Family 1.1.1 Arrival Management extended to en-route airspace

Extended Aman non-applicability assessment process

Supporting Material
to SDP Implementation

March 2024

Control

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1 Introduction

1.1 Background

The SESAR Deployment Manager is established in Reg. (EU) n. 409/2013 with the purpose to, inter alia, develop and maintain the SESAR Deployment Programme (SDP). According to Section 2 Article 11 of said regulation, the Deployment Programme shall provide a comprehensive and structured work plan of all activities necessary to implement technologies, procedures and best practices required to implement common projects. It shall organise these activities in implementation projects identifying the associated risks and mitigation actions, the geographical scope, the timeframe and the operational stakeholders responsible for carrying out the implementation projects.

Among the ATM functionalities defined in Regulation (EU) n. 2021/116 is AF1: Extended arrival Management and Integrated Arrival Management / Departure Management in the High Density Terminal Manoeuvring Areas. This functionality prescribes the implementation of Extended AMAN and AMAN/DMAN Integration in the defined respective geographical scopes, where the AMAN horizon is extended to at least 180 nautical miles from the arrival airport.

Characteristics pertaining to the geographical location of the arrival airport may nonetheless, in specific cases, lead to a situation where the implementation of extended AMAN would bring no additional performance benefits. The Regulation, the SDP and the Supporting Materials acknowledged this situation accordingly:

Extended AMAN is defined in the respective Sub-AF System requirements, point (a) as follows:

> Extended AMAN systems must provide arrival sequence time information and associated advisories into en-route ATC systems to a minimum of 180 nautical miles from the arrival airport as well as into ATC systems of airports impacted by the extended AMAN horizon, **unless a shorter distance is recommended in the deployment programme.**

[EU IR 2021/116 ANNEX 1.1.1 System Requirements (a)]

The Deployment Programme specifies as a result the following:

> The Arrival Manager extended to en-route airspace requires an extension of AMAN advisories up to a minimum of 180 nautical miles from the arrival airport. **Shorter horizon distance will be considered when, due to the geographical location of the arrival airport, the extension of the AMAN horizon does not provide additional performance benefits.**

[SESAR Deployment Programme 2022, Family 1.1.1, Description]

Finally, in Supporting Material to SDP, the following clarification is found:

> The CP1 mandates a minimum range of 180NM, but a shorter range can be considered when recommended in SDP. SDP allows for consideration "when, due to the geographical location of the arrival airport, the extension of the AMAN does not provide additional performance benefits". In these cases, when the stakeholder has considered horizon range less than 180 NM from the mandated airport, **they shall provide relevant evidence/report of justification of no additional performance benefits, for assessment and verification by the SDM."**

[SDP2022 Supporting Material 2023 to SDP Implementation, Section 1.1]

The purpose of this document is to clarify the process for providing such evidence/report by the mandated ANSP wishing to do so, relevant timelines and the elements against which the assessment/verification will be carried out by SDM.

1.2 Scope of the document

This document aims at providing guidance on the assessment criteria and the assessment and verification process as applied by SDM.

1.3 Structure of the document

Chapter 1 provides the legal basis and an introduction to the content of the document.

Chapter 2 discusses the key parameters and criteria to be considered by the implementing stakeholders when seeking to demonstrate the lack of additional performance benefits and elaborates on the main criteria of the assessment process to be performed by SDM. It also provides a description of the procedural steps (concerning the implementing Stakeholders and the SDM).

2 Overview of the assessment/verification process

2.1 The SDP

EU IR 2021/116 allows a horizon shorter than 180 NM to be implemented if so recommended in the SDP. The SDP in its turn introduces the relationship between the shortened horizon, the geographical location of the airport and the resultant performance benefits.

It is therefore considered crucial that SDM, in collaboration with the affected stakeholders, provides guidance on a structured and agreed approach to interpret the available regulatory and guidance material so that an even playing field is preserved with no undue compromise to the benefit of the airspace user. The process is then applied and the results of the assessments/verifications carried out (see also section 2.5) will be shared with EASA / NSAs for any comment and, if the assessment is positive, recorded in the updated SDP sent to the EC.

2.2 The 180 NM parameter

180 NM is the cardinal parameter and represents a legal standard that is sufficiently unambiguous to be applied as Acceptable Means of Compliance for ATM Functionality 1. SDM has observed that questions regarding its origins and interpretation tend to arise nonetheless:

- Why specifically 180NM?
- Is it flown distance, flight-planned distance or Great Circle distance?

As such it is deemed beneficial to discuss the parameter at some length before delving into its interpretations in the SDP and the SDP Supporting Material and their consequences.

2.2.1 The origin of the 180 NM figure

The parameter originates from SESAR Solution #05 of Release 4 and its principal associated Operational Improvement TS-0305-A. With certain assumptions on the typical sequence participant[1] it can be derived that the aircraft will spend around 25 to 30 minutes in descent absorbing the assigned delay. Allowing for 5 minutes for sequence stabilization, 5 minutes for descent planning following the application of the advisory and 5 minutes for the approach phase, it follows that the sequence construction should start at 45 minutes to landing with the sequence stabilizing and active advisories being issued from 40 minutes to landing. This figure would quite possibly serve well enough as a measure for an operationally effective deployment yet for airspace design and optimization purposes it requires assumptions to be made on the traffic mix and in some cases prevailing wind patterns. To simplify things, it was felt that a distance-based measure was required to aid with the deployment of the concept.

Assuming the usual descent planning rule of thumb (1/3+10%) giving the descent path length at 132 NM for an aircraft commencing descent from FL360 and 10 minutes of flight time in cruise at M0.75 (~430 KTAS) giving another 71NM, we arrive at the required horizon distance of 203NM.

SESAR real-time simulations and field trials took airspace considerations into account and settled on a more realistic 180 to 200NM. In the SESAR Solution documentation both the time-based measure (40 minutes) and its distance based equivalent (180-200 NM) would be commonly found. In the predecessor to CP1, EU IR 716/2014 better known as the Pilot Common Project (PCP), the time-based yardstick was omitted but it could still occasionally be found in various supporting documentation. Finally, during the reform of the PCP, the upper bound of the distance-based measure was dropped in the interest of regulatory clarity, arriving at the currently applicable 180 NM.

- [1] a medium category transport twin-engine jet (B737, A320), cruising at FL360 at M0.75, typical descent rate ~ 1000 FPM

2.2.2 Planned, flown or Great Circle distance

From the discussion in 2.2.1 it follows that Extended AMAN operates on the basis of the planned distance, usually referred to as track miles, whereas the miles actually flown may correspond with the measures taken by the executive controller to implement the advisory. However, due to continuous adjustments and improvements ongoing in the airspace design, the track miles distance presents a moving target in terms of regulatory compliance and is therefore unsuitable as a Means of Compliance. SDM cannot predict what methodology will be applied by the competent authorities following the passage of the applicability date for Extended AMAN implementation 31 December 2024, yet some form of yardstick is necessary for effective implementation monitoring and follow-up. It was therefore decided to take the 180NM Great circle distance as a basis to the assessment/verification of the potential lack of performance benefits.

It should also be noted that the Great circle distance corresponds with the theoretical maximum horizontal efficiency in airspace design; in reality, the track miles distance will always fit inside the 180 NM great circle and this relationship forms a sound basis for a shortened implementation horizon to be applied, see in the next chapter.

2.3 Overview of the assessment process

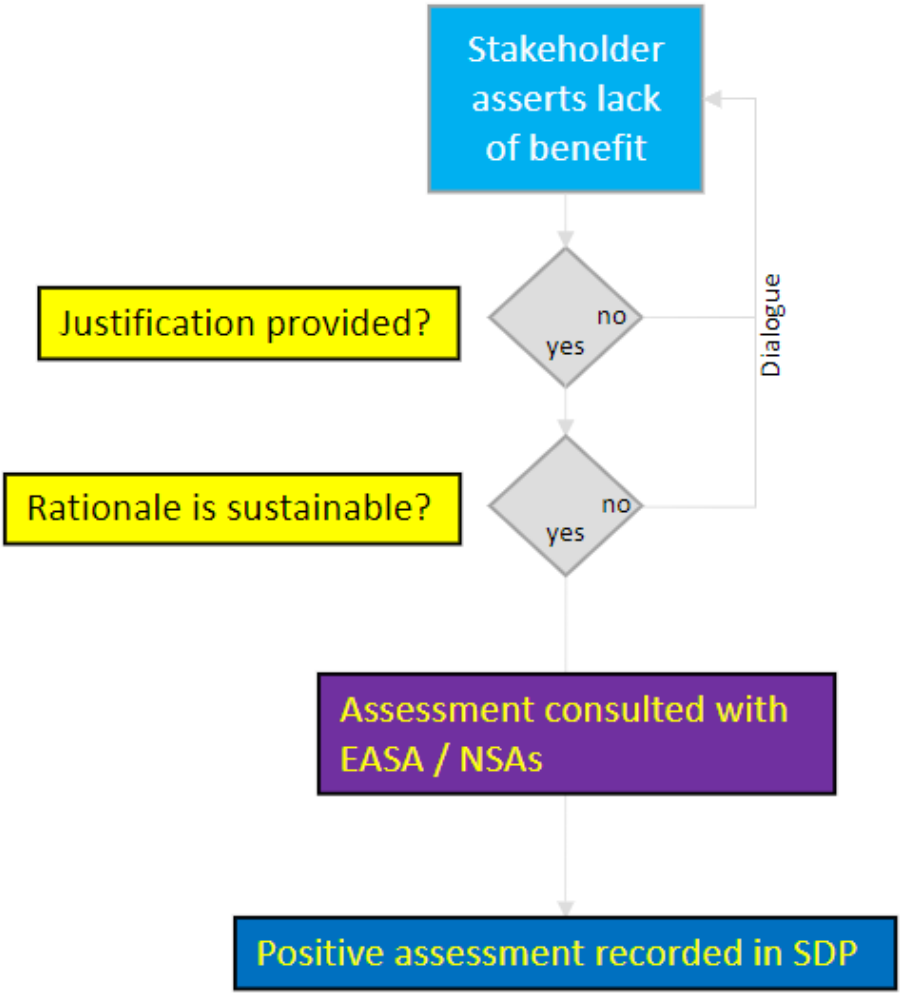

Figure 1 Assessment process flowchart

Figure 1 illustrates the assessment/verification. The process starts with the mandated implementing stakeholder informing SDM of that the implementation of extended AMAN would bring no additional performance benefits. This assertion, including the requisite justification and supporting evidence, must be communicated to SDM.

SDM will then assess the provided material, requesting additional information where needed. The result of SDM assessment/verification will be communicated and reported. It remains nonetheless the competence of EASA / the Competent Authority to concur or not with the result of the SDM assessment. In the following chapters, the parameters and criteria are discussed.

2.4 Generic scenarios

2.4.1 Traffic density

Traffic density may be a possible scenario to be taken into account where the inbound **traffic streams are negligible** and would bring no additional performance benefits. Such a scenario is illustrated in Figure 2 below.

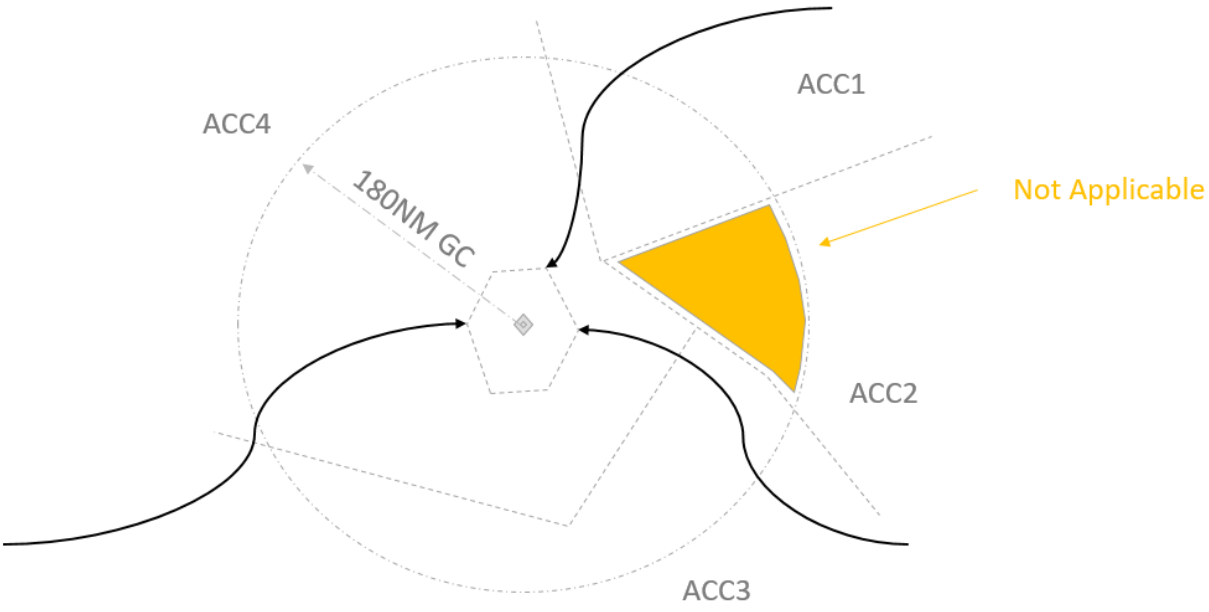

Figure 2 Scenario 1: Traffic density

2.4.2 Route segment length

The primary driving factor behind this scenario is discussed in 2.2.2. Whereas for regulatory purposes a fixed, time-invariant measure is necessary as a Means of Compliance, it does not always align well with the Extended AMAN operational concept which in its core is a time-based operation on the distance of the flight planned segment. As a result, **any inbound traffic path that achieves the 180 NM flown track miles distance** including the entirety of the planned Standard Arrival Route and the FRA-adjoining route network and does so **under the tactical control of ATC units consuming the advisories**, automatically satisfies the needs of the operational concept. The horizon may be shortened for the remaining distance up to and within the 180 NM Great circle. Such a scenario is illustrated in Figure 3 below.

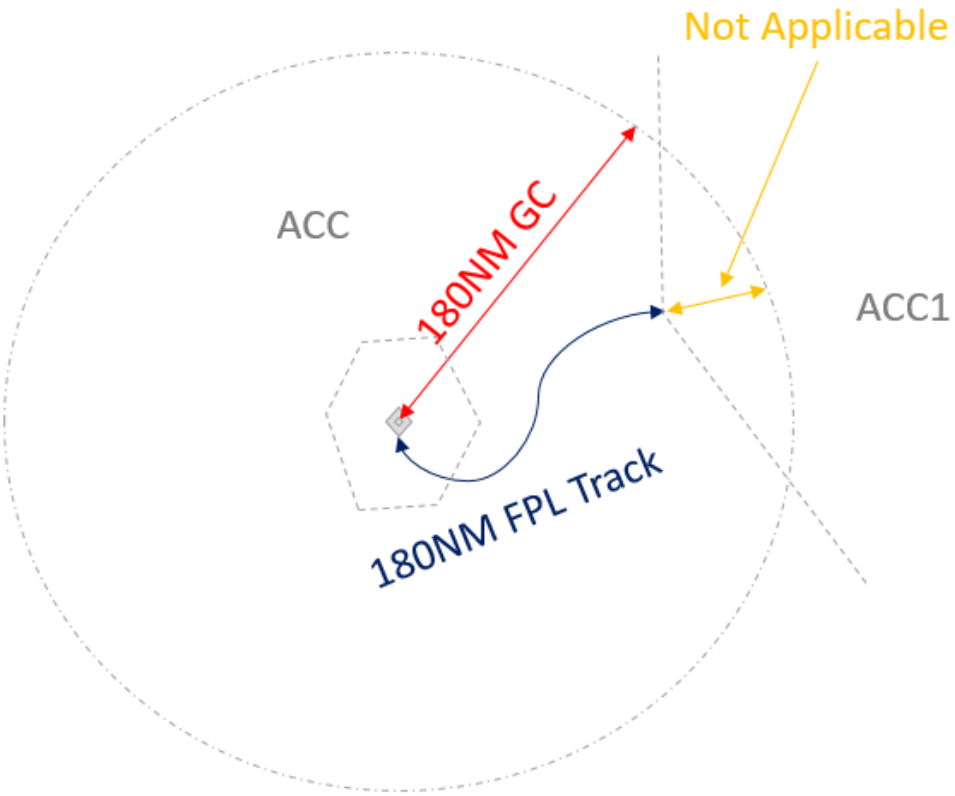

Figure 3 Scenario 2: Route Segment Length

2.4.3 Pop-up flights from an in-horizon airport

An airport residing inside the 180 NM horizon and generating pop-up traffic inbound to the AMAN airport may give rise to unsustainable disturbance to the already established sequence so that implemented advisories may need to be cancelled or revised to accommodate the newly generated arrivals in the sequence. Where this phenomenon exists to such a degree that the pop-up departures **cannot be accommodated by standard operational procedures** and consequently, advisories on other en-route inbound traffic are **routinely cancelled or revised**, The implementing stakeholder should assess the availability and fitness of purpose of departure planning data (e.g. from A-DPI, local FDPS, EFD, etc) in terms of stability and accuracy, and determine whether it is usable for Extended AMAN operations. **In case of a positive assessment**, the departure planning data should be used in arrival sequence management, adapted to local concept of operations (e.g. through procedures, technical implementation in the sequence generator or HMI, LoA etc). If departure planning data is not available or deemed not usable for Extended AMAN operations, the lack of additional performance benefit is self-evident and a corresponding shortening of the implementation horizon may be sought.

This scenario is illustrated in Figure 4 below.

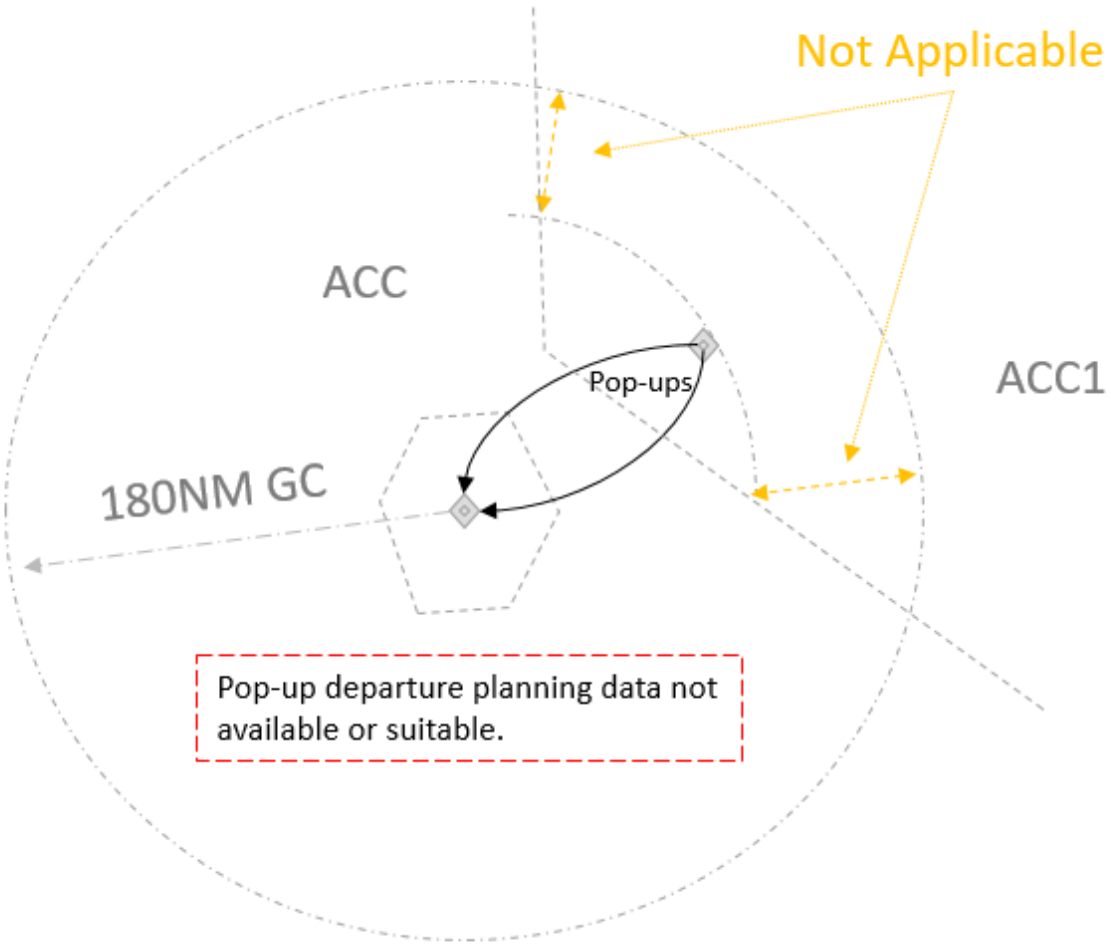

Figure 4 Scenario 3: In-horizon airport

SDM will publish a list of in-horizon airports as part of the SDP Supporting Material.

2.4.4 Other compelling reasons

Implementing stakeholders may provide other justifications on top of the ones laid out in the subsections above.

2.4.5 Futureproofing the justification

When putting forward its justification, the implementing stakeholder must be aware of the fact that SDM will assesses/verify the evidence on an as-is basis. If the basis changes due to for instance changing traffic patterns or airspace changes, the implementing stakeholder owns the responsibility to revisit and reassess the justification and potentially implement post-hoc; continued compliance will be assessed by the Competent Authority.

2.5 Procedural steps

The request for the assessment/verification has to be submitted by the ANSP responsible for ATC in the TMA and operating the AMAN (note: typically, not the ANSP responsible for ATC in the adjacent en-route

sectors) **asap**, to allow for the assessment to happen prior to the update and delivery of the SDP[2] to the EC in 2024. The requests should be submitted to:

af1-assessment@sesardeploymentmanager.eu

Particular attention should be paid in cases where there may exist more than one separate or interrelated grounds for the request; these need to be all considered as part of the request.

The AF1 SDM implementation support team will be in charge of communicating with the submitting ANSP throughout the assessment process, whether concerning missing justification materials or questions or the outcome of the assessments.

SDM will maintain **and publish in its website (**www.sesardeploymentmanager.eu**)** a table listing the received requests for assessment and their associated status with regards the progress of the related assessments. This table will **also be made available in** the SharePoint site of the SDM AF1 Coordination Platform. It will also be referenced in the Supporting Material to the SESAR Deployment Programme, Chapter 5 – Standardization and Regulation Support.

Contingent upon the notification of a positive assessment by SDM that is confirmed with the EASA / NSA and registered in the SDP, the ANSPs responsible for the ATC within a mandated TMA (i.e. for the Extended AMAN) may declare the deployment status as "Not Applicable" for the purposes of deployment monitoring in LSSIP+.

[2] The current delivery date of the SDP is 10 July 2024. It is being discussed whether this date could be delayed later in 2024, or there could be another later update of the SDP.