Episode 3

Single European Sky Implementation support through Validation

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2.00	01/02/2010	Approved	Ros EVELEIGH	Final Alignment with ATM Process Model
3.00	14/04/2010	Approved	Ros EVELEIGH	Alignment with other DODs

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EXECUTIVE SUMMARY

The ATM system and operational descriptions are supported by an ATM Process Model that describes the whole system and allows the scope and interface between the complete set of Episode 3 Detailed Operational Description documents to be defined. The DODs of the SESAR concept breaks down into nine main documents. Each document is mapped on:

- A specific operational phase:
  - Long term planning;
  - Medium/short term planning;
  - Execution.
- A specific operational layer:
  - Network management: sub-regional and regional;
  - Airspace management: civil/military;
  - Airport airside operations: runway, apron and taxiway management;
  - Conflict management: terminal and En-Route airspace;
  - Airspace user operations: trajectory management.

The Detailed Operational Description addressed by the present document focuses on the operating principles relevant to the Long Term Planning Phase for:

- Network management;
- Airspace and airport organisation and management;
- Airspace user operations, when interacting with the network management function.

The Long Term Planning Phase:

- Begins years before the day of operation;
- Terminates six months before day of operation with the first publications of the shared business trajectories;
- Is followed by the Medium Term Planning Phase.

The objective of the Long Term Planning Phase is to design the infrastructure both at airspace and airports levels to optimise the use of these resources, taking into account Airspace Users' preferences. The sizing of ATM resources is driven by:

- The Key Performance Areas (KPAs) and the Key Performance Indicators (KPIs) defined by the SESAR performance framework;
- The reference capacity of ATM resources;
- Traffic forecasts;
- Airspace requirements expressed by Civil and Military users.

Airport and airspace capacity planning is an iterative process starting with the definition of baseline capacities and ending when the target performance levels – i.e. part of the Service Level Agreements between ATS Providers and Airspace Users, are met and the return on investment is maximised – e.g. cost of airport capacity, cost of airspace capacity, cost of delay taken indirectly or directly in the optimisation process.

This Long Term Planning Phase ends with the strategic airport slot allocation related to aircraft operators' schedules. The result of this is the publication of the Shared Business

Trajectories and of already Mission Trajectories, which also corresponds to the beginning of the Medium/Term Planning Phase.

1 INTRODUCTION

1.1 PURPOSE OF THE DOCUMENT

This document contains a refined description of the SESAR concept of operations regarding operational processes taking place at the airspace and network levels during the Long Term Planning Phase. Referred as "Long Term Network Planning – L", this document is part of a set of Detailed Operational Description (DOD) documents which refine and clarify the high level SESAR ConOps concept description in order to support the Episode 3 exercises, which have the objective of developing a better understanding of the SESAR Concept. This set of DODs can be considered as step 0.2 of E-OCVM [1] - i.e. the description of the ATM Operational Concept(s). The DOD document structure and content is derived from the one of the OSED (Operational Service and Environment Definition) described by the ED-78A guidelines [2]. According to the ED-78A: "*the OSED identifies the Air Traffic Services supported by data communications and their intended operational environment and includes the operational performances expectations, functions and selected technologies of the related CNS/ATM system*". The structure of the DOD has been defined considering the level of details that can be provided at this stage – i.e. the nature and maturity of the concept areas being developed.

The complete detailed description of the mode of operations is composed of ten documents according to the main phases defined by SESAR – i.e. Long Term Planning phase, Medium/Short Term Planning and Execution phase (the set of documents is available from the Episode 3 portal home page [3]):

- The General DOD (G DOD) [4];
- The Long Term Network Planning DOD (L DOD), this document [5];
- The Collaborative Airport Planning DOD (M1 DOD) [6];
- The Medium & Short Term Network Planning DOD (M2 DOD) [7];
- The Runway Management DOD (E1 DOD) [8];
- The Apron & Taxiways Management DOD (E2/3 DOD) [9];
- The Network Management in the Execution Phase DOD (E4 DOD) [10];
- The Conflict Management in Arrival & Departure High & Medium/Low Density Operations DOD (E5 DOD) [11];
- The Conflict Management in En-Route High & Medium/Low Density operations DOD (E6 DOD) [12];
- The Episode 3 Lexicon (Glossary of Terms and Definitions) [13].

1.2 INTENDED AUDIENCE

The intended audience includes:

- Episode 3 partners;
- The SESAR community.

1.3 Document Structure

The structure of the document is as follows:

- §2 of this document provides an overview of the functions addressed in this document;
- §3 provides a description of how today's operation will be changed with the implementation of the concept area under analysis;
- §4 gives a description of the future operating principles. It details the benefits, the constraints, the human factors aspects, the enablers, the actors and the operating methods;
- §5 gives environment constraints of interest to the DOD – i.e. a general document provides this information at the global level;
- §6 lists roles and responsibilities applicable to this concept area;
- Annex A provides the list of the various scenarios relevant to this document;
- Annex B provides the summary of the Use Cases defined in this document;
- Annex C the traceability table of the SESAR Operational Improvement (OI) steps addressed by this document.

1.4 Background

The Episode 3 project, also called "Single European Sky Implementation Support Through Validation", was signed on 18th April 2007 between the European Community and EUROCONTROL under the contract N° TREN/07/FP6AE/S07.70057/037106. The European Community has agreed to grant a financial contribution to this project equivalent to about 50% of the cost of the project.

The project is carried out by a consortium composed of EUROCONTROL, Entidad Publica Empresarial Aeropuertos Espanõles y Navegacion Aérea (AENA); AIRBUS France SAS (Airbus); DFS Deutsche Flugsicherung GmbH (DFS); NATS (EN Route) Public Limited Company (NERL); Deutsches Zentrum für Luft und Raumfahrt e.V.(DLR); Stichting Nationaal Lucht en Ruimtevaartlaboratorium (NLR); The Ministère des Transports, de l'Equipement, du Tourisme et de la Mer de la République Française represented by the Direction des Services de la Navigation Aérienne (DSNA); ENAV S.p.A. (ENAV); Ingenieria y Economia del Transporte S.A (INECO) ISA Software Ltd (ISA); Ingeneria de Sistemas para la Defensa de Espana S.A (Isdefe); Luftfartsverket (LFV); Sistemi Innovativi per il Controllo del Traffico Aereo (SICTA); THALES Avionics SA (THAV); THALES AIR SYSTEMS S.A (TR6); Queen's University of Belfast (QUB); The Air Traffic Management Bureau of the General Administration of Civil Aviation of China (ATMB); The Center of Aviation Safety Technology of General Administration of Civil Aviation of China (CAST); Austro Control (ACG); Luchtverkeersleiding Nederland (LVNL). This consortium works under the co-ordination of EUROCONTROL.

With a view to supporting SESAR Development Phase activities whilst ensuring preparation for partners SESAR JU activities, Episode 3 focuses on:

- Detailing key concept elements in SESAR;
- Initial operability through focussed prototyping exercises and performance assessment of those key concepts;
- Initial supporting technical needs impact assessment;
- Analysis of the available tools and gaps for SESAR concept validation; and
- Reporting on the validation methodology used in assessing the concept.

The main SESAR inputs to this work are:

- The SESAR Concept of Operations (ConOps): T222 [32];
- The description of scenarios developed: T223 [33] & [34];
- The list of Operational Improvements allowing to transition to the final concept: T224 [35];
- The definition of the implementation packages: T333 [35] & [36];
- The list of performance assessments exercises to be carried out to validate that the concept delivers the required level of performance: T232 [37];
- The ATM performance framework, the list of Key Performance Indicators, and an initial set of performance targets: T212 [38].

The objective of detailing the operational concept [39] is achieved through the development of the DODs. These documents are available for the SESAR development phase and are produced through the System Consistency work package of Episode 3. The life cycle of the DOD documents is defined through three main steps:

- Initial DODs provided as the first inputs to the Episode 3 project;
- Interim DODs containing first refinement and consolidation from Episode 3 partners aligned to the prototyping/evaluation work, provided by mid-project duration;
- Final DODs updated by the findings and reports produced by the prototyping/evaluation activities, provided at the end of the project.

1.5 Glossary of Terms

The Episode 3 Lexicon contains lists of agreed acronyms and definitions [13].

2 OPERATING CONCEPT-CONTEXT AND SCOPE

2.1 SESAR CONCEPT FOR LONG TERM PLANNING

2.1.1 Introduction

It is anticipated that the advances envisaged by SESAR will provide more than adequate airspace capacity the majority of the time. However, with major European airports already operating at maximum capacity, the risk of extreme peaks of demand, but also special events and significant military exercises and the need to provide a cost effective service, the concept needs to define how potential excess demand is managed. Although the trajectory is not shared, the processes in the Long Term Planning phase will be collaborative and based on traffic forecast including early AO intentions and economic regional development. This method of working will provide early notice to the ANSPs of high demand so that action can be taken to increase available capacity at those times or/and geographic locations – i.e. through the capacity plan itself or through elaboration of predefined solutions. Where it is impossible to provide additional capacity, either physically or at an acceptable cost, depending on the magnitude of the imbalance, either airspace (re-)configuration or/and collaborative demand management processes will be applied to ensure minimum impact on optimum user operations.

The document addresses the processes relevant to the Long Term Planning Phase, in relation to the operational improvements targeted by SESAR for 2020. For those processes, the document describes what the improvements will change to the current operating method, what will enable those changes, what are the expected benefits/anticipated constraints/transition issues and how the improvements, through the processes, will influence the SESAR performance framework.

2.1.2 Long Term Airport Planning

With the lack of airport capacity at major hubs seriously influencing the airspace users' daily operation alternative traffic scenarios could be considered where the market allows for it; these could include, for example, point to point services from and to non-congested airports. If, for certain airports, capacity growth cannot keep pace with increasing demand, segregation transport segments may be considered. Development of underused airports or combined use of nearby military airports should be promoted, provided this does not impact military operations. Transport segments like Business Aviation, leisure airlines and General Aviation could benefit from this development. Reliever airports with dedicated traffic segments will cater much better to the needs of those specific traffic segments than airports with a mix of all sorts of traffic - e.g. low fare airlines do not need the terminal and airside infrastructure that hub-carriers need, therefore they do not need to pay for it. Segregation still allow access to the hubs for all airspace users, however the rules of the market will regulate distribution across available reliever airports. The airports together with their partners in the ATM community they will have to find the best way of managing the risk of saturation and congestion, which they are primarily exposed to, but which will sooner or later impact other partners. It is the airport's business planning that determines if and when capacity increasing measures and initiatives, often infrastructure changes, can be realized and justified. During the planning phase, coordination between users and airports is required and the provision of suitable alternatives like reliever airports would be considered.

2.1.3 Long Term ATM Planning

The objective is that the ATM Network provides sufficient capacity in the En-Route and terminal manoeuvring regions in normal operations while maintaining the high level of safety.

Once the strategy is established at airport level and airport utilisation agreed, the potential major 'traffic flows' are assessed and the best organisation developed to manage them. These major traffic flows are identified as the most directly connected city pairs, above a parameter threshold number of flights to be determined. However, with major European airports almost at capacity limit, the potential of extreme peaks of demand and the need to provide a cost effective service, it is necessary to have agreed pre-defined solutions to balance traffic demand and capacity. Flight schedules may be known to varying degrees depending on the users' business models and plans, but statistics based on historical data, economic facts, early AOs' intentions play an important role at this stage allow building a realistic long term traffic forecast.

Thus, the Target Airspace Capacity is determined so as to accommodate more than predicted traffic demand by assuring sufficient capacity headroom where and when required – i.e. value to be defined in the context of the Quality of Service Agreements.

Aspects considered include:

- Long-term traffic growth forecasts including User business strategy development and planned aircraft procurement;
- Economic, environmental and political considerations;
- Major events - e.g. Olympic Games, Military Exercises;
- Capacity enhancement plans including airspace design, systems acquisition and human resource plan;
- Extensive use of performance analysis and simulation tools within the planning process. The Business Development Trajectory (BDT) is progressively enriched and refined within the user organisation but is not yet shared or made generally available for commercial reasons or due to lack of maturity. However when queried, user intentions represented by trajectories possibly containing limited details, might be provided through specific agreement between the regional and the sub-regional network managers, the civil/military airspace manager, and the AOC Staff, for particular reasons such as the design of the ATM structure concerned with the creation of a new city-pair.

2.2 ATM Processes Described In The Document

The high level processes (refer to Figure 1) described in the document are:

- A1.1 Establish Performance Framework;
- A1.2 Initiate Traffic and Airspace Demand Planning;
- A1.3 Define/Revise ATM Resources;
- A1.4 Perform Long Term Demand Capacity Balancing;
- A1.5 Publish Seasonal Schedule.

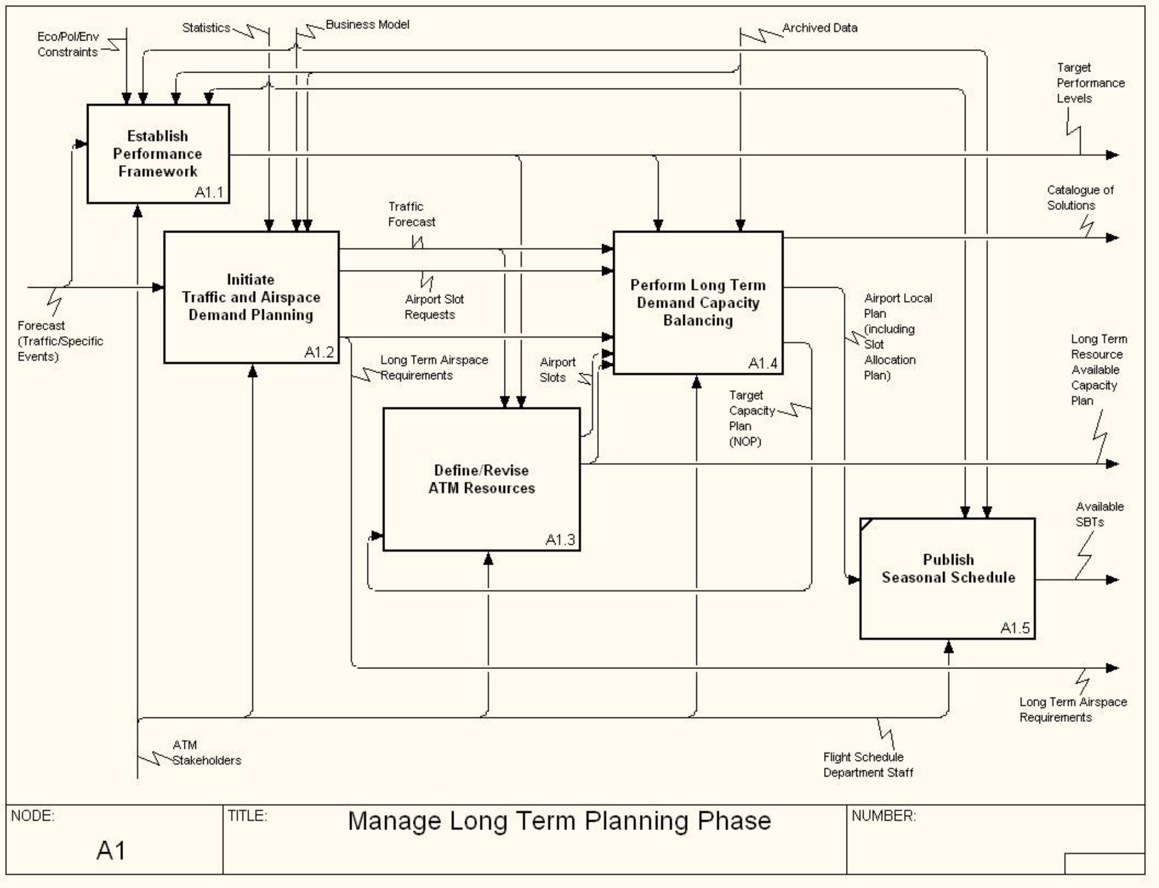

Figure 1: ATM Process Model for the Long Term Planning Phase

The low-level processes addressed in this document are listed in Table 1:

Code[1]	ATM Process	Description	SESAR ConOps References
A1.1.1	Agree on Operational Performance Framework	The purpose of this process is for ATM stakeholders to agree on operational performance framework, which includes the five following KPAs: cost effectiveness, capacity, flexibility, predictability, efficiency.	F.2.6, F.2.6.5.5
A1.1.2	Agree on Societal Outcome Framework	The purpose of this process is for ATM stakeholders to agree on societal outcome framework, i.e. on safety, security, environment KPAs.	F.2.6, F.2.6.5.5
A1.1.3	Agree on Performance Enablers Framework	The purpose of this process is for ATM stakeholders to agree on Performance Enabler framework, i.e. on participation, interoperability, access and equity KPAs.	F.2.6, F.2.6.5.5

CHO[1] This refers to the code associated to the process in the ATM Process Model SADT diagrams.

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Code[1]	ATM Process	Description	SESAR ConOps References
A1.1.4	Agree on Service Levels	The purpose of this process is for ATM stakeholders to agree on service levels, taking account of whole performance framework and decide on trade off between KPAs if required.	F.2.6, F.2.6.5.5
A1.2.1	Forecast Traffic Demand	The purpose of this process is to forecast long-term traffic demand. This is done at network level. Forecasts are produced to evaluate future traffic demand. This process addresses both user and network needs which have two different goals: user needs are related to traffic demand, while network needs relate to airspace interactions.	F.2.6.2, F.2.6.5.1
A1.2.2	Plan Long Term Airspace Reservation Demand	This process managed by the Civil/Military Airspace Manager addresses long-term planning of requirements for airspace reservation including military requirements, but also demand for civil specific events - e.g. Le Bourget airshow. This is why the main output is a specific traffic forecast.	F.2.6.5.1, F.2.6.6, F.3.7
A1.2.3	Request Airport Slots	Initially, this process allows airspace users to request, usually via their Flight Schedule Department, their required quantity of airport slots that will be the basis for the IATA airport slot conference. For those airport slot requests, airspace users take into account their flight intentions – i.e. BDT not shared outside the airspace user's organisation, which are based on their own business model. Next, the Flight Schedule Department Staff will express their requirements in terms of slots requested per flight.	F.5.1.1
A1.3.1.1	Define/Revise Airport Usage Rules	For each airport resource, this process will first allow to establish, in the long-term planning phase, the rules for their allocation. However, current existing rules may be adapted to the next season's needs. Whenever needed, this process also allows update of those allocation usage rules.	F.2.6.5.1, F.5.1.2, F.5.2
A1.3.1.2	Define/Revise Airspace Usage Rules	This process will allow the Airspace designer to define airspace volume usage rules, including military areas, as well as route usage rules.	F.3
A1.3.1.3	Define/Revise Network Usage Rules	This process covers the definition of the network usage rules, especially rules concerning DCB and prioritisation process – e.g. queuing at network level, UDPP.	F.2.6.2, F.2.6.3, F.2.6.5.3
A1.3.2.1	Define/Revise Airport Infrastructure	This process enables the definition and revision of airport infrastructures - i.e. airport design, during the Long Term Planning phase.	F.2.6.5.1, F.5.1.1, F.5.2

Code[1]	ATM Process	Description	SESAR ConOps References
A1.3.2.2	Define/Revise Airspace Infrastructure	This process enables the definition and revision of airspace infrastructures - i.e. airspace design, during the Long Term Planning phase.	F.3
A1.3.3.1.1	Define/Revise Possible Airport Configurations	This process is based on the Airport Master Plan. For each resource type, it builds standard possible configurations from historical/statistical observations and traffic forecasts. The process may also take account of the Airport Capacity Enhancement Plan, if any.	F.2.6.4, F.5.1.1
A1.3.3.1.2	Define/Revise Possible Airspace Configurations	This process allows building, for any airspace resource, standard possible configurations from historical/statistical observations and traffic forecasts.	F.2.6.3, F.2.6.4, F.3
A1.3.3.2.1	Define/Revise Airport Available Capacity Plan	This process consolidates capacity figures from each airport resource into a global airport capacity plan. It is performed when every resource capacity plan is completed, capacity figures taking account of the more stringent resource.	F.2.6.4, F.2.6.5.1, F.5.1.1, F.5.1.2
A1.3.3.2.2	Define/Revise Airspace Available Capacity Plan	This process consolidates capacity figures from each airspace resource into a global airspace capacity plan process, at the level of one airspace. It requires local resource definition (cf. process A1.3.1.2, A1.3.2.2, A1.3.3.1.2).	F.2.6.3, F.2.6.4, F.2.6.5.1, F.3
A1.4.1.1	Identify Target Airport Capacity	This CDM process aims at adjusting the various airport capacity figures included in the long term airport resource available capacity plan in order to agree on capacity figures consistent at a network level. A balance is performed between airport resource available capacity and the associated cost when adapting to the demand. The Target airport capacity plan, published through the NOP, feeds back the define/revise resources process to adjust long term available capacity plans.	F.2.6.1, F.2.6.2, F.2.6.4, F.2.6.5, F.5.1.1, F.5.1.2, F.5.2
A1.4.1.2	Identify Target Airspace Capacity	This CDM process aims at adjusting the various airspace capacity figures in order to assure that the quality of service that has been agreed by all stakeholders is met. The “Identify Target Airspace Capacity” is an iterative process running according to return on investment, on the basis of a baseline capacity plan. The objective e.g. the maximum admissible delay per flight is a function of cost of capacity and cost of delay. This Target airspace capacity plan, published through the NOP, feeds back Process A1.3.3.2 Define Resource Available Capacity Plan to adjust locally the available resources.	F.2.6, F.3

Code[1]	ATM Process	Description	SESAR ConOps References
A1.4.2.1	Define/Revise Airport Catalogue of Solutions	This process allows defining/revising, at the airport level, possible solutions to apply during medium/short term phase in case of detected imbalance. The resulting "catalogue of solutions" is a CDM potential response, taking into account the agreed target performance levels, to face any problem of capacity shortfall at the airport.	F.2.6.2, F.2.6.3, F.2.6.4, F.5
A1.4.2.2	Define/Revise Airspace Catalogue of Solutions	This process allows defining/revising, at the airspace/network level, possible solutions to apply during medium/short term phase in case of detected imbalance. The resulting "catalogue of solutions" is a CDM potential response that consists of basic DCB Solutions, such as a potential response to face any problem of capacity shortfall at the airspace/network level.	F.2.6.2, F.2.6.3, F.2.6.4, F.3
A1.4.3	Assign Airport Resources	This process allows the APOC staff to assign long term traffic demand to various airport resources – e.g. runways, taxiways, stands, de-icing pads. Airport Slot Requests are balanced with available airport slots through slot allocation. Other resources may also be pre-allocated, e.g. to long haul/short haul flights, light or heavy aircrafts, Schengen or non-Schengen flights, etc.	F.5.1.1, F.5.1.2, F.5.2
A1.5	Publish Seasonal Schedule	This process allows the airspace users to finalise their plans and to issue their SBTs. Until the publication of SBTs, any planed information remains confidential.	F.1, F.2, F.2.1, F.2.2, F.2.3, F.2.3.1, F.2.5, F.2.6.4, F.2.6.6

Table 1: Low-level processes scoped by L

2.3 Related SESAR Operational Improvements (OIs)

A table listing the SESAR Operational Improvements steps that are relevant to this DOD, and the associated processes, is provided in Annex C (refer to §11).

In addition, the most important OI Steps are accessible along the document. When an OI Step is referred to, CTRL-click on it to access its definition. Use the Navigator Back-arrow button to revert to your initial location.

2.4 Related SESAR Key Performance Areas (KPAs)

SESAR has defined several Key Performance Areas (KPAs) and Performance Requirements (objectives, indicators and targets) which are defining system wide effectiveness and thus, for most of them, affect the various components of the future 2020 ATM target system.

KPAs and KPIs are defined in deliverable D2 of the SESAR Consortium: Air Transport Framework – The Performance Target (DLM-0607-001-02-00).

The table below shows a list of those Key Performance Indicators (KPIs) which are directly or indirectly affected by Network Planning. The KPIs are organised by KPA and performance requirements as defined by SESAR:

<table>
<tr><th>Key Performance Area (KPA)</th><th>Description</th></tr>
<tr><td>Access & Equity</td><td>
<u>Access</u>:
This Focus Area covers the segregation issue: whether or not access rights to airspace and airports are solely based on the class of airspace user. In other words, is shared use by classes of airspace user allowed, and how much advance notice of this accessibility is provided.
Shared use of airspace by different classes of airspace users should be significantly improved (classes defined by type of user, type of aircraft, type of flight rule). Where shared use is conflicting with other performance expectations (safety, security, capacity, etc.), viable airspace alternatives will be provided to satisfy the airspace users’ needs, in consultation with all affected stakeholder.
No indicators defined yet.
<u>Equity</u>:
The scope covers the subject of equitable access, i.e. the prioritisation issue: under shared use conditions (i.e. access is possible), to what extent is access priority based on the class of airspace user.
No indicators defined yet.
</td></tr>
<tr><td>Capacity</td><td>
This KPA addresses the ability of the ATM system to cope with air traffic demand (in number and distribution through time and space).
The challenge in terms of capacity in the airspace environment is to meet the traffic growth demand and to limit the en-route delay. The strategy aims at widening the current notion of Traffic Flow and Capacity Management from the mere allocation of slots to the optimisation of traffic patterns and capacity management with the emphasis on optimising the network capacity through collaborative decision-making processes.
KPIs affected by Network Planning:

Annual growth rate for the number of IFR flights that can be accommodated in Europe CAP.3.OBJ1.IND2
Annual number of IFR flights that can be accommodated in Europe CAP.3.OBJ1.IND1
Daily number of IFR flights that can be accommodated in Europe CAP.3.OBJ1.IND3
Daily number of IFR movements (departures plus arrivals) CAP.2.OBJ1.IND2
Hourly number of IFR movements (departures plus arrivals) CAP.2.OBJ1.IND1
Annual number of IFR flights able to enter the airspace volume CAP.1.OBJ1.IND2
Hourly number of IFR flights able to enter the airspace volume CAP.1.OBJ1.IND1

</td></tr>
<tr><td>Cost Effectiveness</td><td>
This KPA addresses the cost of gate-to-gate ATM in relation to the volume of air traffic that is managed.
In line with the political vision and goal, the working assumption for Cost Effectiveness design target is to halve the total direct European gate-to-gate ATM costs from 800 €/flight to 400 €/flight, in 2020 (2005 Euros).
KPIs affected by Network Planning:

Average cost per flight, at European annual level CEF.1.1.OBJ1.IND1

</td></tr>
</table>

Key Performance Area (KPA)	Description
	• Average indirect cost per flight, at European annual level (The scope covers the extra costs incurred by airspace users through non-optimum performance in the Efficiency, Flexibility and Predictability KPAs) **CEF.2.OBJ1.IND1**
Efficiency	This KPA addresses the actually flown 4D trajectories of aircraft in relationship to their initial Shared Business Trajectory The efficiency of individual flight operations has to be improved such that: • At least 98% of flights depart on time (punctuality with respect to a 3 minutes tolerance window around off-block departure), the average departure delay of delayed flights does not exceed 10 minutes; • The flight duration is "normal" (with respect to a 3 minutes tolerance window around block-to-block time) more than 95% of the time, the average flight duration extension of flights does not exceed 10 minutes; • Less than 5% of flights suffer additional fuel consumption of more than 2.5%, for flights suffering additional fuel consumption of more than 2.5%, the average fuel consumption does not exceed 5%. KPIs affected by Network Planning: Fuel Efficiency: Conform to the recalculated Initial Shared Business Trajectory (= initial SBT corrected for actual weather) Fuel consumption to the greatest extent : • Occurrence: % of flights with additional fuel consumption of more than 2.5% of intended consumption **EFF.2.OBJ1.IND1** • Severity: Average fuel deviation of deviated flights **EFF.2.OBJ1.IND2** Mission efficiency: Following military trajectory models focus is to reflect the economic impact of transit times associated with military training activities: • Impact of Airspace Location on Training **EFF.3.OBJ2.IND1** (Provides a measurement of the time spent actually in the designated operating area, achieving the mission training objectives, compared with the total time airborne) • Economic impact of Transit **EFF.3.OBJ1.IND1** (Provides a measurement of the economic cost of the time spent by aircraft flying from their bases into their designated operating area and returning at the end of the exercise). Temporal efficiency **EFF.1** : This Focus Area covers the magnitude and causes of deviations from planned (on-time) departure time and deviations from Shared Business Trajectory durations): • Occurrence: % of flights with a normal flight duration **EFF.1.OBJ2.IND1** • Severity: the average flight duration extension of flights with an extended flight duration **EFF.1.OBJ2.IND2** Continually reduce the departure delay due to ATM **EFF.1.OBJ1** (Only primary delay due to ATM in nominal conditions is considered (Flights delayed for non ATM reasons are excluded but would be considered against flexibility performance): • Occurrence (Punctuality): % of flights departing on-time **EFF.1.OBJ1.IND1** • Severity (Delays): the average departure delay of delayed flights **EFF.1.OBJ1.IND2**

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Key Performance Area (KPA)	Description
Environmental Sustainability	This KPA addresses the role of ATM in the management and control of environmental impacts. The aims are to reduce adverse environmental impacts (average per flight); to ensure that air traffic related environmental constraints are respected; and, that as far as possible new environmentally driven non-optimal operations and constraints are avoided or optimised as far as possible. This focus on environment must take place within a wider "sustainability" scope that takes account of socio-economic effects and the synergies and trade-offs between different sustainability impacts. KPIs affected by Network Planning: • Amount of CO_2, H_2O, NO_x emissions which is attributable to inefficiencies in ATM service provision **ENV.4.OBJ1.IND1-4** • Percentage of cases in which local environmental rules affecting ATM are respected **ENV.3.OBJ1.IND1** • Percentage of cases in which the best alternative solution from a European Sustainability perspective is adopted **ENV.1.OBJ2.IND1** • Percentage of proposed ATM constraints which has been subjected to an environmental/socio-economic assessment **ENV.1.OBJ1.IND1** No indicators on noise emissions yet defined.
Flexibility	This KPA addresses the ability of the ATM system and airports to respond to "sudden" changes in demand and capacity: rapid changes in traffic patterns, last minute notifications or cancellations of flights, changes to the Reference Business Trajectory (pre-departure changes as well as in-flight changes, with or without diversion), late aircraft substitutions, sudden airport capacity changes, late airspace segregation requests, weather, crisis situations, etc. Allow Airspace Users translating in time their Business Trajectory to the greatest extent **FLX.1.OBJ1**: • Flexibility demand: % of flights requesting time translation from initial RBT **FLX.1.OBJ1.IND3** • Frequency: % of Business Trajectory delayed more than 3 minutes as a consequence of a 4D Trajectory time translation **FLX.1.OBJ1.IND1** • Lead time is the time difference between the time request and the earliest time constraint (e.g. gate, de-icing, departure runway, weather…) **FLX.1.OBJ1.IND4** • Severity: Average delay of delayed flights as a consequence of a 4D Trajectory time translation **FLX.1.OBJ1.IND2** Allow Airspace Users updating their Business Trajectory for a full redefinition to the greatest extent: • Flexibility demand: % of flights requesting BT redefinition from initial RBT **FLX.1.OBJ2.IND4** • Frequency: % of Business Trajectory delayed more than 3 minutes as a consequence of the Business Trajectory full re-definition **FLX.1.OBJ2.IND2** • Frequency: % of Business Trajectory update accepted possibly with time penalty as a consequence of the Business Trajectory full re-definition **FLX.1.OBJ2.IND1** • Lead time is the average time difference between the time request and the earliest time constraint (e.g. gate, de-icing, departure runway, weather…) **FLX.1.OBJ2.IND5**

<table>
<tr><th>Key Performance Area (KPA)</th><th>Description</th></tr>
<tr><td></td><td>
Severity: Average delay of delayed flights as a consequence of the Business Trajectory full re-definition FLX.1.OBJ2.IND3
Accommodate non-scheduled flight departures FLX.2.OBJ1:
% of non-scheduled flights delayed more than 3 minutes FLX.2.OBJ1.IND1
Average delay of delayed non-scheduled flights FLX.2.OBJ1.IND2
Suitability for military requirements FLX.4
(Focus is to reflect the suitability of the ATM System for military requirements related to the flexibility in the use of airspace and reaction to short-notice changes.)
Be able to increase/decrease the amount of airspace segregation as required FLX.4.OBJ1:
Adherence to optimum Airspace Dimension FLX.4.OBJ2.IND1
Efficient Booking Procedure FLX.4.OBJ4.IND1
</td></tr>
<tr><td>Participation</td><td>
At the level of overall ATM performance, the KPA “Participation by the ATM Community” covers quite a diversity of objectives and involvement levels. Participation by the ATM community can be considered in the following dimensions:
Separate involvement issues and approaches apply for each of the ATM lifecycle phases: planning, development, deployment, operation and evaluation/improvement of the system;
“Meeting the (sometimes conflicting) expectations of the community” implies that participation and involvement should be explicitly pursued for each of the other Key Performance Areas: access and equity, capacity, cost effectiveness, efficiency, environment, flexibility, global interoperability, predictability, safety, security;
Involvement should be monitored and managed per segment of the ATM community.
The three dimensions serve as a framework for focused tracking of the various participation and involvement initiatives, assessment of the actual level of involvement against the desired level, and identification of weaknesses and improvement opportunities.
The aim is to achieve a balanced approach to ATM community involvement.
Different methods and levels of involvement are possible:
Informing the community;
Obtaining feedback and advice from the community;
Collaborative decision making; and
Consensus building.
No indicators defined yet.
</td></tr>
</table>

Issued by the Episode 3 consortium for the Episode 3 project co-funded by the European Commission and Episode 3 consortium.

Key Performance Area (KPA)	Description
Predictability	This KPA addresses the ability of the ATM system to ensure a reliable and consistent level of 4D trajectory performance. In other words: across many flights, the ability to control the variability of the deviation between the actually flown 4D trajectories of aircraft in relationship to the Reference Business Trajectory. • The predictability of individual flight operations has to be improved such that: • Less than 5% of flights suffer arrival delay of more than 3 minutes; • The average delay of delayed flights (with a delay penalty of more than 3 minutes) will be less than 10 minutes; • Variability of flight duration (block to block) is 0.015 (meaning for a 100-minute flight duration, more than 95% flights arrives on-time, according to arrival punctuality target); • Reactionary delays are reduced by 50% by 2020 compared to 2010 baseline. KPI concerning Knock-on Effect: • Number of cancelled flights **PRD.3.OBJ1.IND2** • Reactionary delay **PRD.3.OBJ1.IND1** KPI concerning On Time Operation : • Arrival punctuality: % of flights with an arrival delay of more than 3 minutes **PRD.1.OBJ1.IND1** • Arrival punctuality : Average arrival delay of delayed flights **PRD.1.OBJ1.IND2** • The coefficient of variation of gate to gate time intervals **PRD.1.OBJ2.IND1** KPI concerning Service Disruption: • Number of cancelled flights per type of disruption **PRD2.OBJ1.IND1** • Number of diverted flights per type of disruption **PRD2.OBJ1.IND2** • Total delay due to disruption per type of disruption **PRD2.OBJ1.IND3**
Safety	This KPA addresses the risk, the prevention and the occurrence and mitigation of air traffic accidents. The number of ATM induced accidents and serious or risk bearing incidents do not have to increase and, where possible, have to decrease, as a result of the introduction of SESAR. Considering the anticipated increase in the European annual traffic volume, the overall safety level would gradually have to improve, so as to reach an improvement factor 3 in order to meet the safety objective in 2020. This is based on the assumption that safety needs to improve with the square of traffic volume increase, in order to maintain a constant accident rate. KPI concerning Network Planning: • Safety level, Accident probability per operation or flight hour, relative to the 2005 baseline **SAF.1.OBJ1.IND1** • Severe DCB/Complexity issues not detected/unsolved during network planning **SAF.1OBJ1.IND2**

Key Performance Area (KPA)	Description
Security	This KPA covers a subset of aviation security. It addresses the risk, the prevention, the occurrence and mitigation of unlawful interference with flight operations of civil aircraft and other critical performance aspects of the ATM system. This includes attempts to use aircraft as weapons and to degrade air transport services. Unlawful interference can occur via direct interference with aircraft, or indirectly through interference with ATM service provision (e.g. via attacks compromising the integrity of ATM data or services). ATM security also includes the prevention of unauthorised access to and disclosure of ATM information. No indicators defined yet.

Table 2: SESAR Key Performance Areas

3 CURRENT OPERATING METHOD AND MAIN CHANGES

A number of Operational Improvements (identified by SESAR and listed in section 2.4) are required if the ATM system is to live up to the expectations of the airspace users by 2020. The implementation of such OIs will by essence reshape the current operating method. Some operating principles will change, some will not.

Currently, Long Term Planning activities at the airspace level are ACC-oriented with a time horizon of five years ahead.

The planning process relies on traffic forecast based on economic, environmental and political considerations.

Predefined DCB Solutions and available FAB [20]/ACC and airport configurations are defined to cope with major events such as the Olympic Games or significant military exercises.

Traffic forecast is based on a "cloning flight mechanism" and on a maximum airport capacity that can be accommodated regardless of the flight type that is "cloned" when exceeding the airport accommodation capacity [20][21].

Currently, Long Term Planning activities at the airport level mainly rely on the local Master Plans for each airport. Master plans usually address very long time horizons – e.g. 10-20 years, which difficult the alignment to the time horizon development of the business trajectory.

Airport resources plan development is mainly programmed locally for each airport and through non-standardised collaborative/commitment procedures with the airspace users and the other stakeholders.

Currently, Airport capacity is locally determined and there are no standardised criteria to determine airport capacity in the same way for all the airports.

In addition, inconsistencies between airport slots, EOBTs, and short term departure slots are a current constraint for collaborative Long Term Planning.

3.1 ASPECTS OF TODAY'S OPERATIONS THAT WILL REMAIN

A number of current items related to long term planning will still be considered in the context of SESAR:

- Quality of service;
- Traffic forecast;
- Local capacity planning;
- Catalogue of predefined solutions.

At the airport level, local activities during the Long Term Planning phase will remain.

3.2 ASPECTS OF TODAY'S OPERATIONS THAT WILL CHANGE

A number of items related to long term planning will be introduced in the context of SESAR:

- Quality of service based on SESAR KPAs/KPIs with commitments of ANSP on a volume of traffic to be handled (positive KPI) and not a delay (negative KPI);
- Improved traffic forecast;
- Local capacity plan taking into account airport capacity enhancement plans, capacity costs depending on current traffic complexity and capacity headroom;

- Definition of Functional DCB[2] Areas improving management of network effect;
- Improved catalogue of DCB Solution sorted out by Functional DCB Area;
- Airspace configuration possibly based on no-route airspace structure[3] i.e. DCB/ASM predefined solutions;
- Assessment based on queue management instead of emulation of central Slot Allocation.

At the airport level, new procedures will be introduced:

- Standardised procedures to exchange information and establish commitments between the airport, the airspace users and the other stakeholders;
- Airport capacity extensions will be achieved not only by incrementing the airport resources but also developing more efficient procedures and operations;
- Global and standardised criteria[4] will be developed to define airport capacity in the same way for all the airports;
- Environmental constraints at the airport level will be taken into account from the very early stages of the Long Term Planning Phase.

3.3 ASPECTS OF TODAY'S OPERATIONS THAT WILL DISAPPEAR

From the airport side, the main issue is the reduction of inconsistencies between airport slots, EOBTs and short term departure slots. This will be replaced by unique collaborative planning procedures around the business trajectory for all the stakeholders.

[2] A Functional DCB Area is a construct to define major axes of traffic flow with a view to managing the network effect. They may not necessarily align with a FAB. A definition is provided in 4.4.4.4.

[3] These are areas where, at specific times or permanently, the underlying route structure should be ignored by the controller, OI [AOM-0403]: "Pre-defined ATS routes only when and where required".

[4] Global and standardised criteria for all airports are an objective that should be aimed at as much as possible, especially on the criteria defining capacity, to enable objective comparison of capacity between airports. For this purpose there will be a global set of procedures and metrics that will be defined so as to define airport (and airspace) capacity. These will be the basis for negotiation between ATM stakeholders. Nevertheless, local sets could exist too for internal reason and decision making. Otherwise, comparing capacity from one airport to one other will always be subject to discussion, especially if the criteria differ between both capacity definition approaches.

4 PROPOSED OPERATING PRINCIPLES

The operating principles relevant to Long Term Network Planning are detailed in the following sections.

A synopsis of "Manage Long Term (Network) Planning Phase" is presented on Figure 2. It shows the sequence of processes required.

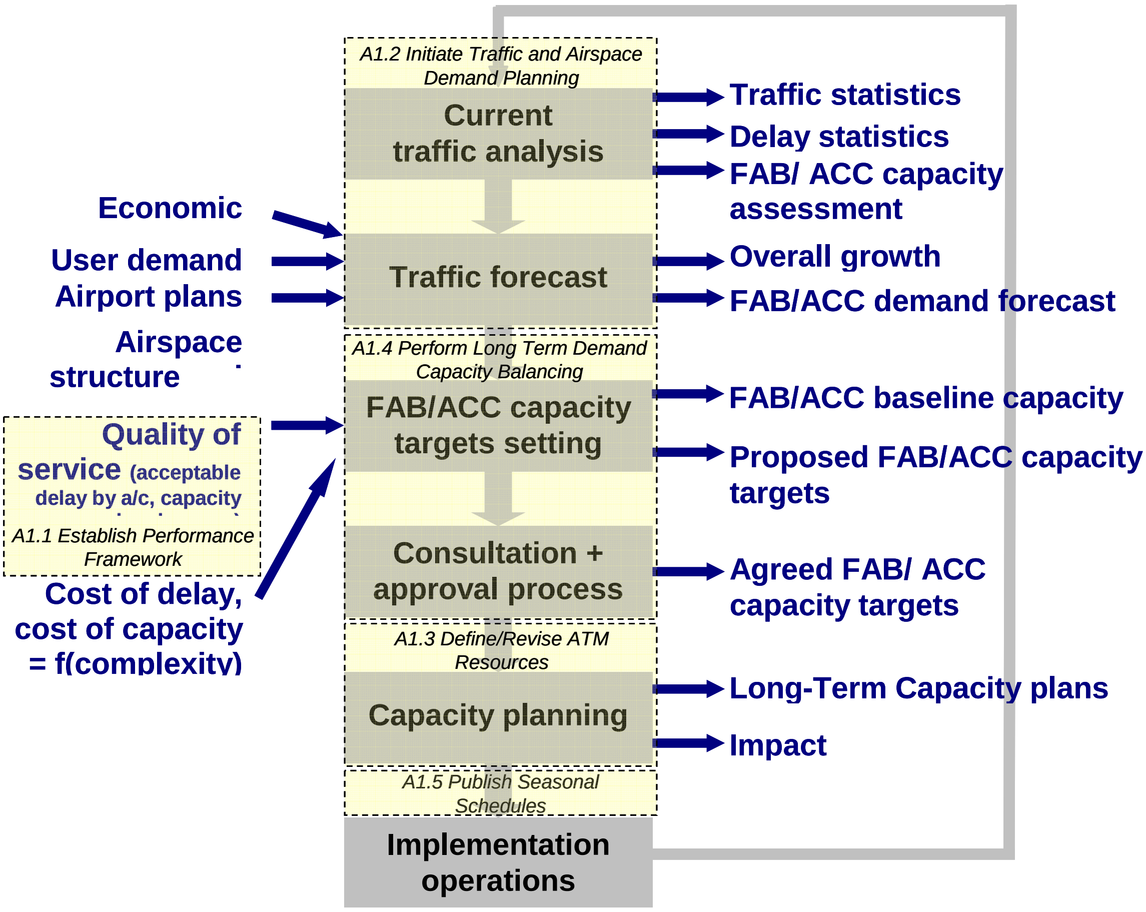

Figure 2: Synopsis for Long Term Capacity Planning

Together with the synopsis:

- Operational Scenario #14 “Long Term capacity planning”;
- Operational Scenario #15 “Airport Operational Plan Lifecycle for Long Term Phase”;

are provided in Annex A: Operational Scenarios.

4.1 ESTABLISH PERFORMANCE FRAMEWORK (A1.1)

The purpose of this process is for ATM stakeholders to agree on Target Performance Levels for each KPA/KPI of the whole ATM System.

Key Performance Indicators are developed and monitored to determine how effective ATM is meeting User’s demand and to act as driver for further improvements of the ATM System.

This is introduced in the SDM-0101, SDM-0102, SDM-0103 operational improvement steps, and developed in the description of the A1.1.1, A1.1.2, A1.1.3, and A1.1.4 sub-processes.

4.1.1 Scope and Objectives

The definition of the ATM Performance Framework takes place during the Long Term Planning Phase and it includes the definition of Key Performance Indicators in order to monitor the quality of service provision - e.g. average delay per delayed flights, number of movements delayed by more than 10 minutes per day, over-deliveries of actual demand.

The quality of service provided to airspace users, either individually or from a global perspective, is linked to how the flight intentions expressed by the airspace users will be accommodated. It is axiomatic that the more airspace users are allowed to operate aircraft as preferred - e.g. flying optimum profiles, arriving on time, the more direct and indirect costs are reduced.

The purpose of Process A1.1 Establish Performance Framework is to formalise the stakeholders' positions regarding the quality of service provision. The agreement that is finally reached results in a commitment of:

- The ATM Service Providers vis-à-vis the Airspace Users regarding the quality of service to be delivered at the end of the ATM value chain;
- The ATM Service Providers vis-à-vis other ATM Service Providers to manage service delivery throughout the ATM value chain[5].

The definition of the Performance Framework is structured around eleven Key Performance Areas (KPAs), clustered in three KPA Groups addressed by Processes A1.1.1 (for Operational Performance), A1.1.2 (for Societal Outcome) and A1.1.3 (for Performance Enablers). For each KPA, performance objectives are expressed and Key Performance Indicators are defined to measure their achievement. The Performance Framework also includes influence models to highlight interdependencies between Key Performance Indicators, as well as their relationship with lower-level metrics.

Thereby, a Target Performance Level can be set for every KPI by Process A1.1.4 Agree on Service Levels to express unambiguously the commitment made on the quality of service. The Service Levels may be agreed once every year.

The Regional Network Manager acts as facilitator in the establishment of Service Level Agreements between ATM Service Providers and Airspace Users:

- Civil and Military Airspace Users want to agree on a level of service quality in line with their own interests;
- Air Navigation Service Providers and Airport Operators need to know the users expectations to adapt their service accordingly and/or potentially re-negotiate affordable levels of service quality.

From the Airport side, the main changes that SESAR introduces for the Long Term Planning Phase are focused in the active involvement of the airport in the ATM performance framework definition from the early stages of the planning process. Airports will support the rest of ATM stakeholders during this process providing the airport related objectives, inputs and constraints and inputs on operational performance, societal outcome, performance enablers and service levels.

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[5] For example, regarding the commitment of DCB vis-à-vis ATC.

4.1.2 Assumptions

The Service Levels will be agreed once every year.

4.1.3 Expected Benefits, Issues and Constraints

The main benefits expected from the Performance Framework activities are:

- Common knowledge and definition of the KPIs and SLAs between every concerned actor;
- Improved CDM through decision-making using common references;
- Level of commitment required and compensation mechanisms;
- Capture of stakeholders' interests;
- Effective evaluation of ATM performance;
- More efficient response to users' needs;
- Increased alignment of ATM service with stakeholders' positions.

The divergent stakeholders' interests are likely to create opposite positions for the management of capacity and in particular for the resolution of critical situations. The process towards reaching an agreement between the parties involved entails each actor balancing its own interests with respect to the common ones. The Regional Network Manager will play a major role in mitigating the various perspectives.

4.1.4 Overview of Operating Method

Process A1.1 (Establish Performance Framework) breaks down as follows:

- Agree on Operational Performance Framework (A1.1.1);
- Agree on Societal Outcome Framework (A1.1.2);
- Agree on Performance Enablers Framework (A1.1.3);
- Agree on Service Levels (A1.1.4).

4.1.4.1 Agree on Operational Performance Framework (A1.1.1)

The purpose of this process is for ATM stakeholders to agree on operational performance framework, which includes the five following KPAs: cost effectiveness, capacity, flexibility, predictability, efficiency.

The main drivers related to this process are the following:

- Inputs:
  - Forecast (Traffic/Specific Events).
- Constraints/Triggers:
  - Constraints (Economic/Political/Environmental);
  - Statistics;
  - Business Model;
  - Archived Data.
- Human Actors:
  - ATM Stakeholders.
- Outputs:

- o Target Operational Performance.

For each KPA dealing with operational performance[6], performance objectives are expressed. Related Key Performance Indicators are defined to measure their achievement. The Performance Framework also includes influence models to highlight interdependencies between Key Performance Indicators, as well as their relationship with lower-level metrics.

Airports will be actively involved in the collaborative process with the rest ATM stakeholders to agree on the operational performance framework, regarding to the following KPAs:

- Cost effectiveness: The introduction of the APOC and systems required to facilitate data sharing should provide benefits outweighing their costs;
- Capacity: Meet or exceed the growth of the busy-hour demand of individual airports. In line with physical airport capacity increases, the overall growth of IFR demand, and the traffic pattern changes in time and space;
- Flexibility: Flexibility to modify operator preferences as well as more flexible approach to operational decision making are characteristics of Airport management and the AOP. Utilising, for example, dynamic processes, capacity headroom;
- Predictability: This Focus Area covers the variability of the flight operation: departure and arrival punctuality, and the variability of flight phase durations – e.g. turnaround time, taxi time, airborne time. Improve the arrival punctuality to the greatest extent. In addition, taxonomy of service disruption is necessary to refine the focus area: adverse weather – e.g. airport closure, system failure, industrial action. Prevent and mitigate service disruption to the greatest extent;
- Efficiency: The efficiency of individual flight operations will be improved through Collaborative Decision Making / Data sharing elements at Airport level. Concerted decision making in the framework of the APOC should provide enhanced efficiency of fleet operations.

The following Use Case has been identified for Agree on Operational Performance Framework process:

Use Case	Description
Agree on Operational Performance Framework	This purpose of this UC is for ATM stakeholders to agree on operational performance framework, which includes the five following KPAs: cost effectiveness, capacity, flexibility, predictability, efficiency.

Table 3: Use Case for Agree on Operational Performance Framework

4.1.4.2 Agree on Societal Outcome Framework (A1.1.2)

The purpose of this process is for ATM stakeholders to agree on societal outcome framework, i.e. on safety, security, environment KPAs.

The main drivers related to this process are the following:

- Inputs:
  - o Forecast (Traffic/Specific Events).
- Constraints/Triggers:
  - o Constraints (Economic/Political/Environmental);
  - o Statistics;

[6] i.e. cost effectiveness, capacity, flexibility, predictability, and efficiency.

- Business Model;
- Archived Data.

- Human Actors:
  - ATM Stakeholders.
- Outputs:
  - Target Societal Outcome.

For each KPA dealing with societal outcome[7], performance objectives are expressed and Key Performance Indicators are defined to measure their achievement. The Performance Framework also includes influence models to highlight interdependencies between Key Performance Indicators, as well as their relationship with lower-level metrics.

Airports will be actively involved in the collaborative process with the rest ATM stakeholders to agree on societal outcome framework, regarding to the following KPAs:

- Safety: Safety will not be negatively impacted as a result of the introduction of new airport procedures. Indeed the philosophy is to retain the responsibility for decision making with the actor in the best place for making that decision but that more information will be available during the process;
- Security: Security requirements can and do have a major impact on passenger connections and airline delay performance. The APOC will draw on information from the terminal including information relating to passengers flows notably in relation to security and check-in so as to enable a more optimal assignment of resources as well as allowing airlines to optimise their fleet management;
- Environment: Airport operation balancing user requirements and environmental constraints will be facilitated by the APOC.

The following Use Case has been identified for Agree on Societal Outcome Framework process:

Use Case	Description
Agree on Societal Outcome Framework	The purpose of this UC is for ATM stakeholders to agree on societal outcome framework, i.e. on safety, security, environment KPAs.

Table 4: Use Case for Agree on Societal Outcome Framework

4.1.4.3 Agree on Performance Enablers Framework (A1.1.3)

The purpose of this process is for ATM stakeholders to agree on Performance Enabler framework - i.e. on participation, interoperability, access, and equity KPAs.

The main drivers related to this process are the following:

- Inputs:
  - Forecast (Traffic/Specific Events).
- Constraints:
  - Constraints (Economic/Political/Environmental);
  - Statistics;
  - Business Model;

[7] i.e. safety, security, and environment.

- o Archived Data.
- Human Actors:
  - o ATM Stakeholders.
- Outputs:
  - o Target Performance Enablers.

For each KPA dealing with performance enablers[8], performance objectives are expressed and Key Performance Indicators are defined to measure their achievement. The Performance Framework also includes influence models to highlight interdependencies between Key Performance Indicators, as well as their relationship with lower-level metrics.

Airports will be actively involved in the collaborative process with the rest ATM stakeholders to agree on societal outcome framework, regarding to the following KPAs:

- Participation: Fundamental to the Airport management concept is the participation of the airport user community on the decision making process through collaborative planning;
- Interoperability: Although not a "first level" indicator of performance, individual users of the APOC may wish to ensure some degree of interoperability between their own internal systems and data being shared through the APOC. An example could be the automatic updating of departure information within the operational control centre of an airline with data coming from the CDM milestones approach;
- Access and equity:
  - o Access to specific resources like airport resources (de-icing facilities, parking stands) for airspace users should be provided in an equitable, transparent and more efficient manner as a result of the SESAR CDM processes followed in the APOC and described in the AOP;
  - o Access to operational information is permitted to all participants, through SWIM, provided that he/she has the right privileges (security) to do so.

The following Use Case has been identified for Agree on Performance Enablers Framework process:

Use Case	Description
Agree on Performance Enablers Framework	The purpose of this UC is for ATM stakeholders to agree on Performance Enabler framework, i.e. on participation, interoperability, access and equity KPAs.

Table 5: Use Case for Agree on Performance Enablers Framework

4.1.4.4 Agree on Service Levels (A1.1.4)

The purpose of this process is for ATM stakeholders to agree on service levels, taking account of whole performance framework and decide on trade off between KPAs if required.

The main drivers related to this process are the following:

- Inputs:
  - o Target Operational Performance;
  - o Target Societal Outcome;
  - o Target Performance Enablers.

[8] i.e. participation, interoperability, access, and equity.

- Constraints/Triggers:
  - Constraints (Economic/Political/Environmental);
  - Statistics;
  - Business Model;
  - Archived Data.
- Human Actors:
  - ATM Stakeholders.
- Outputs:
  - Target Performance Levels.

The establishment of Service Level Agreements is the very first step of the Long Term Planning Phase, since it will be the driver of the following processes: the next steps will be taken in order to fulfil these agreements. Agreements are made between the Airspace Users and all ATM Stakeholders to give the momentum needed for regular improvements at European scale within each area of interest for the community.

Each agreement will define the factors that constitute the quality of service - e.g. high safety, reduced delays, accurate information sharing, as well as means to evaluate them: "you can't improve what you can't measure". Such an agreement will imply the coordination of many different actors and will take into account operational rules/constraints, transportation politics, economy, etc.

The commitment of Service Providers on SLAs may be subject to a regulatory framework defining:

- Playing rules for Airspace Users. The quality of service delivery will be guaranteed provided that the playing rules are respected. Such rules will be set in particular by Process A1.3.1.3 Define/Revise Network Usage and Prioritisation Rules;
- Compensation rules for Airspace Users, if the agreed service levels are not met whereas the playing rules have been respected.

The agreement on Service Levels is the result of a negotiation process embracing all the dimensions of the performance framework. Indeed, their interdependencies - e.g. Efficiency versus Capacity or Capacity versus Flexibility, must be captured if one wants to define achievable performance targets.

When those interdependencies are understood, the trade-off analysis can start to determine an optimal compromise. The Regional Network Manager is pivotal in the negotiations, to facilitate the User-Provider dialogue and broker a deal in case of stalemate.

Airports will be actively involved in the collaborative process with the rest of ATM stakeholders to agree on services levels.

The following Use Case has been identified for Agree on Service Levels process:

Use Case	Description
Agree on Service Levels	The purpose of this UC is for ATM stakeholders to agree on service levels, taking account of whole performance framework and decide on trade off between KPAs if required.

Table 6: Use Case for Agree on Service Levels

4.1.5 Enablers

Main enabler is NOP/SWIM.

4.1.6 Transition issues

Level of commitment required and compensation mechanisms.

4.2 INITIATE TRAFFIC AND AIRSPACE DEMAND PLANNING (A1.2)

4.2.1 Scope and Objectives

The process aims to create as much realistic as possible a traffic demand based on statistics which requires historical data, economic aspects – e.g. transportation means, intermodality, and airlines policies – e.g. fleet evolution, city pair weight.

Improved coordination between airspace users, both military and civilians, is expected by issuing as early as possible airspace requirements.

As a new objective for SESAR, airports will be involved form the early stages of the Long Term Planning Phase in the assessment of the long-term traffic demand, giving support to Network with traffic forecasts and managing Airport Slot Requests from the airlines.

4.2.2 Assumptions

There will be synchronisation between airport and airspace forecasts.

4.2.3 Expected Benefits, Issues and Constraints

The main benefits expected from the Traffic and Airspace Demand Planning activities are:

- Improved accuracy of traffic and airspace demand forecasts available to Airlines to test their BDTs in order to inform ATM Service Providers of intentions or SBTs as early as possible;
- Improved airspace usage planning quality through definition of trajectory advisories (initial assistance to flight planning);
- AO intentions might be very basic information, nevertheless of some use for airport planning and airspace planning. In any case, AO intentions (BDT or else) written in the NOP won't be shared with other Stakeholders but the Regional Level as the manager of the Network stability;
- On the contrary traffic forecasts will be available to everybody for aircraft operators to optimise their scheduling;
- Environmental restrictions constraining traffic forecasts;
- By providing support to Initiate Traffic and Airspace Demand Planning from the airport level, constraints at ground level will be identified well in advance, enabling the network to assess long term traffic demand and airport demand long term requirements with noticeable anticipation.

4.2.4 Overview of Operating Method

Process A1.2 (Initiate Traffic and Airspace Demand Planning) breaks down as follows:

- Forecast Traffic Demand (A1.2.1);
- Plan Long Term Airspace Reservation Demand (A1.2.2);
- Request Airport Slots (A1.2.3).

This whole collaborative planning process is supported by a SWIM enabled Network Operations Plan as introduced in Operational improvement DCB-0103. Being central to the ATM process, this OI Step can be referenced by any of the processes described in this document.

4.2.4.1 Forecast Traffic Demand (A1.2.1)

The purpose of this process is to forecast long-term traffic demand. This is done at network level. Forecasts are produced to evaluate future traffic demand. This process addresses both user and network needs which have two different goals: user needs are related to traffic demand, while network needs relate to airspace interactions.

The main drivers related to this process are the following:

- Inputs:
  - Specific Traffic Forecast.
- Constraints/Triggers:
  - Business Model;
  - Archived Data;
  - Statistics.
- Human Actors:
  - Regional Network Manager.
- Outputs:
  - Standard Traffic Forecast.

Generally, flight intentions will not be made available before the end of the Long Term Planning Phase – i.e. six months prior to the day of operation.

Depending on the nature of its operations, an Airspace User may start a cycle of business planning several years before the day of operation with the aim of defining its schedule and associated resource and institutional requirements. The Airspace User develops a Business Development Trajectory (BDT) which is not shared outside the Airspace User organisation being strategic data. The BDT goes through a number of iterations and it is constantly refined taking into account constraints arising from infrastructure and environmental considerations. Depending on the category of Airspace Users this process may be short or effectively non-existent.

In the meantime, the Network Management function, through this process, populates the NOP with traffic forecasts for the purpose of early DCB activities (Process A1.4), which drives to sub-regional/local Capacity Planning (process A1.3) through the identification of the Target Network Capacity (process A1.4.1).

Traffic forecasts are based on improved growth previsions[9] taking into account historical/statistical/archived data, as well as variables such as:

- The economic/environmental/political context;
- The development of Airspace Users' business strategy and planned aircraft procurement;
- Multi-modal transportation aspects;

[9] Enhanced STATFOR.

- Major events - e.g. Olympic Games, Military yearly (or more) plan[10];
- Capacity enhancement plans[11] including airspace design, human resource plan and systems acquisitions. The required new assets can be considered as available resources for DCB only when their date of delivery becomes firm;
- Allowances for Business and General Aviation are made and military requirements included.

Traffic forecasts also rely on the business strategies of airports including their terminal airspace, as being a possible constraint to growth while sufficient capacity headroom is anticipated for En-Route airspace. Long-term plans are considered for airport infrastructure, as well as airport use – e.g. hub-and-spoke against point-to-point services, traffic mix, traffic segmentation between congested and reliever airports.

Traffic growth deals with Origin-Destination Zones. Depending on the traffic growth, an iterative random process is performed to select one city-pair of the ODZ. One flight is selected randomly for duplication - i.e. this is an additional flight. If one of the airports of origin/destination is overloaded[12], then:

1. The selected flight is allocated before/after the peak period;
2. If 1 is not possible, another flight of the same city-pair is selected;
3. If 1 and 2 fail, another city-pair with the same type of flight is selected.

On that basis, potential trajectory patterns are derived from the assignment of the traffic on the most probable 2D routes – i.e. great circle routes by default, or shortest route taking into account a planned standard airspace infrastructure.

The accuracy of the forecasts depends on the granularity level and the time horizon. They become more and more accurate throughout the long-term planning phase, but can be revised at any time due to external factors - e.g. geopolitical events.

Airports will support the network during this process providing airport needs or constraints and planned development.

Coordination between airports and users is required and the provision of suitable alternatives like reliever airports must be considered. Reliever airports with dedicated traffic segments will cater much better to the needs of those specific traffic segments than airports with a mix of all sorts of traffic - e.g. low fare airlines do no need the terminal and airside infrastructure that hub carriers need therefore they do no need to pay for it. Nevertheless, if segregation still allows access to the hubs for all airspace users however the rules of the market will regulate distribution across available reliever airports.

The following Use Cases have been identified for Forecast Traffic Demand process:

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[10] The Military yearly (or more) plan gathers the requirements of large-scale Military exercises but also of more standard training exercises (based on statistics) provided they can be planned and associated to airspace usage requirements.

[11] If capacity may be derived from traffic forecast (i.e. traffic forecasts can lead to capacity enhancement plans if severe traffic saturation is foreseen at a particular airport), the reverse is also true. If it is known that two economic regions have agreed on whatever business, or that a runway will be built somewhere, a capacity enhancement plan can be issued at a particular (possibly saturated) airport and this sudden release of new capacity will have to be taken into account in the traffic forecasts.

[12] The capacity of an airport is made of a standard capacity and of a buffer on top of it which defines the maximum admissible traffic demand.

Use Case	Description
Establish/Update Network Needs	This UC covers both the establishment of the network needs meaning airspace interactions or, in other words, the needs on interfaces between airspaces, but also further updates of those network needs. Initial traffic demand forecast is assigned on most direct routes. Internal or/and external needs are expressed at sub-regional level. Network needs have to be compatible - i.e. smoothed, producing finally an acceptable traffic demand - i.e. as close as possible to shortest trajectories, assignment and operationally acceptable network needs – e.g. interfaces airspace to airspace to FAB/ACC.
Establish/Update Network Traffic Demand	This UC covers both the first establishment of the traffic demand but also further updates of those traffic forecast figures.

Table 7: Use Cases for Forecast Traffic Demand

4.2.4.2 Plan Long Term Airspace Reservation Demand (A1.2.2)

This process managed by the Civil/Military Airspace Manager addresses long-term planning of requirements for airspace reservation including military requirements, but also demand for civil specific events - e.g. Le Bourget Air Show. This is why the main output is a specific traffic forecast.

This addresses in particular avoidance of national fragmentation, and the harmonisation of airspace design and use as expected in the operational improvement step [AOM-0204].

The main drivers related to this process are the following:

- Inputs:
  - Standard Traffic Forecast;
  - Forecast (Traffic, Specific Events).
- Constraints/Triggers:
  - Statistics [23].
- Human Actors:
  - Exercise Director;
  - Civil/Military Airspace Manager.
- Outputs:
  - Specific Traffic Forecast;
  - Airspace Requirements (Long Term).

Through this process Special Airspace Use activities are planned in the long term by the Civil/Military Airspace Manager taking into account both:

- Military activity – e.g. large scale exercises, statistically known to be reserved airspace volumes… serving as a starting point for a yearly (or more) plan;
- Civil events – e.g. air shows, test flights.

On that basis, an early airspace reservation schedule can be set and refined during the Long Term Planning Phase to circumscribe possible segregation areas, relevant to the process of Capacity Planning.

For that reason, traffic forecast – i.e. trajectory patterns, may be adapted to be compatible with airspace requirements.

More precise airspace requirements will be defined during the Medium/Short Term Planning Phase - e.g. versatility of the airspace volume shape and of the reservation.

The following Use Case has been identified for Plan Long Term Airspace Reservation Demand process:

Use Case	Description
Plan Long Term Airspace Reservation Demand	This UC enables the Civil/Military Airspace Manager to formulate a (long-term) user demand (military or civil) into the system (e.g. reservation of airspace volumes).

Table 8: Use Case for Plan Long Term Airspace Reservation Demand

4.2.4.3 Request Airport Slots (A1.2.3)

Initially this process allows airspace users to request, usually via their Flight Schedule Department, their required quantity of airport slots that will be the basis for the IATA airport slot conference. For those airport slot requests, airspace users take into account their flight intentions – i.e. BDT not shared outside the airspace user's organisation, which are based on their own business model.

Next, the Flight Schedule Department Staff will express their requirements in terms of slots requested per flight.

The main drivers related to this process are the following:

- Inputs:
  - None.
- Constraints/Triggers:
  - Business Model.
- Human Actors:
  - Flight Schedule Department Staff.
- Outputs:
  - Airport Slot Requests.

This process describes how the Airspace Users issue airport slots requests.

Firstly, the Slot Coordinator requests from the System the available slots for the upcoming season matching as closely as possible the Airspace User's request.

Secondly, the System displays the requested information and the Slot Coordinator selects a slot for allocation that respects the allocation rules in force.

Next, the System records the offered slot and notifies the Airspace User. In case there is not slot available according to the Airspace User request, normally the Slot Coordinator denies the slot and offers another slot as close as possible to the requested one. If it is refused by the Airspace User, there are the following possibilities:

- The airspace user Maintain the original one as "pending";
- The airspace User asks for a new different slot, and restarts the normal process.

Finally, the System records the slot and associated status, including accepted and/or pending, and notifies the Airspace User.

The following Use Cases have been identified for Request Airport Slots process:

Use Case	Description
Request an Airport Slot	This UC describes how the Flight Schedule Department requests an airport slot based on their flight intentions.
Submit/Update/Cancel a List of Flight Intentions	This UC describes how a Flight Schedule Department Staff is setting their traffic demand (or flight intentions). Such a demand is built in order to match the Airspace User's business objectives. The Flight Schedule Department provides new flight intentions or confirms/cancels flight intentions according to historical data, grand father's rights, and to Aircraft Operator's own objectives. The first step of preparing the demand is processed inside the airspace user organisation and managed by the Flight Schedule Department. Its result is the submission/update/cancellation of flight intentions, and is the very first expression of aircraft operator demand. A list of flight intentions can be reduced to one element.

Table 9: Use Cases for Request Airport Slots

4.2.5 Enablers

The main enablers identified are:

- NOP/SWIM;
- AO behaviour model in order to guess potential operations structure from point-to-point liaisons to hub-and spoke liaisons;
- From the Airport side will be required the Improved Consistency between Airport Slots, Flight Plans and short term departure Slots.

4.2.6 Transition issues

None.

4.3 Define/Revise ATM resources (A1.3)

This process is dedicated to Resource Long term planning, i.e. airspace and airport usage rules, design, possible configurations regarding airspace structure, and sub-regional/local capacity plans. The "Resource Available Capacity Plan" encompasses all these items. Current Resource Available Capacity plans are compared to traffic forecast in order to adapt resources when needed and achievable. From observed differences between traffic forecast and capacity, airspace and airports will define/revise usage rules, airport and airspace designs, and finally provide Long Term Resource Available Capacity Plan.

Note: In this process, "Traffic Forecast" is used as a constraint to the definition/revision of ATM resources but is not used for capacity demand balancing yet, as far as the traffic is not already allocated to resources.

4.3.1 Scope and Objectives

The service takes place in the Long Term Planning Phase.

The Long Term Planning Phase:

- Begins at least one year before the day of operation;
- Terminates six months before the day of operation with the first publications of the shared business trajectories;

- Is followed by the Medium Term Planning Phase, and in particular, by process A2.2 “Refine ATM resources”. A2.2 is defined in the Medium/Short-Term Network Planning DOD M2.

The purpose of "Define/Revise ATM Resources" is to make it sure that ATS Providers and Airport have made their best endeavour to plan the resources needed to cope with the forecasted demand (traffic and airspace requirements) generated by civil and military airspace users, including capacity headroom[13] to guarantee that sufficient En-Route capacity will be offered most of the time. The objective is that the ATM Network provides sufficient capacity in the En-Route and terminal manoeuvring phases of the flight while maintaining the high level of safety.

“Define/Revise ATM Resources” consists in identifying/validating locally the ATM resources information in terms of airspace infrastructure, Airspace volumes & Airport capabilities through an iterative process with “Perform Long Term Demand and Capacity Balancing” that generates Target Capacity Plans for all ATM Resources. Resource usage rules can be updated, infrastructure can be created, and configurations can be created and modified… so that the local capacity plan matches as far as possible the target capacity plan.

The output is a part of the NOP. The capacity plans are continuously updated to include the latest demand forecasts.

The service turns off six months before operations when detailed winter/summer schedules for the next season are made available, through Process A1.5 Publish Seasonal Schedules. The activity is supported by a continuous process that collects and compiles the information on demand and capacity forecasts into a planned traffic situation available to stakeholders concerned.

The main objective of the define/revise airport resources process is the production and the maintenance of the long term airport operational plan during the whole Long Term Planning Phase.

4.3.2 Assumptions

The service begins at least one year before the day of operation and terminates six months before the day of operation.

Efficiency of this service relies on the sharing of the network capacity situation by all concerned parties.

4.3.3 Expected Benefits, Issues and Constraints

The expected benefits are:

- Shared understanding of network capacity problems and needs by Service Providers and Airspace Users;
- Best usage of resources available according to a greater anticipation of the traffic situation and enhanced co-ordination of available capacities in the European network;
- Co-ordinated resource planning up to Regional Network level;
- Alignment of individual service providers' capacity objectives to the overall optimum.

By providing support to Define/Revise ATM Resources from the airport level, constraints at ground level will be identified well in advance, enabling operators to implement mitigation actions or adjust the demand to the available capacity well in advance.

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[13] Parameter to be defined by stakeholders.

Airports involvement in Long Term Planning Phase will also allow for development of what-if scenarios that can be used to support CDM processes in this planning phase.

4.3.4 Overview of Operating Method

Process A1.3 (Define/Revise ATM resources) breaks down as follows:

- Define/Revise Resource Usage Rules (A1.3.1):
  - Define/Revise Airport Usage Rules (A1.3.1.1);
  - Define/Revise Airspace Usage Rules (A1.3.1.2);
  - Define/Revise Network Usage and Prioritisation Rules (A1.3.1.3).
- Define/Revise Infrastructure (A1.3.2):
  - Define/Revise Airport Infrastructure (A1.3.2.1);
  - Define/Revise Airspace Infrastructure (A1.3.2.2).
- Assess Long Term Resource Available Capacity Plan (A1.3.3):
  - Define/Revise Possible Resource Configurations (A1.3.3.1):
    - Define/Revise Possible Airport Configurations (A1.3.3.1.1);
    - Define/Revise Possible Airspace Configurations (A1.3.3.1.2).
  - Define/Revise Resource Available Capacity Plan (A1.3.3.2):
    - Define/Revise Airport Available Capacity Plan (A1.3.3.2.1);
    - Define/Revise Airspace Available Capacity Plan (A1.3.3.2.2).

4.3.4.1 Define/Revise Airport Usage Rules (A1.3.1.1)

For each airport resource, this process will first allow to establish, in the long-term planning phase, the rules for their allocation. However, current existing rules may be adapted to the next season's needs. Whenever needed, this process also allows update of those allocation usage rules.

The main drivers related to this process are the following:

- Inputs:
  - Resource Usage Rules (Airport).
- Constraints/Triggers:
  - Resource Usage Rules (Airspace);
  - Target Performance Levels;
  - Traffic Forecast.
- Human Actors:
  - APOC Staff.
- Outputs:
  - Resource Usage Rules (Airport).

As an input for the next process define/revise network usage and prioritisation rules, airports will define their usage rules regarding to airports slot allocation, runways, taxiways, stand allocation and plan and de-icing positions.

Airports will express their commitment to this rules that will be used in further negotiation process between ATM stakeholders such as UDPP and DCB procedures.

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The following Use Cases have been identified for Define/Revise Airport Usage Rules process:

Use Case	Description
Define/Revise Airport Slot Allocation Policy	This UC describes how the APOC Staff defines/updates the airport slot allocation policy (e.g. buffers between two stand occupations).
Define/Revise De-icing Allocation Policy	This UC describes how the APOC Staff defines/updates the de-icing allocation policy (e.g. de-icing time per aircraft type).
Define/Revise Preferences for Stand Allocation	This UC describes how the Flight Schedule Department Staff sets or updates its preferences for stand allocation (e.g. optimised stand allocation of connected flights).
Define/Revise Runway Allocation Policy	This UC describes how the APOC Staff defines/revises the runway allocation policy (e.g. runway allocation according to weather conditions, departure and arrival rates).
Define/Revise Stand Allocation Planning Policy	This UC describes how the APOC Staff defines/revises the stand planning policy (e.g. Schengen/non-Schengen stands, stand allocation rules according to aircraft type).
Define/Revise Taxiway Allocation Policy	This UC describes how the APOC Staff defines/updates the taxiway allocation policy (e.g. speed limits, maximum weight per taxiway).

Table 10: Use Cases for Define/Revise Airport Usage Rules

4.3.4.2 Define/Revise Airspace Usage Rules (A1.3.1.2)

This process will allow the Airspace designer to define airspace volume usage rules (including military areas) as well as route usage rules.

This process is consistent with the Advanced FUA and in particular with Europe-wide Military Training Areas shared use as required in the Operational Improvement Step [AOM-0204].

The main drivers related to this process are the following:

- Inputs:
    - Resource Usage Rules (Airspace).
- Constraints/Triggers:
    - Resource Usage Rules (Airport);
    - Target Performance Levels;
    - Traffic Forecast.
- Human Actors:
    - Airspace Designer.
- Outputs:
    - Resource Usage Rules (Airspace).

Through this process, the Airspace Designer defines the usage rules attached to the airspace infrastructure set through Process A1.3.2.2 Define/Revise Airspace Infrastructure.

Usage rules are defined in light of the Target Airspace Capacity identified through Process A1.4.1.2 "Identify Target Airspace Capacity".

Airspace usage rules define:

- **How airspace can be organised** - i.e. rules and procedures applicable by the Sub-Regional Network Manager on the one hand, the Civil/Military Airspace Manager on the other hand. Such rules will relate in particular to the dynamicity of the airspace infrastructure. Indeed in SESAR (IP2), it will be highly flexible and adapted to the changing demand to leave the Airspace Users unconstrained as far as possible. In SESAR, many airspace elements will be adaptive: airspace volumes (through dynamic sectorisation), airspace reservations (through dynamic mobile areas), and temporary route structure being not necessarily conditional routes *CDR (cf. Operational Improvement Step* [AOM-0403]). Usage rules should define when and where adaptation will be required, based on the characteristics of the demand – i.e. traffic demand in terms of the low/medium/high density of operations in terminal/en-route airspace, airspace demand in terms of airspace requirements. Usage rules should also define how adaptation will be managed – e.g. how to switch operational rules in real-time.

- **How airspace can be managed/used** - i.e. the rules and the procedures that can be applied by the Airspace Users and Controllers, as defined in Operational Improvement Step [SDM-0203]. Such rules would define in particular the operating principles of managed and unmanaged airspace, flight rules for GAT and OAT (cf. Operational Improvement Step [AOM-0304]), requirements regarding aircraft equipage and ATM capability levels, the role of the predetermined separator and how it could be delegated, the applicable separation minima.

The following Use Cases have been identified for Define/Revise Airspace Usage Rules process:

Use Case	Description
Establish/Update Airspace Volume Usage Rules	This UC allows the Airspace designer to establish and update the usage rules for sector (or any airspace volume).
Establish/Update Military Area Usage Rules	This UC allows the Airspace designer to establish and update the usage rules for military areas.
Establish/Update Route Usage Rules	This UC allows the Airspace designer to establish and update the usage rules for routes.

Table 11: Use Cases for Define/Revise Airspace Usage Rules

4.3.4.3 Define/Revise Network Usage Rules (A1.3.1.3)

This process covers the definition of the network usage rules, especially rules concerning DCB and prioritisation process (queuing at network level, UDPP).

The main drivers related to this process are the following:

- Inputs:
    - Resource Usage Rules (Airport);
    - Resource Usage Rules (Airspace).
- Constraints/Triggers:
    - Target Performance Levels;
    - Traffic Forecast.
- Human Actors:
    - Regional Network Manager;
    - Sub-Regional Network Manager.
- Outputs:
    - Resource Usage Rules.

Through this process, the Airspace Users and the Local/Sub-Regional/Regional Network Manager agree on Network Usage and Prioritisation Rules, taking into account traffic forecasts and performance objectives.

Those predefined rules will be applied, after possible amendments, during the Medium/Short Term Planning Phase and Execution Phase.

The commitment on Service Levels, made via Process A1.1.4 Agree on Service Levels, is conditional upon conformance with the predefined rules. In other words, the quality of service provision will be guaranteed provided that all ATM Stakeholders are respectful of the predefined rules.

The definition of a rule does not necessarily include explicit values for the thresholds triggering a process. However the nature of the trigger is part of the rule definition. For example, UDPP might be triggered by a capacity shortfall. The usage rule will define how the shortfall is calculated, while the shortfall intended magnitude will be specifically defined by each DCB Solution calling for UDPP.

Within the Network Usage Rules can be found airspace continuum management rules, trajectory management rules and prioritisation rules:

Airspace continuum management rules, including interfacing between airspace volumes of different types, describe the way airspace volumes will be used to match the quality of service agreement objectives.

Trajectory management rules relate to:

- Flight data sharing requirements: they relate to the declaration of flight intentions in the form of SBTs and will govern Process A2.1.2 File/Refine SBT (refer to DOD M2 [7]). Managed Airspace is an environment in which all traffic is known to the ATM network. All aircraft operating, or planned to operate, in Managed Airspace are obliged to share their flight data, including trajectories, in accordance with the applicable rules with all other, applicable nodes in the network. The rules will also include cut-off times for the initial sharing of information before the execution phase commences. These times may be anything between a day (e.g. for scheduled operations) and a few minutes (for pop-up flights);
- Flight data sharing requirements for trajectory changes: they relate to the optimisation of SBTs and the revision of RBTs and will govern respectively Process A2.1.2 File/Refine SBT (refer to DOD M2 [7]) and Process A3.5.1 Revise RBT (refer to DOD E4 [10]). In SESAR both the aircraft and the ground systems will be using shared flight data (including trajectories) to build and maintain a common understanding of trajectory evolution. This does not imply that the ground system will no longer have specific local trajectories derived from a shared trajectory. For example, there may be 'what-if' trajectories used in the conflict resolution process, and deviation trajectories calculated when the observed behaviour of the aircraft does not conform to the anticipated behaviour etc. Similarly, the aircraft system may maintain several trajectories, e.g. the RBT, the trajectory the aircraft is actually flying (cleared trajectory) etc. Not all such "local" trajectories need to be shared. Pre-determined rules specify what data and what changes to data must be shared to ensure the common understanding referred to above;
- Integration of non-ECAC flights: inbound flights will be given an estimated entry time one hour[14] before entering the ECAC area. The estimated entry time is derived from the RTA through trajectory backtracking. The RBT is downlinked to all actors through the NOP, or the TTA is updated and downlinked by the Flight Crew for RBT update and dissemination. For outbound flights the TTOT is allocated one hour

[14] To be validated.

before EOBT, as for regular flights, consistent with the Target Exit Time at ECAC area boundary.

Prioritisation Rules will define the principles of **priority management**, because in SESAR, more options will be available than just the "first-come-first-served" principle, notably for the User Driven Prioritisation Process (refer to DOD M2 [7]):

- Default rules will have to be agreed to manage traffic queues in case of minor/short-duration capacity shortfall which is not inducing the need for UDPP - e.g. to govern the allocation of TTAs. A flight provided with a TTA has to comply with it within a tolerance window [-x min; +y min]. Otherwise a TTA revision will be triggered. The same process will be applied to flights not submitted to any constraint, but according to larger tolerance windows. Both tolerance windows will be subject to validation by the Network Management Function to check compliance of trajectories with the ATM constraints in place at every moment of the flights. For example and as a consequence, if a SBT is not available at a certain time before EOBT then the related flight is considered as a late filer. If a late filer is in competition with another flight having a SBT, the on-time filer will have priority in particular if both flights are handled through the same DCB queue;
- Specific rules will be agreed to manage UDPP, meaning defines in which conditions the process should be triggered – i.e. role of the Regional Network Manager as initiator of the process, and when it should terminate – i.e. role of the Regional Network Manager as arbitrator of the process. In-between, Airspace Users will manage priorities at their convenience within the constraints defined by the regulatory framework;
- Particular rules will continue to exist to prioritise flights depending on their nature e.g. Humanitarian, Hospital, Search And Rescue, Head of State… (refer to [14]) flights will be exempted from any DCB queue management process;
- Prioritisation rules shall be respectful of the equity principles defined by Process A1.1.3 Agree on Performance Enablers Framework and A1.1.4 Agree on Service Levels.

The following Use Cases have been identified for Define/Revise Network Usage Rules process:

Use Case	Description
Establish/Update Network Usage Rules	This UC aims at describing how the Regional Network Manager (in coordination with the Sub-Regional Network Manager and the Airspace Designer) establishes/updates the network usage rules.
Establish/Update UDPP Rules	The purpose of this UC aims at establishing/updating the User Driven Priority Process (UDPP) rules.

Table 12: Use Cases for Define/Revise Network Usage Rules

4.3.4.4 Define/Revise Airport Infrastructure (A1.3.2.1)

This process enables the definition and revision of airport infrastructures - i.e. airport design, during the Long Term Planning phase.

The main drivers related to this process are the following:

- Inputs:
  - Target Capacity Plan (NOP).
- Constraints/Triggers:
  - Resource Usage Rules.

- Human Actors:
    - o APOC Staff.
- Outputs:
    - o Airport Design.

This process allows to the APOC to establish an update in the System all necessary airport infrastructure data:

- Airside: Runways, taxiway layout, de-icing and holding bay areas, which are extracted from the airside airport infrastructure foreseen for the day of operations and provided by airport ATC.
- Landside: All information regarding terminal buildings, directly defining available stands, which is for the day of operations and provided by the airport operator.

The objective for this airport procedure will be to match and be consistent with the target capacity. This is in conformity with the following Operational Improvement Steps:

- AO-0704 dealing with gas emissions;
- AO-0705 addressing the constraints to be satisfied when building a de-icing station.

The following Use Case has been identified for Define/Revise Airport Infrastructure process:

Use Case	Description
Define/Revise Airport Infrastructure	This UC aims at defining/revising the airport infrastructure.

Table 13: Use Case for Define/Revise Airport Infrastructure

4.3.4.5 Define/Revise Airspace Infrastructure (A1.3.2.2)

This process enables the definition and revision of airspace infrastructures - i.e. airspace design, during the Long Term Planning phase.

The main drivers related to this process are the following:

- Inputs:
    - o Target Capacity Plan (NOP).
- Constraints/Triggers:
    - o Resource Usage Rules.
- Human Actors:
    - o Airspace Designer.
- Outputs:
    - o Airspace Design.

Through this process, the airspace infrastructure of the planning horizon is defined by the Airspace Designer. Depending on the Target Airspace Capacity identified by Process A1.4.1.2, the necessary enhancements are brought to airspace organisation.

Managed Airspace is organised in order to define a Trajectory-Managed User Preferred Routing Environment. The airspace infrastructure is mapped on the most probable trajectory patterns identified by Process A1.2.1 Forecast Traffic Demand, so as to respect user preferences as much as possible and minimise the risk of distortion when flight intentions are declared.

Airspace infrastructure refers to the definition of airspace volumes, military areas and temporary route structures (refer to Operational Improvement Step [AOM-0403]):

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- Airspace volumes are flexible and adapted to the actual demand of traffic. However, average contours can be defined at this stage, as well as envelopes to reflect the anticipated dynamicity;
- Areas of temporary segregation either recurrent - e.g. Military Training Areas, or exceptional - e.g. specific airspace volumes reserved for an Air Show, are depending on the Long Term Airspace Requirements planned by Process A1.2.2. If they interfere with the forecast trajectory patterns, alternate trajectory patterns are considered and defined with the Airspace Users, the Sub-Regional and Regional Network Managers;
- High density areas are identified. When the definition of a temporary route structure is necessary, it is also made in cooperation with the Airspace Users, the Sub-Regional and Regional Network Managers;
- Continuity between terminal and En-Route airspace is ensured.

The following Use Case has been identified for Define/Revise Airspace Infrastructure process:

Use Case	Description
Define/Revise Airspace Infrastructure	This UC aims at defining/revising the airspace infrastructure.

Table 14: Use Case for Define/Revise Airspace Infrastructure

4.3.4.6 Define/Revise Possible Airport Configurations (A1.3.3.1.1)

This process is based on the Airport Master Plan. For each resource type, it builds standard possible configurations from historical/statistical observations and traffic forecasts. The process may also take into account the Airport Capacity Enhancement Plan, if any.

The main drivers related to this process are the following:

- Inputs:
    - Airport Design.
- Constraints/Triggers:
    - Resource Usage Rules (Airport);
    - Target Performance Levels;
    - Target Capacity Plan (NOP).
- Human Actors:
    - APOC Staff.
- Outputs:
    - Possible Configurations (Airport).

This process describes how the possible airport configuration schemes that could be applicable for the day of operations are established and updated in the System.

Firstly, the System retrieves and presents all necessary information regarding airport infrastructure data:

- List of runways: all identified runway directions, length, landing assistance equipments and runway incursion alert system;
- Taxiway layout: maximum speed versus aircraft category and ground surveillance and routing equipments;

- Terminal buildings and apron: stands configuration, number and location of stands – i.e. contact and remote;
- De-icing areas: aircraft-related de-icing standard time;
- Holding bay areas.

Secondly, the APOC Staff considers the airport runways as the main data and determines, with possible assistance from the System, all possible airport configurations, each configuration corresponding to a specific usage of the available runways covering both arrival and departure traffic. The identification of all possible airport configurations is performed taking into account many criteria:

- Airport operational rules - e.g. specificities regarding cross or tail wind conditions;
- Segregated or traffic mix situations – i.e. leading to distinct possible airport configurations;
- Weather conditions which may impact usage of a runway or prevent from using a runway for departure when out of control sight and need to be assessed together with the availability of airport surveillance tools – e.g. weather radar, SMGCS [16][17].

When each airport runway configuration has been identified, airport ATC assesses additional dimensioning aspects, again with possible assistance from the system:

- Taxiing routes mainly identified between the departure stand and the departure runway holding point or runway entry, and between the arrival runway exit and the arrival stand. There may be several runway entries and exits identified for a given runway. The taxiing routes may be defined for a group of stands rather than for each individual stand on the airport[15];
- Corresponding taxiing times computed according to the total length of all composing taxiing segments as well as to associated taxiing speeds (that may differ in case a given taxi segment is one-way or bi-directional for example). At this stage of strategic phase, the taxi times are usually default values that apply to all types of aircraft, all weather conditions and all parking stands. Those taxi-times are defined according to the airport layout and infrastructure as well as the number of runway crossings required;
- De-icing areas identification, depending on the departure stand location – e.g. terminal building or stand zone;
- Hot spot identification. Hot spots include runway/runway crossings, runway/taxiway crossings, taxiway/taxiway crossings, cul-de-sac apron zones that may constrain many simultaneous push-backs.

Finally, the APOC Staff records in the System each possible airport configuration scheme applicable for the day of operations (cf. Operational Improvement Step [AO-0703]). For each configuration, the composing characteristics are:

- Usable RWY for arrival, departure and/or both traffic, possibly limited to specific aircraft categories;
- Standard taxi paths and times for each possible stand to runway entry, and runway exit to stand, combination;
- De-icing areas;
- Holding bay areas;

[15] This, depending on the layout of the terminal buildings.

- Hot spot locations.

While the Long Term Planning Phase evolves, new or more accurate data may be available and trigger a new iteration for the update of those airport configuration schemes.

The following Use Cases have been identified for Define/Revise Possible Airport Configurations process:

Use Case	Description
Determine/Revise Possible De-icing Configurations	This UC describes how the APOC Staff establishes and updates the list of available remote de-icing pads with their characteristics (e.g. which aircraft can be accommodated) and the possible configurations that could be applicable for the day of operations.
Determine/Revise Possible Runway Configurations	This UC describes how the APOC Staff establishes and updates the list of available runways, their characteristics (e.g. runway length) and the possible configurations that could be applicable for the day of operations. Runway configurations are treated separately from the taxiway configurations because the parameters and constraints to be considered to establish the Possible Configurations for the runways and for the taxiways may vary. Moreover, it better reflects the resource oriented approach. However, both UC are highly interdependent.
Determine/Revise Possible Stand Configurations[16]	This UC describes how the APOC Staff determines the availability of the stands with their characteristics (e.g. which aircraft can be accommodated) and the possible configurations that could be applicable for the day of operations. Stand resource include both remote parking stands and contact stands.
Determine/Revise Possible Taxiway Configurations	This UC describes how APOC Staff establishes and updates the list of available taxiways, their characteristics (e.g. maximum weight per taxiway) and the possible configurations that could be applicable for the day of operations. Taxiway configurations are treated separately from the runway configurations because the parameters and constraints to be considered to establish the Possible Configurations for the runways and for the taxiways may vary. Moreover, it better reflects the resource oriented approach. However, both UC are highly interdependent.

Table 15: Use Cases for Define/Revise Possible Airport Configurations

4.3.4.7 Define/Revise Possible Airspace Configurations (A1.3.3.1.2)

This process allows building, for any airspace resource, standard possible configurations from historical/statistical observations and traffic forecast.

The main drivers related to this process are the following:

- Inputs:
  - Airspace Design.
- Constraints/Triggers:
  - Resource Usage Rules (Airspace);

[16] Notice that Holding Bay Areas and Hot Spot Locations are not considered within this UC. They would be considered in the "Determine / Revise Possible Taxiway Configurations" UC.

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    - o Target Performance Levels;
    - o Target Capacity Plan (NOP).
- Human Actors:
    - o Sub-Regional Network Manager;
    - o Civil/Military Airspace Manager.
- Outputs:
    - o Possible Configurations (Airspace).

Through this process, the Sub-Regional (supported by the Civil/Military Airspace Manager) and the Regional Network Manager list all the possible airspace configurations, taking into account the infrastructure and usage rules established by the Airspace Designer. They try to identify configurations suitable for the trajectory patterns forecasted by Process A1.2.1 so as to match the Target Airspace Capacity identified by Process A1.4.1.2 and conform to the Service Levels agreed in Process A1.1.4.

Dynamic airspace is conceived based on atomic air blocks that are then further regrouped into airspace volumes that serve as operational sectors. Upon change of the traffic demand, the sectors will adapt and change their shapes vertically and horizontally to improve controller efficiency (cf. Operational Improvement Step [SDM-0202]). These airspace volumes could be associated to activated/de-activated route structure that can be perceived as definition element of the configuration.

An airspace configuration includes at least one particular partition of the airspace that fits specific traffic demand pattern.

In addition to this, definition of the set of possible route configurations to be considered could be performed in conformity with Operational Improvement Step [AOM-0403].

To deal with particular events, predefined solutions will be developed by Process A1.4.2.2 and will select the configurations most adapted to the situation.

All the data are aggregated by the Regional Network Manager to draw an integrated picture of the available ATM resources, taking into account possible configurations for En-Route airspace, terminal airspace and airports.

The following Use Cases have been identified for Define/Revise Possible Airspace Configurations process:

Use Case	Description
Determine/Revise Possible Airspace Volume Configurations	This UC addresses the definition of possible configurations for any airspace volume.
Determine/Revise Possible Route Configurations	This UC addresses the definition of possible configurations for routes.

Table 16: Use Cases for Define/Revise Possible Airspace Configurations

4.3.4.8 Define/Revise Airport Available Capacity Plan (A1.3.3.2.1)

This process consolidates capacity figures from each airport resource into a global airport capacity plan. It is performed when every resource capacity plan is completed, capacity figures taking account of the more stringent resource.

The main drivers related to this process are the following:

- Inputs:
    - o Possible Configurations (Airport);
    - o Target Capacity Plan (Airport).

- Constraints/Triggers:
    - Resource Usage Rules (Airport).
- Human Actors:
    - APOC Staff.
- Outputs:
    - Resource Available Capacity Plan (Long Term) (Airport);
    - Airport Slots.

This collaborative process establishes and updates the capacity figures for the various airport configuration schemes applicable for the day of operations. At the stage of the Long Term Planning Phase, those capacity figures are computed according to various weather conditions, airspace constraints and potential DCB constraints – i.e. network constraints that may be already identified / anticipated for the day of operations.

Firstly, the System retrieves and presents the following input data:

- All available possible airport configuration schemes applicable for the day of operations;
- Each known airspace constraint already identified for the day of operations, since airspace En-Route or TMA constraints may affect the airport capacity for the day of operations;
- Each known DCB constraint already identified for the day of operations.

Secondly, the CDM team, composed of the APOC Staff (Airport ATC and Airport Operator) Sub-Regional and Regional Network Managers and ATC (Approach & En-Route), analyses and assesses each possible airport configuration scheme for determining the capacity limit of the airport (airport capacity) for the day of operations. The starting point is to define the maximum runway capacity for each runway defined in the airport configuration scheme for departure traffic, arrival traffic or mixed traffic. This maximum runway capacity is then refined according to the following constraining factors – i.e. additional input data:

- Weather conditions:
    - Visibility / cloud ceiling: Depending on the visibility and the cloud ceiling over the airport area, reduced runway capacity limits can be defined, ranging from degraded to adverse weather conditions. While cloud ceiling has an impact on the runway capacity only, low visibility conditions have an impact both on the runway and taxiway capacities;
    - Shower: The capacity of a wet arrival runway may be affected since aircraft need more time and runway length to stop ("braking action");
    - Snow / frost / ice: The need of de-icing may affect the departure runway capacity, the constraining factors being the number of de-icing units which is generally limited and the fact that the de-icing procedure may not always be possible at the stand causing extra delay and slowing down the departure rate. In addition, the associated capacity limit of de-icing areas - i.e. number of de-icing per hour or minimum time duration per de-icing, must be taken into consideration.
- Gate/stand capacity: The number of available stands is an important factor for determining the airport capacity. A relatively low total number of available stands may affect the runway capacity;
- Presence of hot spots and determination of associated capacity limits in the runway /taxiway layout: any hot spot on the airport airside has its own capacity limit, a hot

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spot being a runway-runway crossing or runway-taxiway crossing or taxiway-taxiway crossing;

- Airspace constraints: capacity limits in the terminal area possibly combined with En-Route capacity limits may affect the airport capacity, putting a constraint over arrival and/or departure traffic, thus limiting the runway capacity;
- DCB constraints: network constraints already identified for the day of operations - e.g. network constraints set or foreseen according to a forthcoming exceptional event such as Olympic Games, putting a constraint over arrival and/or departure traffic, thus limiting the runway capacity.

Finally, the System (NOP) records all related capacity figures for each possible airport configuration scheme applicable for the day of operations (output data). For each configuration, the capacity figures may be decomposed as the following:

- Nominal arrival/departure capacity (good weather);
- Reduced arrival/departure capacity for limited visibility & cloud cover;
- Degraded arrival/departure capacity for low visibility procedures.

While the Long Term Planning Phase evolves, new or more accurate data may be available and trigger a new iteration for the update of those capacity figures.

The following Use Cases have been identified for Define/Revise Airport Available Capacity Plan process:

Use Case	Description
Determine/Revise Airport Capacity	This UC describes how the APOC Staff establishes and updates the overall airport capacity figures, a consolidation work of capacity evaluation. It takes account of the runway, taxiway, stand, de-icing and landside capacity plans and thus is performed at the overall airport level after the capacity of each resource has been evaluated (using the relevant preceding UCs).
Determine/Revise Airport Slots	This UC describes how the APOC Staff defines or revises the number of available airport slots according to the airport capacity and possible configurations. This is done through a consolidation of each resource capacity figures which lead to a determination of the available airport slots that can be proposed to airspace users.
Determine/Revise De-icing Capacity	This UC describes how the APOC Staff calculates the de-icing capacity. The calculation is based, for example, on the equipments available (number of de-icing trucks, de-icing stands etc.) with their characteristics (or capacities). It takes account of the maintenance plans. This UC does not take into account any other airside resources constraints as it focuses only on de-icing capacity (in terms of equipment and installation).
Determine/Revise Runway Capacity	This UC describes how the APOC Staff establishes and updates the capacity figures for the various Possible Runway Configurations applicable for the day of operations. Those capacity figures are computed, for example, according to various weather conditions, airspace constraints, potential DCB constraints (network constraints that may be already identified/anticipated for the day of operations) and maintenance plans. This UC does not take into account any other constraints at the airport as it focuses only on the runway capacity.

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Use Case	Description
Determine/Revise Stand Capacity	This UC describes how the APOC Staff establishes and updates the capacity figures for the various Possible Stand Configurations applicable for the day of operations. Those capacity figures are computed, for example, according to various weather conditions, landside constraints and maintenance plans. This UC does not take into account any other airside resources constraints as it focuses on stand capacity only.
Determine/Revise Taxiway Capacity	This UC describes how the APOC Staff establishes and updates the capacity figures for the various Possible Taxiway Configurations applicable for the day of operations. Those capacity figures are computed, for example, according to various weather conditions and maintenance plans. This UC does not take into account any other airside resources constraints as it focuses only on taxiway capacity.

Table 17: Use Cases for Define/Revise Airport Available Capacity Plan

4.3.4.9 Define/Revise Airspace Available Capacity Plan (A1.3.3.2.2)

This process consolidates, at the level of one airspace, capacity figures from each airspace resource into a global airspace capacity planning process. It requires local resource definition (cf. process A1.3.1.2, A1.3.2.2, A1.3.3.1.2).

The main drivers related to this process are the following:

- Inputs:
  - Possible Configurations (Airspace);
  - Target Capacity Plan (Airspace).
- Constraints/Triggers:
  - Resource Usage Rules (Airspace).
- Human Actors:
  - Sub-Regional Network Manager.
- Outputs:
  - Resource Available Capacity Plan (Long Term) (Airspace).

The purpose of the process is to make it sure that Sub-Regional Network Management Units and Airports have made their best endeavour to plan the resources, including airspace/route network/staffing, needed to cope with the forecasted demand generated by civil and military airspace users.

The process consists in identifying/validating the Long Term Airspace Resources information in terms of airspace infrastructure, usage rules and configurations. The aim of the process is also to determine the Local Airspace Available Capacity Plan and check convergence with the Target Airspace Capacity Plan as identified by process A1.4.1.2. This is the reason why "Target Capacity Plan" is an input to "Define/Revise Airspace Available Capacity Plan (A1.3.3.2.2)".

The process is iterative in two ways:

- The Planned Airspace Capacity is gradually adjusted to progressively meet the target capacity plan;
- The Target Airspace Capacity is itself gradually adjusted as previsions on traffic and airspace demand become more accurate.

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When the Long Term Planning Phase is over, the Planned Airspace Capacity and the Target Airspace Capacity are aligned, as far as possible, at all levels – i.e. from Local to Regional through Sub-Regional. ANSPs and Airports commit themselves to achieving their own capacity plan.

When/where a risk of significant imbalance is foreseen, specific event due to specific traffic patterns inducing specific capacity patterns, predefined DCB/ASM Solutions will be defined locally and refined at network level through Process A1.4 "Perform Long Term Demand and Capacity Balancing".

This process is triggered anytime an ATS Provider needs to inform the different actors about a decision of capacity modification that may be caused by the expectation of a significant change in the traffic demand profile - e.g. Balkans operations, or a lasting equipment maintenance.

The following Use Case has been identified for Define/Revise Airspace Available Capacity Plan process:

Use Case	Description
Define/Revise Airspace Available Capacity Plan	This UC describes how the Sub-Regional Network Manager defines/revises the Airspace Available Capacity Plan. For each airspace configuration, the available capacity is gathered, also taking into account human resources plans, enhancement plans, etc... This UC is highly linked to Long-term demand capacity balancing. LT-DCB identifies the target capacity plans that are re-injected in "Define/Revise ATM resources" when the target performance levels are not met.

Table 18: Use Case for Define/Revise Airspace Available Capacity Plan

4.3.5 Enablers

At the network level main enablers to support define/revise ATM resources are:

- NOP/SWIM through access rights;
- Systems interoperability;
- Participation of all actors in adequate and accurate information provision, in particular from Airspace Users – e.g. creation of new city pairs, hub implementation.

At the airport level main enablers to support define/revise ATM resources are:

- Interactive Network capacity planning;
- Enablers for the implementation of sustainable operations at the airport.

4.3.6 Transition issues

The main transitions issues identified are:

- NOP/SWIM through access rights;
- Systems interoperability;
- Participation of all actors in adequate and accurate information provision, in particular from Airspace Users – e.g. creation of new city pairs, hub implementation.

4.4 PERFORM LONG TERM DEMAND CAPACITY BALANCING (A1.4)

This process is dedicated to Resource Long term planning at network level according to a standard traffic demand and capacity pattern, and to provide a catalogue of predefined solutions to cope with less frequent patterns.

ECAC-wide “A1.4 Perform Long Term Demand and Capacity Balancing”, together with the local “A1.3 Define/Refine ATM Resources” is an iterative process that should result in the definition of capacity plans both for airports and ACCs.

4.4.1 Scope and Objectives

During the Long Term Planning phase, this process aims at defining globally - i.e. taking into account the network effect at the ECAC area level, the capacity targets both at the level of airports and pieces of airspace that would satisfy the quality of service defined through CDM sessions by the stakeholders. Working out the target capacity plan is fourfold:

- Define the baseline capacity plan for the different airspace entities; then
- Define the target capacity plan; then
- Perform an iterative process with local entities to define their commitments; then
- Build a catalogue of solutions that will allow treating expected but more rare capacity or/and demand patterns, with respect to local available resource plan.

During the Long Term Planning Phase capacity targets associated to the Airports will be defined. Airports check that future capacity needs can be satisfied and/or make their commitment to future capacity values.

Strategic airport slot allocation for coordinated airports and schedules facilitated airports is also performed within this process.

4.4.2 Assumptions

The main assumptions are:

- The process, which spans over a year until six months before the day of operation, relies on the sharing of the network capacity situation by all concerned parties;
- The Airport Slot Allocation process is necessary in order for many airports with airlines’ demands and avoid much more important delays allocated by DCB because the strategic airport slot allocation process lacks the network perspective;
- The level of imbalance between demand and capacity at the level of airport which justifies the strategic airport slot allocation has to be determined;
- AOs will take the opportunity to be assigned on city-pairs to the type of liaison they will offer (hub-and-spoke or not).

4.4.3 Expected Benefits, Issues and Constraints

The expected benefits are:

- Shared understanding of network capacity problems and needs by service providers and Airspace Users;
- Best usage of resources available according to a greater anticipation of the traffic situation and enhanced co-ordination of available capacities in the European network;
- Co-ordinated resource planning up to Regional Network level;

- Alignment of individual service providers' capacity objectives to the overall optimum.

By identifying the Airports that need a Strategic Slot Allocation Conference and by having BDTs to work out consistent coordinated city-pairs, this pre-regulation process will decrease significantly the amount of delay generated by airports and will increase predictability of AOs' scheduling.

4.4.4 Overview of Operating Method

Process A1.4 (Perform Long Term Demand Capacity Balancing) breaks down as follows:

- Identify Network Target Capacity (A1.4.1):
  - Identify Target Airport Capacity (A1.4.1.1);
  - Identify Target Airspace Capacity (A1.4.1.2).
- Define/Revise Catalogue of Solutions (A1.4.2):
  - Define/Revise Airport Catalogue of Solutions (A1.4.2.1);
  - Define/Revise Airspace Catalogue of Solutions (A1.4.2.2).
- Assign Airport Resources (A1.4.3).

4.4.4.1 Identify Target Airport Capacity (A1.4.1.1)

This CDM process aims at adjusting the various airport capacity figures included in the long term airport resource available capacity plan in order to agree on capacity figures consistent at a network level. A balance is performed between airport resource available capacity and the associated cost when adapting to the demand.

The Target airport capacity plan, published through the NOP, feeds back the define/revise resources process to adjust long term available capacity plans.

The main drivers related to this process are the following:

- Inputs:
  - Resource Available Capacity Plan (Long Term) (Airport);
  - Traffic Forecast;
  - Airspace Requirements (Long Term).
- Constraints/Triggers:
  - Archived Data;
  - Airport Capacity Cost;
  - Delay Cost;
  - Target Performance Levels.
- Human Actors:
  - APOC Staff;
  - Regional Network Manager.
- Outputs:
  - Target Capacity Plan (Airport).

This process describes how the APOC Staff in coordination with the network adjusts the airport declared capacity in order to keep the balance between demand and capacity throughout the network. It may inform of some constraints that limit the airport capacity for a particular period.

According to the capacity targets and the network traffic demand, the capacity plan will be adjusted for preserving the best capacity/demand balance.

The following Use Case has been identified for Identify Target Airport Capacity process:

Use Case	Description
Establish/Update Airport Capacity Plan	This UC describes how an APOC staff (in coordination with the Regional Network Manager) adjusts the airport capacity in order to keep the balance between traffic demand and capacity throughout the network. It may inform of some constraints that limit the airport capacity for a particular period.

Table 19: Use Case for Identify Target Airport Capacity

4.4.4.2 Identify Target Airspace Capacity (A1.4.1.2)

This CDM process aims at adjusting the various airspace capacity figures in order to assure that the quality of service that has been agreed by all stakeholders is met.

The “Identify Target Airspace Capacity” is an iterative process running possibly according to return on investment or to any other capacity investment derived from the ANSP's own business model, on the basis of a baseline capacity plan.

This Target airspace capacity plan, published through the NOP, feeds back Process A1.3.3.2 Define Resource Available Capacity Plan to adjust locally the available resources.

The main drivers related to this process are the following:

- Inputs:
  - Resource Available Capacity Plan (Long Term) (Airspace);
  - Traffic Forecast;
  - Airspace Requirements (Long Term).
- Constraints/Triggers:
  - Archived Data;
  - Airspace Capacity Cost;
  - Delay Cost;
  - Target Performance Levels.
- Human Actors:
  - Regional Network Manager;
  - Sub-Regional Network Manager.
- Outputs:
  - Target Capacity Plan (Airspace).

The process starts with the identification of the Baseline Airspace Capacity, that is to say an Airspace Capacity that will serve as a reference to identify the Target Airspace Capacity, based on traffic forecasts.

The Baseline Airspace Capacity is identified at the Sub-Regional Level, down to the Local Level, with all data compiled by the Regional Network Manager.

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In the SESAR context, En-Route capacity is not the limiting factor in standard situation. Hence the Baseline Airspace Capacity should not be determined on the basis of En-Route congestion/saturation, regardless of the airspace structure. Instead a baseline structure may be assumed to derive ACC/FAB capacity figures i.e. based on a "standard sectorisation" and on traffic complexity.

ACC/FAB reference capacity is provided by the Sub-Regional Network Manager. It is based on the current traffic demand and related complexity.

The next process consists in progressively saturating each ACC/FAB by increasing traffic demand while maintaining the network effect before saturation - i.e. keeping the same Demand/Capacity ratio for the other ACC/FAB. The output is a baseline capacity for every ACC/FAB - i.e. the actual current capacity of the ACC/FAB. For TMAs, the same process is applied except for the more dense ones for which capacity is derived from statistical analysis since saturation has been reached.

The process then identifies the Target Airspace Capacity. This is the capacity needed to accommodate the traffic demand of the planning horizon, while maintaining sufficient capacity headroom – i.e. value to be defined in the context of the Quality of Service Agreements.

The airport capacity enhancement plan will be a major input of the process.

The cost of delay will be provided by Airspace Users.

For each ACC/FAB, the cost of En-Route capacity depends on its business model. The cost of capacity may depend on complexity: the more complex, the more expensive since technical means and procedures to be put into operation increases such as strategic de-confliction applied at different levels (AOM, DCB, ATC). Complexity is a function of the number of aircraft, the number of unsteady flights and the number of conflict pairs. The **workload function[31]** WL = $T_{ac}*O_{ac}+T_{Cnf}*O_{Cnf}+T_{Cl}*O_{Cl}$ where O_{ac}, O_{Cnf}, O_{Cl} respectively are the occurrences of routine, conflict and climb/descent tasks during the time period considered; and T_{ac}, T_{Cnf} and T_{Cl} respectively are the duration time of routing, conflict and climb/descent tasks, in seconds. To take into account the incidence of the complexity on the workload, different duration macro-tasks for airspace volumes of different complexity will be defined. It is assumed that airspace volumes sharing similar DCB complexity should have the same macroscopic workload model.

Stakeholders have to agree on assumptions and experimental protocol that will be applied in order to work out the target airspace capacity plan.

The iterative process "Identify Target Airspace Capacity" is launched taking as inputs:

- The Baseline Airspace Capacity;
- The airport capacity figures;
- The future traffic demand;
- The capacity headroom i.e. additional traffic;
- The cost of capacity;
- The cost of delay;
- The target average delay per flight. In normal conditions, the delay is null due to the over-sizing of the capacity.

Each iteration consists in increasing by one point the capacity of the ACC/FAB bringing the best return on investment depending on the ACC/FAB business model.

Delays are generated by mapping the future traffic demand (including extra traffic due to capacity headroom) on the network made of ACC/FAB capacity and Airport capacity figures.

The process ends when the Key Performance Indicators targets are met or the stakeholders, together with the Regional Network Manager have agreed on the best trade-off between KPIs i.e. some KPI will be relaxed.

Key Performance indicators will be calculated, using standardised methods and tools, by the people in the best place to do the calculations, either at local, sub-regional or regional level.

Local, sub-regional 'self' calculated indicators will be subject to auditing by a centralised, independent audit function.

There may need to be a process to handle mitigating circumstances such as missing a target due to another actor.

Regionally calculated values will be performed by an independent assessment body like the PRU.

The output of this process i.e. the target capacity plan is then broadcasted to the stakeholders for validation at sub-regional/local level (A1.3 "Optimise ATM resources").

3 long-term capacity plans will be generated. The objective of each is provided hereafter:

- T + 1: Chokepoint forecast

  Using the latest forecast data predict the expected performance targets for the coming year. The idea is to focus attention on areas that are most likely to miss their own target capacity plan.

- T + 5: Long term capacity planning

  This timeframe allows enough time to train new controllers as a means to provide more capacity.

  There might be a linear interpolation between the year T and T+ 5 to provide capacity targets for intermediate years, unless a planned capacity increase is known and introduced as a step function.

  Currently the cost of capacity and cost of delay provide a prioritisation on who should provide the needed capacity (those who can do it with the best Return on Investment). A new method is required as the method does not work for privatised companies, such as many of the airports, who are not working under a cost recovery system.

- T + 10: Very long term capacity planning

  This timeframe allows enough time to provide new infrastructure, both at the airport and ACC/FAB levels, as a means to provide more capacity. However, the timescale necessary for Airport expansion varies: it may be 10 years if a solution has already been chosen and just needs to be implemented. However airport expansion is often impacted by environmental issues, such as noise and air quality, and getting approval can take a long time – i.e. 15-20 years, depending on the planning processes and whether there are any legal challenges to the plans.

  So the setting of this timeframe to 10, 15 or 20 years will be influenced by the specific factors affecting airport expansion.

The following Use Case has been identified for Identify Target Airspace Capacity process:

Use Case	Description
Establish Airspace Capacity Plan	This UC describes how the Regional Network Manager (in coordination with the Sub-Regional Network Manager) to adjust the various airspace capacity figures included in the long term airspace resource available capacity plan in order to agree on capacity figures consistent (at the network level) and cost effective (according to ANSP Business Model). A balance is performed between airspace availability and associated cost (of delay and of capacity) when adapting the airspace to the demand. For this balancing, an identification of where and when Low/Medium/High Complexity Operations can take place is required. This is defined with the Target Airspace Capacity plan. This Target airspace capacity plan, published through the NOP, feeds back the define/revise resources process to adjust according to local knowledge, the long term resource available capacity plan.

Table 20: Use Case for Identify Target Airspace Capacity

4.4.4.3 Define/Revise Airport Catalogue of Solutions (A1.4.2.1)

This process allows definition/revision, at the airport level, of possible solutions to apply during medium/short term phase in case of detected imbalance. The resulting "catalogue of solutions" is a CDM potential response taking into account the agreed target performance levels to face any problem of capacity shortfall at the airport.

The main drivers related to this process are the following:

- Inputs:
    - Airport Catalogue of Solutions.
- Constraints/Triggers:
    - Long Term Resource Available Capacity Plan[17];
    - Archived data;
    - Target performance levels;
    - Traffic forecast.
- Human Actors:
    - APOC Staff;
    - Regional Network Manager;
    - Sub-Regional Network Manager.
- Outputs:
    - Catalogue of Solutions.

Airport-related DCB Solutions are defined through this process.

[17] Resource Available Capacity Plan includes all data regarding resource usage rules, possible configurations as well as the capacity plan itself.

The following Use Case has been identified for Define/Revise Airport Catalogue of Solutions process:

Use Case	Description
Define/Revise Airport Catalogue of Solutions	This UC describes how an APOC Staff, possibly in co-ordination with the Sub-Regional Network Manager, the Regional Network Manager, prepares (i.e. defines/revises) an airport catalogue of solutions in order to resolve capacity/demand imbalance problems. Such a solution consists of problem identification, solution elaboration at local and sub-regional levels, with network wide impact assessment and coordination.

Table 21: Use Case for Define/Revise Airport Catalogue of Solutions

4.4.4.4 Define/Revise Airspace Catalogue of Solutions (A1.4.2.2)

This process allows defining/revising, at the airspace/network level, possible solutions to apply during medium/short term phase in case of detected imbalance. The process comes up with a "catalogue of solutions" providing collaboratively agreed options for a potential response to solve a standard (often observed or foreseeable) problem of capacity shortfall at the airspace/network level. This process is an enabler for CDM like decision making whenever direct stakeholder consultation is either impractical or impossible due to the short time horizon or too cost intensive compared to the potential benefit.

The main drivers related to this process are the following:

- Inputs:
  - Airspace Catalogue of Solutions.
- Constraints/Triggers:
  - Long-Term Airspace requirements;
  - Long Term Resource Available Capacity Plan[18];
  - Archived data;
  - Target performance levels;
  - Traffic forecast.
- Human Actors:
  - Sub-Regional Network Manager;
  - Regional Network Manager.
- Outputs:
  - Catalogue of Solutions.

Through this process, the Airspace Catalogue of DCB Solutions is defined then revised by the Regional Network Manager, working with the Sub-Regional Network Manager, the Airspace Users and possibly the Civil/Military Airspace Manager.

The Catalogue of DCB/ASM Solutions consists of:

- Basic DCB/ASM Solutions: configuration inc. military activity, temporary route structure, flight level capping, advisory routing, queue management including UDPP, and Strategic De-confliction measures;
- Pre-defined DCB/ASM Solutions made of basic DCB Solutions, characterised by:

[18] Resource Available Capacity Plan includes all data regarding resource usage rules, possible configurations as well as the capacity plan itself.

- o The definition of the ATM situation that triggers its application;
- o The expected result.

- A modus operandi including:
  - o The list of actors that will take part to the negotiation process prior to pre-defined DCB/ASM Solution implementation during the Medium Term or Short Term Planning Phase, and their roles;
  - o The selected procedures and/or DCB/ASM measures, which defines the network use to treat the ATM situation.

Predefined DCB/ASM Solutions are agreed between partners through CDM sessions and will be refined during the medium and short term planning phases, through simulations – e.g. de-icing, fog, snow.

The objective of the Long Term Planning Phase is to:

- Populate collaboratively the catalogue with the Basic DCB/ASM Solutions that will be combined to form DCB/ASM Solutions;
- Predefine collaboratively those DCB/ASM Solutions to prepare in advance for particular situations, be able to deal with the majority of events and minimise the need for ad-hoc DCB/ASM Solutions.

The service relies on an iterative and interactive process based on feed-back experience - e.g. post-analysis of implemented DCB Solutions, as well as continuous validation of long range forecasts from the NOP as more reliable data on demand[19] and capacity[20] becomes available.

There may be predefined DCB Solutions to address ATM issues in the same area. The definition of Functional DCB/ASM Areas that contain those traffic flows is then possible. It is based on the identification of main flows that strongly link airspace volumes one with each other. The purpose of this Functional DCB area is to address the definition of predefined DCB/ASM solutions through a CDM process limited to a reduced number of participants, including Civil and Military Airspace Users, and facilitated by the Regional Network Manager. Functional DCB Areas have a weak level of coupling between each other. Whatever the predefined solution belonging to the Functional DCB Area the network effect is contained within the area, simplifying the role of the Regional Network Manager.

The following Use Cases have been identified for Define/Revise Airspace Catalogue of Solutions process:

Use Case	Description
Identify a Long Term Demand Capacity Imbalance	This UC describes how a Sub-Regional Network Manager or the Regional Network Manager detects a demand/capacity imbalance during the long-term planning phase. The imbalance is detected during the long-term planning phase on the basis of historical data including traffic demand and capacity, of predicted traffic growth, and of the planned capacity.
Select/Refine/Elaborate a DCB solution	This UC describes how a Sub-Regional Network Manager or the Regional Network Manager selects/refines/elaborates a DCB solution from the airspace catalogue of solutions to respond to an identified demand capacity imbalance.

[19] Through Process A1.2.1 Forecast Traffic Demand and Process A1.2.2 Plan Long Term Airspace Reservation Demand.

[20] Through Process A1.3.3 Assess Long Term Resource Available Capacity Plan.

Use Case	Description
Validate the DCB solution	This UC describes how Sub-Regional Network Managers and the Regional Network Manager validate the DCB solution in a collaborative way, before publication in the Catalogue of Solutions.

Table 22: Use Cases for Define/Revise Airspace Catalogue of Solutions

4.4.4.5 Assign Airport Resources (A1.4.3)

This process allows the APOC staff to assign long term traffic demand to various airport resources – e.g. runways, taxiways, stands, de-icing pads. Airport Slot Requests are balanced with available airport slots through slot allocation. Other resources may also be pre-allocated, e.g. to long haul/short haul flights, light or heavy aircrafts, Schengen or non-Schengen flights, etc.

The main drivers related to this process are the following:

- Inputs:
  - Airport Slot Requests;
  - Airport Slots;
  - Target Capacity Plan (Airport).
- Constraints/Triggers:
  - None.
- Human Actors:
  - APOC Staff.
- Outputs:
  - Airport Local Plan (including Slot Allocation Plan).

The main goal for this process is to enable the mapping of the total traffic demand (derived from airline seasonal schedules) versus the capacity of the various possible airport configuration schemes in order to establish, via a collaborative decision making procedure, an adequately balanced airport operational plan, and its possible alternatives, for the Long Term Planning Phase. At the stage of the Long Term Planning Phase where the traffic demand is not known precisely, only high level figures are taken into consideration. Consequently, the Long Term airport configuration plan does not result in a precise plan for the day of operations but rather an adequately balanced solution between the total traffic demand and the total airport capacity.

This process is also related to the biannual strategic slot allocation conference for busy airports which are of two types:

- A “schedules facilitated airport” is defined as an airport where there is potential for congestion at some periods of the day, week or year which can be resolved by voluntary co-operation between airlines and where a schedules facilitator has been appointed to help with this. The schedules facilitator advises air carriers and recommends alternative arrival and departure times when congestion is likely, and monitors the conformity of air carriers' operations with the recommended schedules;
- A “coordinated airport” is an airport with a chronic serious capacity shortfall.

The actors of the process are:

- Any airline that wishes to use one slot of a busy airport;
- National Coordinators;

- Schedules facilitators;
- The APOC Staff.

The inputs of the process are:

- Airport Slot Requests;
- Airport Slots;
- Long Term Airport Resource Available Capacity Plan.

The outputs of the process are:

- Airport Local Plans inc. Slot Allocation Plan and other airport resources allocation plan.

The constraints of the process are:

- None.

During the Conference, schedules are adjusted mainly through bilateral discussions between airlines and Coordinators regarding alternatives offered, or between airlines to exchange slots offered or accepted. A schedule change at one airport must affect one or more other airports.

The following Use Cases have been identified for Assign Airport Resources process:

Use Case	Description
Determine/Revise De-icing Resources Load Plan	This UC describes how the APOC Staff establishes and updates the de-icing resources load plan by balancing the de-icing demand with the de-icing capacity.
Determine/Revise Runway Load Plan	This UC describes how the APOC Staff establishes and updates the runway load plan by balancing the traffic demand with the runway capacity.
Determine/Revise Stand Load Plan	This UC describes how the APOC Staff establishes and updates the stand load plan by balancing the traffic demand with the stand capacity.
Determine/Revise Taxiway Load Plan	This UC describes how the APOC Staff establishes and updates the taxiway load plan by balancing the traffic demand with the taxiway capacity.
Determine/Revise the Airport Operational Plan	This UC describes how the APOC Staff consolidates the various airport plans, maintaining the slot allocation list to correspond with the flight intentions provided by the users and to allocate additional slots available as per unit guideline. This UC is the result of the slot conference, where airport slots are allocated to flights.

Table 23: Use Cases for Assign Airport Resources

4.4.5 Enablers

The main enablers are:

- NOP/SWIM;
- At the airport level, the Improved Consistency between Airport Slots, Flight Plans and short term departure Slots is required.

4.4.6 Transition issues

Acceptance of capacity function based on complexity analysis.

4.5 Publish Seasonal Schedule (A1.5)

4.5.1 Scope and Objectives

This process publishes the AOs' schedules to the outside world and makes SBTs available to the ATM community.

4.5.2 Assumptions

SBT relevance depends on the flexibility airspace users have in assigning an aircraft type to a city-pair.

4.5.3 Expected Benefits, Issues and Constraints

Earlier availability and improved accuracy of SBTs.

4.5.4 Overview of Operating Method

This process "Publish Seasonal Schedule" will allow the airspace users to finalise their plans and to issue their SBTs. Until the publication of SBTs, any planed information remains confidential.

The main drivers related to this process are the following:

- Inputs:
  - Airport Local Plan (including Slot Allocation Plan);
- Constraints/Triggers:
  - Business Model;
  - Statistics.
- Human Actors:
  - Flight Schedule Department Staff.
- Outputs:
  - Available SBTs

The following Use Case has been identified for Publish Seasonal Schedule process:

Use Case	Description
Submit/Update/Cancel a List of SBTs	This UC describes how the Flight Schedule Department Staff produces the first SBTs resulting on internal agreement on Business Development Trajectories (BDT).

Table 24: Use Case for Publish Seasonal Schedule

4.5.5 Enablers

Availability of BDTs (in particular aircraft type).

4.5.6 Transition issues

None.

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5 ENVIRONMENT DEFINITION

Please refer to the General DOD [4].

6 ROLES AND RESPONSIBILITIES

The section addresses the roles and responsibilities of organisations and human actors in the context of Long Term Planning activities.

6.1 MAIN ROLES AND RESPONSIBILITIES

The Regional Network Manager

The Regional Network Manager acts as catalyst and facilitator for an efficient overall network management by all ATM stakeholders.

In the Long Term Planning phase this includes a long-term demand/capacity analysis, preparation of seasonal plans and plans for special events, participation to airspace design activities, and simulation activities to improve the overall DCB process.

The Regional Network Manager closely co-ordinates with the Sub-regional Network Managers. He/she oversees inter-region negotiations and assesses regional decisions for unexpected network effects.

Moreover he/she is responsible for:

- The compilation of the Network Operations Plan (NOP);
- Successive integration of Shared Business Trajectories;
- Collection and dissemination of constraints (specific needs).

Main interactions of the Regional Network Manager are with Aircraft Operators (Airspace Users) and with Capacity Managers of Air Navigation Service Providers in the Business Development Phase and with Sub-regional Network Managers and Aircraft Operators in the Planning Phase.

The Sub-Regional Network Manager

The Sub-Regional Network Manager assures the stability and efficiency of the ATM Network on the sub-regional level, typically in a FAB.

A close co-ordination with the Regional Network Manager is necessary in order to check impact of any sub-regional measure at the network level.

In the Long Term Planning phase the Sub-Regional Network Manager is responsible for:

- Assuring the contributions to the network operations plan at sub-regional level;
- Assuring the provision of information on constraints and opportunities;
- Initiating CDM processes between local stakeholders and partners (Flight Schedule Department Staff, APOC Staff in the region, Civil/Military Airspace Managers and neighbouring concerned Sub-Regional Network Managers) to maintain the network at sub-regional level;
- Check with airspace users the applicability of their own proposed solutions through a CDM process, and suggest a solution if needed.

The Airspace Designer

The main tasks of the Airspace Designer are to design, to assess and to allocate the airspace regardless of national boundaries to fulfil civil and military user requirements. The design of FABs/ACC airspace should be co-ordinated with neighbouring entities.

During the Long Term Planning phase, the main tasks of the Airspace Designer are:

- The optimisation of long-term trajectory definition aiming at offering great circle point-to-point liaisons or occasionally on shortest path negotiated with the airspace users and with the neighbouring Airspace Designers and Sub-Regional and Regional Network Managers and Civil/Military Airspace Manager;

- The definition of military training areas of all types such as TSAs, CBAs, MVPAs, rules to use them and definition of DCB/ASM Solutions in order to minimise impact on Civilians while allowing full military training;
- The definition of high-complexity airspace including strategically de-conflicted SIDs and STARs with specific airspace structures, and rules to use it – e.g. high-density TMAs.

The Civil/Military Airspace Manager

In the Long Term Planning phase, the Civil/Military Airspace Manager is asked to perform the activities of the Airspace Designer related to the design and management of the resources allocated to military authorities.

Civil and Military Airspace Managers have to plan the civil and military airspace utilisation, to resolve conflicting requests and to compile the Airspace Use Plan. In particular they have to:

- Organise and manage the airspace to accommodate predicted traffic demand;
- Coordinate airspace reservations – i.e. location, size and time, with military units in order to keep the impact on civil air traffic to a minimum;
- Publish the Airspace information via the NOP/SWIM.

The APOC Staff

The Airport Operations Centre is the central organisational unit responsible for airport airside operations. The APOC Staff has the various roles of Resource Management, Flight Operations Management and Environment Management. He/She is responsible for CDM with all relevant stakeholders.

Airport Resources are planned and allocated iteratively and fed into the NOP. The data has also to be collected into the airport information sharing database, which will be the entry-point for SWIM applications.

The APOC Staff hosts the function of the Airport CDM Cell. This unit is responsible for ensuring and improving communication between all stakeholders, including data-management of CDM relevant data.

The APOC Staff has to develop and implement an airport wide environmental management policy and has to collaborate and communicate with all affected air transport stakeholders on measures to be taken and with local and national communities.

At military aerodromes, the Wing Operations Centre (WOC) is responsible for the operational functioning of the aerodrome. The WOC provides for CDM management at the aerodrome.

The Flight Schedule Department Staff

The Flight Schedule Department Staff schedules the flight programme of the airspace user for each season during the Long Term Planning phase. He/She takes part in the IATA Airport Slot Conference and he/she creates the Airspace User Flight Schedule based on the business model and on management objectives of the airspace user as well as aircraft and flight crew resources.

Main interactions in this planning activity of the Flight Schedule Department Staff are with Airports and Airspace User Associations.

6.2 Actors' Responsibilities in the ATM Process Model

The following table summarizes the main actors and roles contributing to network management in the medium/short-term planning phase.

Organisation/Unit	Individual Actor	Related Process(es)	Main Role(s) & Responsibilities
Regional Network Management Unit	**Regional Network Manager**	A1.2.1-Forecast Traffic Demand A1.3.1.3-Define/Revise Network Usage and Prioritisation Rules A1.4.1.1-Identify Target Airport Capacity A1.4.1.2-Identify Target Airspace Capacity A1.4.2.1-Define/Revise Airport Catalogue of Solutions A1.4.2.2-Define/Revise Airspace Catalogue of Solutions	The Regional Network Manager acts as catalyst and facilitator for an efficient overall network management by all ATM stakeholders. In particular he: • Manages the Network Operations Plan (NOP); • Analyses demand vs. capacity; • Integrates first SBTs; • Collects and disseminates needs and constraints; • Participates to airspace design and simulations activities.
Sub-Regional Network Management Unit	**Sub-Regional Network Manager**	A1.3.1.3-Define/Revise Network Usage and Prioritisation Rules A1.3.3.1.2-Define/Revise Possible Airspace Configurations A1.3.3.2.2-Define/Revise Airspace Available Capacity Plan A1.4.1.2-Identify Target Airspace Capacity A1.4.2.1-Define/Revise Airport Catalogue of Solutions	The Sub-Regional Network Managers are collectively responsible for the planning of network operations: • During the long-term planning phase they assure contributions to the NOP at sub-regional level; • Provide information on constraints and opportunities; • Initiate CDM processes when needed.

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Organisation/Unit	Individual Actor	Related Process(es)	Main Role(s) & Responsibilities
		A1.4.2.2-Define/Revise Airspace Catalogue of Solutions	
Airspace User	**Flight Schedule Department Staff**	A1.2.3-Request Airport Slots A1.5-Determine Long Term User Traffic Demand	Prepare and publish flight programme.
Airspace Management Cell Civil Military Unit	**Civil/Military Airspace Manager**	A1.2.2-Plan Long Term Airspace Reservation Demand A1.3.3.1.2-Define/Revise Possible Airspace Configurations	The Civil/Military Airspace Manager is responsible for the planning of airspace usage, that is: • The Collection of airspace requirements; • The elaboration, modification and the implementation of the Airspace Use Plan; • The publication of the information in the NOP and the notification to the Sub-Regional and Regional Network Managers, so that the possible impact on networks operations can be assessed. **The Exercise Director** (or Exercise Planner for small scale exercises): • Responsible for scheduling the military needs in terms of airspace reservation and time slot for large-scale exercises; • Responsible for the airspace design for the particular exercises he/she is in charge of in coordination with the Airspace Designer; • The focal point for all Military Actors and for the Airspace Management Cell.
National Airspace Policy Body	**Airspace Designer**	A1.3.1.2-Define/Revise Airspace Usage Rules A1.3.2.2-Define/Revise Airspace Infrastructure	• Design airspace for optimum operations; • Develop scenarios/simulations for efficient airspace use.

Organisation/Unit	Individual Actor	Related Process(es)	Main Role(s) & Responsibilities
Airport Operations Centre	**APOC Staff**	A1.3.1.1-Define/Revise Airport Usage Rules A1.3.2.1-Define/Revise Airport Infrastructure A1.3.3.1.1-Define/Revise Possible Airport Configurations A1.3.3.2.1-Define/Revise Airport Available Capacity Plan A1.4.1.1-Identify Target Airport Capacity A1.4.2.1-Define/Revise Airport Catalogue of Solutions A1.4.3-Assign Airport Resources	The Airport Operations Centre (APOC) is the central organisational unit responsible for airport airside operations. The APOC Staff has the various roles of Resource Management, Flight Operations Management and Environment Management and is responsible for CDM (CDM focal point) with all relevant stakeholders. In summary, the main tasks of the APOC Staff in the long-term planning phase are to: • Plan and allocate airport resources; • Update the NOP with airport data; • Host CDM processes; • Develop and implement airport-wide environmental management policy.
	ATM Stakeholders	A1.1.1-Agree on Operational Performance Framework A1.1.2-Agree on Societal Outcome Framework A1.1.3-Agree on Performance Enablers Framework A1.1.4-Agree on Service Levels	Develop collectively and agree on the Performance Framework.

Table25: Actor's Role & Responsibilities

7 HOT TOPICS

No hot topics were identified for this DOD.

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[28] **Episode 3** OS-22, Life Cycle of the 4D Trajectory, v0.1, December 2008.

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9 ANNEX A: OPERATIONAL SCENARIOS

The detailed description of those scenarios will be provided through individual files (i.e. one per identified scenario).

The following table summarises the dedicated scenarios for En-Route operations. This list could be refined according to the specific needs of En-Route Management exercises.

Scenario	Summary	Status
Long Term capacity planning	This Scenario is one interpretation of the SESAR Detailed Operational Description (DOD) for Long Term Planning. The purpose of the scenario is to interpret the 'Long Term DOD' and provide the reader with a credible, accessible example of how long term planning may work in the future in order to i) provide more detail of the concept, and ii) to provoke thought and comment on how the concept might be improved. This particular scenario is set at a high level. Thus, the detailed processes of, say, preparing traffic forecasts, have been passed over (this process is worthy of an operational scenario itself). Rather, the scenario presented here focuses on the planning cycle during the course of one year. It highlights the broad objectives/processes for successful capacity planning, giving details on what are likely to be the important inputs, who the actors may be, synergies between actors, and a timeline for the flow of information. This scenario covers the very long term capacity planning process (up to about ten years ahead), and includes the following network elements: airports, terminal manoeuvring areas (TMAs) and En-Route. It includes a new method on complexity analysis to avoid en-route bottlenecks. City airport reassignment will need direct participation of airlines.	**Produced (OS-14)**

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Scenario	Summary	Status
Airport Operational Plan Lifecycle for Long Term Phase	This Scenario provides an overview of all the planning activities required for the definition and continuous refinement of the Airport Operational Plan (AOP) during the Long Term Planning Phase, from the long term definition of the airport performance targets to the consolidation and refinement of the AOP prior to the Medium/Short Term Planning Phase. In the Long Term Planning Phase, the performance targets based on the KPA should (will) be established in a collaborative way including the commitment from the stakeholders to match it. This reference becomes the target for the stakeholders and they have to start working to match it from the long term planning phase to the execution phase. In the Long Term Planning Phase, the Demand Capacity Balance is fed with the traffic forecast and the network capacity including 'air segment' capacity and 'ground segment' capacity. The main steps at this stage are: Check if the Network (NOP+AOP) is able to guarantee the agreed performance targets; If necessary, DCB actions will be implemented to match the performance targets. Capacity can be increased by implementing new resources and/or improving the operational procedures. The key element to manage Demand Capacity Balance at long term is predictability, both for demand and for capacity. The refinement of the AOP continues during the Medium/Short Term Planning Phase and the early Execution Phase. Description of these processes is out of the scope of the present Scenario and will be covered by the specific Scenario "Airport Operational Plan lifecycle for Medium-Short-Execution Phases". The scenario starts at the Long Term Planning Phase several years before the flight and ends at the beginning of Medium/Short Term Planning Phase, six months before the day of operation.	**Produced (OS-15)**
Elaboration of pre-defined solutions in the Long Term		**Not planned within Episode 3**

Table 25: Long Term Planning identified Operational Scenarios

10 ANNEX B: DETAILED USE CASE

The detailed description of those Use Cases will be provided through individual files (i.e. one per identified Use Case).

Use Case	Status
Agree on Operational Performance Framework	**Not Planned within Episode 3**
Agree on Societal Outcome Framework	**Not Planned within Episode 3**
Agree on Performance Enablers Framework	**Not Planned within Episode 3**
Agree on Service Levels	**Not Planned within Episode 3**
Establish/Update Network Needs	**Not Planned within Episode 3**
Establish/Update Network Traffic Demand	**Not Planned within Episode 3**
Plan Long Term Airspace Reservation Demand	**Not Planned within Episode 3**
Establish/Update Airspace Volume Usage Rules	**Not Planned within Episode 3**
Establish/Update Military Area Usage Rules	**Not Planned within Episode 3**
Establish/Update Route Usage Rules	**Not Planned within Episode 3**
Establish/Update UDPP Rules	**Not Planned within Episode 3**
Establish/Update Network Usage Rules	**Not Planned within Episode 3**
Define/Revise Airspace Infrastructure	**Not Planned within Episode 3**
Determine/Revise Possible Route Configurations	**Not Planned within Episode 3**
Determine/Revise Possible Airspace Volume Configurations	**Not Planned within Episode 3**
Define/Revise Airspace Available Capacity Plan	**Not Planned within Episode 3**
Establish Airspace Capacity Plan	**Not Planned within Episode 3**
Identify a Long Term Demand Capacity Imbalance	**Produced UC-46**
Select/Refine/Elaborate a DCB solution	**Not Planned within Episode 3**
Validate the DCB solution	**Not Planned within Episode 3**
Submit/Update/Cancel a List of SBTs	**Not Planned within Episode 3**
Request an Airport Slot	**Not Planned within Episode 3**
Submit/Update/Cancel a List of Flight Intentions	**Not Planned within Episode 3**
Define/Revise Airport Slot Allocation Policy	**Not Planned within Episode 3**
Define/Revise De-icing Allocation Policy	**Not Planned within Episode 3**
Define/Revise Preferences for Stand Allocation	**Not Planned within Episode 3**
Define/Revise Runway Allocation Policy	**Not Planned within Episode 3**
Define/Revise Stand Allocation Planning Policy	**Not Planned within Episode 3**
Define/Revise Taxiway Allocation Policy	**Not Planned within Episode 3**
Define/Revise Airport Infrastructure	**Not Planned within Episode 3**
Determine/Revise Possible De-icing Configurations	**Not Planned within Episode 3**
Determine/Revise Possible Runway Configurations	**Not Planned within Episode 3**
Determine/Revise Possible Stand Configurations	**Not Planned within Episode 3**

Use Case	Status
Determine/Revise Possible Taxiway Configurations	**Not Planned within Episode 3**
Determine/Revise Airport Capacity	**Not Planned within Episode 3**
Determine/Revise Airport Slots	**Not Planned within Episode 3**
Determine/Revise De-icing Capacity	**Not Planned within Episode 3**
Determine/Revise Runway Capacity	**Not Planned within Episode 3**
Determine/Revise Stand Capacity	**Not Planned within Episode 3**
Determine/Revise Taxiway Capacity	**Not Planned within Episode 3**
Establish/Update Airport Capacity Plan	**Not Planned within Episode 3**
Define/Revise Airport Catalogue of Solutions	**Not Planned within Episode 3**
Determine/Revise De-icing Resources Load Plan	**Not Planned within Episode 3**
Determine/Revise Runway Load Plan	**Not Planned within Episode 3**
Determine/Revise Stand Load Plan	**Not Planned within Episode 3**
Determine/Revise Taxiway Load Plan	**Not Planned within Episode 3**
Determine/Revise the Airport Operational Plan	**Not Planned within Episode 3**

Table 26: Use Cases summary

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11 ANNEX C: OI STEPS TRACEABILITY TABLE

Table 27 captures the SESAR Operational Improvements relevant to processes related to Long Term Planning.

OI Step	Description	Rationale	Related ATM Model Processes
From Traditional Airspace Classes to Airspace Categories *[L02-1]*			
Two Categories of Airspace [AOM-0103]	Gradual removal of Category K airspace to be changed into: - Category N, when ATS systems are capable of providing real-time data on the position and intentions of all aircraft within the applicable airspace; - Category U, in other cases.		A1.3.2.2-Define/Revise Airspace Infrastructure
From FUA to Advanced FUA *[L02-3]*			
Europe-wide Shared Use of Military Training Areas [AOM-0204]	TSA/TRA sharing concepts - including cross-border operations (CBO) and cross-border areas (CBA) - are extended at European level subject to political endorsement, especially in regard to the dependency on other States (e.g. reciprocity of training opportunities, need to identify and mitigate regulatory and procedural differences).	This improvement refers mainly to the multilateral/European/FAB dimension. The objective is to overcome existing national fragmentation in view of the Single European Sky implementation, and the expected harmonisation of airspace design and use at European level and to facilitate military-military cooperation between Armed Forces.	A1.2.2-Plan Long Term Airspace Reservation Demand A1.3.1.2-Define/Revise Airspace Usage Rules A1.3.2.2-Define/Revise Airspace Infrastructure A1.3.3.1.2-Define/Revise Possible Airspace Configurations A1.3.3.2.2-Define/Revise Airspace Available Capacity Plan
Facilitating OAT Transit *[L02-4]*			
OAT Trajectories [AOM-0304]	Interfacing Military Mission Trajectories with Business Trajectories		A1.2.2-Plan Long Term Airspace Reservation Demand A1.3.1.2-Define/Revise Airspace Usage Rules

OI Step	Description	Rationale	Related ATM Model Processes
User Preferred Routing Environment ***[L02-6]***			
Pre-defined ATS Routes Only When and Where Required [AOM-0403]	The route network will evolve to fewer pre-defined routes with the exploitation of advanced navigation capabilities and generalisation of FABs not constrained by FIR boundaries, allowing for more direct routes and free routing. Route constraints are removed along with the development of 4DT based operations. However, it is assumed that some form of route network will be retained to cater for specific requirements (e.g. non capable aircraft, transition of medium complexity operations to/from TMA lower airspace, segregation between managed and unmanaged airspace, military flight planning, etc.).	Cf. SESAR Concept of Operations.	A1.3.1.2- Define/Revise Airspace Usage Rules A1.3.2.2- Define/Revise Airspace Infrastructure A1.3.3.1.2- Define/Revise Possible Airspace Configurations A1.3.3.2.2- Define/Revise Airspace Available Capacity Plan
Increasing Flexibility of Airspace Management ***[L02-9]***			
Generic' (non-geographical) controller validations [SDM-0203]	Advanced automation support allows controllers to hold more generic validations (e.g. validation according to airspace type and tool-set) rather than validations for specific (geographic) sectors.	Generic validations will allow greater flexibility to match ANSP resources to predicted demand.	A1.3.1.2- Define/Revise Airspace Usage Rules A1.3.2.2- Define/Revise Airspace Infrastructure A1.3.3.1.2- Define/Revise Possible Airspace Configurations A1.3.3.2.2- Define/Revise Airspace Available Capacity Plan

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OI Step	Description	Rationale	Related ATM Model Processes
Transfer of area of responsibility for trajectory management [SDM-0202]	Improved interoperability allows areas of responsibility to be transferred between ATSUs according to demand identified through the publication of the RBT.	Current procedures where LoAs between adjacent ATSUs allow controllers to work outside of their own AoR are extended through improved interoperability to make the procedure more dynamic and flexible.	A1.3.1.2-Define/Revise Airspace Usage Rules A1.3.2.2-Define/Revise Airspace Infrastructure A1.3.3.1.2-Define/Revise Possible Airspace Configurations A1.3.3.2.2-Define/Revise Airspace Available Capacity Plan
Remotely Provided Aerodrome Control Service [SDM-0201]	Tower control service is delivered, where applicable, from an ATC facility elsewhere than at an affected airport. Air traffic controllers in this facility use information collected from remote tower sensor systems to perform real-time tower operations.	Enhanced ATC service can be offered to places not normally eligible for ATC, e.g. rural or smaller airports presently using only AFIS or nothing at all. Services will be easier and more cost-effective to provide, regardless of time and place.	A1.3.1.2-Define/Revise Airspace Usage Rules A1.3.2.2-Define/Revise Airspace Infrastructure A1.3.3.1.2-Define/Revise Possible Airspace Configurations A1.3.3.2.2-Define/Revise Airspace Available Capacity Plan
Collaborative Layered Planning Supported by Network Operations Plan ***[L03-1]***			
SWIM enabled NOP [DCB-0103]	The NOP is in fact a 4 dimensional virtual model of the European ATM environment. It is a dynamic, rolling picture that provides a relational image of the state of the ATM environment for past, present and future. The user, via the appropriate applications, is able to view this image, moving the window along the timeline and focusing on any particular aspect or aspects he or she is interested in.	The plan itself is the result of the complex interactions between the trajectories shared into the system, the capacity being offered, the actual and forecast MET conditions, resource availability, etc. and the automatic and manual negotiations that have been carried out. While a user will only need to see the part of the picture he is concerned with together with its broader implications in order to carry out an action on and with the plan, the applications themselves always use the totality of the information available in	A1.1.1-Agree on Operational Performance Framework A1.1.2-Agree on Societal Outcome Framework A1.1.3-Agree on Performance Enablers Framework A1.1.4-Agree on Service Levels A1.2.1-Forecast Traffic Demand A1.2.2-Plan Long Term Airspace

OI Step	Description	Rationale	Related ATM Model Processes
		the SWIM environment.	Reservation Demand A1.3.1.1-Define/Revise Airport Usage Rules A1.3.1.2-Define/Revise Airspace Usage Rules A1.3.1.3-Define/Revise Network Usage and Prioritisation Rules A1.3.2.1-Define/Revise Airport Infrastructure A1.3.2.2-Define/Revise Airspace Infrastructure A1.3.3.1.1-Define/Revise Possible Airport Configurations A1.3.3.1.2-Define/Revise Possible Airspace Configurations A1.3.3.2.1-Define/Revise Airport Available Capacity Plan A1.3.3.2.2-Define/Revise Airspace Available Capacity Plan A1.4.1.2-Identify Target Airspace Capacity A1.4.2.2-Define/Revise Airspace Catalogue of Solutions

OI Step	Description	Rationale	Related ATM Model Processes
Monitoring ATM Performance *[L04-2]*			
Sustainability Performance Management of the ATM Network [SDM-0103]	Network efficiency indicators are developed and monitored to describe the environmental performance of the ATM network.	Sustainability policies shall remain determined at local level, which means that pan-European harmonisation can only be achieved for the definition of a 'Sustainability framework for ATM'. The dissemination of useful practices is facilitated by harmonised framework that takes fully account of the local specificities and pressures exercised by the neighbouring communities and enables to evaluate the current progress made on this improvement axis by local communities.	A1.1.1-Agree on Operational Performance Framework A1.1.2-Agree on Societal Outcome Framework A1.1.3-Agree on Performance Enablers Framework A1.1.4-Agree on Service Levels
Civil-Military Cooperation Performance Assessment [SDM-0102]	Implement and monitor Military KPIs on Airspace Efficiency, Mission Effectiveness and Flexibility and agree civil-military KPIs. Agreed civil-military Key Performance Indicators and military Key Performance Indicators on airspace usage are monitored, deviations are highlighted and used to take suitable actions as to continuously enhance civil-military cooperation and coordination.	Today, there is no consistency and transparency in ATM performance measurement in respect to military operation. Civil-military KPIs do not exist yet.	A1.1.1-Agree on Operational Performance Framework A1.1.2-Agree on Societal Outcome Framework A1.1.3-Agree on Performance Enablers Framework A1.1.4-Agree on Service Levels
Network Performance Assessment [SDM-0101]	Key Performance Indicators are developed and monitored to determine how effective ATM is meeting users' demand and to act as driver for further improvements of the ATM system. Both users and providers are able to assess the actual operation (routes flown, usage of allocated airspace, runway utilisation, etc.) against the forecast operation and to assess the adequacy of the capacity provision.	Post flight analysis will act as a trigger to develop new or alternative scenarios with regard to sector configurations, system efficiency, etc.	A1.1.1-Agree on Operational Performance Framework A1.1.2-Agree on Societal Outcome Framework A1.1.3-Agree on Performance Enablers Framework A1.1.4-Agree on Service Levels

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OI Step	Description	Rationale	Related ATM Model Processes
Implementing Sustainable Operations at Airport *[L10-8]*			
Environmental Restrictions Accommodated in the Earliest Phase of Flight Planning [AUO-0801]	Environmental sustainability restrictions are becoming more and more a significant restriction for the execution and planning of the business trajectories of aircraft operators. It is in the interest of all ATM-stakeholders (aircraft operators and airports) to take into account the (most often local) environmental restrictions in the early phase of flight planning.	4D-Trajectory management is not only about the business intention of the aircraft operator. Environmental sustainability restrictions have to be taken into account.	A1.3.1.1- Define/Revise Airport Usage Rules A1.3.3.1.1- Define/Revise Possible Airport Configurations
Reduced Water Pollution [AO-0705]	De-icing stations are created where the fluids, spoiled on the apron, can be collected and treated. Furthermore, technical solutions for the bio-degradation of de-icing fluids are implemented. Application techniques are developed in collaboration with airlines to improve the anti-icing treatment on aircraft at the stands so that the amount of glycol released in the storm water can be reduced.	De-icing fluids are spread out over the wing and tail surfaces of the aircraft. A large part of these fluids will drop of the aircraft at the de-icing stand. If the fluid from the stand is not collected and treated, pollution of ground and surface water will happen.	A1.3.1.1- Define/Revise Airport Usage Rules A1.3.2.1- Define/Revise Airport Infrastructure A1.3.3.1.1- Define/Revise Possible Airport Configurations
Aircraft Fuel Use and Emissions Management at and around Airports [AO-0704]	The objectives are to ensure that: - Aircraft fuel use and gaseous emissions (both climate change and air quality) are minimised both in the air and on the ground, - The impacts considered associated with an airport reflect the emissions from that airport and not emissions from third party sources, - Gaseous emissions from airport-related non-aircraft sources (e.g. ground transport) are minimised and that where appropriate these reductions allow growth in aircraft movements, - Emissions are not emitted in locations where they can unnecessarily adversely impact local residents and that where this can not be avoided it is minimised and mitigated for, - any constraints, non-optimal procedures or economic burdens that are imposed strike the most appropriate balance between social, economic and environmental imperatives. Where a bigger strategic gain can be won by the voluntary adoption of lesser restrictions, that - These	Performance improvements gained are not wasted by failure to protect airport environmental capacity.	A1.3.1.1- Define/Revise Airport Usage Rules A1.3.2.1- Define/Revise Airport Infrastructure A1.3.3.1.1- Define/Revise Possible Airport Configurations

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OI Step	Description	Rationale	Related ATM Model Processes
	are developed following the balanced approach and with the full input from all relevant ATM stakeholders, and - The option with the best sustainability balance is selected.		
Aircraft Noise Management and Mitigation at and around Airports [AO-0703]	The objectives are to ensure that: - Aircraft noise emissions are minimised both in the air and on the ground, - Any noise impact falls on the least number of people, - Unnecessary noise driven limits, restrictions or non-optimal operations are not imposed, - Any constraints, non-optimal procedures or economic burdens that are imposed strike the most appropriate balance between social, economic and environmental imperatives. Where a bigger strategic gain can be won by the voluntary adoption of lesser restrictions, that: - These are developed following the balanced approach and with the full input from all relevant ATM stakeholders, and - The option with the best sustainability balance is selected.	Performance improvements gained are not wasted by failure to protect airport environmental capacity.	A1.3.1.1-Define/Revise Airport Usage Rules A1.3.3.1.1-Define/Revise Possible Airport Configurations

Table 27: Operational improvements scoped by L

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