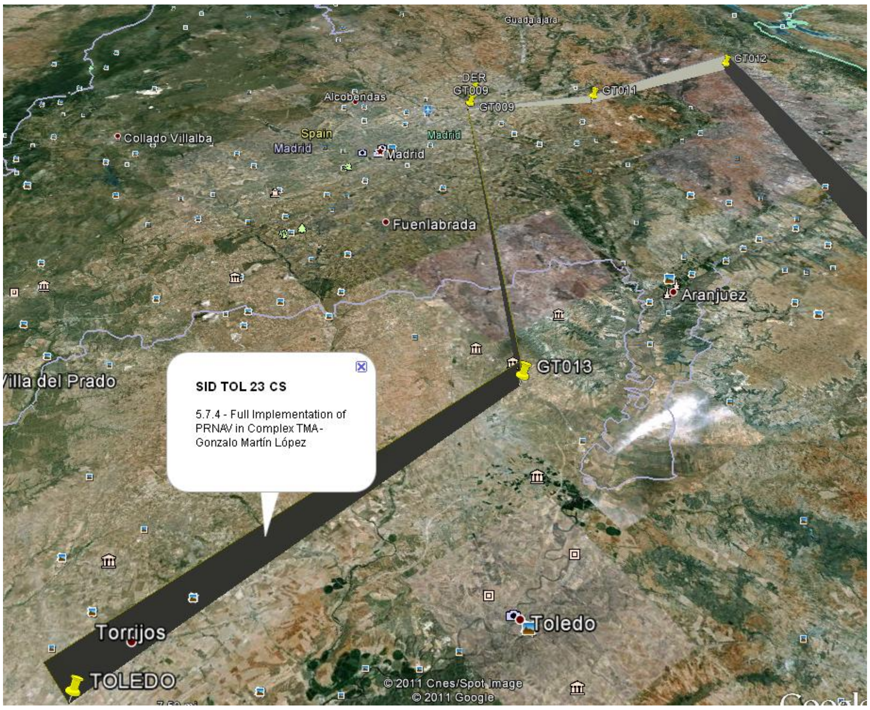

Figure 149: P-RNAV SID TOL 23

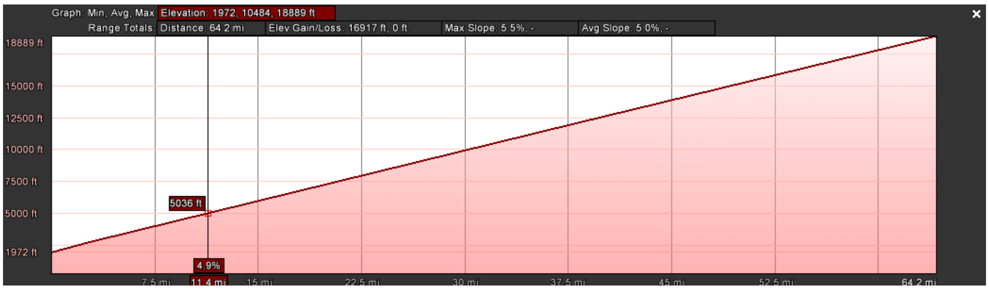

Figure 150: P-RNAV SID TOL 23 - Vertical Profile

6.3.2.2 DEPARTURES RWY 05:

6.3.2.2.1 SID SOMOSIERRA RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º30'31.3900"N	003º25'51.7700"W	1971
GT001	40º33'50.7000"N	003º21'37.2000"W	3449,8
GT002	40º33'13.6800"N	003º11'25.1800"W	5757,8
GT003	40º59'35.2800"N	003º05'52.4200"W	13746,6
SOMOSIERRA	41º09'06.0000"N	003º36'17.5000"W	21305,5

Table 64: P-RNAV SID SIE 05

Figure 151: P-RNAV SID SIE 05

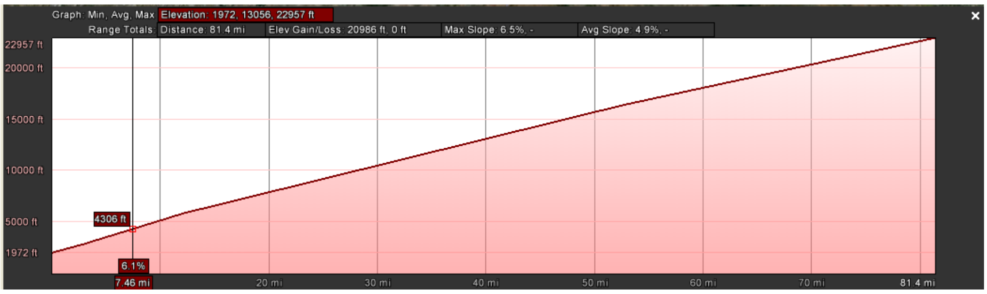

Figure 152: P-RNAV SID SIE 05 - Vertical Profile

6.3.2.2.2 SID BARAHONA RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º30'31.3900"N	003º25'51.7700"W	1971
GT001	40º33'50.7000"N	003º21'37.2000"W	3449,8
GT002	40º33'13.6800"N	003º11'25.1800"W	5757,8
GT003	40º59'35.2800"N	003º05'52.4200"W	13746,6
BARAHONA	41º19'24.5000"N	002º37'47.6000"W	22215,9

Table 65: P-RNAV SID BAR 05

Figure 153: P-RNAV SID BAR 05

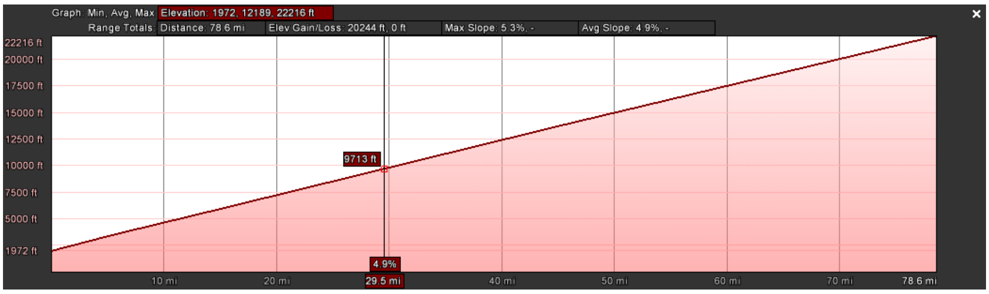

Figure 154: P-RNAV SID BAR 05 - Vertical Profile

There is a potential risk in terms of vertical separation between this SID BAR 05 in South Configuration with STAR DULCI 18L (8 000 ft in the intersection of both routes), apart from the fact that a noise assessment is needed due to both procedures pass over Guadalajara (a populated area) like is shown in this picture:

Figure 155: P-RNAV SID BAR 05 vs. STAR DULCI 18L

6.3.2.2.3 SID PINAR RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º30'31.3900"N	003º25'51.7700"W	1971
GT001	40º33'50.7000"N	003º21'37.2000"W	3449,8
GT002	40º33'13.6800"N	003º11'25.1800"W	5757,8
GT003	40º59'35.2800"N	003º05'52.4200"W	13746,6
PINAR	41º58'49.1000"N	002º35'57.0000"W	19742,2

Table 66: P-RNAV SID PNR 05

Figure 156: P-RNAV SID PNR 05

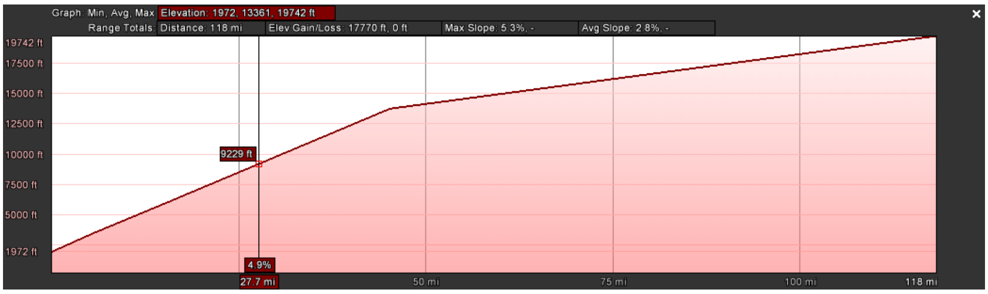

Figure 157: P-RNAV SID PNR 05 - Vertical Profile

6.3.2.2.4 SID NANDO RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º30'31.3900"N	003º25'51.7700"W	1971
GT001	40º33'50.7000"N	003º21'37.2000"W	3449,8
GT002	40º33'13.6800"N	003º11'25.1800"W	5757,8
NANDO	39º59'19.9000"N	002º10'28.4000"W	23242,8

Table 67: P-RNAV SID NND 05

Figure 158: P-RNAV SID NND 05

Figure 159: P-RNAV SID NND 05 - Vertical Profile

6.3.2.2.5 SID VILLATOBAS RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º30'31.3900"N	003º25'51.7700"W	1971
GT001	40º33'50.7000"N	003º21'37.2000"W	3449,8
GT002	40º33'13.6800"N	003º11'25.1800"W	5757,8
VILLATOBAS	39º46'50.6000"N	003º27'51.1000"W	19397,7

Table 68: P-RNAV SID VTB 05

Figure 160: P-RNAV SID NND 05

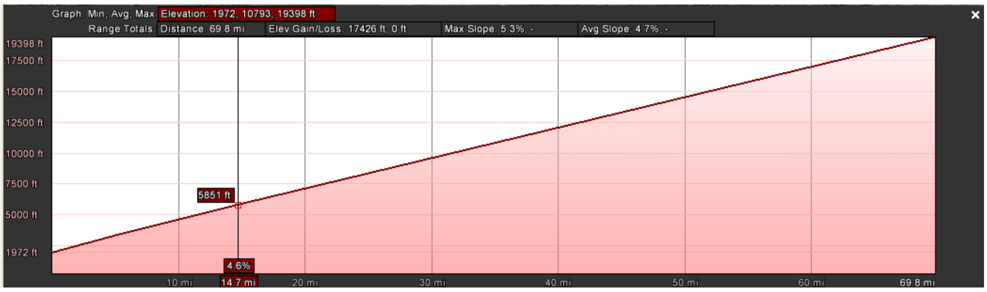

Figure 161: P-RNAV SID NND 05 - Vertical Profile

6.3.2.2.6 SID TOLEDO RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º30'31.3900"N	003º25'51.7700"W	1971

GT001	40º33'50.7000"N	003º21'37.2000"W	3449,8
GT004	40º30'20.9200"N	003º16'55.5300"W	4724,4
GT005	40º26'03.0100"N	003º22'25.1300"W	6274,5
GT006	40º28'04.5100"N	003º29'42.4000"W	7892,0
TOLEDO	39º58'10.1000"N	004º20'14.6000"W	22631,0

Table 69: P-RNAV SID TOL 05

Figure 162: P-RNAV TOL NND 05

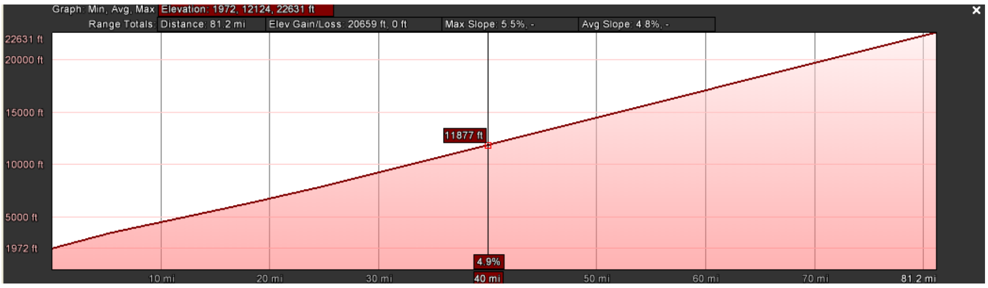

Figure 163: P-RNAV SID TOL 05 - Vertical Profile

There is a potential risk of this SID TOL 05 in South Configuration with SID NVS 15R crossing both procedures at 12 500 ft. approx in the intersection point shown in the figure (40º 18' 39.06'' N, 3º 45' 46.75'' W):

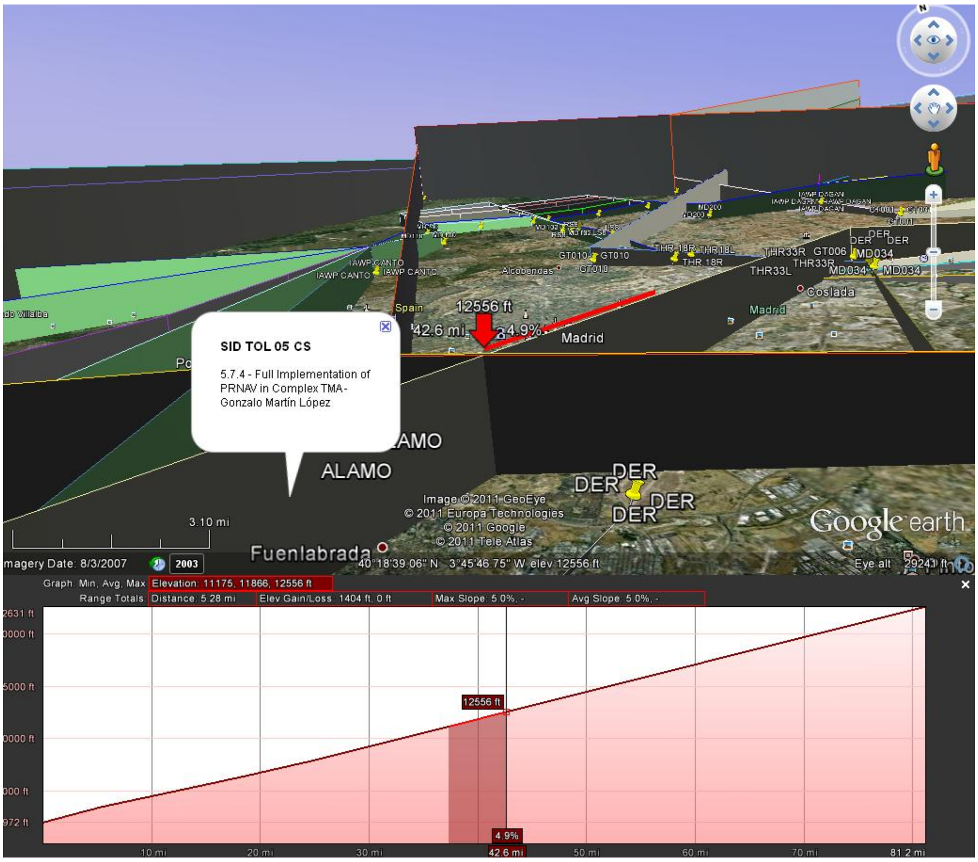

Figure 164: P-RNAV SID TOL 05 vs. SID NVS 15R

6.4 Operational Scenario 4: Getafe Departures

6.4.1 LEGTN EW SIDs

6.4.1.1 P-RNAV DEPARTURES RWY 05:

6.4.1.1.1 SID SOMOSIERRA RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º17'01.7800"N	003º44'13.9100"W	1971
GETAFE	40º11'59.2000"N	003º50'39.4000"W	4179,7
GT007	40º02'24.6300"N	003º32'49.1300"W	9991,7
GT015	40º03'03.6900"N	003º12'45.1300"W	14676,7
GT016	40º18'47.0900"N	003º07'44.5400"W	19348,5
ROBLEDILLO	40º51'13.9000"N	003º21'37.2000"W	29317,2
SOMOSIERRA	41º09'06.0000"N	003º36'17.5000"W	36621,9

Table 70: P-RNAV LEGT SID SIE 05

Figure 165: P-RNAV LEGT SID SIE 05

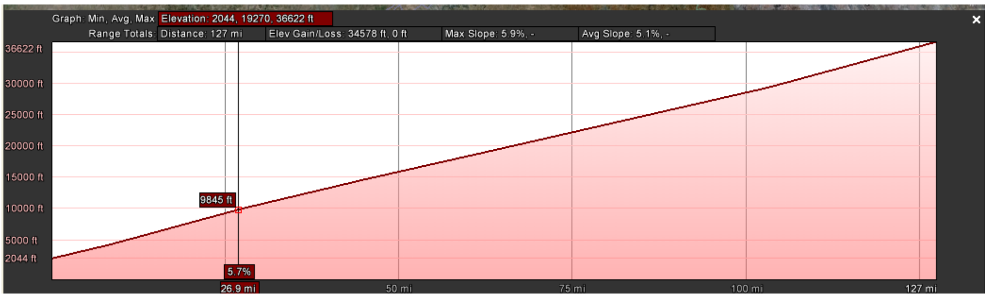

Figure 166: P-RNAV LEGT SID SIE 05 - Vertical Profile

6.4.1.1.2 SID BARAHONA RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º17'01.7800"N	003º44'13.9100"W	2044
GETAFE	40º11'59.2000"N	003º50'39.4000"W	4179,7
GT007	40º02'24.6300"N	003º32'49.1300"W	9991,7
GT015	40º03'03.6900"N	003º12'45.1300"W	14676,7
GT016	40º18'47.0900"N	003º07'44.5400"W	19348,5
ROBLEDILLO	40º51'13.9000"N	003º21'37.2000"W	29317,2
BARAHONA	41º19'24.5000"N	002º37'47.6000"W	41197,0

Table 71: P-RNAV LEGT SID BAR 05

Figure 167: P-RNAV LEGT SID BAR 05

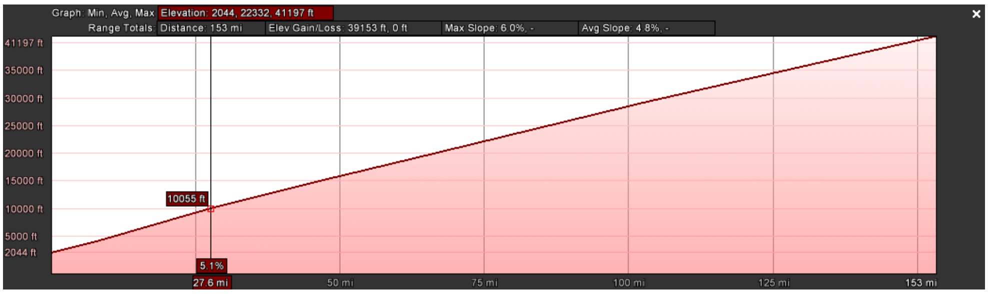

Figure 168: P-RNAV LEGT SID BAR 05 - Vertical Profile

6.4.1.1.3 SID TUMIL RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º17'01.7800"N	003º44'13.9100"W	2044
GETAFE	40º11'59.2000"N	003º50'39.4000"W	4179,7
GT007	40º02'24.6300"N	003º32'49.1300"W	9991,7
GT015	40º03'03.6900"N	003º12'45.1300"W	14676,7
GT016	40º18'47.0900"N	003º07'44.5400"W	19348,5
TUMIL	41º02'00.0000"N	002º06'30.8000"W	38600,3

Table 72: P-RNAV LEGT SID TML 05

Figure 169: P-RNAV LEGT SID TML 05

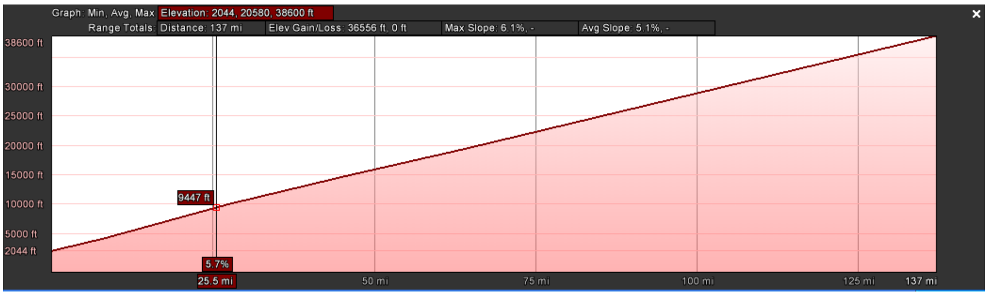

Figure 170: P-RNAV LEGT SID TML 05 - Vertical Profile

6.4.1.1.4 SID NANDO RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º17'01.7800"N	003º44'13.9100"W	2044
GETAFE	40º11'59.2000"N	003º50'39.4000"W	4179,7
GT007	40º02'24.6300"N	003º32'49.1300"W	9991,7
GT015	40º03'03.6900"N	003º12'45.1300"W	14676,7
NANDO	39º59'19.9000"N	002º10'28.4000"W	29241,8

Table 73: P-RNAV LEGT SID NND 05

Figure 171: P-RNAV LEGT SID NND 05

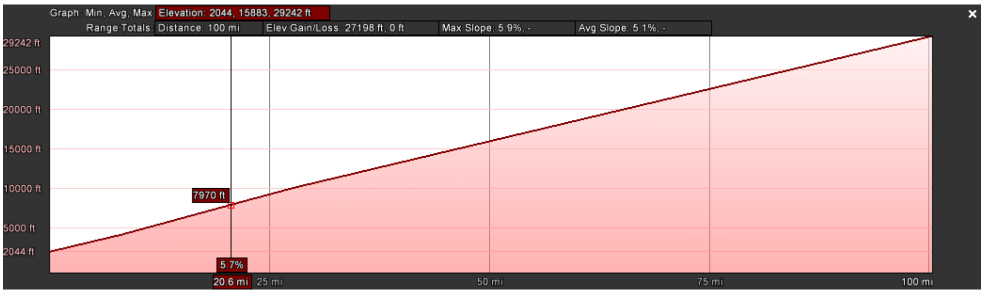

Figure 172: P-RNAV LEGT SID NND 05 - Vertical Profile

6.4.1.1.5 SID VILLATOBAS RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º17'01.7800"N	003º44'13.9100"W	2044
GETAFE	40º11'59.2000"N	003º50'39.4000"W	4179,7
GT007	40º02'24.6300"N	003º32'49.1300"W	9991,7
VTB	39º46'50.6000"N	003º27'51.1000"W	14770,2

Table 74: P-RNAV LEGT SID VTB 05

Figure 173: P-RNAV LEGT SID VTB 05

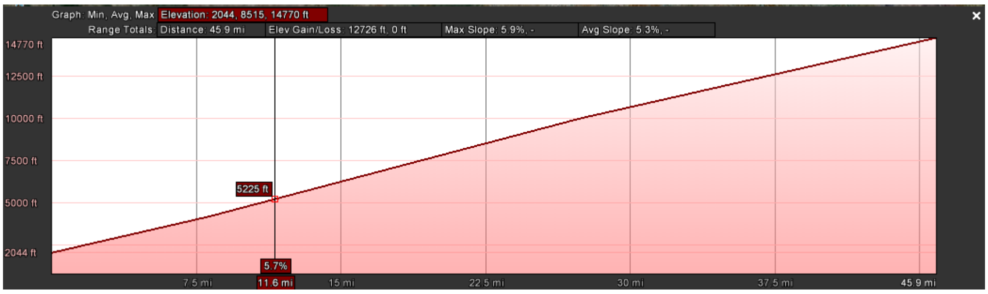

Figure 174: P-RNAV LEGT SID VTB 05- Vertical Profile

6.4.1.1.6 SID TOLEDO RWY 05

Procedural description:

Id	Latitude	Longitude	Altitude (ft)
DER	40º17'01.7800"N	003º44'13.9100"W	2044
GETAFE	40º11'59.2000"N	003º50'39.4000"W	4179,7
GT007	40º02'24.6300"N	003º32'49.1300"W	9991,7
GT014	39º51'35.2600"N	003º45'32.5000"W	13388,9
TOLEDO	39º58'10.1000"N	004º20'14.6000"W	21600,8

Table 75: P-RNAV LEGT SID TOL 05

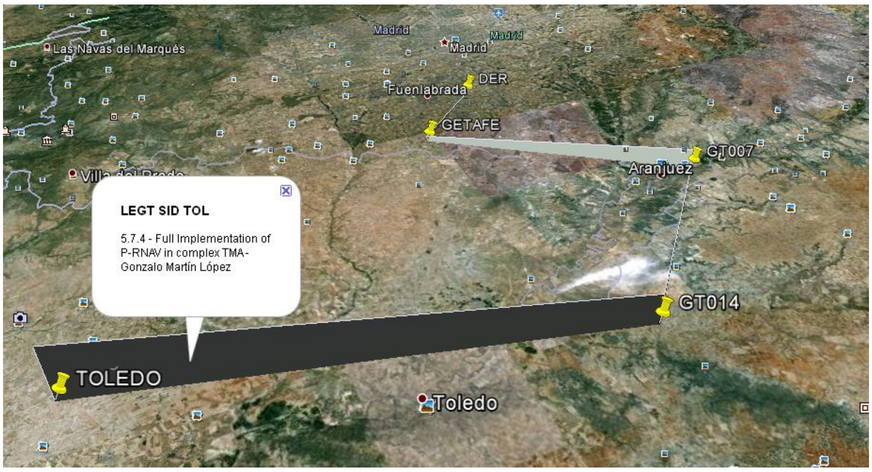

Figure 175: P-RNAV LEGT SID TOL 05

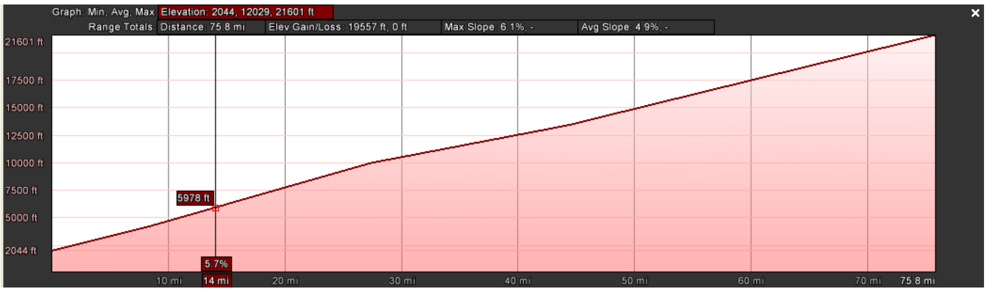

Figure 176: P-RNAV LEGT SID TOL 05- Vertical Profile

6.5 Operational Scenario 5: LEMD CDAs proposal

6.5.1 LEMD NORTH CONFIGURATION

6.5.1.1 CDA001 GRECO 33L

Procedural description:

Id	Latitude	Longitude	Altitude
GRECO	40º03'20.3802''N	003º55'28.9317''W	Alt.- FL150
IAWP BRUNO	40º19'00.2658''N	003º37'49.7942''W	Alt (ft).- 9000
MD300	40º16'53.9203''N	003º30'28.9773''W	Alt (ft).- 7500
MD310	40º13'43.9203''N	003º27'17.0324''W	Alt (ft).- 6000
MD312	40º16'47.5622''N	003º22'06.8622''W	Alt (ft).- 5000

MD302	40º19'29.1782''N	003º24'49.9061''W	Alt (ft).- 5000
LN8	40º20'16.8975''N	003º25'38.1013''W	Alt (ft).- 5000
THR33L	40º27'47.1004''N	003º33'14.0167''W	Alt (ft).- 1932.74

Table 76: CDA001 GRECO 33L

Figure 177: CDA001 GRECO 33L

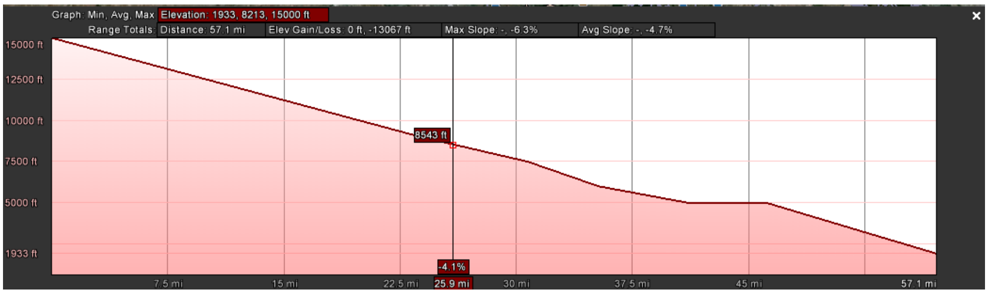

Figure 178: CDA001 GRECO 33L - Vertical Profile

6.5.1.2 CDA002 GRECO 33L

Procedural description:

Id	Latitude	Longitude	Altitude
GRECO	40º03'20.3802''N	003º55'28.9317''W	Alt.- FL150
MD530	40º12'50.6825''N	003º59'34.4839''W	Alt (ft).- 11000
IAWP BRUNO	40º19'00.2658''N	003º37'49.7942''W	Alt (ft).- 9000
MD300	40º16'53.9203''N	003º30'28.9773''W	Alt (ft).- 7500
MD310	40º13'43.9203''N	003º27'17.0324''W	Alt (ft).- 6000
MD312	40º16'47.5622''N	003º22'06.8622''W	Alt (ft).- 5000
MD302	40º19'29.1782''N	003º24'49.9061''W	Alt (ft).- 5000
LN8	40º20'16.8975''N	003º25'38.1013''W	Alt (ft).- 5000
THR33L	40º27'47.1004''N	003º33'14.0167''W	Alt (ft).- 1932.74

Table 77: CDA002 GRECO 33L

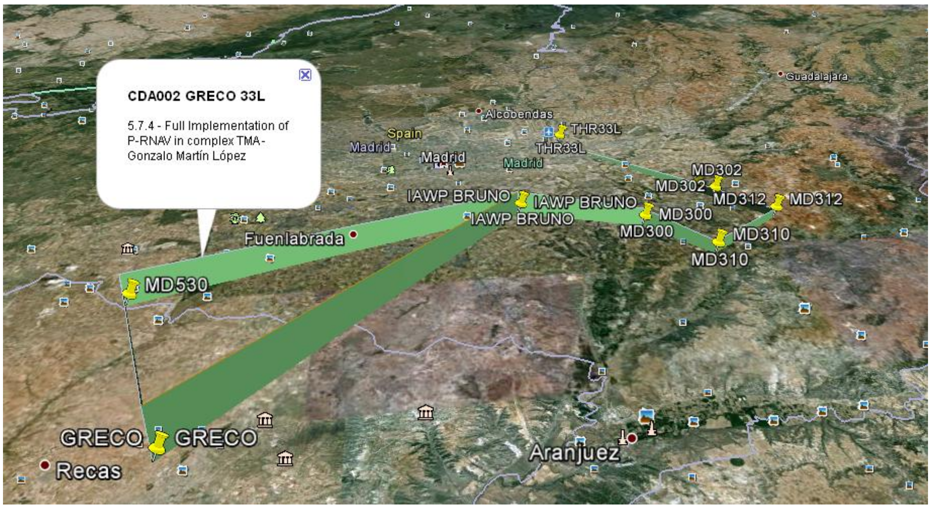

Figure 179: CDA002 GRECO 33L

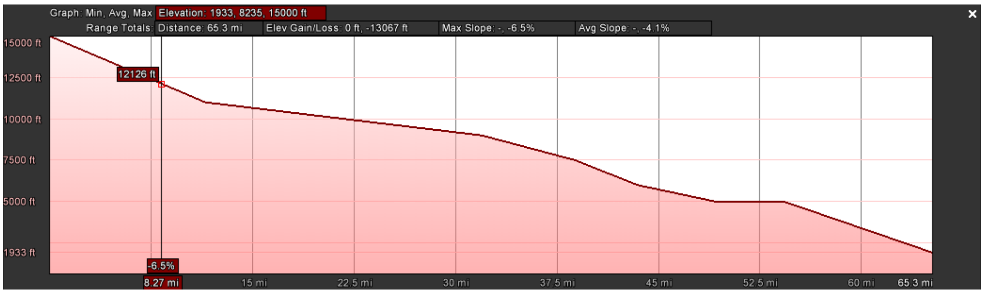

Figure 180: CDA002 GRECO 33L - Vertical Profile

6.5.1.3 CDA001 TERES 33L

Procedural description:

Id	Latitude	Longitude	Altitude
TERES	40º41'20.5323''N	004º11'58.2167''W	Alt.- FL150
IAWP BRUNO	40º19'00.2658''N	003º37'49.7942''W	Alt (ft).- 9000
MD300	40º16'53.9203''N	003º30'28.9773''W	Alt (ft).- 7500
MD310	40º13'43.9203''N	003º27'17.0324''W	Alt (ft).- 6000
MD312	40º16'47.5622''N	003º22'06.8622''W	Alt (ft).- 5000
MD302	40º19'29.1782''N	003º24'49.9061''W	Alt (ft).- 5000
LN8	40º20'16.8975''N	003º25'38.1013''W	Alt (ft).- 5000
THR33L	40º27'47.1004''N	003º33'14.0167''W	Alt (ft).- 1932.74

Table 78: CDA001 TERES 33L

Figure 181: CDA001 TERES 33L

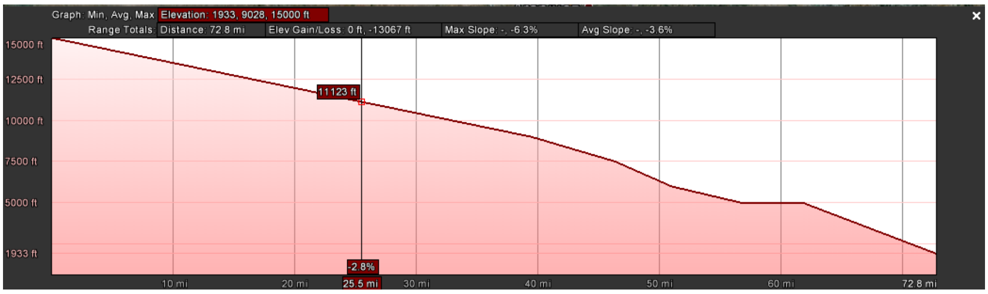

Figure 182: CDA001 TERES 33L - Vertical Profile

6.5.1.4 CDA002 TERES 33L

Procedural description:

Id	Latitude	Longitude	Altitude
TERES	40º41'20.5323''N	004º11'58.2167''W	Alt.- FL150
MD520	40º31'50.7613''N	004º07'49.1128''W	Alt (ft).- 11000
IAWP BRUNO	40º19'00.2658''N	003º37'49.7942''W	Alt (ft).- 9000
MD300	40º16'53.9203''N	003º30'28.9773''W	Alt (ft).- 7500
MD310	40º13'43.9203''N	003º27'17.0324''W	Alt (ft).- 6000
MD312	40º16'47.5622''N	003º22'06.8622''W	Alt (ft).- 5000
MD302	40º19'29.1782''N	003º24'49.9061''W	Alt (ft).- 5000
LN8	40º20'16.8975''N	003º25'38.1013''W	Alt (ft).- 5000
THR33L	40º27'47.1004''N	003º33'14.0167''W	Alt (ft).- 1932.74

Table 79: CDA002 TERES 33L

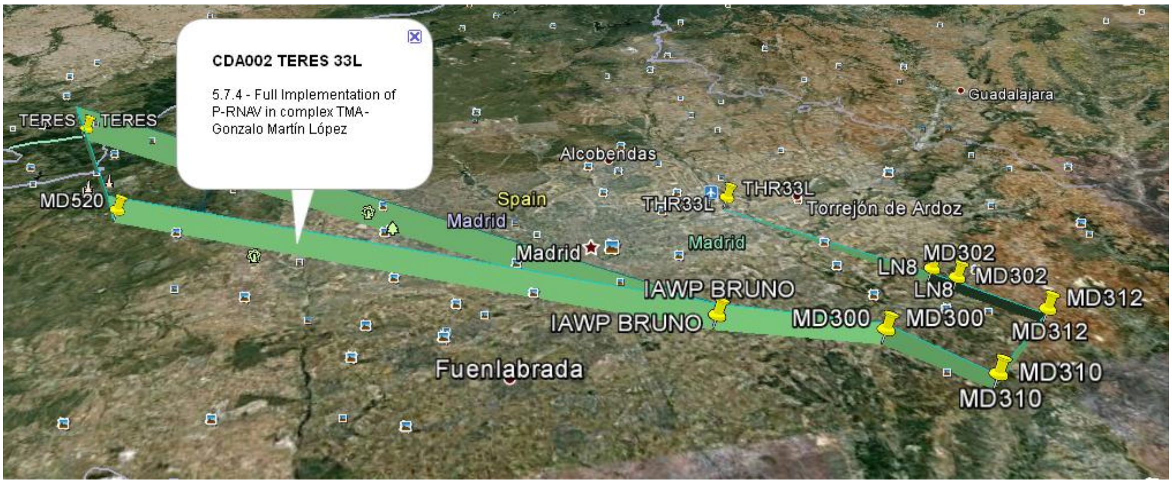

Figure 183: CDA002 TERES 33L

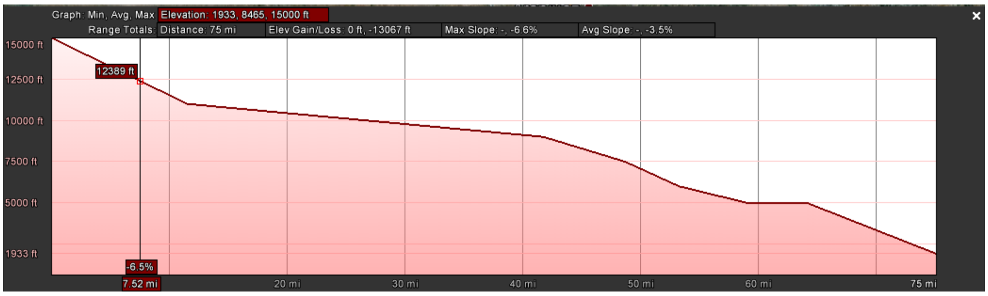

Figure 184: CDA002 TERES 33L - Vertical Profile

6.5.1.5 CDA001 DULCI 33R

Procedural description:

Id	Latitude	Longitude	Altitude
DULCI	40º21'20.5188''N	002º45'10.8585''W	Alt.- FL150
IAWP PACOS	40º28'33.2176''N	003º15'43.6125''W	Alt (ft).- 7500
MD400	40º25'13.9799''N	003º20'40.2000''W	Alt (ft).- 6000
MD410	40º20'28.5367''N	003º15'52.4993''W	Alt (ft).- 5000
MD411	40º18'56.8837''N	003º18'27.9240''W	Alt (ft).- 4000
MD412	40º17'25.1731''N	003º21'03.2323''W	Alt (ft).- 4000
MD402	40º20'06.8138''N	003º23'46.2595''W	Alt (ft).- 4000
RN8	40º23'16.8048''N	003º26'58.2140''W	Alt (ft).- 4000
THR33R	40º28'24.8516''N	003º32'10.3032''W	Alt (ft).- 1885.83

Table 80: CDA001 DULCI 33R

Figure 185: CDA001 DULCI 33R

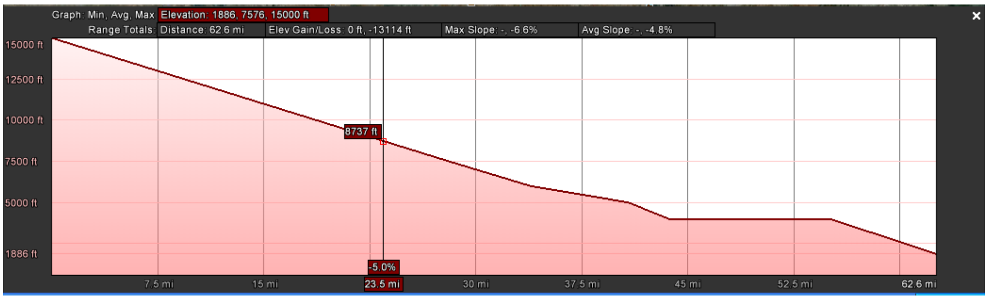

Figure 186: CDA001 DULCI 33R - Vertical Profile

6.5.1.6 CDA002 DULCI 33R

Procedural description:

Id	Latitude	Longitude	Altitude
DULCI	40º21'20.5188''N	002º45'10.8585''W	Alt.- FL150
MD630	40º30'50.7386''N	002º49'17.9028''W	Alt (ft).- 10000
IAWP PACOS	40º28'33.2176''N	003º15'43.6125''W	Alt (ft).- 7500
MD400	40º25'13.9799''N	003º20'40.2000''W	Alt (ft).- 6000
MD410	40º20'28.5367''N	003º15'52.4993''W	Alt (ft).- 5000
MD411	40º18'56.8837''N	003º18'27.9240''W	Alt (ft).- 4000
MD412	40º17'25.1731''N	003º21'03.2323''W	Alt (ft).- 4000
MD402	40º20'06.8138''N	003º23'46.2595''W	Alt (ft).- 4000
RN8	40º23'16.8048''N	003º26'58.2140''W	Alt (ft).- 4000
THR33R	40º28'24.8516''N	003º32'10.3032''W	Alt (ft).- 1885.83

Table 81: CDA002 DULCI 33R

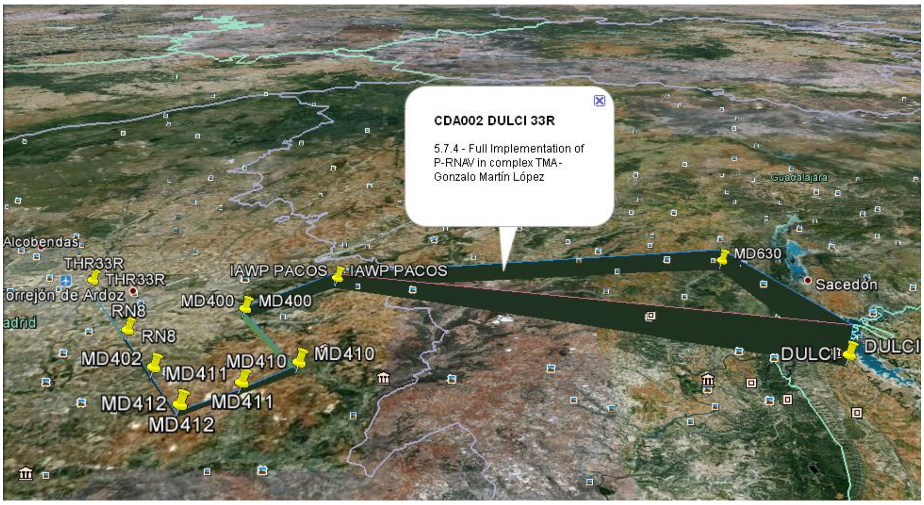

Figure 187: CDA002 DULCI 33R

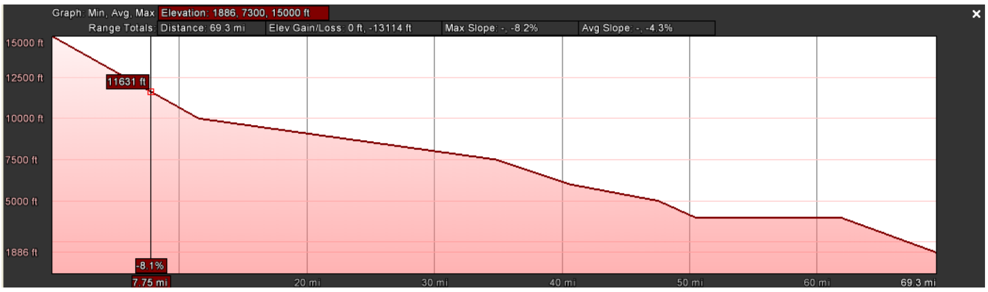

Figure 188: CDA002 DULCI 33R - Vertical Profile

6.5.1.7 CDA001 PILAR 33R

Procedural description:

Id	Latitude	Longitude	Altitude
PILAR	40º59'20.4257''N	003º01'46.0537''W	Alt.- FL150
IAWP PACOS	40º28'33.2176''N	003º15'43.6125''W	Alt (ft).- 7500
MD400	40º25'13.9799''N	003º20'40.2000''W	Alt (ft).- 6000
MD410	40º20'28.5367''N	003º15'52.4993''W	Alt (ft).- 5000
MD411	40º18'56.8837''N	003º18'27.9240''W	Alt (ft).- 4000
MD412	40º17'25.1731''N	003º21'03.2323''W	Alt (ft).- 4000
MD402	40º20'06.8138''N	003º23'46.2595''W	Alt (ft).- 4000
RN8	40º23'16.8048''N	003º26'58.2140''W	Alt (ft).- 4000
THR33R	40º28'24.8516''N	003º32'10.3032''W	Alt (ft).- 1885.83

Table 82: CDA001 PILAR 33R

Figure 189: CDA001 PILAR 33R

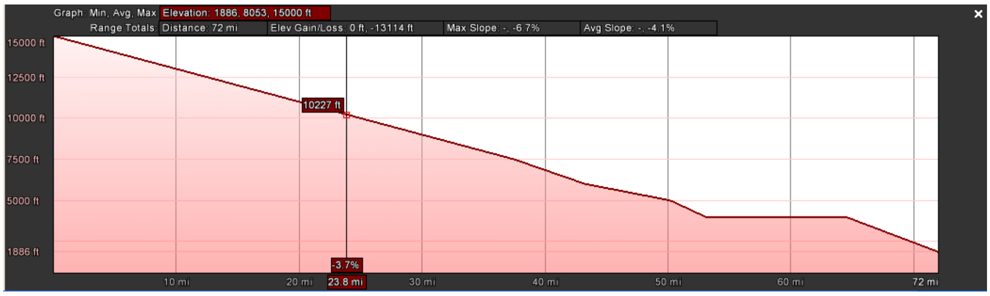

Figure 190: CDA001 PILAR 33R - Vertical Profile

6.5.1.8 CDA002 PILAR 33R

Procedural description:

Id	Latitude	Longitude	Altitude
PILAR	40º59'20.4257''N	003º01'46.0537''W	Alt.- FL150
MD620	40º49'50.6949''N	002º57'35.4864''W	Alt (ft).- 10000
IAWP PACOS	40º28'33.2176''N	003º15'43.6125''W	Alt (ft).- 7500
MD400	40º25'13.9799''N	003º20'40.2000''W	Alt (ft).- 6000
MD410	40º20'28.5367''N	003º15'52.4993''W	Alt (ft).- 5000
MD411	40º18'56.8837''N	003º18'27.9240''W	Alt (ft).- 4000
MD412	40º17'25.1731''N	003º21'03.2323''W	Alt (ft).- 4000
MD402	40º20'06.8138''N	003º23'46.2595''W	Alt (ft).- 4000
RN8	40º23'16.8048''N	003º26'58.2140''W	Alt (ft).- 4000
THR33R	40º28'24.8516''N	003º32'10.3032''W	Alt (ft).- 1885.83

Table 83: CDA002 PILAR 33R

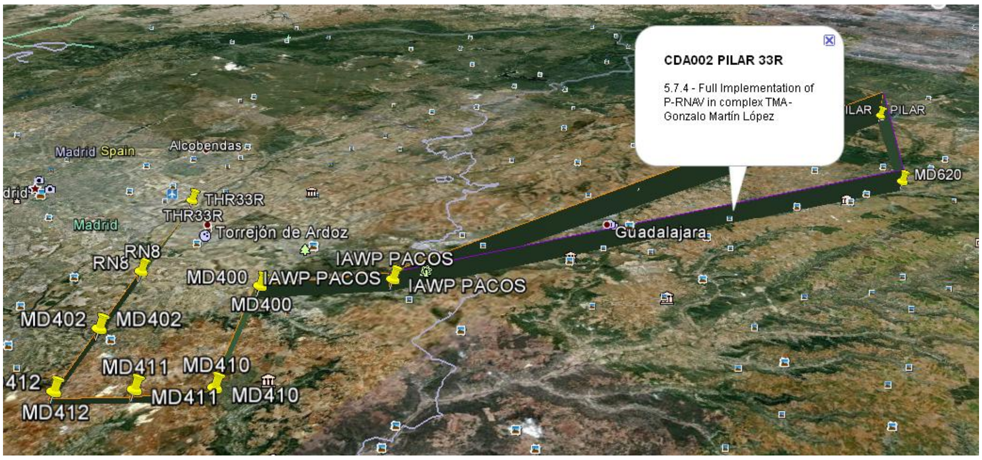

Figure 191: CDA002 PILAR 33R

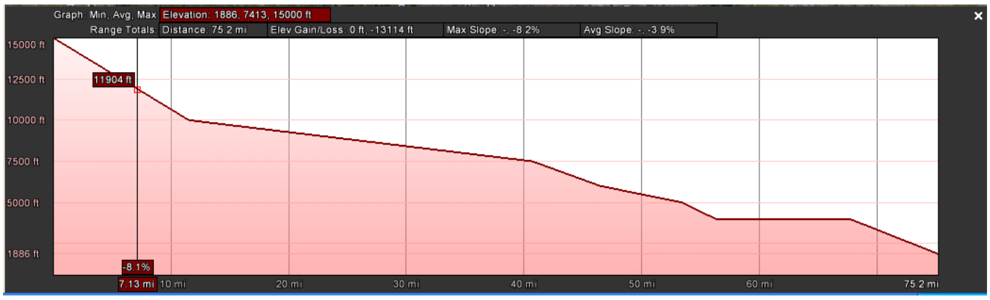

Figure 192: CDA002 PILAR 33R - Vertical Profile

This is how all CDAs procedures (green extruded wall) will look like in North Configuration living together with CCDs design and P-RNAV arrivals:

Figure 193: North Configuration CDAs

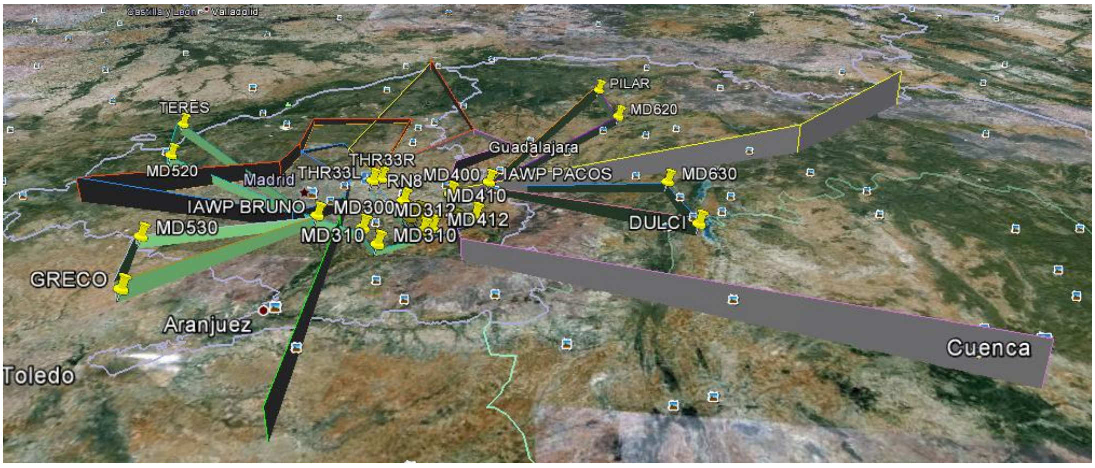

Figure 194: North Configuration CDAs (departures Interaction)

Figure 195: North Configuration CDAs (Arrivals Interaction)

6.5.2 LEMD SOUTH CONFIGURATION

6.5.2.1 CDA001 GRECO 18R

Procedural description:

Id	Latitude	Longitude	Altitude
GRECO	40º03'20.3802''N	003º55'28.9317''W	Alt.- FL150
IAWP CANTO	40º36'47.7455''N	003º45'27.1510''W	Alt (ft).- 9000
MD100	40º41'48.9386''N	003º41'07.3655''W	Alt (ft).- 7100
MD110	40º45'48.8411''N	003º41'09.1490''W	Alt (ft).- 7100
MD111	40º45'49.9767''N	003º37'52.1116''W	Alt (ft).- 5500
MD112	40º45'50.6879''N	003º34'34.1984''W	Alt (ft).- 5500
MD102	40º41'40.4028''N	003º34'32.7484''W	Alt (ft).- 5000
RS8	40º40'40.7766''N	003º34'32.4040''W	Alt (ft).- 5000
THR 18R	40º31'22.4008''N	003º34'29.2663''W	Alt (ft).- 1991.14

Table 84: CDA001 GRECO 18R

Figure 196: CDA001 GRECO 18R

Figure 197: CDA001 GRECO 18R - Vertical Profile

6.5.2.2 CDA002 GRECO 18R

Procedural description:

Id	Latitude	Longitude	Altitude
GRECO	40º03'20.3802''N	003º55'28.9317''W	Alt.- FL150
MD530	40º12'50.6825''N	003º59'34.4839''W	Alt (ft).- 11000
IAWP CANTO	40º36'47.7455''N	003º45'27.1510''W	Alt (ft).- 9000
MD100	40º41'48.9386''N	003º41'07.3655''W	Alt (ft).- 7100
MD110	40º45'48.8411''N	003º41'09.1490''W	Alt (ft).- 7100
MD111	40º45'49.9767''N	003º37'52.1116''W	Alt (ft).- 5500
MD112	40º45'50.6879''N	003º34'34.1984''W	Alt (ft).- 5500
MD102	40º41'40.4028''N	003º34'32.7484''W	Alt (ft).- 5000
RS8	40º40'40.7766''N	003º34'32.4040''W	Alt (ft).- 5000
THR 18R	40º31'22.4008''N	003º34'29.2663''W	Alt (ft).- 1991.14

Table 85: CDA002 GRECO 18R

Figure 198: CDA002 GRECO 18R

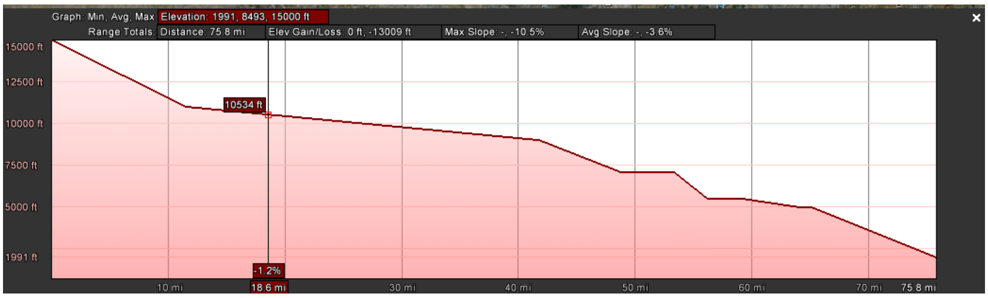

Figure 199: CDA002 GRECO 18R - Vertical Profile

There is a potential risk between the CDA proposed from GRECO to 18R Runway with the SID NAVAS 15R in terms of vertical separation.

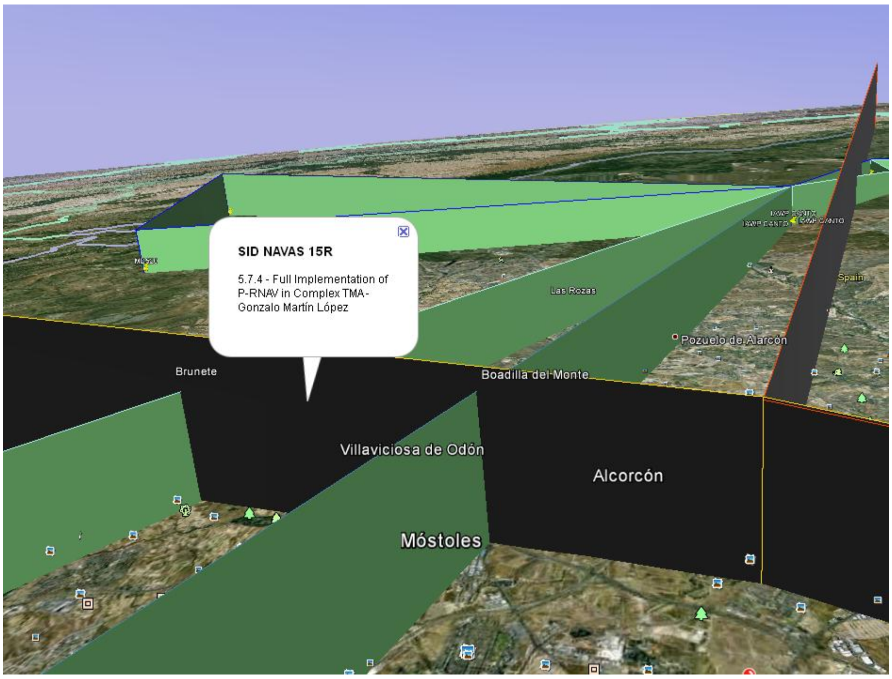

Figure 200: CDA001 and CDA002 GRECO 18R vs. SID NAVAS 15R

6.5.2.3 CDA001 TERES 18R

Procedural description:

Id	Latitude	Longitude	Altitude
TERES	40º41'20.5323''N	004º11'58.2167''W	Alt.- FL150
IAWP CANTO	40º36'47.7455''N	003º45'27.1510''W	Alt (ft).- 9000
MD100	40º41'48.9386''N	003º41'07.3655''W	Alt (ft).- 7100
MD110	40º45'48.8411''N	003º41'09.1490''W	Alt (ft).- 7100
MD111	40º45'49.9767''N	003º37'52.1116''W	Alt (ft).- 5500
MD112	40º45'50.6879''N	003º34'34.1984''W	Alt (ft).- 5500
MD102	40º41'40.4028''N	003º34'32.7484''W	Alt (ft).- 5000
RS8	40º40'40.7766''N	003º34'32.4040''W	Alt (ft).- 5000
THR 18R	40º31'22.4008''N	003º34'29.2663''W	Alt (ft).- 1991.14

Table 86: CDA001 TERES 18R

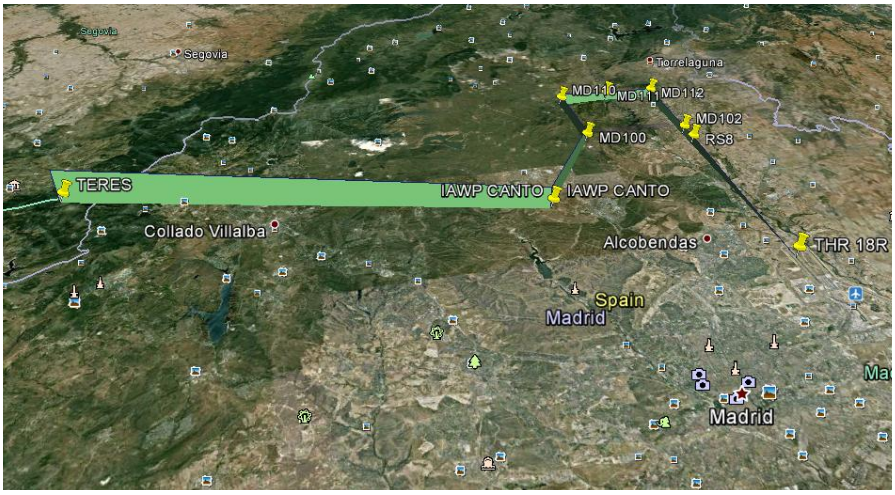

Figure 201: CDA001 TERES 18R

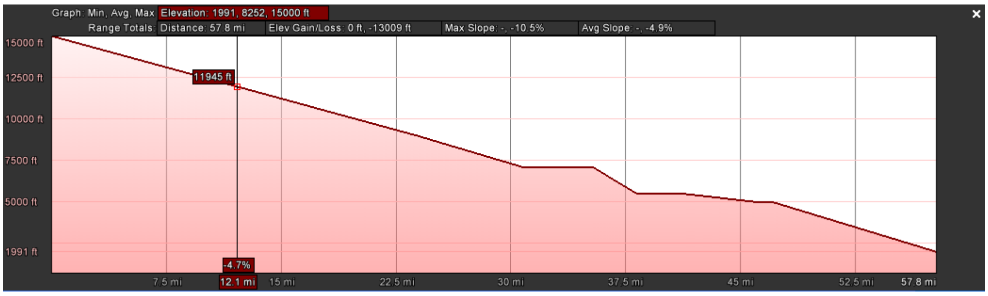

Figure 202: CDA001 TERES 18R - Vertical Profile

6.5.2.4 CDA002 TERES 18R

Procedural description:

Id	Latitude	Longitude	Altitude
TERES	40º41'20.5323''N	004º11'58.2167''W	Alt.- FL150
MD520	40º31'50.7613''N	004º07'49.1128''W	Alt (ft).- 11000

IAWP CANTO	40º36'47.7455''N	003º45'27.1510''W	Alt (ft).- 9000
MD100	40º41'48.9386''N	003º41'07.3655''W	Alt (ft).- 7100
MD110	40º45'48.8411''N	003º41'09.1490''W	Alt (ft).- 7100
MD111	40º45'49.9767''N	003º37'52.1116''W	Alt (ft).- 5500
MD112	40º45'50.6879''N	003º34'34.1984''W	Alt (ft).- 5500
MD102	40º41'40.4028''N	003º34'32.7484''W	Alt (ft).- 5000
RS8	40º40'40.7766''N	003º34'32.4040''W	Alt (ft).- 5000
THR 18R	40º31'22.4008''N	003º34'29.2663''W	Alt (ft).- 1991.14

Table 87: CDA002 TERES 18R

Figure 203: CDA002 TERES 18R

Figure 204: CDA002 TERES 18R - Vertical Profile

This particular CDA profile is not all the effective that could be, so hereby is proposed a new one by eliminating MD100 and MD111 as is shown in the following pictures:

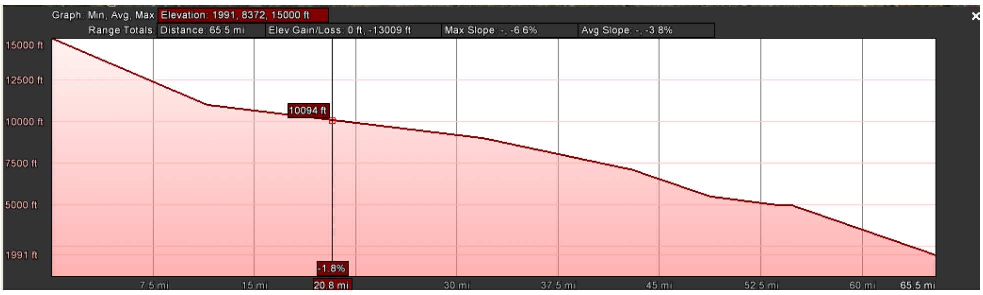

Figure 205: CDA002 TERES 18R - Vertical Profile optimized

The same can be applied to all CDAs ending on 18R runways in order to optimized CDAs procedures.

6.5.2.5 CDA001 DULCI 18L

Procedural description:

Id	Latitude	Longitude	Altitude
DULCI	40º21'20.5188''N	002º45'10.8585''W	Alt.- FL150
IAWP DAGAN	40º39'31.2224''N	003º20'34.9303''W	Alt (ft).- 8000
MD200	40º39'51.5876''N	003º27'02.0078''W	Alt (ft).- 6500
MD210	40º45'51.9557''N	003º27'03.4174''W	Alt (ft).- 5300
MD211	40º45'51.4605''N	003º30'20.9002''W	Alt (ft).- 4100
MD212	40º45'50.8713''W	003º33'38.3807''W	Alt (ft).- 4000
MD202	40º41'40.5861''N	003º33'36.9889''W	Alt (ft).- 4000
LS8	40º38'03.8703''N	003º33'35.7887''W	Alt (ft).- 4000
THR18L	40º31'41.2179''N	003º33'33.6809''W	Alt (ft).- 1922.24

Table 88: CDA001 DULCI 18L

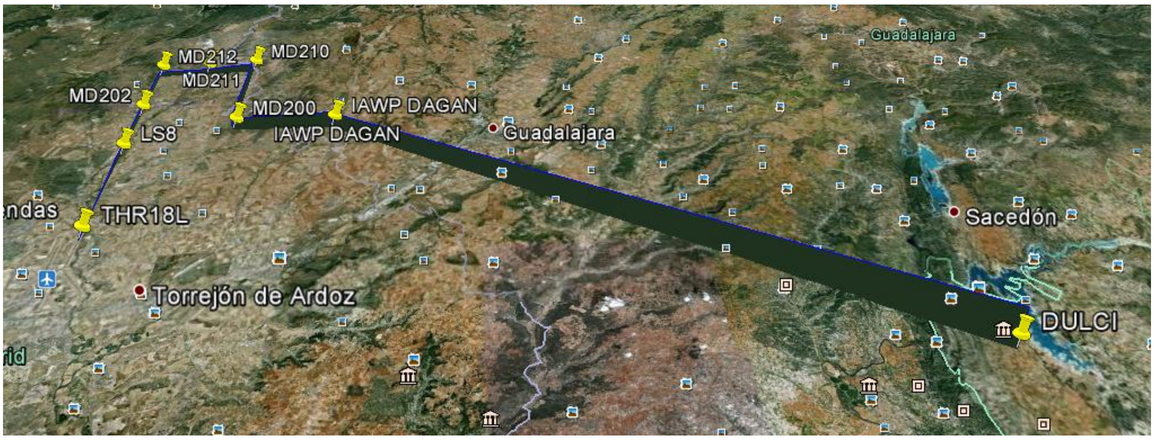

Figure 206: CDA001 DULCI 18L

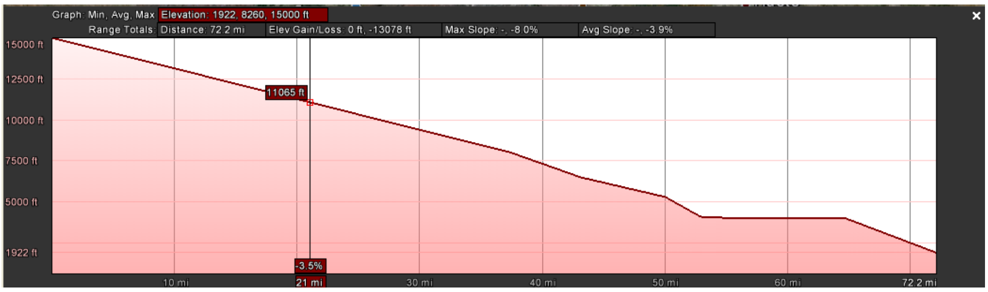

Figure 207: CDA001 DULCI 18L - Vertical Profile

6.5.2.6 CDA002 DULCI 18L

Procedural description:

Id	Latitude	Longitude	Altitude
DULCI	40º21'20.5188''N	002º45'10.8585''W	Alt.- FL150
MD630	40º30'50.7386''N	002º49'17.9028''W	Alt (ft).- 10000
IAWP DAGAN	40º39'31.2224''N	003º20'34.9303''W	Alt (ft).- 8000
MD200	40º39'51.5876''N	003º27'02.0078''W	Alt (ft).- 6500
MD210	40º45'51.9557''N	003º27'03.4174''W	Alt (ft).- 5300

MD211	40º45'51.4605''N	003º30'20.9002''W	Alt (ft).- 4100
MD212	40º45'50.8713''W	003º33'38.3807''W	Alt (ft).- 4000
MD202	40º41'40.5861''N	003º33'36.9889''W	Alt (ft).- 4000
LS8	40º38'03.8703''N	003º33'35.7887''W	Alt (ft).- 4000
THR18L	40º31'41.2179''N	003º33'33.6809''W	Alt (ft).- 1922.24

Table 89: CDA002 DULCI 18L

Figure 208: CDA002 DULCI 18L

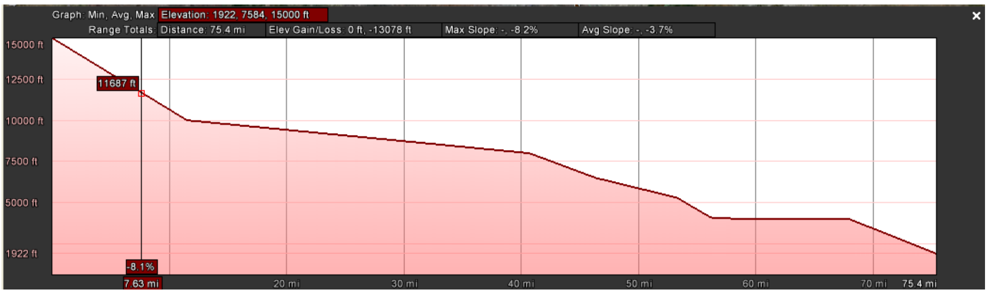

Figure 209: CDA002 DULCI 18L - Vertical Profile

6.5.2.7 CDA001 PILAR 18L

Procedural description:

Id	Latitude	Longitude	Altitude
PILAR	40º59'20.4257''N	003º01'46.0537''W	Alt.- FL150
IAWP DAGAN	40º39'31.2224''N	003º20'34.9303''W	Alt (ft).- 8000
MD200	40º39'51.5876''N	003º27'02.0078''W	Alt (ft).- 6500
MD210	40º45'51.9557''N	003º27'03.4174''W	Alt (ft).- 5300
MD211	40º45'51.4605''N	003º30'20.9002''W	Alt (ft).- 4100
MD212	40º45'50.8713''W	003º33'38.3807''W	Alt (ft).- 4000
MD202	40º41'40.5861''N	003º33'36.9889''W	Alt (ft).- 4000
LS8	40º38'03.8703''N	003º33'35.7887''W	Alt (ft).- 4000
THR18L	40º31'41.2179''N	003º33'33.6809''W	Alt (ft).- 1922.24

Table 90: CDA001 PILAR 18L

Figure 210: CDA001 PILAR 18L

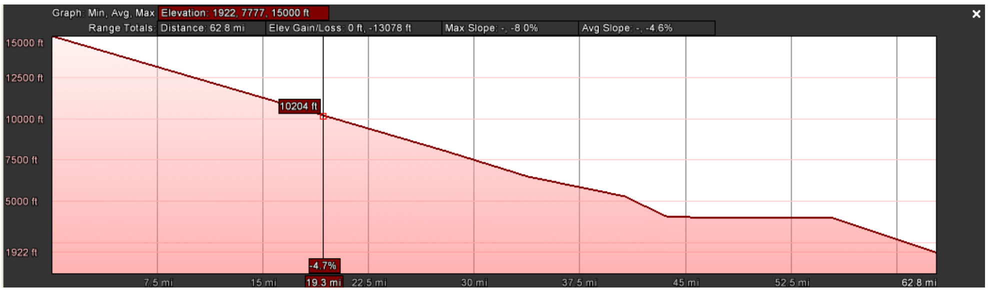

Figure 211: CDA001 PILAR 18L - Vertical Profile

There is a potential risk of vertical separation between this CDA001 via PILAR with SID TUMIL 15L like it is shown in the following picture:

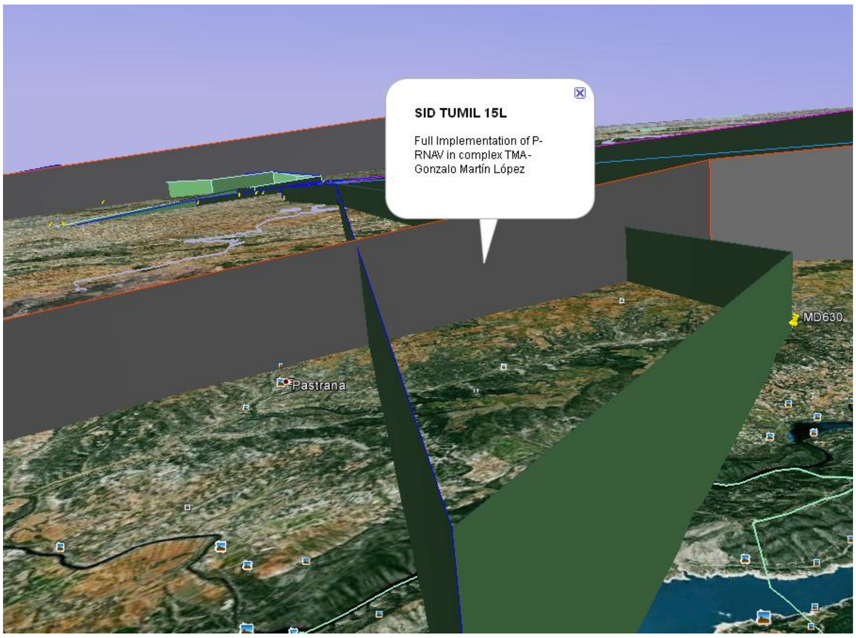

Figure 212: CDA001 PILAR 18L vs. SID TUMIL 15L

6.5.2.8 CDA002 PILAR 18L

Procedural description:

Id	Latitude	Longitude	Altitude
PILAR	40º59'20.4257''N	003º01'46.0537''W	Alt.- FL150
MD620	40º49'50.6949''N	002º57'35.4864''W	Alt (ft).- 10000
IAWP DAGAN	40º39'31.2224''N	003º20'34.9303''W	Alt (ft).- 8000
MD200	40º39'51.5876''N	003º27'02.0078''W	Alt (ft).- 6500
MD210	40º45'51.9557''N	003º27'03.4174''W	Alt (ft).- 5300
MD211	40º45'51.4605''N	003º30'20.9002''W	Alt (ft).- 4100
MD212	40º45'50.8713''W	003º33'38.3807''W	Alt (ft).- 4000
MD202	40º41'40.5861''N	003º33'36.9889''W	Alt (ft).- 4000
LS8	40º38'03.8703''N	003º33'35.7887''W	Alt (ft).- 4000
THR18L	40º31'41.2179''N	003º33'33.6809''W	Alt (ft).- 1922.24

Table 91: CDA002 PILAR 18L

Figure 213: CDA002 PILAR 18L

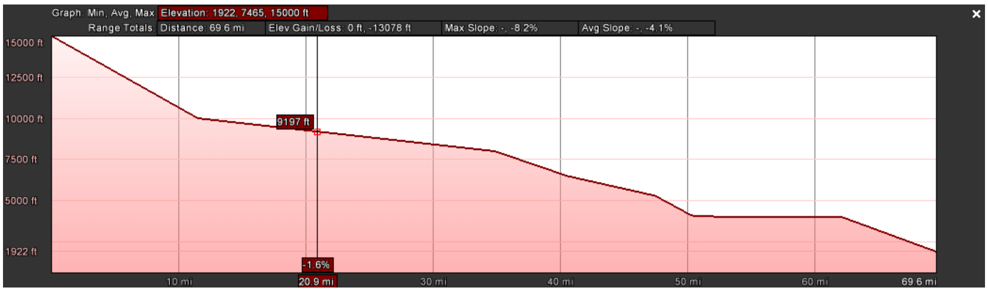

Figure 214: CDA002 PILAR 18L - Vertical Profile

This is how all CDAs procedures (green extruded wall) will look like in North Configuration living together with CCDs design and P-RNAV arrivals:

Figure 215: South Configuration CDAs

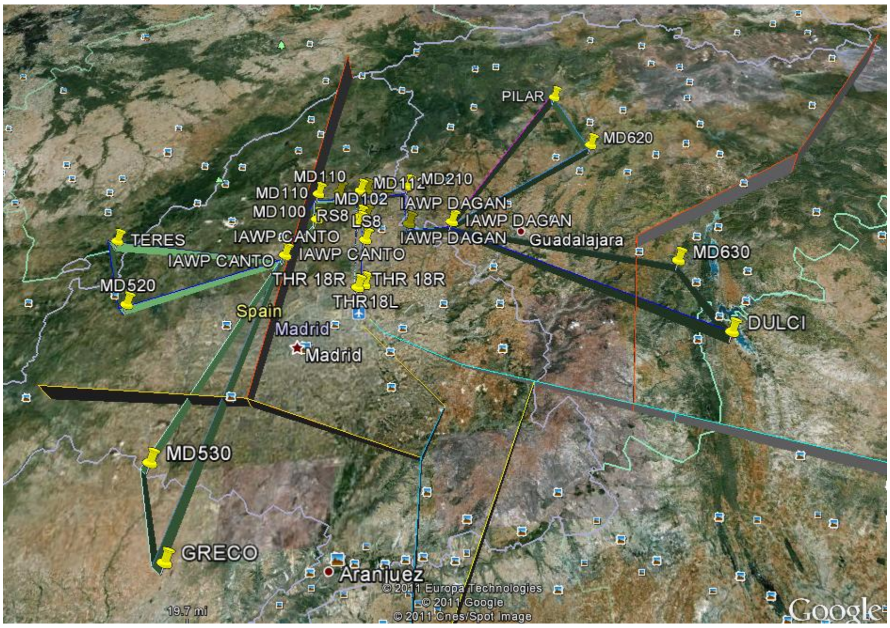

Figure 216: South Configuration CDAs (departures Interaction)

Figure 217: South Configuration CDAs (Arrivals Interaction)

7 Requirements

This section describes the functional or qualitative requirements applicable to every operational service.

This section develops the DOD requirements which are applicable to the Operational Focus Area addressed by this OSED. The OSED defines the requirements, which will be refined into quantitative requirements in the Safety and Performance document (SPR) and in the INTEROP.

To address interaction between operational services, a consolidation5 shall have been achieved before writing the requirements..

The requirements are traced with respect to the high level operational requirements identified in the DOD (Figure 4), when available:

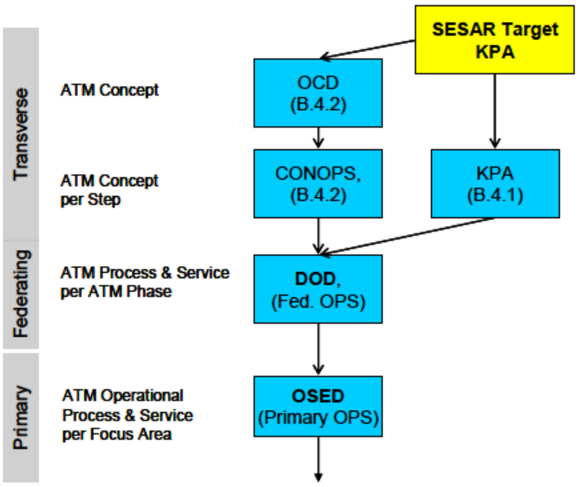

Figure 218: Requirements traceability

In order to facilitate the import of the requirements in a the Requirements Database (DOORS), the description uses the layout (Table 7) [4] (details are p [5]).

The Id field contains the Operational project number, owner of the requirement. The requirement field comprises Requirements: Functionality, domain of operation.

[REQ]

Identifier	
Requirement	
Title	
Status	
Importance	
Rationale	
Category	
V&V Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	DOD Requirement Identifier	<Full>
<SATISFIES>	<ATMS Requirement>	DOD Requirement Identifier / (KPA 1)	<Full>
<SATISFIES>	<ATMS Requirement>	DOD Requirement Identifier / (KPA n)	<Full>
<APPLIES_TO>	<Operational Process> or <Operational Service>	Operational Process or Operational Service Identifier	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A
<ALLOCATED_TO>	<Operator/Procedure>	Operator/Procedure identifier	N/A
<ALLOCATED_TO>	<Information Service>	Information Service identifier	N/A
<ALLOCATED_TO>	<Application Service>	Application Service identifier	N/A

5 Consolidation consists of providing a coherent set of requirements, by removing duplication, filling gaps and trading-off conflicting requirements. This may be done in isolation, by the primary project, or in conjunction with the federating project, depending on the level of responsibility for such a decision.
Interactions between operational services do not need to be explicitly identified, for they can be represented in two ways:
2 operational services interact by invoking a common Application / Information Service / procedure
One operational service is the Customer (resp. Supplier) of the other one.

<ALLOCATED_TO>	<System Function>	System Function identifier	N/A
<CHANGED_BECAUSE_OF>	<Change Order>	Change reference	N/A

Table 92: REQuirement Trace layout

The Rationale field contains:

- Justification of the allocation or a reference to a source document Source (OSED, OSA, OPA);
- Explanation about the requirement formulation or and/or how the requirement has been amended for the need of consolidation
- Influence diagram to explain the contribution to performance.

The Table 92: REQuirement Trace layout, contains the down-links to the projects (Operational or System) that receive the allocated requirement. There can be several down linked projects for a given requirement.
If a cell cannot be filled in, it has been left in blank.

The <SATISFIES>6 indicates the higher level requirements (applicable to the overall ATM System) captured in the DOD. They include performance requirements. Note that the Performance requirements are a subset of the DOD requirements, in relation with the B4.1 Performance framework. In particular, the <SATISFIES> rows support traceability to the corresponding Perf_Req from the DOD summarized in Table 5: List of the relevant DOD Requirements.

The operational requirements are structured in accordance with the OSED OFA 02.01.01 Optimization of RNP structures

REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0001
Requirement	Definition of the transitions to the ILS as symmetric between north and south configuration.
Title	Design Symetry
Status	<Completed>
Importance	
Rationale	Design Symetry is required when the airport configuration changes from North to South to facilite the ATC situational awareness and clearness of the airspace
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0002
Requirement	In independent parallel runways, the horizontal leveled transition segments, intermediate waypoints are needed to establish in an accurate mode the altitude to overfly this points

[6] *Satisfies = contributes to*

Title	Intermediate Waypoints
Status	< Completed >
Importance	
Rationale	In order to minimize consequences derived from the overshoot in consecutive aircraft approaching to 18R and 18L in South Configuration some intermediate points were needed for safety aspects
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED IN ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0003
Requirement	The distance flown between the IF and the first waypoint in the base leg are equal (25NM.).
Title	Distance Waypoints (IF)
Status	< Completed >
Importance	
Rationale	With the aim of reducing the operational complexity and to facilitate the building of approach sequences, having a common basic operational procedure for North / south configurations, thus reducing the impact of the runways changing making them faster and easier.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED IN ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0004
Requirement	Holding Patterns for mix mode of operations
Title	Holding Patterns (MOPS)
Status	< Completed >
Importance	
Rationale	Holding patterns must be convenient for P-RNAV and conventional traffic to facilitate the mix-mode operation and be usefull for the controller to use it as a tool in contingency situations. P-rnav regulations do not prescribe the obligation of defining a waypoint as a fix for the holding pattern.

Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0005
Requirement	Holding patterns shall be located in the first feeders points and in the IAWP.
Title	Holding Patterns (IAWP)
Status	< Completed >
Importance	
Rationale	Holding patterns shall be located in the first feeder points and in the IAF (for non-PRNAV traffic) in order to dispatch the aircrafts to the final approach sector in charge of the sequence building (3-5 NM).
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0006
Requirement	The new TMA dimension must include the holding patterns located on the CLs.
Title	New TMA Dimensions
Status	< Completed >
Importance	
Rationale	The new dimension for the TMA Airspace will be based on the buffer area of the holding pattern as well as its orientation for conventional navigation in some cases.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>

<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0007
Requirement	Ensure general aviation needs are correctly captured.
Title	GA Needs
Status	< Completed >
Importance	
Rationale	GA (P-RNAV or non-PRNAV equipped) must be managed without supporting any additional delay. To accomplish with this, the airspace design must allow the controller to insert these traffics on the same sequence as commercial flights.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0008
Requirement	It is required to liberalize the airspace in a complex TMA structure
Title	Airspace Liberalization
Status	< Completed >
Importance	
Rationale	P-RNAV will permit the liberalization of airspace for GA utilization.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0009
Requirement	The flow of the departing traffic shall be implemented well separated from the feeders or overflying the lowest part of the transitions.
Title	New SIDs
Status	< Completed >
Importance	
Rationale	The new P-RNAV SID will create different departure routes for different performance levels, fully deconflicted from arrival routes
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0010
Requirement	Integration of P-RNAV & conventional routes used by a mix of P-RNAV-compliant and conventional aircraft in high traffic density TMAs.
Title	Mixed Mode Operations Integration
Status	< Completed >
Importance	
Rationale	It is needed in order to preserve the traditional methods (e.g. RNAV) in case some non PRNAV compliant aircraft decides to approach to the TMA structure and the service is required.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0011
Requirement	Use of P-RNAV procedures to improve safety of manoeuvres in TMA where high terrain and bad weather conditions cause limitations to use of airspace.
Title	High Terrain and bad weather
Status	< Completed >
Importance	
Rationale	It provides a more predictable and safe operation when bad weather conditions prevailed and at the same time P-RNAV precision allows to optimize the use of airspace in high terrain areas.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0012
Requirement	MOPS change for adapting ATCOs to new P-RNAV procedures.
Title	Controller Mode of Operation adapting period
Status	< Completed >
Importance	
Rationale	To obtain the maximum benefit from the P-RNAV structure, the actual mode of operation based upon radar vectoring is substituted by direct-to waypoints instructions.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0013
Requirement	Suitable descent slope for P-RNAV Arrivals in all meteorological conditions.
Title	Suitable Descent Slope
Status	< Completed >

Importance	
Rationale	The airspace structure and operational procedures must facilitate at maximum for each aircraft the most adequate descent slope in all weather conditions.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED IN ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0015
Requirement	P-RNAV CDAs in high density traffic
Title	CDAs
Status	< Completed >
Importance	
Rationale	Although is a requirement to try to adapt complex airspace in the environmental initiatives (ultra-green airports), when the airspace capacity peak is reached is barely possible to build the approach sequence with aircrafts with different approach and descending slope performances and make it with safety and environmental sustainability. Further investigation is needed (Windows concept, 3D dynamic routes). In PRNAV complex TMAs structures, CDAs can be performed in low and medium traffic density like it is proposed in this document (5.5Operational Scenario 5: LEMD CDAs proposal)
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED IN ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0016
Requirement	Continuous Climb Departures enabled by the enhanced horizontal performance of P-RNAV
Title	CCDs
Status	< Completed >
Importance	
Rationale	Even though in Madrid TMA noise restrictions and populated areas are

	present along the departure paths, a continuous climb departure is needed in both configurations once these areas are over flown. Moreover, reducing noise emissions in scenarios where early turns are required in departures is needed.
[REQ] Identifier	REQ-05.07.04-OSED-Ac01.0016
Requirement	Continuous Climb Departures enabled by the enhanced horizontal performance of P-RNAV
Title	CCDs

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0017
Requirement	It is required different departure routes due to different aircraft climbing performances
Title	Different departing routes (Short/Long)
Status	< Completed >
Importance	
Rationale	Impact on departure sequencing due to aircraft performance mix (climb rates, turn capability, etc) is minimized by creating different departure routes for different performance levels.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0018
Requirement	The usage of radar vectoring shall be eliminated from normal mode of operation and reserve it only as contingency method
Title	Elimination of radar vectors
Status	< Completed >
Importance	

Rationale	Full P-RNAV implementation pursues the elimination of radar vectoring, thus avoiding open loop instructions, which will have a positive effect on safety and in Controller workload reduction through the use.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED IN ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0019
Requirement	It is required that the system pre-advises the non-PRNAV compliant aircraft approaches
Title	Pre-advise non-PRNAV approaches
Status	< Completed >
Importance	
Rationale	System should be able to pre-advice, by automated means to final approach controller about the arrival of non P-RNAV equipped aircrafts, as well as to the initial approach controller. This will avoid extra coordinations between both controllers, to ask the initial approach controller to open a gap between two P-RNAV equipped traffic, to allow final controller to put in sequence the non equipped aircraft.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED IN ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0020
Requirement	Feeder sectors should pre-sequence traffic to facilitate management of initial approach sectors
Title	Sequence in the feeder sectors
Status	< Completed >

Importance	
Rationale	Operational procedures should facilitate the possibility for the feeder sectors to build an initial approach sequence even if no sequencing tools are available.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0021
Requirement	Silent coordination procedures should be implemented
Title	Silent coordination procedures
Status	< Completed >
Importance	
Rationale	Operational procedures and system should minimize the use of verbal coordinations.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0022
Requirement	Sequencing tools are desirable to build the approach sequence beyond the TMA boundaries
Title	AMAN
Status	< Completed >
Importance	
Rationale	For high traffic demands as simulated in the higher traffic samples, the support of tools such as AMAN is needed to help pre-sequencing traffic to feeder sectors.
Category	<Operational>

Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0023
Requirement	In strong wind conditions, the separation between traffics at the deliverance from initial to final approach sectors needs to be increased
Title	Separation in strong wind conditions
Status	< Completed >
Importance	
Rationale	In strong wind conditions, the separation between traffics at the deliverance from initial to final approach sectors needs to be increased from seven to ten miles to prevent overtaking in the final approach path.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0024
Requirement	Open transitions are needed for single runway closure condition
Title	Single Runway Approaches
Status	< Completed >
Importance	
Rationale	For single RWY operation closed transitions have been observed as non manageable by NORVASE specialists and also by controllers. Open transitions and radar vectoring to localizer has conducted all right, always accompanied by a reduction in capacity.

Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0025
Requirement	Usage of radar vectoring is required when for whatever reason the final approach ATC decides to change the transition assigned or revert to nearer transitions.
Title	Changing Transitions
Status	< Completed >
Importance	
Rationale	If at a given time it is necessary to change a pre-assigned transition to localizer, once the aircraft has passed the IAF, it is recommended to instruct the traffic to turn to localizer by using radar vectors better than assigning a new transition, since pilot may not be able to introduce the change in the FMS.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0026
Requirement	Elevate of upper TMA limit till FL245
Title	TMA superior limit extension
Status	< Completed >
Importance	
Rationale	Elevate the upper limit till FL245 is needed to elevate the entry point to the TMA so the aircrafts descent profile is not too low and avoid over fuel consumption and gas emissions. With this requirement traffic coming at

	higher levels from clearance limits (e.g. FL 210) will perform better approaches to the distance left to IAWP" s.
[REQ] Identifier	REQ-05.07.04-OSED-Ac01.0026
Requirement	Elevate of upper TMA limit till FL245
Title	TMA superior limit extension

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0027
Requirement	Transferring FL above 200 is required in a complex TMA
Title	En-route transition in climbing phase
Status	< Completed >
Importance	
Rationale	It is required that the departing procedures have the transferring FL above 200 so that departure sectors could climb the traffic before transferring it to en-route sectors
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0028
Requirement	Missed approach procedures are required in order to send them to the IAF.
Title	Missed Approach Procedures
Status	< Completed >
Importance	
Rationale	In case a missed approach is needed during an approach, directing it to the IAF will ease the recovery of the approach sequence due to the proximity and feasibility of reaching those controlling points.

Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0029
Requirement	Alternative procedures are needed in paths below MVA.
Title	Radar Vectoring in areas below MVA
Status	< Completed >
Importance	
Rationale	In South Configuration, MEA's in the final grids are below MVA. Alternative procedures should be studied for the event of need of radar vectoring.
Category	<Operational>
Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

[REQ]

Identifier	REQ-05.07.04-OSED-Ac01.0030
Requirement	It is necessary that director sectors receive the traffic from external feeders sectors at FL 150 via TERES and PILAR; and FL 160 via GRECO and DULCI.
Title	Director Sectors superior limit extension
Status	< Completed >
Importance	
Rationale	Dispatching traffics at different flight levels from feeders North and South to director sector is necessary to avoid face-to-face traffic at the same FL in the external trombones.
Category	<Operational>

Validation Method	<Real Time Simulation>
Verification Method	<N/A>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-ENV0.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CAP0.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-CEF0.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.02-DOD-PRED.0005	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA02.01.01	N/A
<APPLIED_IN_ENVIRONMENT>	<Environment Class>	Environment Class Identifier	N/A

Table 93: REQuirement Trace layout

8 References

8.1 Applicable Documents

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

[1] IS SESAR SEMP 2.0
[2] B4.2 Initial Service Taxonomy document
[3] IS SESAR Template Toolbox Latest version
[4] IS SESAR Requirements and V&V Guidelines Latest version
[5] IS SESAR Template Toolbox Users Manual Latest version
[6] 5.2. D04 DOD
[7] ATM Master Plan
[8] B4.1 Related deliverables
[9] B5 Related deliverables
[10] 16.6.1D02-002SCF - SESAR Safety Policy and Principles
[11] 16.6.1D06-002SESAR Safety Reference Material
[12] 16.6.1D24SRM 1
[13] 16.6.1D49Step x (x=1,2 or 3) SAF Case & Inputs to Business Case
[14] 16.6.2D02-002SCF - SESAR ATM Security Policy and Principles
[15] 16.6.2D04-002SCF - ATM Security Regulatory Interface Reviews
[16] 16.6.2D05-002SCF - ATM Security and Cross-TA Output Communication and Outreach
[17] 16.6.2D06-002SESAR ATM Security Reference Material
[18] 16.6.2D08-003Common Baseline and Assumptions
[19] 16.6.2D09-003Cross-TA Register
[20] 16.6.2D10-003Project and Package Impacts / Benefits Mechanisms
[21] 16.6.2D20-002ATM Security Awareness and Training Material
[22] 16.6.2D21-003ATM Security Training
[23] 16.6.3D01-005Project Execution Plan (PEP) and Reports
[24] 16.6.3D02-002SESAR Environmental Policy and Plan
[25] 16.6.3D03-002ENV and Cross-TA Assessments Management Plans
[26] 16.6.3D04-001Regulatory Interface Reviews
[27] 16.6.3D05-002ENV and Cross-TA Output Communication and Outreach
[28] 16.6.3D06-003SESAR ENV Reference Material
[29] 16.6.3D08-003Cross-TA Common Baseline and Assumptions
[30] 16.6.3D09-003Cross-TA Register of Data
[31] 16.6.3D10-005Cross-TA Database of Project Impacts / Benefits Mechanisms
[32] 16.6.3D20-003ENV and cross-TA Awareness and Training Material
[33] 16.6.3D21-003ENV and cross-TA Training and Coaching
[34] 16.6.5D01-005Project Execution Plan (PEP) and Progres Reports
[35] 16.6.5D03-002HP and Cross-TA Assessments Management Plans
[36] 16.6.5D04-001Regulatory Interface Reviews
[37] 16.6.5D06-002SESAR HP Reference Material
[38] 16.6.5D08-002Cross-TA Common Baseline and Assumptions
[39] 16.6.5D09-002Cross-TA Register of Data
[40] 16.6.5D10-002Cross-TA Project and Package Impacts / Benefits Mechanisms
[41] 16.6.5D71SESAR HP Assessment Process 1

[42] 16.6.5D96Step x (x=1,2 or 3) HP Case & Inputs to Business Case
[43] 16.6.6D01-005P16.06.06 Project Management Plans & Reports
[44] 16.6.6D02-003SCF - SESAR Business Case & CBA Process Specification
[45] 16.6.6D04-001SCF - Regulatory Interface Reviews
[46] 16.6.6D05-002SCF - CBA, Business Case and Cross-TA Output Communication and Outreach
[47] 16.6.6D06-003SESAR Business Case and CBA Reference Material
[48] 16.6.6D13Time-Based Operations (Step 1) CBA and Business Cases - SAR
[49] 16.6.6D08-003Common Baseline and Assumptions
[50] 16.6.6D10-003Project and Package Impacts / Benefits Mechanisms
[51] 16.6.6D20-002Cross-TA, CBA and Business Case Awareness and Training Material
[52] 16.6.6D21-002Cross-TA, CBA and Business Case Training and Coaching
[53] 16.6.6D22-002Validated improvements to BC & CBA practices
[54] 16.6.6D41Refined Performance Framework
[55] 16.6.6D42Validation Targets
[56] 16.6.6D47Refined B.05 Influence Models
[57] 16.6.6D48Initial Performance Assesment Step 1 based on Expectations
[58] 16.6.6D49Initial Gap Analysis and recommendations for Step 1
[59] 16.6.6D50Perfromance assesment Products 2013
[60] 5.3D02Integration Business Case (step 1)
[61] 5.3D03Integration Validation Plan (step 1)
[62] 5.3D04OSED Specification (step 1)
[63] 5.3D05Safety and Performance Requirements (step 1)
[64] 5.3D06INTEROP Specification (step 1)
[65] 5.3D13Validation Exericise Plan VA3 (step 1)

8.2 Reference Documents

The following documents **were used to provide input/guidance/further information/other**:

[66] B4.3 Architecture Description Document
[67] ICAO Document 9694
[68] B4.1 [Initial] Baseline Performance Framework (Edition 0) D12.
[69] Aena. TRABAJOS REALIZADOS PARA EL FUTURO TMA PRNAV DE MADRID-BARAJAS. 20/11/09
[70] Aena. P-RNAV IMPLEMENTATION IN SPAIN. ANÁLISIS DE LA PROPUESTA DE DISEÑO DEL NUEVO TMA DE PALMA. 08/04/2010
[71] Aena. DOCUMENTO DE PROYECTO DE NUEVO TMA P-RNAV MADRID: ESTUDIO INICIAL. 13/08/08
[72] Aena -TMA MADRID PRNAV-“CODIFICACIÓN DE LAS TRANSICIONES EN CONF. NORTE Y SUR PARA EL NUEVO TMA MADRID PRNAV”. 08/09/2008
[73] Aena. PROYECTO: NUEVO TMA DE MADRID PRNAV. JUSTIFICACIÓN Y PROPUESTA DE DESARROLLO DEL PROYECTO. 12/02/08
[74] Aena. TMA MADRID 2008. ANÁLISIS DE NUEVOS. PROCEDIMIENTOS DE ENTRADA 08/04/2008
[75] RETACDA: REDUCTION OF EMISSIONS IN TERMINAL AREAS USING CONTINUOUS DESCENT APPROACHES 30/09/09
[76] 5.2. D04 DOD
[77] Reference material form V&V coaching Session SESAR IS (April 2012)

Appendix A Assessment / Justifications

A.1ALL Assessments

https://extranet.sesarju.eu/WP_05/Project_05.07.04/Project%20Plan/Forms/AllItems.aspx?RootFolder=%2fWP_05%2fProject_05.07.04%2fProject%20Plan%2fT003%20-%20Full%20P-RNAV%20Impl.%20In%20Madrid%20TMA%20-%20Operational%2c%20performance%20and%20safety%20aspects%2fD03%20-%20P5.7.4%20Final%20OSED%20-%20Madrid%20TMA%2fAnnexes&FolderCTID=0x0120009506F724D58BB141BAA16F219769CCE6&View={E8428DE2-6485-48E7-9019-0C3292DA595D}

Appendix B Validation Plan

https://extranet.sesarju.eu/WP_05/Project_05.07.04/Project%20Plan/Forms/AllItems.aspx?RootFolder=%2fWP_05%2fProject_05.07.04%2fProject%20Plan%2fT003%20-%20Full%20P-RNAV%20Impl.%20In%20Madrid%20TMA%20-%20Operational%2c%20performance%20and%20safety%20aspects%2fD03%20-%20P5.7.4%20Final%20OSED%20-%20Madrid%20TMA%2fAnnexes&FolderCTID=0x0120009506F724D58BB141BAA16F219769CCE6&View={E8428DE2-6485-48E7-9019-0C3292DA595D}

Appendix C Benefit Mechanisms

https://extranet.sesarju.eu/WP_05/Project_05.07.04/Project%20Plan/Forms/AllItems.aspx?RootFolder=%2fWP_05%2fProject_05.07.04%2fProject%20Plan%2fT003%20-%20Full%20P-RNAV%20Impl.%20In%20Madrid%20TMA%20-%20Operational%2c%20performance%20and%20safety%20aspects%2fD03%20-%20P5.7.4%20Final%20OSED%20-%20Madrid%20TMA%2fAnnexes&FolderCTID=0x0120009506F724D58BB141BAA16F219769CCE6&View={E8428DE2-6485-48E7-9019-0C3292DA595D}

Appendix D Safety Case

https://extranet.sesarju.eu/WP_05/Project_05.07.04/Project%20Plan/Forms/AllItems.aspx?RootFolder=%2fWP_05%2fProject_05.07.04%2fProject%20Plan%2fT003%20-%20Full%20P-RNAV%20Impl.%20In%20Madrid%20TMA%20-%20Operational%2c%20performance%20and%20safety%20aspects%2fD03%20-%20P5.7.4%20Final%20OSED%20-%20Madrid%20TMA%2fAnnexes&FolderCTID=0x0120009506F724D58BB141BAA16F219769CCE6&View={E8428DE2-6485-48E7-9019-0C3292DA595D}

Appendix E Security Case

https://extranet.sesarju.eu/WP_05/Project_05.07.04/Project%20Plan/Forms/AllItems.aspx?RootFolder=%2fWP_05%2fProject_05.07.04%2fProject%20Plan%2fT003%20-%20Full%20P-RNAV%20Impl.%20In%20Madrid%20TMA%20-%20Operational%2c%20performance%20and%20safety%20aspects%2fD03%20-%20P5.7.4%20Final%20OSED%20-%20Madrid%20TMA%2fAnnexes&FolderCTID=0x0120009506F724D58BB141BAA16F219769CCE6&View={E8428DE2-6485-48E7-9019-0C3292DA595D}

Appendix F Environment Case

https://extranet.sesarju.eu/WP_05/Project_05.07.04/Project%20Plan/Forms/AllItems.aspx?RootFolder=%2fWP_05%2fProject_05.07.04%2fProject%20Plan%2fT003%20-%20Full%20P-RNAV%20Impl.%20In%20Madrid%20TMA%20-%20Operational%2c%20performance%20and%20safety%20aspects%2fD03%20-%20P5.7.4%20Final%20OSED%20-%20Madrid%20TMA%2fAnnexes&FolderCTID=0x0120009506F724D58BB141BAA16F219769CCE6&View={E8428DE2-6485-48E7-9019-0C3292DA595D}

Appendix G Human Factor Case

https://extranet.sesarju.eu/WP_05/Project_05.07.04/Project%20Plan/Forms/AllItems.aspx?RootFolder=%2fWP_05%2fProject_05.07.04%2fProject%20Plan%2fT003%20-%20Full%20P-RNAV%20Impl.%20In%20Madrid%20TMA%20-%20Operational%2c%20performance%20and%20safety%20aspects%2fD03%20-%20P5.7.4%20Final%20OSED%20-%20Madrid%20TMA%2fAnnexes&FolderCTID=0x0120009506F724D58BB141BAA16F219769CCE6&View={E8428DE2-6485-48E7-9019-0C3292DA595D}

Appendix H Cost Benefit Case

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