Airport Detailed Operational Description (DOD) Step 1 – Yearly Update 2013

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This document details and refines the SESAR Airport Operations Concept for Step 1 “Time Based Operations”.

“Time Based Operations” is a building block for the implementation of the SESAR 2020 concept and is focused on flight efficiency, predictability and environment.

It follows on from SESAR Deployment Baseline.

This first Yearly Update version of the document aims to present the most accurate overview of concepts covering the scope of OIs devoted to WP6. The Airport DOD Step 1 will continue to evolve every year according to the evolution of both the Road Map and the results of Primary Project’s (or OFAs) validations. The DOD can be seen as guiding principles established at a certain time of SESAR Programme which will be further enhanced with the developments and outcomes of the WP6 primary projects.

Authoring & Approval

Prepared By		
Name & company	Position / Title	Date
Alan Ross Groskreutz – AENA	Contributor	20/12/2013
Amalia Garcia Alonso – AENA	Contributor	20/12/2013
Carmen María Andreo Almansa – AENA	Contributor	20/12/2013
Francesco Javier Fernandez de Liger – AENA	Contributor	20/12/2013
Bernard Arini – DSNA	Contributor	20/12/2013
Judicaël Bédouet – DSNA / ONERA	Contributor	20/12/2013
Sandrine Gnassou – DSNA	Contributor	20/12/2013
Anthony Inard – Eurocontrol	Contributor	20/12/2013
Stefano Antonio Iannucci – SELEX	Contributor	20/12/2013
Andrea Cosmi – SELEX	Contributor	20/12/2013
Matteo Caruso – SELEX	Contributor	20/12/2013
Daniel Ferro – Airbus	Contributor	20/12/2013
Jurgen Busink – SEAC	Contributor	20/12/2013
Rob ten Hove – SEAC	Contributor	20/12/2013
Andy Knight – SEAC	Contributor	20/12/2013
Stephen Mathewson – SEAC	Contributor	20/12/2013
Rolf Wyss – SEAC	Contributor	20/12/2013
Thorsten Astheimer – SEAC	Contributor	20/12/2013
Frank Pötsch – SEAC	Contributor	20/12/2013
Denys Bourguignat – SEAC	Task Lead	20/12/2013

Reviewed By		
Name & company	Position / Title	Date
Project team P6.2		
SJU/IS, WPB4.1, WPB4.2, WP4.2, WP5.2, Airspace Users, OFA Coordinators (01.01.01, 01.01.02, 01.02.01, 01.02.02, 01.03.01, 04.01.01, 04.02.01, 05.01.01, 06.01.01, 06.03.01)		
Alan Ross Groskreutz – AENA	Project Manager	
Denys Bourguignat – SEAC	Task lead	

Approved By		
Name & company	Position / Title	Date
Alan Ross Groskreutz – AENA	Project Manager	19/12/2013
Daniel Ferro – Airbus	Contributor	
Bernard Arini – DSNA	Contributor	19/12/2013
Anthony Inard – Eurocontrol	Contributor	20/12/2013
Stefano Antonio Iannucci – SELEX	Contributor	20/12/2013
Jurgen Busink – SEAC	SEAC PoC	19/12/2013

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Executive summary

This document is the first update of the Step 1 DOD (corrected version) issued on February 20, 2012. The high level objectives of the Step 1 DOD and the structure of the document have been updated and have not been significantly modified.

This Detailed Operational Description document provides the description of an Airport Operational concept aiming to achieve the SESAR Step 1 (Time Based) objectives.

During Step 1, the process to elaborate the DOD has also been bottom-up. In other words; it has been built from the various contributing OSEDs, generating high level requirements from the lower level requirements.

The DOD describes the concept as it will be at the end of Step 1. The Primary projects, as well as the validation strategies, describe and develop the ways to reach that Step 1 end level. For that reason OI Steps that describe interim solutions and ways of working, which will be superseded by other OI Steps in Step 1, are not part of this DOD but might be part of the Validation Strategy and Primary Project Development.

This first Yearly Update of this document aims to present the most accurate overview of concepts covering the scope of OIs devoted to WP6. The Airport Step 1 DOD will continue to evolve every year according to the evolutions of both the Integrated Road Map and the results of Primary Projects (or OFAs) validations. The DOD can be seen as guiding principles established at a certain time of the SESAR Programme which will be further enhanced with the developments and outcomes of the WP6 primary projects.

DOD Step 1 development

"Time Based Operations" is the building block for the implementation of the SESAR 2020 concept and is focussed on efficiency, predictability and the environment. It follows on from SESAR Deployment Baseline (DB).

"Time Based Operations" encompasses SESAR Definition Phase Service Level 2. The goal is a synchronised and predictable European ATM system, where partners and stakeholders are aware of the business and operational situations and collaborate to optimise the Airport Operations.

Airport operations in Step 1 are driven by enhanced stakeholders' participation in a rolling collaborative process, by continuously sharing the latest demand and capacity intentions, defining targeted measures in the airport operations plan, realising the plan taking into account operational updates, evaluating operations against performance targets and updating the plan.

Fundamental to Step 1 improvements is the integration of airport operations in the network.

The SESAR Airport Concept Step 1 foresees the following key elements:

- Increased surface and runway safety,
- Optimum surface management and arrival and departure sequence planning,
- Accurate arrival and departure times and separation,
- Optimum use of existing airport infrastructure and available capacity,
- Reducing noise pollution and gas and particulate emission through operational improvements,
- Better relations with neighbours (communities and local authorities),
- Additions and changes to airport infrastructure,
- Optimum use of on-board devices / systems,
- Improved efficiency by shared information and collaborative decision making leading to improved collaborative work between ANSP, Airspace User and Airport on operational and environmental issues,
- Improved resilience to adverse conditions,
- Improved weather forecasts.

While the above are essentially issues local to the airport they will be developed and implemented to support the system wide goals and benefits.

1 Introduction

1.1 Purpose of the document

The Detailed Operational Description (DOD) provides a top-down view of the ATM Phases as guidance to the Primary project developing Operational Services and Environment Definition (OSED) and Safety and Performance Requirements (SPR). This covers scenarios and associated use cases, Processes and Services (P&S), high-level requirements and environment descriptions. This document is the first update of the 6.2 Step 1 DOD.

Figure 1-1 presents the DOD within the overall documentation, together with the SESAR Projects responsible for their production and maintenance.

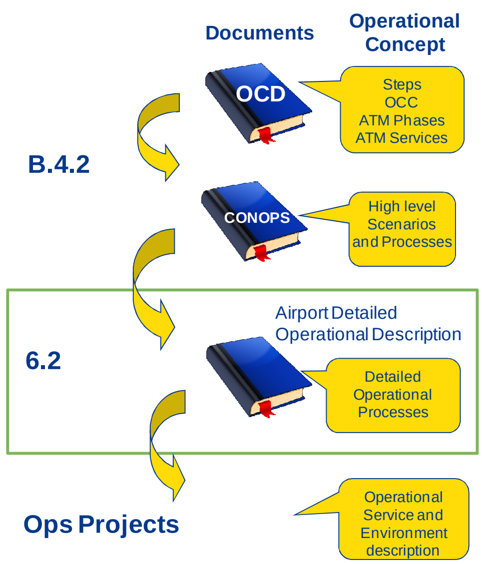

Figure 1-1: The 4 types of SESAR Operational Concept documents

The purpose of the update task is to set up a reference document which integrates the changes that have occurred since the delivery of the previous version (WP6.2 – D07 – Airport Detailed Operational Description (DOD) Step 1 – Edition 01.00.01), delivered on February 20, 2012. There are two ways for updating:

- Top-down, by taking into account the modifications done at higher level (especially Road Map and CONOPS),
- Bottom-Up, by taking into account the development of concepts elaborated by the Primary Projects, either the concept itself via the OSED or the applicability of the concept through the validation exercises.

The above chain is then completed as follows:

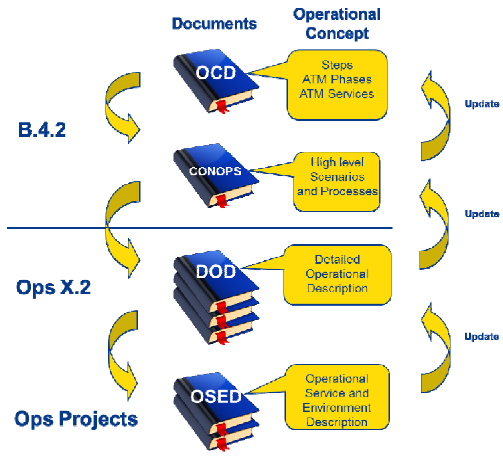

Figure 1-2: The 4 types of SESAR Operational Concept documents

The review of OSED, SPR and INTEROP will be referenced against the DOD to provide evidence of coherency and maturity. Specifically, requirements will be captured and agreed through the SEMP (Requirements Management (RM) process), , and OSEDs and their use cases will be reviewed and compared against the referenced scenarios in the DOD and agreed.

This activity is undertaken for both release preparation and validation reviews using the accumulated evidence referenced through the DOD.

For Step 1, the DOD is guided by the Concept of Operations (SESAR– D66-B4.2 – SESAR Concept of Operations Step 1 ed 2013 – 01.01.00-22/11/2013" [11]).

The DOD describes the concept as it will be at the end of Step 1. The Primary projects as well as the validation strategies describe and develop the way to reach that Step 1 end level. For that reason OI Steps that describe interim solutions and ways of working, which will be superseded by other OI Steps in Step 1, are not part of this DOD but might be part of the Validation Strategy and Primary Project Development.

The submission of this version of the document certainly does not mean that the Airport DOD Step 1 is fixed in concrete and that the primary projects have to arrange their development around the content of this DOD. The DOD can be seen as guiding principles which will be further enhanced with the developments and outcomes of the WP6 primary pro•jects. The Airport DOD Step 1 is therefore a living document that will continue to be updated over the Step 1 validation life cycle.

1.2 CONOPS Reference

The SESAR Concept of Operations "SESAR– D66-B4.2 – SESAR Concept of Operations Step 1 ed 2013 – 01.01.00-22/11/2013" [11] defines the main aspects of the changes expected from SESAR Programme for ATM Operations:

Moving from Airspace to Trajectory Management

The central pillar of SESAR is the efficient management of the European ATM network in order to accommodate, as far as possible and in the context of network performance targets, Airspace Users' preferred trajectories from planning through execution gate to gate. Trajectories will be expressed in all 4 dimensions (4D) and flown with significantly higher accuracy than today.

In Step 1 User preferred routing[1], without pre-defined routes, is applicable in low and medium complex airspace. More detailed information about the flight is available for network planning through the use of the Extended Flight Plan and improved OAT Flight Plan. Aircraft derived data or onboard trajectory information is shared with the ground system to feed the ground tools. This improves predictability and consistency between air and ground trajectories.

[1] Including free routing / direct routing

Conflict Management

Thanks to the improvement of the trajectory accuracy and the related information better shared between Air and Ground, the tools supporting Conflict Alert and Collision Avoidance are improved.

Thanks to the improvement of the trajectory accuracy and the related information better shared between Air and Ground the tools supporting Conflict Alert and Collision Avoidance are improved.

Conflict Detection Tools look-ahead time is increased. STCA is especially better adapted to TMA operations. ACAS is improved thanks to the reduction of inappropriate Resolution Advisory (RA) alerts occurring during level off and also benefits from automation in the execution of the RAs.

Traffic Synchronisation

AMAN is extended to support the management of arrival flows further out from the destination airport. DMAN servicing multiple airports enable a constant delivery of flights from multiple airports merging into the En-route phase of flight.

AMAN and DMAN are synchronised by including the operations of close proximity airports in the arrival metering before departure to constrained destination airports.

On-board trajectory information down linked by capable aircraft (EPP and ETA min/max) enhances the accuracy of AMAN and other controller support tools.
Controlled Time of Arrival (CTA) is proposed by the AMAN when needed, implemented by Controllers and met by aircraft with high accuracy, improving the performance and reliability of arrival sequencing.

ASAS spacing supports tactical actions to achieve optimum arrival spacing.

More information is available to Controllers and Flight Crews to ensure a safe, expeditious and efficient movement on the ground. The coordination of AMAN/DMAN with surface management operations supports efficient mixed mode operations (arrivals and departures) on a single runway and dependent parallel runway operations.

Network and Airport Collaborative Management

Airport Collaborative Decision Making (A-CDM) processes progressively build the Airport Operations Plan (AOP) and Network Operation Plan (NOP) through the sharing of more and more up-to-date and precise data as the day of operations approaches.

User Driven Prioritisation Process (UDPP) is mainly used to address airlines constraints in reduced airports capacity situation, with a primary focus on addressing departure congestion in the planning phase, and it is used as well for coping with constraints in the En-route airspace and arrival airport.

The use of Target Time Over/Arrival (TTO/TTA) improves the effectiveness and the smoothing effect of regulations on the demand in congested airports and areas.

A new Variable Profile Area (VPA) design principle, based on flexible allocation and management of small fixed predefined modules of airspace, ensures that civil and military airspace users' requirements are met and properly balanced via CDM process.

Dynamic DCB / Short-Term ATFCM Measures manage traffic peaks and complexity, to smooth ATC workload through the application of fine-tuned measures close to the real time operations.

AOP and NOP ensure the best overall system outcome by linking key airport operational parameters of the turnaround giving a better situational awareness of the aircraft progress at the airport to Airspace Users, Airport ATC, ANSPs and Network. A-CDM is extended to include interconnected regional airports and affects all IFR flights.

Enhanced route Structures

An efficient fixed airspace structure combined with advanced airborne and ground system capabilities is deployed.

TMAs are optimised through Performance Based Navigation (PBN) using Advanced RNP. The aim is to generate route structures in lateral dimensions (2D), while the vertical dimensions of the flight remains managed tactically by Controller.

RNP procedures facilitate the increased use of Continuous Climb Operations (CCO) and Continuous Descent Operations (CDO), improving the flight efficiency and reducing among other things, fuel burn, CO_2 emissions and noise.

Airport Integration and Throughput

Flight Crew Enhanced Vision provides a clearer vision of landing and ground operations in Low Visibility Conditions. Low Visibility Procedures and Precision Approaches using initial CAT II/III GBAS are used more systematically.

Airport surface safety is enhanced thanks to increased situation awareness and the introduction of conflict detection tools and alerting systems for Controller, Flight Crew and vehicle drivers. Surface management and predictability of surface operations are improved thanks to the automatic generation of taxi routes, which are shared between Tower Controllers and can be provided via datalink to aircraft and vehicles in order to be displayed on board. Situation awareness of ATCOs, flight crews and vehicle drivers is improved, particularly in low visibility conditions.

Time based Separation (TBS) dynamically adapted to the dissolving of wake turbulence on final approach, aids towards consistent and accurate delivery between arrival aircraft.

Remotely Provided Air Services for Aerodromes

Remotely Operated Aerodrome Air Traffic Services is provided from a remote location, significantly reducing the infrastructure costs by co-locating remote tower modules for a number of airports centralized at a single site.

1.3 Scope

The operational content deals with the following subset of Business Needs (BN) and Focus Areas (OFA), where the highlighted OFAs are identified as primary for this DOD.

Business Needs	Operational Focus Area (OFA)
BN02 Airport Integration and Throughput	OFA01.01.01 LVPs using GBAS
	OFA01.01.02 Pilot Enhanced Vision
	OFA01.02.01 Airport Safety Nets
	OFA01.02.02 Enhanced Situational Awareness
	OFA01.03.01 Enhanced Runway Throughput
	OFA04.02.01 Integrated Surface Management
	OFA05.01.01 Airport Operations Management
	OFA06.03.01 Remote Tower
BN01 Traffic Synchronisation	OFA02.02.04 Approach Procedures with Vertical Guidance
	OFA04.01.01 Integrated Arrival/Departure Management at Airport
BN03 Moving from Airspace to 4D Trajectory Management	OFA03.01.04 Business and Mission Trajectory
BN04 Network Collaborative Management and Dynamic Capacity Balancing	OFA05.03.06 UDPP
	OFA05.03.07 Network Operations Planning
	OFA06.01.01 CWP Airport
	ENB02.01.01 SWIM
	ENB02.01.01 AIM/MET

Table 1-1: BNs and OFAs addressed in the DOD

1.4 Intended Readership

This DOD is intended first for WP6 primary projects, WP5 primary projects addressing departure and approach aspects, B4.2, B4.1 and B5.

More precisely, the process dealing with DOD refining and updating in the frame of SESAR Step 1 involves the following primary operational projects:

06.03.01	The Airport in the ATM environment,
06.03.02	Airport ATM performance (execution phase),
06.05.01	Airport Operations Plan Definition,
06.05.02	Airport Operations Plan Validation,
06.05.03	Airport Capacity and Flow Management,
06.05.04	AirPort Operations Centre (APOC) definition,
06.05.05	Integration of MET Data into APOC processes,
06.06.01	Operations in adverse weather and/or exceptional operating conditions / recovery management,
06.06.02	Integration of airport - airline/ground handlers - ATC processes (incl. turn-round) in ATM,
06.07.01	Airport safety support tools for pilots, vehicle drivers and controllers,
06.07.02	A-SMGCS Routing and planning functions,
06.07.03	A-SMGCS Guidance Function,
06.08.01	Flexible and Dynamic Use of Wake Turbulence Separations,
06.08.02	Enhanced Runway Management Through Optimised Braking Systems,
06.08.03	Separation minima reductions across flight phases,
06.08.04	Coupled AMAN/DMAN,
06.08.05	GBAS operational implementation,
06.08.07	Improved weather resilience - re-classify criteria for Low Visibility Procedures LVP),
06.09.02	Advanced integrated CWP (A-CWP),
06.09.03	Remote & virtual TWR,
09.49	Global Interoperability - Airborne Architecture and Avionics Interoperability Roadmap
11.01	Flight and Wing Operations Centres
11.02	Meteorological Services (MET) Co-ordination & Management.

Secondly this document is aimed at the SESAR community in general, with a special relevance to:

- P5.2: Consolidation of Operational Concept Definition and Validation (in TMA); a close coordination is required between the two x.2 projects considering many overlaps or common CONOPS topics between Airport and TMA areas.
- P7.2: Co-ordination and consolidation of concept definition and validation (NOP) ; coordination is required between the two x.2 projects considering that 7.2 is the focal point to consolidate the NOP issues addressed by 6.2. Moreover, the interaction between airport and runway management has to be coordinated with the UDPP concept.
- P8.1: Information Models Development and P8.3: Information Service Models Development ; co-ordination is required between the three projects in order to share the same views on the Information Models and Information Service Models matching the Airport Operations and then depicted in DOD modelling and description.
- P9.13 D-TAXI and P9.14 On-board Alerts to ensure consistency. Aircraft system functions being derived from operational concept requirements.
- P12.1.7 and the P12.x.y “mirror” system projects focusing on Airport System definitions and development. These technical projects must build a traceability matrix between the OSED, SPR

and their system requirements, making it possible to check the coverage level with regard to the CONOPS.

1.5 Structure of the document

Chapter 1	introduces the document,
Chapter 2	describes the previous operating methods, the new methods and the differences between them,
Chapter 3	describes the operational environments, roles and actors connected to airport operations,
Chapter 4	describes the operational scenarios and identifies the related use cases,
Chapter 5	describes the processes and services associated with the chapter 4 scenarios,
Chapter 6	details the operational and performance requirements at the airport level,
Chapter 7	details the OI Steps, OFA and OSED mapping associated with this document,
Chapter 8	outlines outstanding issues,
Chapter 9	lists appropriate references,
Annex A	lists OIs changes between previous version and the update,
Annex B	BPMN (Business Process Model and Notation) elements.

1.6 Background

The first edition of the 6.2 Step 1 DOD was delivered on November 18th, 2011 and was modified following recommendations for consistency. Then, the final deliverable D07 "Airport Detailed Operational Description Step 1 – Ed.01.00.01" was issued on February 20th, 2012, with the complementary name "corrected version – V2". This update aims to reflect mainly the consequences of the changes in the Integrated Roadmap (OIs) and additionally a few modifications incurred by the development of the PPs.

The next yearly update, expected by end of 2014, will be more focused on the bottom-up approach by fully integrating both the developments of PPs and the results of consistency check of OSEDs and validation reports.

1.7 Acronyms and Terminology

1.7.1 Acronyms

A list of the important terminology and acronyms used in this document is presented below; they are taken, when available, from the SESAR ATM Lexicon. In case of any difference between the definitions provided here and the SESAR Lexicon, the SESAR Lexicon should be taken as the authority.

Term	Definition
A-CDM	Airport Collaborative Decision Making
A-CWP	Advanced Controller Working Position
A-DPI	ATC Departure Planning Information Message
ACARS	Aircraft Communications Addressing and Reporting System
ADFT	Actual Departure Fix Time
ADS-B	Automatic Dependant Surveillance - Broadcast
ADS-C	Automatic Dependant Surveillance – Contract
AFIS	Aerodrome Flight Information Service
AFISO	Aerodrome Flight Information Service Officer
AIAT	Actual Initial Approach Fix Time
AIBT	Actual In Block Time
AIP	Aeronautical Information Publication
ALDT	Actual Landing Time
AMAN	Arrival Manager
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
AOBT	Actual Off-Block Time
AOC	Airline Operations and Control Centre
AOP	Airport Operations Plan
APOC	Airport Operations Centre

Term	Definition
A-SMGCS	Advanced Airport Surface Movement Guidance and Control System
A-VDGS	Advanced Visual Docking Guidance System
ARES	Airspace Reservation
A-RNP	Advanced Requirements Navigation Performance
ASAS	Airborne Separation Assistance System
ASMA	Arrival Sequencing and Metering Area
ATC	Air Traffic Control
ATFCM	Air Traffic Flow and Capacity Management
ATIS	Automatic terminal Information Service
ATM	Air Traffic Management
ATMAP	ATM Airport Performance
ATOT	Actual Take Off Time
ATS	Air Traffic Service
ATSAW	Airborne Traffic Situational Awareness
ATV	Airport Transit View
AU	Airspace User
AUO	Airspace User Operations
BDT	Business Development Trajectory
BT	Business Trajectory
CAA	Civil Aviation Authority
CAVOK	Ceiling and Visibility OK
CCO	Continuous Climb Operations
CDM	Collaborative Decision Making
CDO	Continuous Descent Operations
CODA	Central Office of Delay Analysis
CONOPS	Concept of Operations
CPDLC	Controller Pilot Data Link Communication
CTA	Controlled Time of Arrival
CTOT	Calculated Take Off Time
DCB	Demand and Capacity Balancing
DMAN	Departure Manager
DOD	Detailed Operational Description
DPI	Departure Planning Information message
D-OTIS	Data-link Operational Terminal Information Service
D-TAXI	Data-link TAXI clearance delivery
EASA	European Aviation Safety Agency
EDFT	Estimated departure Fix Time
EFPL	Extended Flight Plan
EIAT	Estimated Initial Approach Fix Time
EIBT	Estimated In-Block Time
ELDT	Estimated Landing Time
EOBT	Estimated Off Block Time
ETA	Estimated Time of Arrival
ETOT	Estimated Take Off Time
EXIT	Estimated Taxi-In Time
EXOT	Estimated Taxi-Out Time
FAB	Functional Airspace Block
FATO	Final Approach and Take-Off paths for rotorcraft
FMS/MMS	Flight Management System/Mission Management System
FOC	Flight Operations Centre
FOD	Foreign Object Debris
GA	General Aviation
GBAS	Ground Based Augmentation System
GLS	Global Landing System
GNSS	Global Navigation Satellite Service
HMI	Human-Machine Interface
IAF	Initial Approach Fix
ICAO	International Civil Aviation Organisation
ILS	Instrument Landing System
IP	Implementation Package
IR	Implementing Rule
KPA	Key Performance Areas

Term	Definition
LVC	Low Visibility Conditions
LVP	Low Visibility Procedures
MET	Meteorological
MLS	Microwave Landing System
NM	Network Manager
NMF	Network Management Function
NMOC	Network Manager Operations Centre
NOP	Network Operations Plan
NOTAM	Notice to Airman
OCD	Operation Concept Document
OFA	Operational Focus Area
OI Step	Operation Improvement Step
P&S	Process and Services
PDI	Performance Driver Indicator
RTM	Remote Tower Module
R&D	Research and Development
R/T	Radio Telephony
iRBT/iRMT	Initial Reference Business Trajectory / Reference Mission trajectory (Step 1)
RNP	Required Navigation Performance
ROT	Runway Occupancy Time
R/T	Radio Telephony
RWSL	Runway Status Lights
SARPS	Standards and Recommended Practices
iSBT/iSMT	Initial Shared Business Trajectory / Shared Mission Trajectory (Step 1)
SES	Single European Sky
SESAR	Single European Sky ATM Research
SIAT	Scheduled Approach Fix Time
SIBT	Scheduled In Block Time
SID	Standard Instrument Departure
SIGMET	Significant Meteorological Information
SL	Service Level
SLDT	Scheduled Landing Time
SOBT	Scheduled Off Block Time
SNI	Simultaneous Non-Interfering operations (between rotorcraft and fixed wings)
SSC	Single Sky Committee
SSR	Secondary Surveillance Radar
STAR	Standard Instrument Arrival
STOT	Scheduled Take-Off Time
SWIM	System Wide Information Management
TDFT	Target Departure Fix Time
TIAT	Target Initial Approach Fix Time
TIBT	Target In Block Time
TLDT	Target Landing Time
TMA	Terminal Manoeuvring Area (also Terminal Control Area)
TOAT	Target Off-Block Approval Time
TOBT	Target Off-Block Time
TSAT	Target Start-up Approval Time
TTA	Target Time of Arrival
TTOT	Target Take-off Time
TWR	Tower
UDPP	User Driven Prioritization Process
WT	Wake TurbulenceTurbulence

Table 1-2 Acronyms

1.7.2 Terminology

Actual Initial Approach Fix Time (AIAT): The actual time the aircraft crosses the Initial Approach Fix (IAF) – or any other pre-defined point within the TMA (e.g. TMA entry point).
Actual In-block Time (AIBT): The actual date and time when the parking brakes have been engaged at the parking position.

Actual Landing Time (ALDT): The actual date and time when the aircraft has landed (touch down).
Actual Off-Block Time (AOBT): The actual date and time the aircraft has vacated the parking position (pushed back or on its own power).
Actual Take Off Time (ATOT): The time that an aircraft takes off from the runway (Equivalent to ATC ATD–Actual Time of Departure, ACARS = OFF).
Advanced Surface Management Guidance and Control System (A-SMGCS): A system providing routing, guidance and surveillance for the control of aircraft and vehicles in order to maintain the declared surface movement rate under all weather conditions within the aerodrome visibility operational level (AVOL) while maintaining the required level of safety.
Airport Operations Plan (AOP): A single, common and collaboratively agreed rolling plan available to all airport stakeholders whose purpose is to provide common situational awareness and to form the basis upon which stakeholder decisions relating to process optimisation can be made.
Airport Transit View (ATV): the description of the "visit" of an aircraft to the airport. It consists basically of three separate sections: -The final approach and inbound ground section of the inbound flight, -The turn-round process section in which the inbound and the outbound flights are linked, -The outbound ground section and the initial climb segment of the outbound flight.
Air Traffic Control clearance: Authorization for an aircraft to proceed under conditions specified by an Air Traffic Control Unit. *Note 1.— For convenience, the term “air traffic control clearance” is frequently abbreviated to “clearance” when used in appropriate contexts.* *Note 2.— The abbreviated term “clearance” may be prefixed by the words “taxi”, “take-off”, “departure”, “en-route”, “approach” or “landing” to indicate the particular portion of flight to which the air traffic control clearance relates.*
Air Traffic Control instruction: Directives issued by Air Traffic Control for the purpose of requiring a pilot to take specific action.
The term **airspace user** mainly refers to the organizations operating aircraft which includes rotorcraft, and their pilots. *Three classifications of airspace users are considered:* *1. ICAO-compliant manned flight operations (the largest segment by far): ICAO-compliant manned flight operations are those conducted in accordance with ICAO provisions (e.g. SARPs, PANS). ICAO-compliant airspace users include:* *a) all civil aircraft operators engaged:* *§ in commercial air transport -scheduled and non-scheduled (passenger transport, mail and cargo services, emergency medical services, etc...),* *§ in business and general aviation: air taxi operators, aerial work, private air transport, sporting and recreational aviation, etc... ; and* *b) the portion of States’ users operating State aircraft using civil air traffic rules (GAT)* *2. ICAO non-compliant manned flight operations: ICAO non-compliant manned flight operations are those which cannot comply for operational or technical reasons (e.g.: conducted by State aircraft -OAT-)* *3. Flight operations of unmanned aerial vehicles (UAVs): Flight operations of unmanned aerial vehicles (UAVs), a growing segment of airspace users, include civil and military applications of UAV technology.*
Cleared Route: The part of a route that has been approved by an ATCO for a mobile in his/her area of responsibility.
Departure Clearance: Instructions which specify the aircraft identification, clearance limit; route of flight; level(s) of flight for the entire route or part thereof and changes of levels if required, any necessary instructions or information on other matters such as SSR transponder operation, approach or departure manoeuvres, communications and the time of expiry of the clearance (cancelled if the flight has not been started) and in addition runway and Standard Instrument Departure (SID).
Estimated Initial Approach Fix Time (EIAT): The estimated time the aircraft crosses the Initial Approach Fix (IAF) – or any other pre-defined point within the TMA (e.g. TMA entry point).

Estimated In-Block Time (EIBT): The estimated time that an aircraft will arrive in-blocks. (Equivalent to Airline/Handler ETA – Estimated Time of Arrival). *The estimated in-block time is based on the flight progress and updated continuously as the aircraft approaches the airport, lands and taxies to its stand.*
Estimated Landing Time (ELDT): The estimated time that an aircraft will touchdown on the runway (Equivalent to ATC ETA–Estimated Time of Arrival = landing).
Estimated Off-block Time (EOBT): The estimated time at which the aircraft is foreseen to commence movement associated with departure (ICAO). *Derived from the filed Flight Plan / iSBT. It serves to provide a reference time first issued by the Aircraft Operator and updated according to actual events at airport for determining whether or not a new TOBT shall be agreed upon. The EOBT serves to determine the ETOT used to plan ATC operations for the flight.*
Estimated Take-Off Time (ETOT): The Estimated Take-Off Time an aircraft is expected to commence its take-off roll.
IATA Schedules Conference: The Schedules Conference is a working conference. As part of the scheduling process, the purpose of this voluntary assembly of both IATA and non-IATA airlines worldwide is to provide a forum for the allocation of slots at fully coordinated airports (Level 3), and for the reaching of consensus on the schedule adjustments necessary to conform to airport capacity limitations (Level 2). The bi-annual (June and November) Schedules Conference is IATA's largest event. The Conference operating procedures are published in the Worldwide Scheduling Guidelines.
Landing Clearance: Instruction which specifies the runway, surface wind, (visibility), the actual runway conditions and the clearance to land on this runway; communication may be either via Data Link or via voice communication (R/T): the selection being dependent upon ICAO SARPS and local procedures (if an aircraft is still airborne, the ATM system may uplink the planned “exit” and “taxi routing” data to the flight deck).
Minimum Turn-round Time (MTTT): The minimum turn-round time agreed with an AO/GH (aircraft operator/ground handler) for a specified flight or aircraft type. *The minimum time required to perform the necessary ground handling processes between in-blocks and off-blocks. This MTTT may be different per aircraft type as also per type of flight (European / intercontinental / cargo) and be based on airline / operator demands.*
Mobile: Any cooperative aircraft / vehicle operating in the movement area of the aerodrome (source EUROCONTROL A-SMGCS Implementation Levels)
Movement area:
Network Operations Plan (NOP): A set of information derived and reached collaboratively both relevant to, and serving as a reference for, the management of the Pan-European network in different timeframes for all ATM stakeholders, which includes, but is not limited to, targets, objectives, how to achieve them, anticipated impact.
Planned Route: Part of an aerodrome used for take-off, landing, and taxiing of aircraft. Consisting on the manoeuvring area and the apron(s) (source ICAO Doc. 9830)
Pre-departure Information: the Pre-departure information is delivered during the pre-departure phase and contains the designated runway (potentially the SID), and the most recent information regarding airport conditions, meteo forecasts, SIGMET (if any) and NOTAM. This information is available through the D-OTIS.
Push-back/start up Approval: the Push-back/start up approval is issued by Tower Ground Controller (or Apron Manager) and indicates that flight crew is now allowed to push-back and move the aircraft following the push-back path delivered with the approval. The authorisation to move is restricted to this movement only.
Remote Tower Module: (RTM) is the term for the complete module including both the CWP(s) and the Visual Reproduction display screens.
Runway Exit: A designated turn-off or high speed turn-off from the runway that leads the aircraft out of the runway and out of the runway safety strip to the apron areas of an airport.

Runway Holding Position: A designated position intended to protect a runway, an obstacle limitation surface, or an ILS/MLS critical/sensitive area at which taxiing aircraft and vehicles shall stop and hold, unless otherwise authorized by the aerodrome control tower.
Scheduled Times: Scheduled Times are milestone events published in a schedule or the initial flight plan (SOBT and SIBT) and the times of other airport events estimated from these times (STOT and SLDT). These times are used for schedule creation and planning purposes.
Scheduled In-Block Time (SIBT): The planned arrival time of the flight according to the airspace users schedule.
Scheduled Landing Time (SLDT): The Scheduled Landing Time is used in airport performance monitoring activities It is derived from the SIBT and an estimate of the in-bound taxi time or the SOBT and forecast flight duration
Scheduled Off-Block Time (SOBT): The planned departure time of the flight according to the airspace users schedule.
Scheduled Take-Off Time (STOT): The Scheduled Take-Off Time is used in airport performance monitoring activities. It is derived from the SOBT and an estimate of the out-bound taxi time.
Target Initial Approach Fix Time (TIAT): The agreed (planned) time the aircraft should cross the Initial Approach Fix (IAF) – or any other pre-defined point within the TMA (e.g. TMA entry point).
Target In-block Time (TIBT): The agreed time the aircraft should arrive at the parking position.
Target Off-block Time (TOBT): The time that an Aircraft Operator or Ground Handler estimates that an aircraft will be ready, all doors closed, boarding bridge removed, push back vehicle available and ready to start up / push back immediately upon reception of clearance from the TWR (A-CDM Manual).
Target Start-up Approval Time (TSAT): The time provided by ATC taking into account TOBT, CTOT and/or the traffic situation that an aircraft can expect to receive start-up / push back approval. *Note: The actual start up approval (ASAT) can be given in advance of TSAT (A-CDM Manual).*
Target Take Off Time (TTOT): Time taking into account the Target Start Up Approval Time (TSAT) plus the Estimated Taxi-Out Time (EXOT).
Target Time of Arrival (TTA): An ATM computed arrival time. It is not a constraint but a progressively refined planning time that is used to coordinate between arrival and departure management applications. It is an ATM computed time. *As soon as the iSBT is instantiated, it becomes an agreed parameter of the iRBT that the Airspace users agree to fly and the ANSPs and Airports agree to facilitate. TTA should be managed and facilitated to ensure a precision in the order of +/- 3 min allowing Network Management and ATC to ensure monitoring and trajectory adherence during execution.*
Taxi Clearance: The Taxi clearance is issued by TWR Ground Controller to the flight crew and indicates that the flight crew is now allowed to taxi from its current position to the next assigned (cleared) position.
Transfer Control: The transfer of responsibility of a flight from one controller to another, using R/T or data link. The transfer of control at least implies a communication from the controller towards the Flight Crew to provide it with next frequency. Then the Flight Crew contacts the next controller in charge of the aircraft.

367 **Table 1-3 Terminology**

2 Operating Methods

DISCLAIMER: This chapter of Step 1 Airport DOD Update has imported the description text of the OI Steps directly from the existing ATM roadmap (Integrated Roadmap DS11 released in October 2013). Consequently, any comment made by reviewers for this section will have to be corrected first in the ATM roadmap to avoid discrepancies.

Operational Improvements included in the «Deployment Baseline» (DB) are considered as being part of the "as is" baseline for Step 1. This starting baseline for Step 1 is described in section 2.1. Any OI Steps that are part of the «Deployment Baseline» but which are superseded by OI Steps in «Step 1» are listed in Section 2.3**Error! Reference source not found.**. Even though these OI Steps will be superseded and not part of the final "to be" Step 1 solution, their validation and implementation is required for their following improvement's implementation. The OI Steps listed in this section have been checked against the SESAR D79-WPB.01-Integrated Roadmap Dataset 11-release Note-00.01.00 – 11/10/2013[4].

The Operational Improvements included here are not assumed to be implemented in all airports nor in any single airport in their totality. Just as an airport with one runway does not have the same operational tools and procedures as one with multiple parallel and crossing runways, not all airports will implement the same changes. The operating methods description detailed below is to show all of the changes that will have occurred across Europe with a Step 1 implementation. Which of the new methods are to be implemented is a decision of the local authorities based upon their needs and capabilities.

2.1 Introduction

The airport view of the ATM concept is from the perspective of "en-route to en-route" as this includes the ground as well as the aircraft turn-round process. In this view, the airport can be considered as another, rather complex, "sector" through which the aircraft passes, where complementary processes, such as the aircraft turn-round, work together in a fashion similar to a modern production facility.

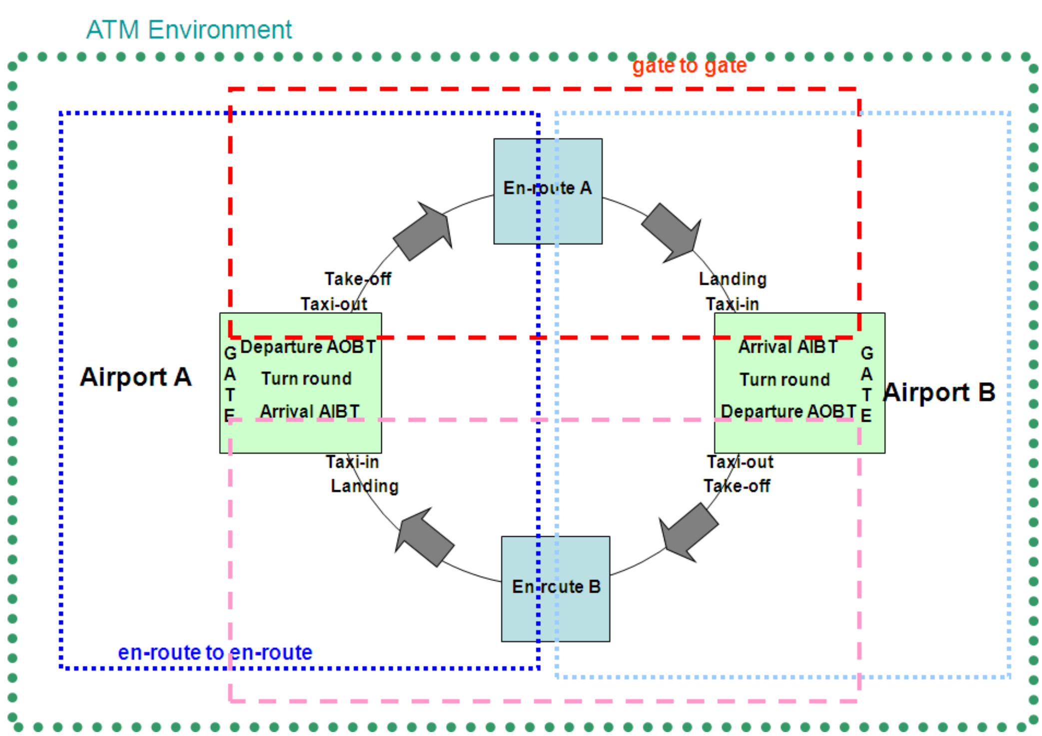

Figure 2-1 Air transport as a continuous process

It is essential that not only the runway and surface movement of the aircraft be included in this concept, but also the ground handling process if reactionary delay is to be fully addressed.

Airport organisation is aimed at supporting co-operation between all stakeholders at appropriate decision-making stages whilst ensuring a seamless process over the entire planning spectrum, starting many years ahead down to real time. Besides these high-level operational processes, there is also a medium to long-term development process which focuses on future demand and capacity planning for airport expansion. This includes issues ranging from airport infrastructure and environmental aspects to landside capacity and regional planning. The focus of airports is divided between both the potential aircraft movement rate and also passenger throughput.

Airport operators own and/or operate their nodes of the Air Transport Network. It is their responsibility to provide a safe airport infrastructure in balance with environmental limitations. In partnership with all stakeholders, the airport aims at achieving a common business approach, by linking flight segments, surface operations, and the aircraft turn-round process. This requires collaborative decision making based upon an equal acceptance of all stakeholders (level playing field), a common planning process and understanding of its inherent assumptions, a common situational awareness of traffic evolution during execution, a common situational awareness of the status of the turn-round process, and a common performance framework to all stakeholders sharing a common target, aiming at on-schedule performance meeting the business needs of the airspace users and airport operators.

Based on the capacity figures of available resources, provided by the Airport Operator and the (local) ANSP, an initial Airport Resource Allocation and Capacity Plan is initiated ahead of the seasonal planning. For coordinated airports this initial plan will be input for the Slot Coordination Process in which the traffic demand from the users is balanced against the airport and airspace capacity and constraints (if any).

A seasonal Airport Operational Plan is established in a collaborative manner between the airport operator, ATC and users (aircraft operators), and iteratively maintained up to date. This operational plan accommodates the appropriate level of on demand operations.

The execution of the Airport Resource and Capacity Plan involves the real-time management and separation of aircraft moving on the airport surface. Short notice changes and/or refinements are handled using a mixture of collaborative processes and tactical interventions.

If surface movement capacity is to be increased without increasing the risk of runway incursions a range of actions need to be taken. Better situational awareness both for the controller, aircrew and vehicle drivers including conflict detection and warning systems will not only enhance airports surface safety but will also create room for surface movement capacity expansion.

Optimum management of surface traffic flows will not only increase efficiency and predictability during the ground movement phase but will also have a positive impact on the environment. The planning of surface routes may consider constraints imposed by the need to minimise the environmental impact especially surface holding or the need to avoid braking or changes in engine thrust levels as the aircraft moves from the runway to the stand or vice versa.

The turn-round process links the airborne and ground segments. Seamless progress of the turn-round process is a main factor affecting punctuality. Co-operative mechanisms will improve visibility for ATM actors regarding the progress of the turn-round process and result in better estimated times of subsequent events such as off-blocks and take-off.

Runways act as ‘single servers’ processing one aircraft landing or one aircraft taking off at a time. Although a single server, more than one aircraft could be simultaneously on the runway. For example an aircraft could already be lining up for take-off while the landing aircraft is still rolling out to its exit.

A degree of departure and arrival queuing is a consequence of airports being used close to their capacities. The effects of weather conditions on queuing (e.g. wet runways, strong winds, low visibility) are well known today and contribute to the variability of instantaneous runway capacity.

Increasing runway throughput and runway utilisation has to be achieved within the SESAR safety goals. Dependencies between multiple runways determine the practical runway capacity which in most cases is lower than the combined single runway capacities. Reducing dependencies between runways by implementing more accurate surveillance techniques and controller tools as well as advanced procedures, will enlarge the capabilities of existing runway configurations (like closely spaced parallel runways).

In order to provide some mitigation for the inherent delays/queuing associated with capacity constrained airports and to gain a significant capacity enhancement without impacting the overall queue management concepts on airports with multiple runways, the use of interlaced take-off and landing procedures (runway mixed mode operations) instead of segregated use of multiple runways can be envisaged. These procedures will be implemented when feasible and when required to maximise runway capacity taking into account the implied more complicated ground movement operations and potential safety issues that may arise.

The concept of remotely provided air traffic services applies at aerodromes where the service provider has determined that this is feasible, that the site and techniques to be used are proven to meet all appropriate safety requirements and where/ when this is cost-effective.

2.2 Previous Operating Methods

This section describes the operating methods that were used previous to the SESAR Step 1 implementation and make up the baseline for Step 1 activities. The following basic conditions are set to be unchanged in SESAR Step 1:

The notion of a runway as a protected surface for aircraft to land and take-off safely will remain unchanged.

The Tower Runway Controller will remain the authority for assuring safe operations on the runway.

The main aspect of current surface movement operations that will remain is the reliance on ‘see and avoid’ principle as the primary mean to ensure the safety of surface movements.

Controllers will remain responsible for issuing information and instructions to aircraft under control in order to assist pilots to navigate safely and timely on the airport surface.

Voice communication for time critical and tactical clearances will also remain.

A range of technical and procedural solutions, both ground and airborne, will have been introduced or more widely implemented. These are the airport related OI Steps that are part of the Deployment Baseline (DB). They have been grouped according to the Business Needs / Operational Focus Area to which they apply and are ordered alphabetically according to the OI Step code.

BN01 - Traffic Synchronization

OFA04.01.01 – Integrated Arrival/Departure Management at Airports

(no OI step identified in the Integrated Roadmap)

BN02 - Airport Integration and throughput

OFA01.01.01 – LVPs using GBAS

- Capacity gains can be achieved by increased utilisation of the combined runways. Reducing dependencies between runways by implementing more accurate surveillance techniques and controller tools as well as advanced procedures, will enlarge the capabilities of existing runway configurations (like closely spaced parallel runways). **[AO-0403]**
- Improved Operations in Low Visibility Conditions through enhanced ATC procedures and/or navigation systems. LVP (Low Visibility Procedures) are collaboratively developed and are implemented at applicable airports involving in particular a harmonised application across airports and the use of optimised separation criteria. Navigation systems can be enhanced through changes applied to ILS antenna (smaller ILS sensitive and critical areas in CAT II/III) or use of MLS. **[AO-0502]**

OFA01.01.02 – Pilot Enhanced Vision

(no airport-related OI step identified in the Integrated Roadmap)

OFA01.02.01 – Airport Safety Nets

- ECAC airports and aircraft operators develop procedures and apply recommendations contained in the European Action Plan for the prevention of runway incursions (e.g. compliance of infrastructure with ICAO provisions, best practices on flight deck procedures for runway crossing, while taxiing; assessment for pilots regarding aerodrome signage, markings and lighting). **[AO-0101]**
- The system detects conflicts and infringements of some ATC rules involving aircraft or vehicles on runways, and provides the controller with appropriate alerts. Whereas the detection of conflicts identifies a possibility of a collision between aircraft and/or vehicles, the detection of infringements focuses on dangerous situations because one or more mobiles infringed ATC rules. This improvement addresses also incursions by an aircraft into an area where the presence of an aircraft (or vehicle) is temporarily restricted or forbidden (e.g. closed taxiway, ILS or MLS critical area). **[AO-0102]**
- The system provides the controller with the position and automatic identity of all relevant aircraft and all relevant vehicles on the movement area (i.e. manoeuvring area plus apron). **[AO-0201]**
- The system provides the controller with information on Foreign Object Debris detected on the movement area. **[AO-0202]**

OFA01.02.02 – Enhanced Situational Awareness

- In addition to display of the airport layout (showing taxiways, runways, fixed obstacles) and the own aircraft position, the Flight Crew has an improved situational awareness thanks to the additional display of surrounding traffic (incl. both aircraft and optionally airport vehicles). A decrease in flight crew and controller workload is expected by reducing requests for repeated information with respect to surrounding traffic. An improvement of safety is also expected, especially at taxiway and runway intersections, as well as for aircraft landing and taking off. **[AUO-0401]**

OFA01.03.01 – Enhanced Runway Throughput

- This improvement proposes a change in the current ATM procedures that enables ATC controllers to reduce separations without any support of a new ATC controller tool. The level of operational applicability and benefits will depend on local wind conditions and runway orientation. Under defined crosswind conditions the wake turbulence minima to be applied between two aircrafts, can be reduced by 0.5 Nm for arrivals. **[AO-0301]**
- The Time Based Separation Transitional Step proposes a change in the current ATM procedures that will enable ATC controllers to apply a 0.5NM fixed reduction of the ICAO wake turbulence distance-based radar separation minima between wake turbulence separated aircraft pairs in specified headwind conditions. The level of operational applicability and benefits will depend on local wind conditions and runway orientation. **[AO-0302]**
- Appropriate runway exits are provided for the aircraft mix using the runway. The Runway Occupancy Time (ROT) as well as the predictability is based on the number of exits, the design/shape of the exit, the location with respect to the landing threshold as well as pilot/airline behaviour policy. Finding a well-accepted balance between number, shape and location is necessary. Multiple runway entries and a wide holding area can help to optimize the sequencing process for departing aircraft and can generate significant operational benefits during periods of traffic congestion. **[AO-0305]**
- The main flight operations elements that affect the Runway Occupancy Time (ROT) include not only braking distance or runway/taxiway design but also pilot's awareness of ROT requirements, pilot's reaction times to line-up/departure clearances, pre-departure actions, etc. This improvement addresses enhancements to operating practices of airlines and pilots in that respect. **[AUO-0701]**

OFA04.02.01 – Integrated Surface Management

(no airport-related OI step identified in the Integrated Roadmap)

OFA05.01.01 – Airport Operations Management

- Systematic strategies are agreed and applied by CDM partners to deal with predictable (e.g. forecast bad weather, industrial action, scheduled maintenance) or unpredictable adverse conditions (e.g. unforeseen snow or fog, accident). This involves effective methods of exchanging appropriate information on the expected or actual arrival of such conditions, special procedures, and system support to facilitate the sequencing of operations where needed (e.g. de-icing) **[AO-0501]**.
- A set of milestones in the turn-round process are established at airport and flight progress is monitored against those milestones. The information is shared by all involved partners, not only at the airport concerned but also in other relevant units such as the NMOC and destination airport. The completion of a milestone triggers decision making processes for downstream events. Shared information on the progress of turn-round will be used to estimate departure demand and enable arrival/departure balancing. **[AO-0601]**
- The pre-departure sequence refers here only to the organisation of flights from the stand/parking position. Pre-departure sequences are established collaboratively with the airport CDM partners concerned taking into account agreed principles to be applied for specified reasons (e.g. slot compliance, airline preferences, night curfew, evacuation of stand/gate for arriving aircraft, etc.). The resulting pre-departure list is used by ATC while sequencing departing aircraft, as and when feasible. **[AO-0602]**
- De-icing stations are managed through CDM procedures enabling airport and ANSP to know the flights to de-ice and establish sequences accordingly. **[AO-0603]**
- A correctly balanced environmental regime at an airport can help to ensure that legal compliance to regulation is maintained, that the rules are harmonised to the extent possible, and the global and local impacts are minimised to the extent possible. The objectives are to ensure that decisions taken at the local level achieve the optimum environmental performance from aircraft operations at and around airports, by achieving the most appropriate balance between social, economic and environmental imperatives. A key aim will be to balance sometimes conflicting needs for noise and atmospheric emissions reduction and to account for system wide implications of local decisions. Most importantly, a key objective is to ensure that non optimal environmental procedures and constraints are avoided and where such constraints are being considered that the least damaging options are selected. Optimum environmental efficiency and capacity can be achieved at and around airports through the collaborative local selection of the most appropriate ATM capabilities and OIs available, within an overarching and harmonising framework. This framework must involve all operational stakeholders. **[AO-0703]**
- 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 de-icing fluids released in the storm water can be reduced. **[AO-0705]**
- The environmental performance (compliance to operational procedures, key performance indicators) of ATM stakeholders at the airport is recorded and monitored in support of continuous improvement process. In particular, it is possible to determine the amount of airport related versus external pollution. This improvement involves use of noise monitoring system, flight tracking and air quality monitoring system. **[AO-0706]**
- Convergence is ensured between airport slots, ATFM slots together with flight plan / iSBT monitoring processes in order to improve consistency on a daily basis. **[DCB-0301]**

BN03 - Moving from Airspace to 4D Trajectory Management

OFA03.01.04 – Business and Mission Trajectory

- Airspace users are assisted in filing their flight plans and in re-rerouting according to the airspace availability and ATFM situation, through collaboration with NMOC, ANS providers and airports. Airspace users can make more informed decisions when compromises are needed between delay, re-routing, trajectory limitations or costs. On the basis of the offered routings, they can select the one which is best suited to their company policy for optimising flight time, fuel burn or other parameters. **[AUO-0201]**

BN04 - Network Collaborative Management and Dynamic Capacity Balancing

OFA05.03.04 - Enhanced ATFCM processes

- After analysis of anticipated capacity shortfalls at local, regional or network wide levels, responses are selected from pre-defined scenarios and adjusted to the planned situation until day of operation. This relies on improved working relationship and processes between all involved stakeholders especially during the anticipating and reacting phases to optimise capacity throughput in sector groups based upon current improvement of ATFM activities. **[DCB-0206]**
- Critical event means an unusual situation or crisis involving a major loss of EATMN capacity, or a major, imbalance between capacity and demand, or a major failure in the information flow involving many partners and requiring immediate action to minimise consequences and to retrieve network stability. A pan-European procedure is established for managing critical events such, as industrial actions etc, which can be tailored to the needs/requirements of individual countries thus leading to better utilisation of limited available capacity. Since the impact of some events goes beyond ATM a European Aviation Crisis Coordination Cell (EACCC) has been established supporting the activation and coordination of contingency plans at State level. **[DCB-0207]**

OFA05.03.06 – UDPP

- Aircraft Operators' tactical priorities are introduced in a cooperative process with the NMOC through ATFM slot exchanges (such slot exchange will be between flights within a single company). NMOC may propose slot exchanges between flights to minimise the overall inconvenience to the community as a whole with the objective of minimising the total ATFM delay. **[AUO-0101]**

OFA05.03.07 – Network Operation Planning

- The contents of summer and winter versions of the NOP - consolidating the existing information on traffic demand and capacity plans - are improved by using feedback from previous seasons. Stakeholders contribute to the elaboration of the NOP and updates are integrated more dynamically. **[DCB-0101]**
- The Network Operation Plan provides an overview of the ATFCM situation from strategic planning to real time operations (accessible from 6 months to the day of operation) with ever increasing accuracy up to and including the day of operations. The data is accessible online by stakeholders for consultation and update as and when needed, subject to access and security controls. The elements and formats of the NOP will be established taking into account the requirements of the users of these plans. It will be possible for them to access and extract data for selected areas to support their operation and, if required, to create their specific operations plan. The NOP will also be updated taking into account the actual traffic situation and real time flow and capacity management. The first steps of the interactive Rolling NOP were already implemented through the deployment of the NOP portal. Further systems and tools are available or planned for deployment (between 2010/2013-15) to support the Interactive approach to the NOP (e.g. NEVAC, ADR, CIAM, LARA...); most of the enablers required are expected to be gradually deployed over this period. **[DCB-0102]**

- Up-to-date and comprehensive capacity data and information from ANSPs and airports is available. The process offers an interactive support to stakeholders in the development of medium-term plans. Capacity planning information, data and tools are available on-line. Latent capacity is used to relieve bottlenecks through consolidated capacity planning process based on coordination and network synchronisation of ANSPs/airports enabling the adaptation of the capacity delivery where and when required. **[DCB-0201]**
- The interface between airports and ATFCM is reinforced at the tactical level in order to improve predictability of operations through exchanges of accurate departure and arrival times, NMOC providing airports with arrival estimates up to 3 hours prior landing (taking account of updated information on flight progress) whilst airports provide NMOC with flight data updates before take-off. **[DCB-0302]**
- 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. In particular for RP1, the agreed NM KPIs on en-route delay and flight efficiency/route extension will be monitored and reported by NM and PRB **[SDM-0101].**

BN05 - Conflict management and automation

(no airport-related OI step identified in the Integrated Roadmap)

EN02 – SWIM

ENB 02.01.01 SWIM

- Airspace users, airport and ATM have a consistent view of the filed flight plan including late updates until departure. **[IS-0101]**
- ATFCM is aware of deviations from the flight plan including route changes, diverting flights, missing flight plans, change of flight rules (IFR/VFR) or flight type (GAT/OAT). This enables a better assessment of the impact of airspace changes on aircraft while in flight, an improved monitoring of actual traffic situation and, if necessary, the triggering of revisions to the network and airports operations plan. **[IS-0102]**
- The data required during the pre-flight phase are provided and presented in an integrated and flexible manner. The user can access various/information sources such as AIS, ARO, MET and ATFM which provide NOTAM, SNOWTAM, MET messages, FPL and related messages or network management messages. **[IS-0201]**
- Compiled ATIS information specifically relevant to the departure, approach and landing phases of flight (such as runway in use, current weather, and airport and facility conditions) is transmitted to the aircrew by data link. ATIS messages (synthesised voice) can be generated fully automatically or at the controller's request. **[IS-0401]**

OFAs not part of any Business Needs

OFA06.01.01 – CWP Airport

(no airport-related OI step identified in the Integrated Roadmap)

OFA06.03.01 – Remote Tower

(no airport-related OI step identified in the Integrated Roadmap)

ENB 02.01.02 AIM/MET

(no airport-related OI step identified in the Integrated Roadmap)

2.3 New Operating Methods

This section describes the new operating methods and lists the airport OI Steps that will be developed as part of Step 1.

They have been grouped according to the Business Needs / Operational Focus Area to which they apply and are ordered alphabetically according to the OI Step code. Some OI Steps listed are developed outside of WP6, but have an effect on the operations developed within WP6.

BN01 - Traffic Synchronization

OFA02.02.04 – Approach Procedures with Vertical Guidance

- Advanced RNP transitions with curved procedures connecting directly to the final approach can provide improved access in obstacle rich environments and can reduce environmental impact. **[AOM-0605]**

OFA04.01.01 – Integrated Arrival/Departure Management at Airports

- Pre-Departure management has the objective of delivering an optimal traffic flow to the runway. Accurate taxi time forecasts provided by route planning are taken into account for TSAT-Calculation while the flight is off-block. Pre-Departure sequence (TSAT sequence) is set up by Tower Clearance Delivery Controllers who will follow TSAT-window when issuing start-up approval. **[TS-0202]**
- Integrated Arrival and Departure management aims at increasing throughput and predictability at an airport by improved co-ordination between Approach and Tower controllers. Arrival and Departure flows to the same runway (or for dependent runways) are integrated by setting up fixed arrival-departure pattern for defined periods. The successive pattern might be chosen by the operators or provided by an optimization algorithm considering arrival and departure demand. Departure flow to the runway is managed by pre-departure sequencing (integrating route planning) while arrival flow to the runway is managed by arrival metering. **[TS-0308]**

BN02 - Airport Integration and throughput

OFA01.01.01 – LVPs using GBAS

- Use of GBAS CAT II/III based on GPS L1 for precision approaches. **[AO-0505-A]**

OFA01.01.02 – Pilot Enhanced Vision

- 'Out of the window' positional awareness is improved through the application of visual enhancement technologies thereby reducing the difficulties of transition from instrument to visual flight operations. **[AUO-0403]**

OFA01.02.01 – Airport Safety Nets

- The System detects conflicting ATC clearances during runway operations, and non-conformance to procedures or clearances for traffic on runways, taxiways and in the apron/stand/gate area. Appropriate alerts are provided to controllers. **[AO-0104-A]**
- The System detects potential and actual risk of collision with aircraft and infringement of restricted or closed areas. The Vehicle Driver is provided with the appropriate alert, either generated by the on-board system or uplinked from the controller airport safety net. **[AO-0105]**
- The runway usage awareness is enhanced thanks to implementation of the Runway Status Light (RWSL) system (which covers both new procedures and new airfield lights). RWSL is a surveillance driven automatic system that visually indicates to flight crews and vehicle drivers when it is unsafe to enter, use or cross a runway, through new airfield lights which can be composed of Runway Entrance Lights (REL), Take-off Hold Lights (THL) and Runway Intersection Lights (RIL). **[AO-0209]**
- The on-board system detects potential and actual risk of collision with other traffic during runway operations and provides the Flight Crew with the appropriate alert. **[AUO-0605-A]**

OFA01.02.02 – Enhanced Situational Awareness

- Ground Controller Situational Awareness in all Weather Conditions is further enhanced with the use of ADS-B applications which improve accuracy in target positioning of the traffic within the controller sector. **[AO-0201-A]**

OFA01.03.01 – Enhanced Runway Throughput

- The application of time based wake turbulence radar separation rules on final approach (TBS), so as to aid towards stabilising the overall time spacing between arrival aircraft. The final approach controller and the Tower runway controller are to be provided with the necessary TBS tool support to enable consistent and accurate delivery to the TBS rules on final approach. The minimum radar separation and runway related spacing constraints will be required to be respected when applying the TBS rules. **[AO-0303]**
- The application of weather dependent separation (WDS) for departures from the runway for the initial common departure path, through a reduction or a suspension of the wake turbulence separation, over the duration of identified and stable forecast weather conditions, that either ensures transport of the wake turbulence out of the path of the follower aircraft, or ensures decay of the wake turbulence so that it is no longer a hazard to the follower aircraft. **[AO-0304]**
- The application (by ATC) of pair wise separation (RECAT 2) for arrivals on final approach, and for departures from the runway for the initial common departure path, through taking into account aircraft characteristics of the lead and follower aircraft (such as maximum landing weights and speed profiles), that impact the strength of the wake generated by the lead aircraft or the resistance of the follower aircraft to a wake encounter. **[AO-0306]**
- The application of weather dependent separation (WDS) for arrivals on final approach, through a reduction or a suspension of the wake turbulence separation, over the duration of identified and stable forecast weather conditions, that either ensures transport of the wake turbulence out of the path of the follower aircraft, or ensures decay of the wake turbulence so that it is no longer a hazard to the follower aircraft. **[AO-0310]**
- Optimised braking to vacate at a pre-selected runway exit by shortening or extending the roll-out phase. Coordinated with ground ATC through datalink, and based on avionics that controls the deceleration of the aircraft to the design speed for the selected exit. **[AUO-0703]**

OFA04.02.01 – Integrated Surface Management

- The System provides the controller with an operationally-relevant route calculated by minimising the delay according to planning, ground rules, and potential conflicting situations with other mobiles. **[AO-0205]**
- The system provides to the Vehicle Drivers the display of dynamic traffic context information including status of runway and taxiways, obstacles, route (potentially by application of an airport moving map). Ground signs (stop bars, centreline lights, etc.) are triggered automatically according to the route issued by ATC. **[AO-0206]**
- Improved efficiency of surface operations thanks to automated exchange between Vehicle Drivers and Tower Controllers using datalink for ground-related clearances and information. **[AO-0215]**
- Exchange between Flight Crew and Controller using datalink for start-up/pushback taxi[2] (D-TAXI services) supported on the airborne side by DCL/ATN, CPDLC/D-TAXI. **[AUO-0308]**
- The system provides to the Flight Crew the display of the airport layout (showing taxiways, runways, fixed obstacles), the own aircraft position and the route to runway or stand. Ground signs (stop bars, centreline lights, etc.) are triggered automatically according to the route issued by ATC. **[AUO-0603-A]**

OFA05.01.01 – Airport Operations Management

- Maintenance of the evolving content of the Airport Operations Plan (AOP) identifying, as a minimum:
  (1) those elements that are common to the Network Operations Plan (NOP) and
  (2) the procedures to ensure they are effectively shared and commonly updated within a "Rolling NOP structure".
  The AOP will optimise the operation of the Airport through time as more accurate information is made available from the Airspace Users and other Airport stakeholders and share the information with the NMOC in real time. **[AO-0801]**
- Enhancement of the airside process with the inclusion of landside (passenger and baggage flow) process outputs that can affect ATM performance e.g. through delayed departures.
  This concept builds on A-CDM to describe the functional and technical requirements for inclusion of landside processes at an airport in both the planning and execution timeframe. **[AO-0802]**
- Improvement of the ATM/airport operations through the integration and monitoring of Airport Transit Views (Aircraft flows). An Airport Transit View describes the visit of an airframe to an airport. This includes the connections with inbound-outbound airborne segments (which are parts of iSBT/iRBT) as well as the main CDM milestones (e.g. TLDT, TIBT, TOBT / TSAT and TTOT).
  This concept builds on A-CDM to describe the functional and technical requirements for monitoring of aircraft movements at an airport in both the planning and execution timeframe. **[AO-0803]**
- Development of the Airport Operations Performance Management concept. The concept identifies the functional and technical requirements required to manage the airport process. Specifically it requires an Impact Assessment of proposed tactical changes to operational inputs and rules by the Decision Support tools and procedures that facilitate the collaborative decision making involving all airport stakeholders. **[AO-0804]**
- 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 (typically local) environmental restrictions in the early phase of flight planning. **[AUO-0801]**

[2] AUO-0308 does not cover the datalink service for negotiation of the runway exit since this is covered by AUO-0703. The OI step description text has been updated here to bring this clarification. A Change Request to the Integrated Roadmap has been raised in parallel and will materialize in DS12 (May 2014).

- Airport CDM is extended to include interconnected regional airports. Relevant A-CDM airports at regional level and the Central Flow Management Unit exchange information, especially in support of improving the estimated time of arrival for all flights bound to the region. **[DCB-0304]**
- Pro-actively assess the balance between available airport capacity and scheduled/forecast demand given the prevailing and/or forecast weather and other operational conditions and pro-actively make suggestions for runway configuration and capacity distribution according to priorities of performance management. **[DCB-0309]**
- Airport planning is continuously refined with the application of local airport CDM processes. The overall network planning proposes CTOT / TTA for all regulated flights. For those flights where the allocated constraints will have a negative impact (e.g. disturbing airport/airline operations), the Network shall take into account this information in order to possibly re-allocate CTOT / TTA. This results in an improved efficiency in the management of Airport and ATFCM Plannings **[DCB-0310]**

<u>BN03 - Moving from Airspace to 4D Trajectory Management</u>

OFA03.01.04 - Business and Mission Trajectory

- The current flight plan will first be extended to include flight performance and 4D profile information. This extended flight plan will then evolve into the initial SBT/SMT (iSBT/iSMT). The iSBT/iSMT will be a partial implementation of the SBT/SMT, which is the published business/mission trajectory that is available for collaborative ATM planning purposes. The iSBT/iSMT will be published when the flight intentions (schedules, airport slots and routing) of the airspace user have stabilized sufficiently (in the medium-term planning). The iSBT/iSMT will include all extended flight plan information. The iSBT/iSMT will additionally include a unique flight identification (GUFI). The iSBT/iSMT will be progressively refined with incoming information from the airspace user, following a layered collaborative ATM planning process, as time moves towards the execution phase and latest information affecting the flight becomes available. **[AUO-0203-A]**
- The iRBT/iRMT will be the partial implementation of the RB/MT, which is the reference used by all ATM partners during the flight execution. The iSBT/iSMT will change to the iRBT/iSMT either at a fixed time before off-block or when a specific A-CDM milestone occurs. The iRBT/iRMT will include all iSBT/iSMT information. The iRBT/iRMT will contain, among other information, target times (TTO/TTA). **[AUO-0204-A]**

<u>BN04 - Network Collaborative Management and Dynamic Capacity Balancing</u>

OFA05.03.06 – UDPP

- The swapping of regulated flights on departure, on arrival, and en-route, that is already possible for the flights of the same Airspace User (AU) sharing the same Most Penalising Regulation (MPR), will be extended to all regulated flights without any constraints due to AU (or MPR if possible). Changing of flight priority between 2 flights where at least one flight is not regulated will also be possible. The AUs requests for these changes in flight priority will be introduced at the initiative of the AUs themselves, of the airport authorities or of the Network Management function. The Network Management function may propose ATFM slot exchanges that satisfy the network performance targets. The Network Management function will supervise the swapping or changing of flight priority requests. **[AUO-0101-A]**
- CDM airports will allow the Airspace Users to change among themselves (via the pre-departure management process) the priority order of flights in the pre-departure sequence. **[AUO-0103]**

OFA05.03.07 – Network Operation Planning

- The NOP will be enhanced to achieve collaborative planning with the support of services which can be automated (B2B services are initial examples). The NOP will provide information on stakeholders' agreements and related justifications. To enhance the planning process, the NOP will use available information provided by the airports (available from the AOPs). The NOP will continuously provide up-to-date information on the Network situation. This is especially important in the case of crisis. Furthermore, the NOP will provide access to initial network performance objectives and support to network performance assessment in post-operations. **[DCB-0103-A]**

<u>EN02 – SWIM</u>

ENB 02.01.01 SWIM

- SWIM Step 1 includes the provision of the following capabilities: (1) Ground - ground flight coordination and transfer functions between en-route systems based on ED-133 flight object concept (ATC 2 ATC profile). (2)Business to Business services to share traffic flow management information (including the capability to fill and validate flight plans) between the Regional NM / AM and APOC, FOC (NMOC B2B Profile) (3) Business to Business services to share Aeronautical information between the EAD (as part of Regional NM / AM) and ER-APP-ATC, Airport Airside Operations, FOC/WOC (EAD B2B Profile)).Swim step 1 also includes the provision of new information exchange standards. The three profiles will still use their own infrastructures (supervision, security, ..), they are not interoperable. **[IS-0901-A]**

<u>OFAs not part of any Business Needs</u>

OFA06.01.01 – CWP Airport

- The integration and exploitation of new ATC functions such as routing, guidance, BTV and alerts, with current elements such as surveillance and Electronic Flight strips into an Advanced Integrated Controller Working Position (A-ICWP) will result in enhanced situational awareness for ATCOs and flight crews, improved safety nets and integrates the Tower with external units such as the TMA and the Network. **[AO-0208-A]**

OFA06.03.01 – Remote Tower

- Aerodrome Control Service or Aerodrome Flight Information Service for an aerodrome is provided from a remote location, i.e. not from a control tower local to the aerodrome. The ATCO (or AFISO) in this facility performs the remote ATS for the concerned aerodrome[3]. **[SDM-0201]**

ENB 02.01.02 AIM/MET

- Current meteorological and operational flight information derived from ATIS, METAR and NOTAMs/SNOWTAMs, specifically relevant to the departure, approach and landing flight phases is transmitted to pilots by data link. The flight crew has real-time access to the relevant airport operational parameters applicable to the most critical phases of flight (ATIS, METAR and OFIS). **[IS-0402]**
- The planning and associated decision making for a multiplicity of considerations in an Airport/TMA, En-route and Network operations context will be improved by integrating knowledge on the past, current and future state of the atmosphere. The obtained knowledge, translated in meteorological (MET) information, is essential in decision making with a `time to decision' of more than 20 minutes (planning). Various stages of enhanced planning will become possible by integrating MET information and the associated uncertainty. Consequently, MET information supporting (automated) decision making processes involving: the translation of weather into system component constraint, the impact of these constraints due to weather on ATM and the associated required decision support process and aids. Examples of MET information that qualify for its utilisation in a planning decision making environment are enhanced MET information services in support of trajectory/flight planning and the en-route re-planning of trajectory/flight. This includes information on forecasted meteorological hazards such as icing, Clear Air Turbulence (CAT), volcanic ash, etc. and basic parameters such as wind, temperature, humidity

[3] The remote tower concept is not intended to be (fully) implemented at airports with a significant traffic volume and a certain complexity. The thresholds for this have to be defined by the local authority. However some aspects of remote tower might be applicable at other airports (even large and complex ones) as a contingency measure in case of system malfunction at the tower (to be addressed in Step 2).

and air pressure. Furthermore, information on the future state of the atmosphere (including the consequences on low visibility conditions, convective weather, winter conditions) to assess the Network impact from a MET perspective on a day-1 up to day-7 is included. **[MET-0101]**

2.4 Differences between new and previous Operating Methods

A range of previous technical and procedural solutions, both ground and airborne, which are part of the Deployment Baseline (section 2.1) will be superseded by more advanced solutions in Step 1 (section 2.2). In the table below, the Step 1 OI steps, listed in the left column, come as replacement solutions to previous OI Steps (DB) listed in the right column.

Step 1 OI step		**DB OI Step superseded by Step 1 OI step**	
AO-0201-A	Enhanced Ground Controller Situational Awareness in all Weather Conditions for Step 1	**AO-0201**	Enhanced Ground Controller Situational Awareness in all Weather Conditions
AO-0303	Time Based Separation for Final Approach - full concept	**AO-0302**	Time Based Separation (TBS) for Arriving Aircraft -Transitional Step
AO-0304	Weather-dependent reductions of Wake Turbulence separations for departure	**AO-0301**	Crosswind Reduced Separations for Arrivals
AO-0310	Weather-dependent reductions of Wake Turbulence separations for final approach		
AUO-0101-A	ATFM Slot Swapping for Step 1	**AUO-0101**	ATFM Slot Swapping
IS-0402	Extended provision of Terminal Information using datalink	**IS-0401**	Automatic Terminal Information Service Provision through Use of Datalink

Table 2-1 DB OI steps superseded by Step 1 OI Steps

A range of technical and procedural solutions, both ground and airborne, implemented as «intermediate» improvements serving as stepping stones to the final Step 1 state, will be developed during Step 1, but then superseded by more advanced Step 1 solutions. As a consequence, those « intermediate » Step 1 OI steps are not referenced in section 2.2 but are shown in the table below (left column) with their corresponding “more advanced” Step 1 solutions listed in the right column.

“Intermediate” Step 1 OI step		**More advanced Step 1 OI step**	
AO-0204	Airport Vehicle Driver's Traffic Situational Awareness	**AO-0206**	Enhanced Guidance Assistance to Airport Vehicle Driver Combined with Routing
AUO-0702	Optimised braking to vacate at a pre-selected runway exit coordinated with Ground ATC by voice	**AUO-0703**	Optimised braking to vacate at a pre-selected runway exit coordinated with Ground ATC by Datalink

Table 2-2 “Intermediate” Step 1 OI steps superseded by more advanced Step 1 OI Steps

3 Operational Environment

The objective of this section is to describe the detailed operational environment which forms the "airport operational context". In the SESAR research structure, airport operations exist in the following ATM phases: Long Term Planning, Medium / Short Term Planning, Execution Phase, including Arrival, Turn round and departure, and Post-Operations analysis.

This section first describes the operational characteristics of airports with the intent to provide a method for categorising airports with respect to future verification / validation activities. Together with an indication of traffic characteristics, airport capabilities and aircraft equipage, this section then reviews the actors / roles involved in airport operations and their responsibilities.

The ATM Master Plan has developed a simplified categorisation to support their work on deployment. This can be found in SESAR D02-WPC02- Performance Plan – Airports Classification-00.00.01, 28/11/2011[12]. This identifies four categories of airports determined by the number of hourly movements.

3.1 Operational characteristics

The SESAR airport concept will be deployed according to the operational needs at airports throughout Europe. However each airport varies significantly according to its configuration, demand characteristics and local operational limitations both geographical and environmental/political.

This means that validation and/or verification of operational improvements at a specific airport cannot simply be extended to other airports. The differences are numerous. For the purpose of comparison and projecting validation results at other airports, a set of objective criteria have been defined that will allow the 'real' airport(s) used in the validation exercise, to be categorised objectively. This will support a realistic generalisation of the results from one particular airport to the overall population of airports within the ECAC states.

3.1.1 Generic Airport Characteristics

DISCLAIMER: Airports mentioned in this section are possible examples and purely for indicative purposes. The specific category and class of every airport mentioned in the document needs to be checked and confirmed by the appropriate airport and/or authority.

In principle, thousands of influencing factors on airport operations exist, both internal and external. This makes every airport unique. However, there are several key features / factors that shape the mental image of an airport. Those key features can be used as means to classify airports in Europe.

The key airport features identified are:

- The function of the airport within the European Network ("Network Function" – coverage and importance),
- The physical layout of the airport ("Layout and Basic Operational Criteria"),
- The utilisation of available capacity ("Capacity Utilisation"), and
- The impact of external influences ("External Influencing Factors").

3.1.1.1 Category 1, "Network Function"

The "Network function" of an airport is an indicator of the impact it may have on both the European Air Transport Network and individual Airline Networks in the case of operational disruptions. A larger airport acting as a transfer hub for one of the main European airlines will have a larger impact on the total network than a small regional airport with only destination / origin traffic.

The following airport classification can be distinguished for the category "Network Function":

Class		Description
1.	Intercontinental Hub	Large intercontinental airport acting as a transfer hub for one or more major European airlines with a wide route network spanning to a large number of destinations inside and outside Europe. Examples for this type of airport are: London LHR, Paris CDG, Frankfurt, Amsterdam, Madrid etc.
2.	European Hub	Large European airport acting as a transfer hub for at least one European airline with a wide route network encompassing a wide range of European destinations. Only a limited number of destinations outside Europe are served directly from this airport. Examples of this class of airport are: Copenhagen, Helsinki, Vienna, Brussels, Palma, Milan-MXP etc.
3.	Primary node	Medium sized airport with a limited hub function and intercontinental P2P connections). Examples of this class of airport are: London-STN, Lyon-Saint Exupéry, Budapest, Warsaw, Athens etc.
4.	Secondary Node	An airport with limited or no intercontinental traffic, mainly scheduled connections to the large intercontinental (class 1) or European (class 2) hubs, a significant size of charter/leisure operations and acting as a major base for one or more low fare carriers. Examples of this type of airport are:, London-LTN, Nuremberg, Gothenburg, Leeds Bradford, Milan-BGY, Rome –CIA, Valencia etc.
5.	Third Level node	A regional airport with a limited number of scheduled connections mainly operated by one or two (low fare) carriers. Examples of this class of airport are: Bern, Dortmund, Aarhus, Rotterdam, Girona etc.
6.	Fourth Level node[4]	A (regional) airport with only a very few (<10) aircraft movements a day. Examples of this class of airport are: Mora (Sweden), Hof (Germany) etc.
7.	General / Business Aviation	An Airport dedicated to General / Business Aviation close to large metropolitan areas. Examples for this class of airports are: Paris LBG, Farnborough, Egelsbach, Copenhagen-Roskilde, Cannes etc.
8.	Military / Civil mixed operations	Primarily a military airfield with a (limited) number of civil operations (commercial and/or business aviation). Examples for this class of airports are: Eindhoven, Aalborg etc.
9.	Fixed wing / rotorcraft mixed operations	An airport, often of class 3, 4 or 5, with a large portion (> 20%) of the air transport movements performed by Rotorcraft operations . Examples for this class of airports are: Nice, Aberdeen, Stavanger, etc.

Table 3-1: Classes for category 1, "Network Function"

The preceding airport classes are identified based on their significance to the European network and to the network of the carriers operating at that airport. Secondary classes could be identified such as general aviation aerodromes (green fields) and pure military aerodromes. However their impact on the European network, and indeed for the SESAR airport concept, is very limited if not non-existent. For this reason those airport classes are excluded.

<u>Selection criteria:</u>

The following criteria could be used to distinguish between classes:

- Total passenger numbers;
- Total aircraft movements;
- Transfer passenger percentage.

3.1.1.2 Category 2, "Layout & Basic Operational Procedures"

Airports can be categorized on their runway – taxiway layout and the associated basic operational procedures. The number of runways, their geometry (parallel or converging / crossing) as well as the connecting taxiway system determines the "basic" runway and ground movement operations. Three types of runway geometry / basic operation have been selected.

- Multiple independent runways;
- Multiple dependent runways;
- Single runway.

[4] It is considered that the ATC services may be provided often by a Remote Tower for these airports.

Multiple runway layouts are numerous; they can be parallel, converging or crossing. For airports with three or more runways it can even be a combination of these. Here the runway combination with the highest capacity prevails where the use of the crossing / converging runway combination is mostly dictated by weather conditions.

Parallel runways, separated at a sufficient distance (more than 1035 meters, ICAO Annex 14) can be operated fully independently. This can either permit the use of segregated mode (one runway dedicated for landings and the other runway dedicated for take-offs) or the use of both runways in mixed mode.

Closely spaced parallel runways (less than 1035 meters separation) and converging / crossing runways are operated dependently. That means that operations on one runway are synchronised with operations on the other (and vice versa). The best in class capacity of dependent runways will be less than the capacity of the same number of independent runways.

A single runway will always be used in mixed mode with both landings and take-offs.

According to the ATM Master Plan, objectives and targets (“Best-in-class”) have been set for the capacity of the following runway layouts and basic operational procedures:

- Two (parallel) independent Runways: VMC – 120 mov/hr IMC – 96 mov/hr;
- Two (parallel) dependent Runways:VMC – 90 mov/hr IMC – 72 mov/hr;
- Single Runway:VMC – 60 mov/hrIMC – 48 mov/hr.

For taxiway systems, two configurations are distinguished,

- A complex layout;
- A non-complex layout.

Complex taxiway layouts are those where one or more of the following issues apply:

- Ground movement traffic in opposing directions takes place on a regular basis;
- Crossing of active runways is required;
- Congestion at taxiway nodes;
- Backtracking on the runway is required.

In the case of backtracking, the airport layout may look simple, comprising a single runway with one or two entries/exits from the runway. However the operations are complex because of the high runway occupancy time caused by backtracking and the dependency between runway operation and ground movement.

An airport with a single runway and a parallel taxiway along the full length of that runway is therefore a non-complex taxiway system, whereas an airport with a single runway having only one entry/exit is classified as a complex layout.

An increasing amount of taxiways does not always result in greater complexity of surface movement operations. It also provides flexibility to the controller in solving congested situations and/or re-sequencing aircraft flows. Complex surface lay-outs provide more routing options.

The following airport classification can be distinguished for the category “Layout & Basic Operational Criteria”

Class	Description
1. Multiple Independent Runways, complex surface layout	An example of this class of airports might be Madrid Barajas
2. Multiple Dependent Runways, complex surface layout[5]	Examples of this class of airports might be London Heathrow, Paris CDG, Frankfurt and Amsterdam
3. Single Runway, complex surface layout	An examples of this class of airports might be London Gatwick
4. Multiple Independent Runways, non-complex surface layout	An example of this class of airports might be Munich
5. Multiple Dependent Runways, non-complex surface layout[3]	Examples of this class of airports might be Hamburg and Hanover
6. Single Runway, non-complex surface layout	Examples of this class of Airports might be Rotterdam, Bremen and Stuttgart

Table 3-2: Classes for category 2, “Layout & Basic Operational Criteria”

[5] Dependent Runways Class includes closely spaced parallel, converging and crossing runways.

<u>Differentiation:</u>

The following additional criteria could be used to distinguish between the preceding classes:

- Potential go-around conflicts;
- Closely spaced parallel, converging and crossing runways;
- Potential conflicts with the Final Approach and Take-Off area (FATO) of heli-pads;
- Runway crossings by taxiing/towed aircraft;
- Backtracking;
- Potential surface conflicting situations (opposing traffic, significant amount of towing traffic).

3.1.1.3 Category 3, "Capacity Utilisation"

Airports can be distinguished in the way their available capacity is utilised. High utilisation means that the airport is vulnerable to disruptions such as adverse weather conditions. In those cases the impact on the network may be large. Airports with low runway utilisation will have fewer disruptions from capacity reduction due to adverse conditions or other type of disturbances.

The following airport classification can be distinguished for the category "Capacity Utilisation"

Class		Description
1	Highly utilised airports/runways, traffic mix of super-heavy, heavy, medium and light aircraft. More than 90% utilisation during 3 or more peak periods a day.	Examples of this class of airports might be London Heathrow, Amsterdam, Paris CDG, Madrid
2	Highly utilised airports/runways, homogeneous traffic: dominant super-heavy, heavy or medium or light. More than 90% utilisation during 3 or more peak periods a day	Examples of this class of airports might be Barcelona, Palma, Oslo
3	Normally utilised airports/runways. 70 – 90% utilisation during 1 or 2 peak periods a day	Examples of this class of airports might be Düsseldorf, Manchester, Hamburg
4	Low utilised airports/runways less than 70% utilisation during peak periods	Examples of this class of airports might be Ljubljana, Luxembourg, Southampton

Table 3-3: Classes for category 3, "Capacity Utilisation"

<u>Differentiation:</u>

The following additional criteria could be used to distinguish between classes:

- Traffic mix (G/H/M/L distribution[6]);
- Number and duration of peak periods during the day;
- Landing/take-off demand versus available capacity;
- Network delay (optional).

3.1.1.4 Category 4, "External Influencing Factors"

"External (Environmental) Influencing Factors" can limit airport operations. For example, a significant weather situation, like wind constantly blowing at 90° to the runway, or obstacles such as high buildings or mountains close to the airport will limit operations. Political factors such as country boundaries adjacent to the TMA, military airspaces close by or airspace reservations allocated for military needs can also limit operations. Restrictions on operating hours may also be imposed to restrict the noise exposure of the local community.

[6] G=Super-Heavy, H=Heavy, M=Medium, L=Light

Airports may be constrained by a combination of more than one of the above issues. Frequent bad weather conditions (like fog) may be a big constraint for an airport while political / community influences may not permit the addition of a parallel runway or longer operating hours which could otherwise significantly reduce the impact of bad weather conditions.

The following airport classification has been distinguished for the category "External Influencing Factors"

Class	Description
1. Highly Constrained (Geographical / Weather issues)	Example of this class of airports might be Funchal
2. Highly Constrained (Political / Community issues)	Examples of this class of airports might be Amsterdam, Madrid
3. Moderately Constrained (both Geographical / Weather and Political / Community)	Example of this class of airports might be Cologne
4. Lightly or Unconstrained	

Table 3-4: Classes for category 4, "External Influencing Factors"

Selection criteria:

The following list gives an overview of different factors that may determine the external influences on an airport and its operations:

Weather: • Fog (ICAO CAT I/II/IIIa/IIIb/IIIc); of course these categories are not limited to fog situations, as heavy rain or heavy snow fall can also reduce the visibility; • Rain (light, moderate, heavy); • Snow / Ice (light, moderate, heavy) on the ground and/or on aircraft; • Wind (light, moderate, heavy, steady, changing direction, gusts); • Thunderstorm (light, moderate, heavy); • Temperature and barometric pressure; • Volcanic eruption and dispersed ash (a special situation, but as this has occurred twice in the last 13 month and heavily disrupted operations, it is worth mentioning,); • etc.
Topographical Issues • Height above Mean Sea Level; • Obstacles (mountains, buildings, industrial buildings); • Location (close to water, close to obstacles, close to other airports); • etc.
Political Issues • Airport close to country boundary (approach and departure via a second country); • Restricted airspace (military or other reason); • Expansion or opening of a new airport (long term or short term capacity constraints); • etc.
Community Issues • Noise; • Gas and particulate emissions; • Operating hours (limited, restricted or 24 hours); • Expansion of an existing airport; • etc.

Table 3-5: External Influencing Factors on Airport Operations

3.1.2 Mapping of Operational categories on the Operational Focus Areas (OFAs)

DISCLAIMER: The mapping of airports to categories (and thus OFAs) is purely indicative. A dedicated mapping exercise is not the responsibility of a DOD and needs to take place outside 6.2. From this exercise the mapping of some airports may change as the local situation of many airports may not be known centrally or interpreted differently locally. Final applicability of the mapping of airports to categories (and OFAs) needs to be checked and confirmed by the appropriated airport and/or authority

The approach taken is to provide generic criteria that will allow results from validation and verification activities at specific airports to be projected onto other airports within the same category. For each OFA the two most significant categories have been assigned. The two other categories may also apply but are less dominant.

OFA	OFA description	Network function	Layout & Basic Operational Criteria	Capacity Utilisation	External influences
01.01.01	LVPs Using GBAS	-	Yes	-	Yes
01.01.02	Pilot Enhanced Vision	Yes	-	Yes	-
01.02.01	Airport Safety Nets	-	Yes	-	Yes
01.02.02	Enhanced Situational Awareness	-	Yes	-	Yes
01.03.01	Enhanced Runway Throughput	-	Yes	Yes	Yes
	Vortex				
02.02.04	Approach Procedures with vertical guidance[7]			Yes	Yes
03.01.04	Business and Mission Trajectory	Yes	-	Yes	-
04.01.01	Integrated Arrival/Departure Management at Airports	-	Yes	Yes	-
04.02.01	Integrated Surface Management	Yes	Yes	-	-
05.01.01	Airport Operations Management	Yes	-	Yes	-
05.03.04	Enhanced ATFCM processes	Yes	-	Yes	-
05.03.06	UDPP	Yes	-	Yes	-
05.03.07	Network Operations Planning	Yes	-	Yes	-
06.01.01	CWP Airport	-	Yes	Yes	-
06.03.01	Remote Tower	-	Yes	Yes	-

Table 3-6: Mapping of Categories versus OFAs

While six different combinations of Airport Classification categories can be distinguished, only five fall within the 15 OFAs.

Combinations of Categories allocated to the OFAs:
- Network Function versus Layout & Basic Operational Criteria
- Network Function versus Capacity Utilisation
- Capacity Utilisation versus Layout & Basic Operational Criteria
- External Influences versus Layout & Basic Operational Criteria
- Capacity Utilisation versus External Influences
Combination of Categories NOT allocated to an OFA
- Network Function versus External Influences

Table 3-7: Combinations of Airport Operational Categories

The following tables show the matrices for each of the five combinations of two categories. Within these matrices, example airports are given for each combination of parameter value / classes. These are initial recommendations and may be revised in the light of a detailed examination of the OFA and the Operational Category as well as by a check and confirmation of the appropriate airport operator and/or authority.

The Airports used in the matrices as examples have been identified by the three letter IATA code. Translation of the three letter airport codes can be found in Table 3-12.

If a cell is empty then no representative example airport could be identified. Validation / verification exercises on this particular combination of parameter values / classes are of no added value.

In cells which include one or a number of airports, validation / verification exercises can add value and the results may be usefully projected (within limits) on the other airports mentioned in that cell or those with specific features in common.

[7] Even though the majority of the work in this OFA applies to WP5, there is a small part covered by PP6.8.5 (RNP transition to GLS).

	Inter-cont. Hub	European Hub	Primary Node	Second. Node	Third Level Node	Fourth Level Node[8]	General / Buss. Aviation	Mixed Civil / Military	Mixed Fixed wing / rotor-craft [9]
Multiple Ind. runways, complex Surface Layout	MAD, FCO,	PMI							
Multiple Dep. Runways, Complex Surface Layout[10]	LHR, CDG, AMS, FRA, ZRH, IST	CPH, HEL, VIE, BRU, MXP, BCN, ORY, ARN,	BUD, DUS, LIS, TXL, PRG, LYS	SXF, CGN			RKE, LBG		NCE, SVG
Single Runway, Complex Surface Layout	LGW		WAW, OPO, LIS	LTN, LBA, FNC, LCY, OPO					
Multiple Ind runways, non-complex Surface Layout	MUC	OSL	ATH						
Multiple Dep. Runways, non-complex Surface Layout[11]			HAM	HAJ, LEJ					
Single Runway, non-complex Surface Layout			STN, STR, VLC	NUE, GOT, BGY, CIA, SOF, OTP, LUX, CRL, HHN, LIN	DTM, AAR, RTM, GRO, BRE, DRS, LJU	MXX, HOQ	BRN, FAB, QEF	EIN,	BGO, ABZ

Table 3-8: Network Function versus Layout & Basic Operational Criteria

	Inter-cont. Hub	European Hub	Primary Node	Second. Node	Third Level Node	Fourth Level Node[12]	General / Buss. Aviation	Mixed Civil / Military	Mixed Fixed wing / rotor-craft
Highly Utilised Apt, traffic mix of G, H,M&L	MAD, FCO, LHR, AMS, CDG, FRA, LGW, MUC, ZRH, IST	MXP							

[8] It is considered that a Remote Tower may often provide the ATC services for these airports.

[9] Airports with a mixed Fixed wing / Rotorcraft operation are often a primary, a secondary or a tertiary Node

[10] Dependent Runways Class includes closely spaced parallel, converging and crossing runways.

[11] Dependent Runways Class includes closely spaced parallel, converging and crossing runways.

[12] It is considered that the ATC services may be provided often by a Remote Tower for these airports.

	Inter-cont. Hub	European Hub	Primary Node	Second. Node	Third Level Node	Fourth Level Node[12]	General / Buss. Aviation	Mixed Civil / Military	Mixed Fixed wing / rotor-craft
Highly Utilised Apt. dominant traffic mix of G, H,M or L		ARN, BRU, CPH, PMI, HEL, VIE, PMI, BCN, ORY, OSL	STN, PRG, DUS, LYS						NCE
Normally Utilised Apt		PRG	ATH, HAM, WAW, TXL, LIS, STR	LTN, LIN, LCY, CGN					BGO
Low Utilised Apt.			BUD, VLC	SXF, FNC, LBA, HAJ, NUE, GOT, BGY, CIA, SOF, OTP, LUX, CRL, HHN, OPO	DTM, AAR, RTM, GRO, BRE, LJU	MXX, HOQ	RKE, LBG, BRN, FAB, QEF	EIN	SVG, ABZ

Table 3-9: Network Function versus Capacity Utilisation

	Highly Utilised Apt, traffic mix of G, H,M&L	Highly Utilised Apt. dominant traffic mix of G, H,M or L	Normally Utilised Apt	Low Utilised Apt.
Multiple Ind. runways, complex Surface Layout	MAD, FCO	PMI		
Multiple Dep. Runways, Complex Surface Layout[13]	CDG, LHR, AMS, ZRH, FRA, MXP, IST	ARN, BRU, PRG, CGN, DUS, CPH, VIE, ORY, HEL, BCN, LYS, NCE		BUD, SXF, LBG, RKE, SVG
Single Runway, Complex Surface Layout	LGW		LCY, LTN, WAW, LIS	FNC, LBA, EIN, OPO
Multiple Ind. runways, non-complex Surface Layout	MUC	OSL	ATH	
Multiple Dep. Runways, non-complex Surface Layout[8]			HAM	LEJ, HAJ
Single Runway, non-complex Surface Layout		STN	LIN, STR, BGO	BRE, NUE, GOT, CIA, LUX, DTM, RTM, DRS, BGY, VLC, LJU, SOF, OTP, CRL, HHN, AAR, GRO, ABZ

Table 3-10: Capacity Utilisation versus Layout & Basic Operational Criteria

	Highly constrained	Moderately constrained	Lightly constrained

[13] Dependent Runways Class includes closely spaced parallel, converging and crossing runways.

Multiple Ind. runways, complex Surface Layout	MAD	FCO	PMI
Multiple Dep. Runways, Complex Surface Layout[14]	CDG, LHR, AMS, ZRH, FRA, ARN, BRU, ORY, LYS, NCE, IST	PRG, CGN, DUS, CPH, MXP, VIE	HEL, BCN, BUD, SXF, SVG
Single Runway, Complex Surface Layout	LGW, LCY	FNC, LIS, LTN, WAW, LBA, EIN	OPO
Multiple Ind. runways, non-complex Surface Layout	MUC	OSL	ATH
Multiple Dep. Runways, non-complex Surface Layout[15]	HAM	LEJ	HAJ
Single Runway, non-complex Surface Layout	LIN	BRE, STR, STN, NUE, GOT, CIA, LUX, DTM, RTM	DRS, BGY, VLC, LJU, SOF, OTP, CRL, HHN, AHR, GRO, BGO, ABZ

Table 3-11: External Influences versus Layout & Basic Operational Criteria

	Highly constrained	Moderately constrained	Lightly constrained
Highly Utilised Apt, traffic mix of G,H,M&L	MAD, CDG, LHR, AMS, ZRH, FRA, LGW, MUC, IST	FCO, MXP	
Highly Utilised Apt. dominant traffic mix of G,H,M&L	ARN, BRU, ORY, LYS, NCE	PRG, DUS, CPH, STN, VIE, OSL	PMI, HEL, BCN
Normally Utilised Apt	HAM, LCY, LIN,	STR, LTN, WAW, LIS, CGN	ATH, BGO
Low Utilised Apt.		FNC, LEJ, BRE, LBA, NUE, GOT, CIA, LUX, DTM, RTM, EIN	HAJ, DRS, OPO, BUD, SXF, HAJ, BGY, VLC, LJU, SOF, OTP, CRL, HHN, AHR, GRO, SVG, ABZ

Table 3-12: External Influences versus Capacity Utilisation

The table below shows the translation of IATA code to City / airport name.

CODE	CITY	AIRPORT NAME	CODE	CITY	AIRPORT NAME
AAR	Aarhus	Tirstrup	LBG	Paris	Paris - Le Bourget
ABZ	Aberdeen	Dyce	LCY	London	London City
AMS	Amsterdam	Schiphol	LEJ	Leipzig	Leipzig / Halle
ARN	Stockholm	Stockholm – Arlanda	LGW	London	Gatwick
ATH	Athens	Hellenicon	LHR	London	Heathrow
BCN	Barcelona	Barcelona-El Prat	LIN	Milan	Linate
BGO	Bergen	Flesland	LIS	Lisbon	Portela de Sacavem
BGY	Bergamo	Orio al Serio	LJU	Ljubljana	Ljubljana-Brnik
BRE	Bremen	Bremen (Neueland)	LTN	London	Luton
BRN	Bern	Belp	LUX	Luxembourg	Findel
BRU	Brussels	National	LYS	Lyon	Lyon – Saint Exupéry
BUD	Budapest	Ferihegy	MAD	Madrid	Madrid-Barajas
CDG	Paris	Charles de Gaulle	MUC	Munich	Munchen
CEQ	Cannes	Mandelieu	MXP	Milan	Milan – Malpensa
CGN	Koln	Cologne (Koeln)-Bonn	MXX	Mora (Sweden)	
CIA	Rome	Rome-Ciampino	NCE	Nice	Cote d'Azur
CPH	Copenhagen	Kastrup	NUE	Nürnberg	Nürnberg (Nuremberg)
CRL	Charleroi	Charleroi Brussels Sth	OPO	Porto/Oporto	Dr F. Sa. Cerneiro
DRS	Dresden		ORY	Paris	Orly
DTM	Dortmund		OSL	Oslo	Oslo-Gardermoen
DUS	Dusseldorf	Dusseldorf (Rhein-Rhur)	OTP	Bucharest	Otopeni

[14] Dependent Runways Class includes closely spaced parallel, converging and crossing runways.

[15] Dependent Runways Class includes closely spaced parallel, converging and crossing runways.

CODE	CITY	AIRPORT NAME	CODE	CITY	AIRPORT NAME
EIN	Eindhoven		PMI	Palma	Palma de Mallorca
FAB	Farnborough		PRG	Prague	Ruzyne
FCO	Rome	Rome-Fiumicino	QEF	Egelsbach	
FNC	Funchal	Santa Cruz Madeira	RKE	Copenhagen	Roskilde
FRA	Frankfurt	Frankfurt Main	RTM	Rotterdam	
GRO	Girona	Girona-Costa Brava	SOF	Sofia	International
GOT	Goteborg	Landvetter	STN	London	Stansted
HAJ	Hanover	Hanover (Langenhagen)	STR	Stuttgart	Stuttgart (Echterdingen)
HAM	Hamburg	Hamburg (Fuhlsbuttel)	SVG	Stavanger	Sola
HEL	Helsinki	Vantaa	SXF	Berlin-	Berlin (Schoenefeld)
HHN	Hahn	Frankfurt-Hahn	TXL	Berlin	Berlin (Tegel)
HOQ	Hof (Germany)		VIE	Vienna	Schwechat
IST	Istanbul	Ataturk	VLC	Valencia	Valencia
LBA	Leeds/Bradford		WAW	Warsaw	Okecie

Table 3-12: Mapping of IATA codes for Airports cited in the above tables

3.1.3 Traffic Characteristics

The traffic volume and growth forecast applicable to the overall European Airspace does not provide any specific information for the development of traffic at a specific airport. As mentioned before, there are numerous differences between airports, and the specific differences in growth in traffic volume or change in traffic mix over time are examples.

Traffic volume ranges from several hundred (commercial) annual movements for the very small airports to almost two thousand daily commercial movements. An average number of movements or a total (cumulative) number of movements for all European airports is therefore not applicable for a local situation.

The same is the case for traffic mix in the context of the distinction between Super Heavy, Heavy, Medium and Light (ICAO classes). The percentage distribution between these four classes is different for every airport and in fact only really significant to traffic management if the airport operates at, or close to, runway capacity. The SH/H/M/L distribution determines the in-trail separation to be used on the approach, landing, take-off and climb phases in order to minimise Wake Turbulence incidents. Even when applied for safety reasons it does not determine the practical capacity of an airport which operates at less than 50% of its theoretical capacity.

Based on the Generic Airport Characteristics Category 1 - “Network Functions”, an approximate indication can be given on traffic volume and traffic mix. It must be stressed that it is not more than just an indication and deviations from this categorisation will exist.

Airport Category (network function classes see table 3-1)	Indicative Annual Movements[16][17] (total of arrivals AND departures)	G/H/M/L mix
Intercontinental Hub	300.000 +	>15% Super Heavy-Heavy <1% Light
European Hub	150.000 – 300.000	<15% Super Heavy-Heavy 10-20% Light
Primary Node	75.000 – 150.000	< 5% Super Heavy-Heavy 20-30% Light
Secondary Node	30.000 – 75.000	< 1% Super Heavy-Heavy >30% Light
Third Level Node	5000 – 30.000	No Super Heavy-Heavy > 40% Light
Fourth Level Node	< 5000	No Super Heavy-Heavy > 90% Light
General / Business Aviation	A few hundred – 80.000	No Super Heavy-Heavy > 90% Light
Military / Civil Mixed Ops	< 30.000	> 50% military ops
Fixed wing / rotorcraft mixed operations	< 150.000	> 20% Rotorcraft Ops

Table 3-13: Traffic Volume and Traffic Mix for Different Categories of Airports

Several studies, e.g. “EUROCONTROL Challenges of Growth 2013” [10] show that in the future many airports will shift between airport categories. Secondary Nodes may become Primary nodes,

[16] Airports measure activity in movements which can be a landing or a take-off. The rest of the ATM world deals with flights where each flight consists of two movements (a take-off and a landing).

[17] Number of movements given in this column includes both fixed-wing aircraft and rotorcraft operations. These values are indicative and should not be used as a strict limit for classifying airports.

European Hubs may become Intercontinental Hubs. Military aerodromes with mixed military / civil use may become fully dedicated to civil operations and may serve as tertiary or even secondary nodes to relieve the larger airports.

3.1.4 Infrastructure Characteristics

3.1.4.1 Airport (ground) Equipment

This section identifies the technical basis for characterising the airport infrastructure. The implementation rate at a particular airport is hard to determine without insight into the local cost benefit analysis. Incentives may be necessary to increase implementation to the minimum level at which the expected benefits to the overall ATM system become achievable.

In the table below, an indication is given of implementation at airports with an estimated level of confidence, based on the knowledge at the time when this document is issued and provides some possible trends for the future.

Airport Equipage	Current	Trend
Surveillance Systems (multi-lateration)	High (Airport classes 1 – 2) Low (Airport classes 3 – 6)	=
Surveillance Systems ADS-B	Low	+
AMAN/DMAN	High (Airport classes 1 – 2) Low (Airport classes 3 – 6)	+
A-SMGCS (level 4)	High (Airport classes 1 – 2) Low (Airport classes 3 – 6)	+
GNSS / GBAS / SBAS	Low	+
MLS	Low	-
ILS	High	=
Datalink (CPDLC)	Medium	+
A-CDM DB	High (Airport classes 1 – 2) Low (Airport classes 3 – 6)	+
SWIM	Low	+
AOP, APOC, DCB	Low	+
DME	High	-
NDB, VOR	High	-

Table 3-14: Airport Equipage Rates

3.1.4.2 Aircraft (airborne) Equipment

This section identifies the aircraft technology that impacts the airport operation. The implementation rate of aircraft technology that brings benefits to airport operations is hard to determine as implementation strongly depends on the associated cost benefit to the airline. This will be influenced by such factors as the retrofit cost and the expected future life of the airframe. Scheduled, low cost and charter airlines may differ substantially in their business models. Incentives may be necessary in increasing implementation to the minimum level at which the expected benefits to the ATM system becomes achievable.

In the table below an indication is given of on-board implementation, based on the knowledge with a confidence level at the time when this document is issued and provides some possible trends for the future.

Aircraft Equipage	Current	Trend
ADS- B out	High	+
ADS- B in / ATSAW	??	??
ATSA-SURF	??	??
Optimised Braking (e.g. BTV)	Low	+
CPDLC / D-TAXI	Low	+
GNSS / GBAS Cat II/III	Medium	+
GNSS / SBAS	Low	+

Aircraft Equipage	Current	Trend
MLS	Low	-
ILS	Low	=
E&SV/HUD	High	+
Electronic Flight Bag	Low	+
VHF-RT	Medium	=

Table 3-15: Aircraft Equipage Rates

"**??**" means there is no reliable information about present or expected status.

3.1.5 Weather Characteristics

Weather conditions have a significant impact on the airport operational performance. Operational improvements must therefore be considered in both good and degraded weather conditions as some improvements may only provide benefits during specific conditions. The following three basic weather categories have been distinguished for an airport:

- **Nominal** weather describes conditions in which the airport operates in more than 90% of time and which form the basis of the declared capacity for scheduling purposes. Use of Nominal conditions in the scheduling round may differ for summer and winter seasons. Nominal conditions translate into conditions such as no wind, no snow, no visibility constraints etc.
- **Adverse** weather describes degraded conditions within the operational envelope of the airport, which have a significant negative impact on operations unless an appropriate response is organised; adverse weather conditions may be reduced visibility conditions (e.g. Cat II) or strong and gusting wind.
- **Disruptive** weather describes adverse conditions which are generally rare and would have a severe impact on airport performance. The airport cannot be expected to provide resources to mitigate such conditions e.g. snow at a Mediterranean airport.

The table below gives the characteristics for the categories of **Nominal** and the typical **Adverse** conditions which have a negative impact on operations at airports. Coordination with primary project 6.5.5 may further detail this table and/or adjust where necessary.

Weather Constraint	Nominal Conditions	Typical Adverse Conditions	Comments
Visibility	More than 1,500 m	Less than 550 m	Visibility Condition 2[18]
Cloud Base	More than 1,500 ft	Less than 200 ft	
Wind Intensity and Direction	Less than 15 kt	More than: • 15 kt head • 30 kt cross	Head winds reduce the arrival stream capacity for distance based separation. The limits on tail winds will depend on runway length Cross wind of 5 kts will reduce arrival stream capacity in order to increase distance to cater for standing wake turbulence over the touchdown area and on last part of final approach.
Wind gusts	No gusting	Gusting	Cross wind gust characteristics impact runway use (runway selection, in-trial separations)
Icing conditions	Above +3 deg C, no moisture	Below +3 deg C	Some aircraft might experience clear ice conditions in high humidity with cold soaked within temperatures up to + 15 deg. C. Engine anti-ice is for some aircrafts used in temperatures up to + 10 deg. C with dew point spread of 3 deg C or less.
Precipitation	No precipitation, No standing water on the runway → Runway braking conditions Good	Heavy rain, standing water on the runway → Runway braking conditions Medium to Poor	The amount of standing water will negatively impact the Runway braking conditions.

[18] ICAO (Manual on A-SMGCS doc 9830) Visibility sufficient for the pilot to taxi and to avoid collision with other traffic on taxiways and at intersections by visual reference, but insufficient for personnel of control units to exercise control over all traffic on the basis of visual surveillance

Weather Constraint	Nominal Conditions	Typical Adverse Conditions	Comments
Snow/slush/ice	No snow, slush or ice on the runway → Runway braking conditions Good	Snow, slush or ice on the runway → Runway braking conditions Medium to Poor	
Duration of weather events	Less than 15 minutes	15 minutes or more	
Thunderstorm / lightning	No occurrence	Within 5 km of airport or on arrival / departure paths	Within 5 km of airport may result in the temporary halt of aircraft handling (e.g. fuelling) at the aircraft stand. On arrival / departure path may result in runway changes or temporary halt of runway operations.

Table 3-16: Weather Categories

A further specification to characterise visibility might be applicable where Runway Visible Range is used as the metric.

Category	Landing Decision Height (DH)	Runway Visual Range
1	DH ≥ 200 ft	≥ 550 m
2	100 ft ≤ DH < 200 ft	≥ 300 m
3a	0 ft ≤ DH 100 ft	≥ 200 m
3b	0 ft ≤ DH < 50 ft	≥ 200 m
3c	DH = 0 ft	0 m

Table 3-17: Low Visibility Landing Minima

In some cases, the operational improvement is developed to provide its principal benefit in specific adverse conditions. If these conditions are significant for the airport validation site, these conditions should be considered within the operational envelope of the airport validation exercises / activities.

3.2 Roles and Responsibilities

A summary of the roles and responsibilities is provided here. The reader should refer to the "SESAR–D66-B4.2 – SESAR Concept of Operations Step 1 ed 2013 – 01.01.00-22/11/2013" [11] and the "DEL-06.05.04 D08_OFA050101_OSED 00.02.02" [13] deliverables for more detailed information. Where WP6.2 has recommended some changes to the role granularity and their descriptions, these are provided as footnotes.

The roles and responsibilities related to airport operations are presented in table 3-19. The precise allocation of roles to actors or business units will depend on the operational and business needs of the stakeholders at the individual airport.

Some specific roles might be combined and performed by a single individual depending on local conditions. For example, the roles and responsibilities of the Tower Clearance Delivery Controller, the Tower Ground Controller and Tower Runway Controller might well be combined.
In other cases some specific roles and related responsibilities might be outsourced to other actors within the airport operational environment. The roles of Stand Planner and Apron Manager are often performed by one or more dedicated airline and/or ground handling agents.
However it is important to note that, independently of the precise roles allocated to the airport actors, the airport authority will always be obliged to operate the airfield according to the conditions of the licence.

Role Name	Summary of Responsibility
Airspace Users Operations (AUO)	
Flight Crew	The Flight Crew remains ultimately responsible for the safe and orderly operation of the flight in compliance with the ICAO Rules of the Air, other relevant ICAO and CAA/EASA provisions, and within airline standard operating procedures. It ensures that the aircraft operates in accordance with ATC clearances and with the agreed Reference Business Trajectory.

Role Name	Summary of Responsibility
Airline Operations and Control Centre (AOC)[19]	The Airline Operations and Control Centre is an organisational unit of an airline and is usually run by a variety of professionals from different areas. It hosts the roles of Flight Dispatch, Slot Management and Strategic & CDM Management, thereby managing the operations of the Airline and implementing the flight programme. The AOC (flight Dispatch) is in charge of the iSBT and the iteration to integrate ATM constraints.
Flight Dispatcher	The Flight Dispatcher is an actor included in the Airline Operations and Control Centre and is responsible for planning and monitoring the progress of a flight.
Slot Manager	The Slot Manager is an actor included in the Airline Operations and Control Centre and is responsible for the day to day management of all slot restricted airports within the network of the specific Airspace User. The Slot Manager communicates / coordinates with the Slot Coordinator of the relevant slot restricted airports.
Strategic and CDM manager	The Strategic / CDM Manager is an actor included in the Airline Operations Centre and is responsible for the overall management of the Airspace Users daily operations and the initiation or / participation in CDM processes with concerned partners to resolve potential and existing issues
Flight Schedule Planner	The Flight Schedule Department of an Airspace User schedules their flight programme for each subsequent season during the long-term planning phase. The output of the process in Trajectory Management terms is the Business development Trajectory (BDT). The flight plan / iSBT schedulers take part in the IATA Schedules Conferences and create their Flight Schedule based on the business strategy and management objectives of the airline as well as aircraft and flight crew resources.
Ground Handling Agent[20]	The Ground Handling Agent has the role to execute the aircraft turn round agreements established with the Aircraft Operators and is responsible for the turn round of all arriving aircraft. Ground Handling covers a complex series of processes that are required to separate an aircraft from its load (passengers, baggage, cargo and mail) on arrival and combine it with its load prior to departure.
De-icing Agent	The specific responsibility for the De-icing Agent is to ensure that the departing aircraft is free of snow and ice. The main interactions of the De-icing Agent are with the Flight crew to communicate the point in time for start of holdover time as well as with the Apron Manager for stand de-icing and with the Tower Ground Controller for remote de-icing.
Airport Operations (APO)	
Airport Operator	The Airport Operator is responsible for safe operations at the airport. This includes the physical conditions of the runways, taxiways, aprons, terminal facilities and security at the airport as well as creating and maintaining a good relationship with local / national authorities and neighbouring communities. In also includes assurance that the scale of equipment and facilities provided are adequate for the activities which are expected to take place at that Airport, as well as provision of staff that are competent and where necessary, suitably qualified (licensing of vehicles and companies on airside).
Airport Duty Officer	The airport duty officer is the manager responsible for the daily operations, entitled by the airport operator, in charge of assuring that the airport is operated in accordance with its national licensing conditions and international regulations. Other responsibilities: • Changes to the airport infrastructure, including the manoeuvring area under the delegated authority of the Tower Supervisor. • Ensuring that the best interest of passengers and airlines are met.
Airside Operations Control Centre[21]	The Airside Operations Control Centre is the central organisational unit responsible for airport airside operations. In addition, the airside Operations Centre is responsible for the on-time provision of resources like aircraft parking stands, gates, busses etc.

[19] The Airline Operations and Control centre (AOC) is often referred to as Flight Operations Centre (FOC). The term FOC has been adapted in the CONOPS and ADD.

[20] The term Fixed Based Operator (FBO) is often used by Business Aviation as their ground handling service provider.

[21] The **A**irside **O**perations **C**entre must not be mistaken with the APOC (Airport Operations Centre). The APOC will be the operational management structure that permits relevant airport actors to have a common operational overview and to communicate, coordinate and collaboratively decide on the progress of present and near term airport operations.

Role Name	Summary of Responsibility
Airport Slot Coordinator	The Airport Slot Coordinator's role in ATM is three-fold: 1.To prepare the allocation of airport slots to Aircraft Operators wanting to operate from/to a fully coordinated airport on a seasonal basis, in a neutral, non-discriminatory and transparent way. This responsibility occurs during the Long-term Planning phase. 2.To facilitate the operations of Aircraft Operators at schedule facilitated airports. The corresponding responsibility (Airport Slot Negotiation) is to negotiate with the Aircraft Operators the allocation of airport slots in accordance with the rules and regulations and to define the airport slot allocation plan. This responsibility occurs during all phases. 3.To monitor the use of airport slots and adherence of Aircraft Operators to allocated schedules. The corresponding responsibility (Airport Slot Monitoring) is to monitor that the utilisation of airport slots by the Aircraft Operators is in accordance with the airport slot allocation plan. This responsibility occurs during the Execution phase.
Stand Planner	The Stand Planner has the role to of assigning flights/aircraft to their stands on a given airport, taking into account inter alia: aircraft type, aircraft load (e.g. passenger vs. cargo), gate assignment to airlines, origin/destination of flight (e.g. Schengen, international, etc…). The Stand Planner modifies the plan dynamically to comply with real time constraints (stand usage conflicts, stand out-of-service etc.). The stand plan is generated during the medium/short-term phase and is iterated up to and including the execution phase.
Apron Manager	The Apron Manager is responsible for guidance of aircraft to and from the stands (e.g. providing push-back approval), ensuring the safe and efficient movement of aircraft and vehicles within his area of responsibility according to local procedures. The Apron Manager also maintains close coordination with Tower Ground Controller on planned aircraft movements. Normally, control of the activities and the movement of aircraft and vehicles rest with ATC with respect to the manoeuvring area. In the case of aprons, such responsibility sometimes rests with the apron management.
Air Navigation Service Provider (ANSP)	
Local ANSP (ATC provider)	Provides operational targets, thresholds, rules, etc. for the performance baseline and maintains the system supporting the AOP. Where airport operators may not have the competence to assess the airside capacity (runway and manoeuvring area) and the immediate constraints within the TMA, the Air Traffic Service Operations (ANSP) may provide guidance to the airport operator in the context of runway and manoeuvring area capacity to assist them in the overall capacity declaration.
Executive Controller	The Executive Controller is part of the controller team providing Air Traffic Service (ATS) to designated area (e.g. control sector, multi sector area). He is responsible for the safe and expeditious flow of all flights operating within his area of responsibility. His principal tasks are to separate and sequence known flights operating within his area of responsibility and to issue instructions to pilots for conflict resolution and segregated airspace circumnavigation. Additionally, he monitors the trajectory (4D and 3D) of aircraft according to the clearance they have received. He is assisted in these tasks by automated tools for conflict detection and resolution, trajectory monitoring and area proximity warning (APW). The responsibilities of the Executive Controller are focused on the traffic situation, as displayed at the Controller Working Position (CWP), and are very much related to task sharing arrangements within the sector team.
ACC/Approach Supervisor	The ACC/Approach Supervisor is responsible for the general management of all activities in the Operations Room. He decides on staffing and manning of controller working positions in accordance with expected traffic demand.
Tower Clearance Delivery Controller	The Tower Clearance Delivery Controller is part of the controller team responsible for providing Air Traffic Service (ATS) at controlled aerodromes. He is responsible for verification of Flight data (e.g. FPL, CTOT, Stand, TSAT, etc.), delivery of ATC Clearance (Departure Clearance) and Start Up Approval. His main task is to provide the Flight crew its departure clearance (which consists of information like, clearance limit, departure procedure, route and altitude information, communication frequency and transponder code). The Tower Clearance Delivery Controller also provides the flight crew with start-up information (TSAT). He is assisted by a departure management system (DMAN)
Tower Ground Controller	The Tower Ground Controller is part of the controller team responsible for providing Air Traffic Service (ATS) at controlled aerodromes. His main task is the provision of ATS to aircraft and vehicles on the manoeuvring area. The TWR Ground Controller must also ensure that airport maintenance vehicles and manoeuvring aircraft are separated. He will be assisted by an advanced surface movement guidance and control system (A-SMGCS).

Role Name	Summary of Responsibility
Tower Runway Controller	The Tower Runway Controller is part of the controller team responsible for providing Air Traffic Service (ATS) at controlled aerodromes. He is responsible for the provision of air traffic services to aircraft within the control zone, or otherwise operating in the vicinity of controlled aerodromes (unless transferred to Approach Control/ACC, or to the Tower Ground Controller), by issuing clearances, instructions and permission to aircraft, vehicles and persons as required for the safe and efficient flow of traffic. The Tower Runway Controller will be assisted by arrival (AMAN), departure (DMAN) and surface (A-SMGCS) management systems, where available.
Airport Tower Supervisor	The Airport Tower Supervisor is responsible for the safe and efficient provision of air traffic services by the Tower crew. He decides on staffing and manning of controller working positions in accordance with expected traffic demand. He represents the Tower when coordinating with the Airport Operator on operational issues. Other general tasks: • Maintains close liaison with the Airport Operator with respect to the daily inspection of the movement area, the aerodrome lighting system, the marking of obstructions, snow clearance etc. • Coordinates with the Airport Operator regarding traffic emergencies/incidents on the movement area. • Implements and discontinues adverse conditions operations (e.g. low visibility operations / CAT II or CAT III) after liaison with Airport Operator and ACC/Approach Supervisors.
Local Capacity Manager	The Air Navigation Service Providers perform their own day to day local capacity planning coordinated with the Network Management function. Local Capacity Management is a planning role, which contributes to the sub-regional (e.g. FAB) capacity planning.
Aerodrome Flight Information Service Officer (AFISO)	A properly trained person; competent, duly authorized and, if necessary, licensed to provide aerodrome flight information service.
Network Operations	
Network Manager (NM)	The Network Manager acts as a catalyst and facilitator for efficient overall network management by all ATM actors. In the Execution Phase the Network Manager assures the stability of the NOP, reacting to unexpected events, which impact overall network performance. Such unusual meteorological conditions imply loss of significant assets (e.g. runways, airports), among other means. ctivating pre-agreed scenarios will enable the Network Manager to restore Network stability.
Other	
Airport Operations Centre (APOC)	An operational management structure that permits relevant airport stakeholders to have a common operational overview and to communicate, coordinate and collaboratively decide on the progress of present and near term airport operations. The APOC hosts the roles of APOC Supervisor and Airport CDM Project Manager.
APOC Supervisor	The APOC supervisor (short term and execution phases) will liaise with all APOC participants for the purpose of coordination and arbitration between actors in the management of the Airport Operations Plan (AOP). He will act as a final decision maker in case of issues for which no consensus has been reached. The following roles and responsibilities are identified: • Liaison between airport operations and Network, • Liaison between airport stakeholders, • Ensures that total airport overview and information is available to all relevant stakeholders, • Coordinate with the relevant AOP stakeholders on the feasibility of specific airport scenario's, • Ensures that agreed actions are taken by the appropriate stakeholder(s), • Monitors that expected benefits from agreed actions are reached and coordinates any new operational measure if appropriate, • Acts as arbitrator in case a mutualy agreed decision cannot be made in time, Updates the AOP with information within the AOP sphere of responsibility.
Airport Performance Board (APB)	The Airport Performance Board (APB) is made up of board level (i.e. Strategic) representatives from the various airport stakeholders' organisations. The representatives must have the ability to agree to performance decisions for the airport operation and accept that the collaborative result may or may-not equal strategic agreements between individual stakeholders.

Role Name	Summary of Responsibility
Operational Steering Board (OSB)	The Operational Steering Board (OSB) is made up of operational based managers/representatives from the airport stakeholders' organisations and will meet on a regular basis (e.g. monthly) or as it is deemed necessary by the local airport. The Operational Steering Board (OSB) will use the high level (Strategic) agreed parameters from the Airport Performance Board (APB) and extend this to define performance metrics to be measured, the performance levels (thresholds) against which warnings / alerts are generated and the target values for the KPI/DPI included in the Current Airport Performance Framework.
Vehicle Driver[22]	The Vehicle Driver is the one operating on the airport manoeuvring area (i.e. beyond the apron) and as such is licensed by the Airport Operator. The single main responsibility of the Vehicle Driver is to ensure the safe and efficient movement of his assigned vehicle on the airport manoeuvring area.
Meteorological services (MET)	Presents available weather data (observations and forecasts) to be selected as specific fields in the AOP by the relevant stakeholders at the airport.

Table 3-18: Roles and Responsibilities at the Airport

Systems

Table 3-18 describes only human actors, but not systems. For the modelling of the scenarios, systems are required, for this reason the following system is defined:

- **ATM System**
  SESAR WPB4.3; A collection of ATM components organised to accomplish a specific ATM function or set of ATM functions.

3.3 Constraints

Military activity, ATC workload and traffic density could be a subject to airspace constraints that impact airport ground operations.

[22] Vehicle Drivers are employees of many of the organisations, performing activities at the airside part of the airport. These activities range from aircraft ground handling, aircraft de-icing to airport infrastructure maintenance and airside operations (bird-control, snow clearing, Follow me etc.).

4 Operational Scenarios / Use Cases

4.1 Operational Scenario Hierarchy

As illustrated by the figure below, 3 types of operational scenarios ranging from high-level to very detailed scenarios can be found in the various SESAR concept documents.

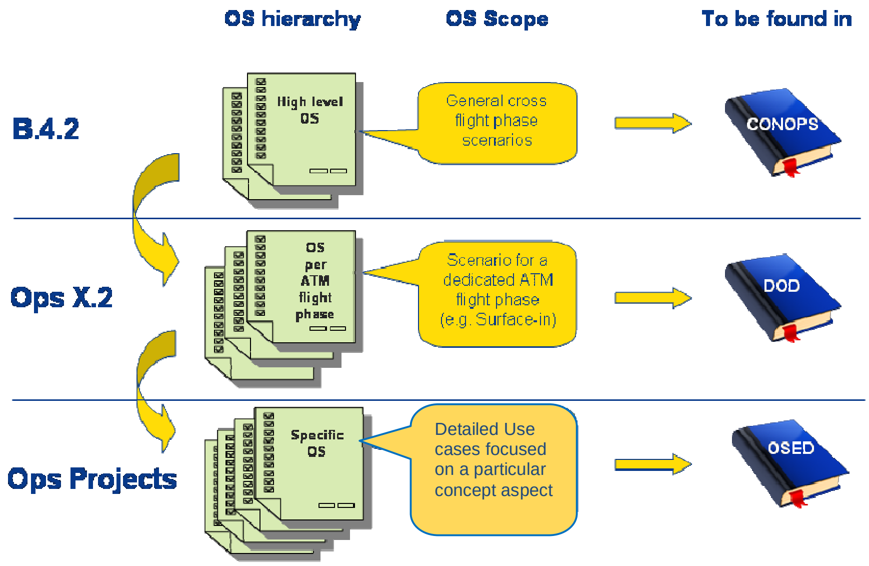

Figure 4-1: The Operational Scenario Hierarchy

The X.2 Work Packages are then responsible for the production and maintenance of “Operational Scenarios per ATM flight phase”.

4.2 Operational Scenario per ATM Phase

The level of specialisation of the operational scenarios found in the DOD is defined according to ATM phases.

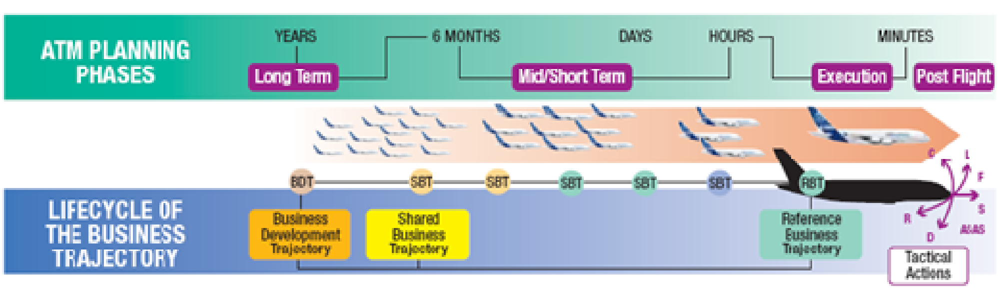

Figure 4-2: Life Cycle of a Business Trajectory compared to the ATM flight phases

With reference to " SESAR– D66-B4.2 – SESAR Concept of Operations Step 1 ed. 2013 – 01.01.00-22/11/2013" [11], the Execution Phase is divided in several segments corresponding to the Flight Phases; the overlapping of these two views are detailed in the below table:

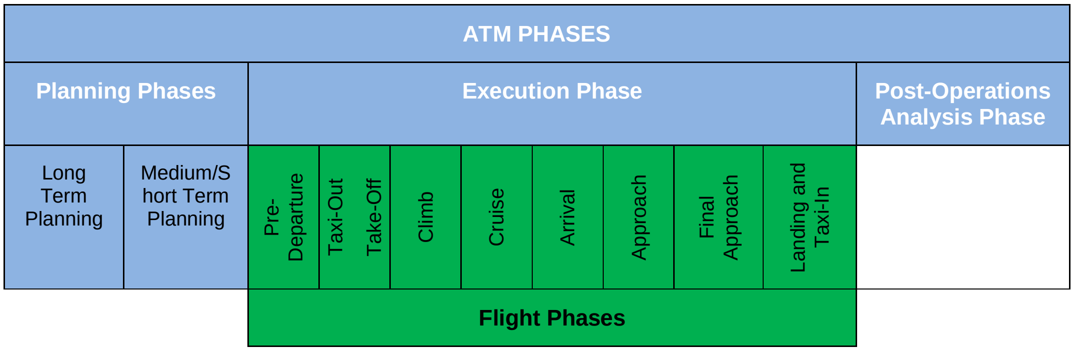

Figure 4-3 ATM Phases and Flight Phases 1

The ATM phases and the Flight Phases are described in Table 4-1:

ATM Phase	Flight Phase	Operational Scenario	Description
Long Term Planning		Long term Planning Phase (Section 4.2.3)	The long term issues of activities associated with the development of airport process and infrastructure and aircraft operator business (e.g. business plans, resources, budget planning, historical data, performance targets, demand forecasts, trends, options, facilities).
Medium-Short Term Planning		Medium-Short term Planning Phase (Section 4.2.4)	All activities concerning to the planning of Shared Business/Mission Trajectories (e.g. resource allocations, airspace organizations adoption and mode of operations, network operations plan, adjustments or refinements of assets and budgets).
X Trajectory Execution		Execution Phase (Section 4.2.5)	All activities concerning to the agreement and execution of the Reference Business/Mission Trajectories. It includes the monitoring of events applying service refinements or adjustments needed in order to maintain the stability of Network Operations Plan.
	En-Route	*Out of WP6 scope*	*The period from reaching the initial cruise level to the top of descent.*
	Descent	*Out of WP6 scope*	*The period from the top of descent until touchdown.*
	Landing[23] and Taxi-In	Arrival (Section 4.2.5.3)	The period from touch down through taxi until in-blocks.
		Turn-round (Section 4.2.5.4)	The period from in-blocks to off-blocks.
	Pre-Departure Taxi-Out Take-Off	Departure (Section 4.2.5.5)	The period from off-blocks, through taxi and take-off until the wheels are off the ground.
	Climb	*Out of WP6 scope*	*The period from take-off to the initial cruise level.*
	En-Route	*Out of WP6 scope*	*The period from reaching the initial cruise level to the top of descent.*
Post-Operations Analysis		Post-Operations Analysis Phase (Section 4.2.6)	The period after the conclusion of the flight (on block), e.g. Performance Analysis.

Table 4-1: ATM Phases and Flight Phases

Except for Climb, En-Route and Descent ATM flight phases (greyed-out in the table above), airport operational processes can be found in all other ATM phases.

[23] Information has to be shared and exchanged before landing or after take-off for airport management purposes. Although those parts of the landing and take-off operations are out of the scope of WP6, the airport scenarios have to integrate them.

Therefore, 4 airport operational scenarios can be identified in the domain of airport operations corresponding to the ATM Phases, in accordance with CONOPS structure:

- Long Term Planning Phase,
- Medium-Short Term Planning Phase,
- Execution Phase, encompassing the ATV Phases Arrival, Turn-round, Departure,
- Post-Operations Analysis Phase.

Those 4 airport operational scenarios per ATM Phase are presented in detail in sections 4.2.3 to 4.2.6.

These four scenarios describe the processes occurring at the airport level as well as the interactions among the relevant airport actors as related to SESAR– D66-B4.2 – SESAR Concept of Operations Step 1 ed. 2013 – 01.01.00-22/11/2013 [11]. For the purpose of this document, the Ground Flight Phases are developed within the ATV scope.

4.2.1 Additional Information

4.2.1.1 Airport Coordination

While airports continue to come under pressure to maximize their performance by limiting capacity shortfalls and their consequences, the aviation industry must deal with the realities of airport congestion and find ways to minimize its impact.

Depending on the level of activity at airports, procedures to ensure acceptance of airline schedules have been developed. For the purpose of schedule co-ordination for airlines and aircraft operators there are three broad levels of airports:

Level 1 describes those airports whose capacities are adequate to meet the demands of users. Such airports are referred to as **non-coordinated**;

Level 2 describes airports where, due to demand, a more formal level of co-operation and facilitation is required to avoid exceeding scheduling parameters. These airports are referred to as **schedules facilitated**;

Level 3 describes those airports where demand exceeds the coordination parameters and voluntary cooperation to resolve the problems of over-demand is no longer appropriate. In this scenario, formal procedures have been implemented at the airport to allocate capacity and coordinate schedules. Airports with such high levels of congestion are referred to as **coordinated** (according to IATA Worldwide Scheduling Guidelines).

4.2.1.2 IATA & Scheduling

IATA places a facilitating role in the planning process through the organisation of the twice yearly, global, Schedules Conference. During the conference, schedules are adjusted mainly through bilateral discussions between airlines and coordinators when it involves offered alternatives, or between airlines to exchange slots. As a schedule change at one airport could affect one or more other airports, the conference provides the best forum in which all such repercussive changes can be quickly and efficiently processed and all airlines can leave the conference with schedules which they consider are the best compromise between what is wanted and what is available.

The June conference considers northern winter schedules, and the conference held in November deals with the northern summer schedules for the following year. All relevant dates for summer and winter schedule coordination activities can be found in the calendar of Schedule Coordination.

The Conference also deals with adjustments to planned future schedules to fit in with the slots available at airports. This activity has nothing to do with adjustments to schedules on the day of operation for air traffic flow management. The two types of slot allocation are quite different and unrelated.

4.2.1.3 Airport Transit View (ATV)

From the viewpoint of improving predictability and efficiency, aircraft movement and handling on the ground is as important as movement in the air. The integration of the airfield surface operations in the

4D trajectory of aircraft allows airports to be developed as ground sectors within the SESAR concept. The aircraft's movement on the surface, including turn-round handling, is to be carefully managed to minimize delays. Information sharing between the Airport Operational Plan (AOP) and the Network Operations Plan (NOP) will assure the best overall system outcome while paying due attention to the needs of the airport, the individual aircraft operators and also the network.

The ATV can be described as shown in Figure 4-4. A Business Trajectory (BT) consists of several phases, starting at "off-blocks" (pushback) at airport A, through phases as taxi-out, take-off, climb, en-route, approach, landing and taxi-in ending with "on-blocks" (end docking) at airport B.

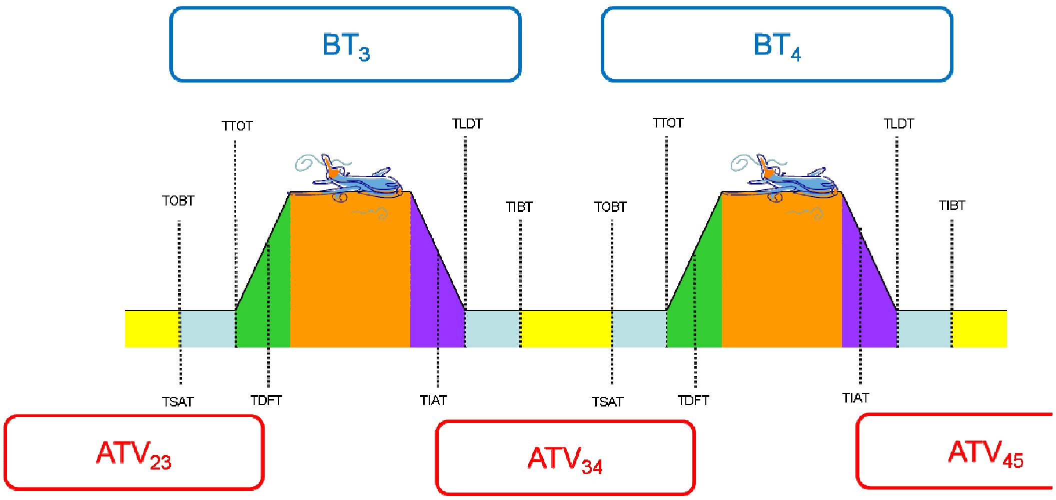

Figure 4.4: Flight phases of a single flight trajectory

Each BT contains two ground segments: an outbound ground segment at airport A, and an inbound ground segment at airport B.

Trajectories can be of different types. Some consist of only one flight (from A to B) and there are even flights from A to A. The second one is typical for training, test and General Aviation flights but certainly also for many of the military missions currently flown in the European Airspace and on a large number of combined civil / military used airports.

During the planning phases (often short term), these flights evolve into trajectories where they fit into the airspace user's airframe utilisation schedule and in the airports / networks resource availability planning (landing slots, high-level parking/stands availability). For this to fit into the airport resource availability planning (i.e., ground handler, airport operator, airspace user, and local ATC), the ground segment of the trajectories is important.

Definition of Business Trajectory Segments Applicable to Airports

Where the BT is seen from an Airspace User perspective (flight from A to B), the Airport Transit View (ATV) takes the perspective of the ground node actors (Airport Operator, Local ANSP, Ground Handler).

Irrespective of the definition of a Business Trajectory, in most cases the Airport Transit View links two flights that will be performed by the same aircraft (tail-number) and thus describes the 'visit' of the aircraft to the airport. It connects the ground segment of the inbound flight with the ground segment of the outbound flight through an aircraft turn-round process. During this turn-round process the aircraft is prepared for the execution of the next flight of the same business trajectory (in case of an intermediate stop, from A to B to C; e.g. QF001 SYD-SIN-LHR) or for the execution of a new business trajectory.

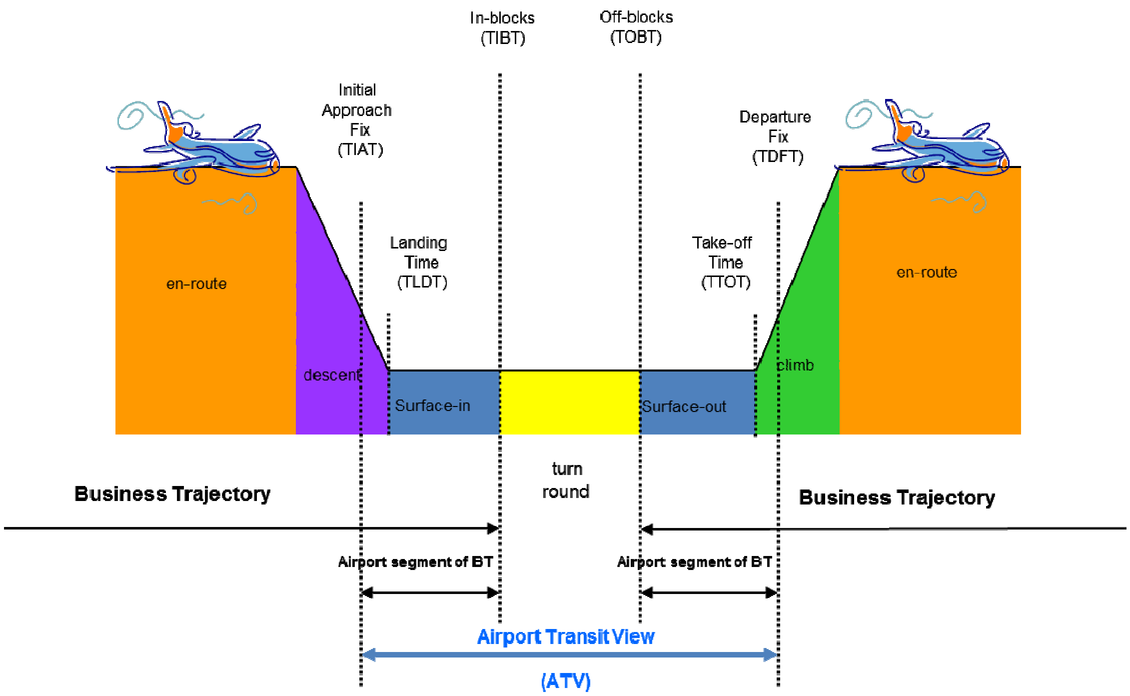

Figure 4.5: Business trajectory applicable to airports (ATV)

An ATV is the local set of data describing the path and operations of an airframe during its “visit” to the airport. It starts at the Initial approach fix and includes the taxi-in segment, the turn-round processes from the airspace user, the taxi-out segment and ends with the handover to the TMA departure controller (see Figure 4-5).

This will guarantee a similar scope of the airport segment for all airports and will as well generate a partial overlap of AOP and NOP, for full consistency. The ATV does not by definition start with the descent/landing and end with the take-off/climb phases. For example an aircraft may not perform a subsequent outbound flight but is towed to a maintenance area or a remote parking area; five ATV types are identified:

- ATV Type 1: The current "visit" to the airport, executed in three separate sections (the final approach and landing/taxi-in ground flight phases of the inbound flight, the turn-round process section in which the inbound and the outbound flights are linked, the taxi-out/take-off ground flight phases and the initial climb segment of the outbound flight).
- ATV Type 2: The current visit Type 1 is divided in two parts, with a long break (of x hours) in between the arrival and the departure services. This break may be a night stop due to the closure of the airport, or a long stay due to schedule timings of the AU, particularly for long-haul operations. The ATV Type 2 is corresponding to the final approach and landing/taxi-in ground flight phase of the inbound flight and to the arrival operations of turn-round process section in which the inbound and the later outbound flights are linked.
- ATV Type 3: The current visit Type 1 is divided in two parts, with a long break (of x hours) in between the arrival and the departure services. This break may be a night stop due to the closure of the airport, or a long stay due to schedule timings of the AU, particularly for long-haul operations. The ATV Type 3 is corresponding to the departure operations of turn-round process section linked to an earlier inbound flight and to the taxi-out/take-off ground flight phase and the initial climb segment of the outbound flight.
- ATV Type 4: The inbound flight is not linked to outbound flight because of towing operation to another parking location or hangar or of planning reasons. In that case, the ATV Type 4 is corresponding to the final approach and landing/taxi-in ground flight phase of the inbound flight and to the arrival operations of turn-round process section, following by towing operation on ground or stand by on the apron.

- ATV Type 5: The outbound flight is not linked to inbound flight because of towing operation from another parking location or hangar or of planning reasons. In that case, the ATV Type 5 is corresponding to the departure operations of turn-round process section linked to an earlier inbound flight and to the taxi-out/take-off ground flight phase and the initial climb segment of the outbound flight.

ATV Types 4 & 5 describe scenarios where the arrival and departure BT's of the airframe may be on different days or weeks and hence the airframe is effectively 'not in use' from an airport perspective. In these scenarios an ATV is not relevant for the ATM network as the arrival is unlikely to impact a departure.

An ATV does not just link two flight segments; it serves as a planning and execution tool. The key linking points between an "inbound" iRBT / "outbound" iSBT and an ATV are the A-CDM data points TIAT, TLDT, TIBT, TOBT, TTOT, TDFT. The conjoined set of data making up an ATV is required for efficient and predictable management in various operational phases (Medium/Short Term Planning and execution Phases). Examining these operations on an individual trajectory basis is not sufficient. To achieve the overall SESAR predictability and capacity targets, any knock-on effect needs to be known / published throughout the network. The ATV is the link that provides this ability.

4.2.2 Assumptions

The operational scenarios are based on the following assumptions:

- SESAR Deployment Baseline (DB) results or corresponding output / results of other similar ATM research programmes are fully implemented at airports and network level,
- CDM (DB) operational procedures are implemented,
- Two way coordination with adjacent military aerodromes (if relevant) is established,
- Service Levels agreed between the airport operator and airspace users or set by regulatory bodies will be regularly updated,
- Airport (and TMA) and airspace demand and capacity forecasts are available and exchanged with other stakeholders (like Airspace Users),
- The long term planning process, which spans from over years ahead until five months before the day of operation, relies on the sharing of the network capacity situation by all concerned parties,
- The long term planning inputs in terms of declared capacity and performance framework including targets are available. The level of the imbalance between demand and capacity at airport will be reviewed to determine the airport status as a non-coordinated, schedules facilitated or coordinated airport,
- Airspace Users should provide future traffic forecasts containing aircraft type, origin/destination and preferred time of operation to the airport operator[24],
- The NOP, that is the plan of all operations at a network level, is in place. The initial AOP, that is the plan of all operations at airport level, is in place. Thus planning and operational coordination is done through the exchange and update of A-CDM milestones for each BT,
- Flights are assigned to airframe numbers by the owner of the "flights" (trajectories) and the owner of the airframe (often the same Airspace User but not always by definition). It is assumed that this airframe utilisation scheme is fixed input to this operational scenario provided by the Airspace User(s) not earlier than 1 to 2 days before day of operation (Short Term Planning Phase),
- If the airport is coordinated, all flights (especially during peak traffic periods) are subject to regulation to ensure that demand does not exceed capacity,
- The anticipated ATM System capabilities for SESAR Concept Storyboard Step 1 as listed in table 4-2 are available,
- Data for Airport Post-Operations Analysis is received from various sources, e.g. AOP, Stakeholders Operational database or Flight Processing Systems,

[24] Certain categories or operations of AUs Business Model require flexibility (e.g. Business Aviation, replacing aircraft, State or Military flights, etc.) and it is assumed some flights are possibly not forecasted before the day of operations.

- While WP6.2 acknowledges the existence of other analysis, e.g. CODA reports or Airport-CDM KPI, the Airport Post-Operations Analysis is targeted at the interest of the whole local Airport Community and other external actors, especially NM.

It is vital that all systems mentioned are capable of immediately taking input data and updates into account, in order to generate and transfer new or updated output data virtually in real-time to the relevant displays and to provide the information to the human in a way that can quickly, easily and uniquely be transferred into a mental image and be reacted upon.

Anticipated System Capabilities (IP2, SL2 [25])		
Aircraft System	**Ground System**	**Vehicle System**
ADS-B out	Surveillance Systems (e.g. multi-lateration, ADS-B)	VDS
ADS-B in / ATSAW		ADS-B out
	AMAN/DMAN	ADS-B in
ATSA-SURF	A-SMGCS (level 4)	
Optimised Braking	GNSS/GBAS	
CPDLC / D-TAXI	MLS	
GNSS/GBAS Cat II/III	ILS	
MLS	Datalink (CPDLC)	
ILS	A-CDM DB	
E&SV/HUD	SWIM	
Electronic Flight Bag	AOP, APOC, DCB	
AMM	DME	
	NDB, VOR	

Table 4-2: System Capabilities

Data link facilities in the aircraft make data communications with both the systems of ATC and the Airlines Operations Systems (AOC) possible. [26]

ATC related Data link communications will focus on the A-CDM process. Information will be exchanged between flight crew and controller without the use of often overloaded R/T. Data link communications reduces misinterpretations and increase safety and time efficiency.

Data link communications with the AOC will be used to update information for trajectory planning such as flight plan / iSBT on outbound trajectory, aircraft load etc.

Data link communication with vehicle drivers will be used to inform them on their expected (next) operation and assigned routing (through restricted areas), but may (and will) also be used to accurately determine the off block time (for push-back tug), passenger bus at parking position etc.

Ground vehicle accessibility of aircraft parking positions may require the crossing of active taxiways. To increase ground movement safety, reduction of taxiway incursion and conflicts between aircraft and vehicles, ground vehicles are equipped with ADS-B, Moving Map and output of a Conflict Alerting System[27].

[25] SL2: Service Level 2 introduces the fundamental changes underpinning the SESAR Concept of Operations thanks to the progressive implementation of an information rich and information sharing environment with SWIM supporting the Shared Business Trajectory. More and more user-preferred trajectories will be accommodated along with Functional Airspace Block (FAB) implementation over Europe, enabling more direct routes in upper airspace. The User Driven Prioritisation Process (UDPP) will be applied defining prioritisation as the result of a collaborative process involving all partners. New modes of separation will be introduced and ASAS Spacing applications will be introduced in terminal areas. Advanced environmental friendly operations will be used in higher density terminal areas, with the introduction of 3D trajectory management and new controller tools.
Surface movement operations will benefit from increased automation and improved surface navigation. Positional awareness will be improved through the application of visual enhancement technologies (excerpt from the ATM-Masterplan).
Main Focus of this DOD is: Automated Surface Movement Planning and Routing, Airport Safety Nets (Pilot, Controllers and Vehicles), BTV via Data Link, Improved LV Operations (e.g. GBAS), Enhanced Navigation for Airport Vehicles, Adjustment of Separation Based on Ground Wake Vortex detection.

[26] Voice communication is still possible and valid, but in the scenario description the focus is on data link. Voice communication can be required in certain instances (e.g. time-critical situation, runway operations)

[27] Due to the cost of Moving Map equipment for vehicles, this assumption is subject to Cost Benefit Analysis at concerned airports and could be a driver to not implement this communication tool.

The ground part of the ATM System has an AMAN/DMAN and an A-SMGCS (Advanced Surface Movement Guidance & Control System) to assist the Tower Clearance Delivery Controller and the Tower Ground Controller in optimizing and achieving the appropriate pre-departure sequence. These systems feed the Tower Clearance Delivery Controller to determine and issue the TSAT.

4.2.3 Operational Scenario Long Term Planning

4.2.3.1 Scope of scenario

This Operational Scenario describes, for SESAR Service Level 2 (SESAR Concept Story Board Step 1), the processes occurring at the airport level during the long-term planning phase and the relevant interactions among airport actors.

This Scenario provides an overview of all the activities required for the definition and continuous refinement of the various outputs of the Long Term Planning Phase – optimising existing infra-structure. This set of long-term plans (that will finally compose the Airport Strategic Plan) will be the basic input data for an AOP that will be established at the outset of the Medium/Short-term Planning phase.

Because the long-term planning phase potentially stretches over decades (between 6 months and up to 30 years in extreme cases [28]):

- The various activities will be assessed through a time horizon organized in terms of years with a particular focus on the next IATA scheduling season (to be considered in the medium/short-term planning phase).
- The scheduling season will be generally treated through details provided for generic days of operations (according to weeks, months or any other criteria). This will not prevent long-term planning addressing a specific day of operation in the next season if relevant (e.g. a Football Final).

The scenario starts at the early stage of the Long-term Planning and ends with the beginning of the Medium/Short Term Planning Phase following the IATA Schedules conference.

4.2.3.2 Scenario text

The scenario is based on the logical progression of the planning function. It starts with a definition of the performance requirements, considers the identification of the imbalance between future demand and capacity and discusses potential solutions through enhancement of the infrastructure, the supporting systems and the operational process. Finally it identifies what is possible in the long term and what actions are sensible to prioritise in the period leading up to the seasonal schedule declaration.

4.2.3.3 Establish or Review Local Airport Performance Targets (UC 6 01)

Fundamental drivers for the long-term planning are the local airport performance targets. They may, but not necessarily will, reflect a subset of the SESAR Key Performance Areas (KPAs), but the targets will need to be consistent with Commission Regulation 691/2010. Where monopoly airport providers exist the State may set Airport Performance Targets and impose penalties for failure to meet the requirements.

In this context the Airport Operator, together with appropriate actors (Airspace Users, ANSP etc.), defines the overall operational strategy - establishing the operational and performance framework and determining the performance targets and associated levels. The Airport Operator provides the airport related objectives, inputs and constraints on operational performance, societal outcome, performance enablers and service levels. Further refinements of the Use Case may be found in the OFA05.01.01 OSED.

For analytic purposes, the Key Performance Indicators (KPIs) may be defined and structured within 2 KPA groups:

- Operational Performance; and

[28] Building extra facilities at some already very congested and constraint airport may require decades of planning – e.g. Heathrow Terminal 5

- Societal Outcome.

The table below shows the ATMAP indicators that have been generally adopted and are currently among those monitored on a regular basis by the major European airports.

KPA Category	KPA	KPA definition	Examples of KPIs
Operational Performance	**Capacity**	Ability of the airport to accommodate the traffic demand	- Runway Capacity - Ground movement Capacity - Apron capacity - Capacity shortage
	Efficiency	Addresses the difference between actually flown trajectory versus initial iSBT	- Pre-departure delay - ATFM Arrival delay - Taxi-out additional time - ASMA additional time
	Predictability	Controls the variability of the deviation between ground segments of flown trajectory versus AOBT and initial TOBT	- ATC local Pre-departure delay - ATFM Arrival delay - Taxi-out additional time - ASMA additional time
	Cost-effectiveness	Addresses the cost of gate-to-gate ATM in relation to the volume of air traffic that is managed	Part of the ATM gate-to-gate flight cost related to the airport segment
Societal Outcome	Safety	Addresses the risk, prevention, occurrence and mitigation of air traffic accidents	Currently universally monitored: - Runway incursions - Other airport surface incidents
	Security	Addresses the risk, prevention, occurrence and mitigation of unlawful interference with airport operations	- Unlawful interference within the landside part of the airport (i.e. terminal building) - Unlawful interference within the airside part of the airport
	Environmental Sustainability	Controls environmental impacts of the airport activity	Currently monitored at many airports: - Noise (contours, impacts, taxying noise…) - Air Quality (gaseous and particulate emissions) - Others areas (water, waste, recycling…)

Table 4-2 Key Performance Areas and Indicators for airports

Primary Project P6.5.1 "AOP definition" has developed the SESAR P6.5.1 D004 Identification of Key Performance Areas and Focus Areas, version 00.01.01, 27 May 2010 [8 and SESAR P6.5.1 D005/D006 Identify Airport KPIs and Performance Drivers for the selected KPAs / Focus Areas, version 00.01.00, (6 separate documents) – 30 September 2010 [9] which includes the five bold identified KPA's in table 4-3.

Local airport performance targets include a commitment from all the stakeholders through the implementation of a Collaborative Airport Management process **[AO-0804]**. This process is owned by the "Steer Airport Performance" business service. Together with three other business services tasked to Monitor, Manage and Analyse performance from the long-term planning phase to the execution phase

When established and agreed, Airport Performance Targets are made available to all relevant actors.

A review process to monitor and feedback the local and wider network key performance indicators will usually be owned by the airport on behalf of all stakeholders **[SDM-0101]**

<u>Output of the Process:</u>

"Airport Performance Targets"

4.2.3.4 Determine and Review Airport Demand (UC 6 02)

For the Airport operator and the ANSP, the scope for the prediction of future traffic demand stretches from the near term (with considerations of new aircraft types, potential new entrants to the fleet, etc.) to a horizon years ahead (or even decades ahead for the larger airports) where the drivers will change to reflect the aggregate issues of economic growth, national/international infrastructure improvements (e.g. high speed rail links) as also price driven changes in customer transportation behaviour.

Generally, short term forecasts have an annual cycle to reflect the scheduling seasons. In the long term issues such as the expected duration of planning appeals or external constraints imposed by outside bodies can greatly vary the forecasting horizon for the airport.

Airport Traffic Forecasts take into account historical data, as well as such variables as:-

- the economic/environmental/political context,
- the development of Airspace Users' business strategy and planned aircraft procurement,
- multi-modal transportation aspects,
- major events (e.g. Olympic Games, Military Exercises),
- the development of a competitive airport market,
- the Airport capacity development program (with their terminal airspace),
- Airport long-term plans, as they relate to airport infrastructure expansion as well as airport use (hub-and-spoke against point-to-point services, the encouragement of new entrants, traffic mix, traffic segmentation between congested and reliever airports…).

The network manager will also have a view as to the growth of airport traffic and generally will be supported by an in-house team.

Output of the Process:

"Future Airport Traffic Demand for next season and beyond"

4.2.3.5 Establish Preferred Airport Operational Configurations (UC 6 03)

This process will be performed in order to define all Possible Airport Configurations that could be applicable during the next season.

The various Possible Airport Configurations are established and updated by the Airport Operator, in coordination with the other relevant stakeholders, using the airport infrastructure as an input and taking into account as constraints the Airport Resource Usage Rules, the Airport Performance Targets and the Network Target Capacity Plan (part of the NOP) [AO-0801].

As result, the Airport Operator lists each possible airport configuration scheme applicable during the next season – noting the benefits and dis-benefits:

- Usable runway for arrival, departure and/or both traffic, possibly limited to specific aircraft categories,
- Airport circulations rules taking into account aircraft size as also standard taxi paths / times for each possible stand to runway entry (and runway exit to stand) combination,
- Stand configurations and relevant pushback procedures,
- Proximity to de-icing areas/facilities,
- Terminal facilities,
- Holding bay areas.

The choice may involve trade-offs between such issues as

- Hot spot locations for runway incursion,
- Manoeuvring area bottlenecks, and
- Environmental constraints.

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.

Output of the Process:

"Airport Configuration Schemes"

4.2.3.6 Review Future Airport Capacities (UC 6 04)

At any point in the Long Term planning cycle, the expected path of future capacity growth at the airport when in a particular operating configuration will be available to the airport management. There are four sources of this information.

- The Existing Masterplan,
- Analysis of past operations in known configurations using the archived information from the regular output of the "Post Operations Analysis" business service
- Expert judgement,
- Computer modelling.

The analysis of past operations may be used to validate the computer model. Sensitivity analysis through such advanced analysis techniques (e.g. control variation analysis) may also indicate the degree to which the level of specific resources contributes to the overall performance.

Output of the Process:

"Planned Long Term Future Airport Capacity"

4.2.3.7 Identify the Future Airport Demand Capacity Imbalance (UC 6 05)

The outcome for this process identifies those airport facilities that will require enhancement either to achieve new performance targets or achieve the same level of performance under the forecast demand for the airport. Note that demand and capacity growth will not normally be in step as the outcome of an enhancement at the airport is usually a step change in capacity.

The knowledge of the airport performance under specific operating configurations (obtained from the history of Post-Operations analysis), together with the known frequency of occurrence – customarily weather conditions but also other potential drivers such as movement limitations on the basis of environmental impact, will enable the airport managers to gain insights into the degree of criticality associated with particular operating configurations and thus to prioritise potential enhancements.

The timing of any investment decision by the airport will be a matter of commercial judgement. Every potential enhancement will need to demonstrate a business case that meets the investment criteria of the airport operator. Cost benefit analysis in the airport context is complex and the benefits may not arise to the one making the investment.

Output of the Process:

"Identification of future potential capacity bottlenecks"

4.2.3.8 Build Airport Plans

The introduction of enablers to support a number of the OIs identified in the subsequent text (e.g. [AO-0101] [AO-0103] [AO-0305] [AO-0402], etc.) will require to be integrated into the business plans of the airport and ATC provider. Typically those discussed during the long term planning phases are concerned with the airfield layout, environmental protection, the terminal facilities, air traffic management systems and third party issues.

Propose Airport Infrastructure Enhancement Plans (UC 6 06)

The planning function within the Airport Operator is tasked to prepare revisions and enhancements to optimise the performance of the airport:

- at a strategic level: by the corporate business plan to enable growth at the airport where this is not constrained by external regulation, and
- generally, the revision and enhancement cycle as it applies to the infrastructure and supporting systems has a time horizon in excess of six months.

AIRFIELD

The airfield areas include:

- Additional runways or enhancement to existing runways – improved rapid exit taxiways, the provision of Rapid Exit Taxiway Indicator Lights (RETILS) or equivalent markings, runway access, better holding areas,
- Upgrades to the taxiway structure,
- Additional Apron and Stand Provision, and the provision of new gates when such types as the A380 are expected.

ENVIRONMENTAL PROTECTION

In addition to capacity enhancements there may also be a concomitant requirement for improved environmental protection. One aspect of this is the introduction of continuous descent approaches and continuous climb departures. Although these initiatives are closely monitored by the airport on behalf of the local community, they fall within the responsibility of WP5 and details are found in the WP5.2 DOD. Similarly the use of RNP procedures to manage flight around noise sensitive local areas is often driven by airport pressures but managed by the AU and ANSP.

LANDSIDE

The Terminal Capacity can be a constraint to Capacity Declaration. This is further complicated by the schedule where long haul arrivals are bunched around particular times and can overload a terminal allocated to particular airlines or airline groups. Long term planning for terminal development can therefore achieve significant improvements by re-considering the allocation of airlines to terminal buildings in addition to the more obvious solution of adding extra-extensions or new buildings. Associated with the re-allocation of airlines to different terminals may be a need for interior modification – larger gate rooms to accommodate different aircraft types.

Security regulations and requirements may require new passenger handling processes that affect terminal design – for example segregation between arriving and departing passengers or extra-security screening for particular destinations. Schengen and non-Schengen requirements introduce a constraint on the capacity and flexibility of terminal designs. These landside capacity disruptions may be significant in their effect on the processing capacity and planning should aim to mitigate them.

Output of the Process:

"Airport Resource Enhancement Plan(s)"

Initiate Introduction of new ATM Systems (UC 6 07)

The improvement to capacity and the reduction of environmental impact can be achieved by the provision of more resources or the greater efficiency in the use of the resources – essentially through revisions to the processes and systems. Some of these initiatives are essentially independent of the airport operator (for example electronic flight strips). Others require provision of support infrastructure (buildings and cabling).

In the context of improving the resilience, delivering economies, or enhancing the ATM service level.

- The potential economies in providing stand-by facilities by way of a remote tower potentially shared with other airports with the same requirement, controlled by their common ATM service provider.

The potential service enhancements/economies that might be achieved for small airports by providing a remote tower shared between a number of similar sized airports who might wish to upgrade their service levels e.g. to attract business aviation.

In the context of reductions to the environmental impact on the airspace adjacent to the airports:

- The introduction, and continuing support and monitoring, of low environmental impact approach profiles (CDO) and those offering a fully tailored approach from Top of Descent,
- Introduction of environmental restrictions at the earliest stage of flight / iSBT planning.

In the context of enhancements to the runway these could include introducing:

- An interim application of GLS (GPS only) instead of ILS for precision approach will also bring extra runway capacity,
- An ATM Micro-wave systems to detect small objects on the movement area will also enhance safety,

- Improvements in layout of taxiway system, signage and markings will reduce the risk of runway incursions and thus improve safety,
- Provision of infra-structure enhancements in support of dependent parallel operation (e.g. the dual threshold operation on the southern landing runway of Frankfurt Airport).

In the context of the manoeuvring area these could include:

- The introduction of Airport Safety Nets - system safety defences that provide additional safety layers to prevent accidents. Effective introduction requires that the appropriate enablers are present. For example, equipping the airport with an ATM multi-lateration system and airport vehicles with two-way communication means would allow an enhanced ground controller situational awareness in all weather conditions, and thus impacting safety and capacity,
- Providing the airport ATC with an ATM system to provide optimum routing for all movements (considering the constraints of departure sequencing and environmental impact) with a view to reducing ground movement delays and thus increasing efficiency.

In the overall management function this might include:-

- The emerging airport system will require a Data Warehouse capability in order to capture, store and provide access to management information and decision support systems. In a planning process this will be reviewed as, and when, the demand of new processes flags up the need.

Output of the Process:

"Airport plans for integration with ANSP Enhancement Initiatives"

Planning for the Management of External Issues (UC 6 08)

FLIGHT CREW

The ability of the airport to interact with the flight crews operating at the airport and to influence their behaviour in the context of runway occupancy needs a formal process that ensures that the necessity for good practices to minimise runway occupancy do not become stale and, at intervals, are introduced in new ways. A harmonised approach between airports is also important and processes need to be in place. Parallel mechanisms must support the European Action Plan for the Prevention of Runway incursions.

ADJACENT AIRPORT OPERATIONS

In closely coupled TMAs the airport operators may wish to be involved in the trade-offs that naturally occur in the management of congested airspace. These would include the departure management from airports in close proximity and the integration of ATM systems (AMAN and DMAN) where there are potential interferences between adjacent airports.

THE SURROUNDING COMMUNITY

Negotiation of any regulatory constraints that might impact on change to mixed mode operation.

Output of the Process

"Airport plans managing external issues associated with enhancement plans"

Review of and Preparation for the Response to Extraordinary and Emergency Situations (UC 6 09)

Extraordinary and Emergency situations are critical events that create sudden and usually unforeseen circumstances leading to a high drop in airport capacity. This will involve many actors and will require immediate action to minimise consequences and to recover to normal airport operations.

Airports will maintain their contingency plans under continuous review and revise where necessary. One important enabler could be the use of remote towers to act as cost effective solutions for the provision of continuity of coverage by the Air Traffic Service Operations**.**

Output of the Process:

"Airport plans for response and training for Emergency/Disruptive Events"

4.2.3.9 Pre-Seasonal Capacity Declaration (UC 6 10)

Given the outcome of any enhancements that have been completed between the seasons, the Airport works with its key stakeholders (airport Slot Coordinator, ANSP, Airlines) in order to define the appropriate capacity declaration for the following season. This capacity declaration profile may vary throughout the airport opening hours to reflect the historical traffic mix and permit the possibility of recovery from demand peaks by incorporating a fire-break in the schedule. Declared capacity is underpinned by assumptions of a seasonal weather norm, operational practices designed to maximise the productivity of the airport infrastructure and recognition of the external constraints. Typically these might embrace

- noise and emission constraints,
- the loading on and capacity of terminal facilities,
- runway capacities,
- taxiway capacities,
- stand allocation/planning, and
- de-icing positions.

For example, taxiway usage rules are defined for all traffic and depend on the runway configurations in use and the weather conditions. Meanwhile, stand allocation usage rules are defined for each type of aircraft and priority criteria could be established depending on the airline or type of cargo. The output of the Pre-seasonal Capacity Declaration is input for the IATA Schedules Conference.

The role of Slot Regulation (Airport Slot Coordinator) is to constrain demand within capacity.

Output of the Process:

"Pre-seasonal airport capacity declaration"

4.2.3.10 Publish Seasonal Schedules (UC 6 11)

This process allows the Airspace Users, via their Flight Schedule Planner, to finalise their planning and to issue their Shared Business Trajectories (iSBTs). Until the publication of iSBTs through the NOP, any planning information remains confidential. The Long term Planning Phase finishes 6 months before operations when detailed winter/summer schedules for the next season are made available. The seasonal schedule for the specific airport is at the end produced and published by the Airport Operator and made available not only to the airport actors but also to the Network Manager for inclusion in the initial NOP **[DCB-0103-A]**.

The seasonal schedule will be used to initiate the AOP which is the OFA05.01.01 use case AOM 01. Although this is formally part of the Medium Term Plan there may be local initiatives which permit a proportion of these actions to be undertaken earlier.

4.2.3.11 Use Cases Identified

Use cases describe nominal conditions and topics that deviate from the nominal conditions. These use cases should be assigned to specific WP6 (sub)work packages.

Use Case ID	Use Case title	Use Case description
UC 6 01	Establish / Review Local Airport Performance targets	Refer to Section 4.2.3.3 of this Document
UC 6 02	Determine and Review Airport Demand	Refer to Section 4.2.3.4 of this document
UC 6 03	Establish Preferred Airport Operational Configurations	Refer to section 4.2.3.5 of this document
UC 6 04	Review Future Airport Capacities	Refer to section 4.2.3.6 of this document
UC 6 05	Identify the Future Airport demand Capacity Imbalance	Refer to section 4.2.3.7 of this document
UC 6 06	Propose Airport Infrastructure Enhancement Plans	Refer to section 4.2.3.8 of this document

Use Case ID	Use Case title	Use Case description
UC 6 07	Initiate Introduction of new ATM Systems	Refer to section 4.2.3.8 of this document
UC 6 08	Planning for External Issues	Refer to section 4.2.3.8 of this document
UC 6 09	Review of and Preparation for the Response to Extraordinary and Emergency Situations	Refer to section 4.2.3.8 of this document
UC 6 10	Pre-Seasonal Capacity Declaration	Refer to section 4.2.3.9 of this document
UC 6 11	Publish Seasonal Schedules	Refer to section 4.2.3.10 of this document

Table 4-3 Identified Use Cases for Long Term Planning

4.2.4 Operational Scenario Medium to Short-Term Planning

4.2.4.1 Scope of scenario

This Scenario provides an overview of all the planning activities required for the continuous refinement of the AOP during the Medium/Short Term Planning Phase.

The Medium Term planning phase addresses the airport plan evolution from about 6 months before the day of operation until one day before start of operations, while the short term planning phases addresses the airport plan evolution from one day before operation until and including the execution of operations.

In the Medium/Short Term Planning Phase, as the execution of the flight(s) / trajectory(ies) is getting closer, more specific data becomes available: accurate traffic demand, links between arrival and departure flights, RWY configurations, weather predictions, trajectory planning deviations, etc.

At this stage the en-route to en-route concept can be applied, in other words the seamless ATM can be built. The main steps to follow are:

- Refine the operational capacity according to the actual situation (i.e. airport configuration, weather);
- Check if the Performance Targets can be achieved;
- Make the airspace user's demand balance with the declared capacity;
- Ensure coherence between Airport Operations and Network Operations.

The initial reference for the schedule is performed during the Long Term Planning Phase in terms of declared airport capacity. A description of these processes is out of the scope of the present Scenario and is covered by the Long Term Operational Scenario.

The scenario starts after the IATA Schedules Conference; approx. 6 months before the day of operations. The scenario ends when the flight / trajectory is ready for execution (start of operation).

The focus of the scenario is on the medium term planning activities, especially during the last days before the actual operation (execution) of the flight / trajectory, and details the short term activities until the actual start of operation.

4.2.4.2 Scenario text

4.2.4.2.1 Operations prior to Medium/Short-Term planning

The Medium and Short Term Planning Phase is a continuation of the previous work developed in the Long Term Planning Phase and will take the following on board as inputs:

- Declared Airport Capacity for the next season.
- Performance framework including the agreed targets.
- Strategic plan which includes the airport resources in service for the next season
- The airport configuration schemes.
- The Environmental regulations and restrictions.

Those inputs form the baseline for the creation of the seasonal operational plan, starting from the intentions of the Airspace Users (IATA slot conference) until the day of actual operation.

4.2.4.2.2 Medium Term Planning Phase

General Description

The Medium Term planning phase addresses the airport plan evolution from about 6 months before the day of operation until one day before the start of operation.

There are two main activities in the scenario:

- The creation of the AOP is executed some months before the day of operation. The characteristics of this activity are the global approach to the demand and capacity balance assessment and the generic treatment of resource allocation.
- Development of the AOP, including the subsequent updates between the creation of the plan until one day before the day of operation when most of the information is (should be) known including the aircraft rotations or links between the arrival and departure flight related to the same aircraft frame. At this moment the specific resource allocation for every single flight and aircraft can be performed, and the AOP is the reference for the execution.

Creation of AOP (UC 6 12)

The creation of the AOP starts at the beginning of the mid-term planning phase. At this point the results of the IATA Slot Conference are available. This permits an initial airport demand profile to be entered into the AOP and allow airport operators to ensure that local decisions achieve the optimum performance from aircraft operations at and around airports, through the integration and monitoring of Airport Transit Views (Aircraft flows) that describes the functional and technical requirements for monitoring aircraft movements at an airport in both the planning and execution timeframe **[AO-0803]** and to attain the most appropriate balance between social, economic and environmental imperatives **[AO-0703].** This improvement includes use of noise monitoring systems, flight tracking and air quality monitoring systems, **[AO-0706]**

To enhance the planning process, the NOP will use the available information provided by the airports (available from the AOP). It will provide information on stakeholders' agreements (Airport Operator, Airspace users, ANSP, Ground Handling and De-icing agents as well as the Network Manager) and will continuously provide up-to-date information on the Network situation. **[DCB-0103-A] [DCB-0102]**. Latent capacity is used to relieve bottlenecks through a consolidated capacity planning process based on coordination and network synchronisation of ANSPs/airports, enabling the adaptation of the capacity delivery where and when required **[DCB-0201]**. Business to Business services to share this traffic flow management information (including the capability to fill and validate flight plans) between the Regional NM and the APOC will be provided by SWIM **[IS-0901-A]**.

The AOP includes information on critical events like adverse weather conditions (storm, fog, etc.) regarding the past, current and future state of the atmosphere **[MET-0101]**., allowing improved operations in Low Visibility Conditions through enhanced ATC procedures and/or navigation systems **[AO-0502]**, industrial actions (strikes) as also any foreseen special event (like football finals) having an impact either on capacity, traffic demand or the airport operational performance. Scenarios for dealing with these events will be created during the medium term planning phase based on experiences and analysis from past (comparable) events. Experiences are extracted from the Post-Operations analysis and scenarios developed in close cooperation with airport actors **[AO-0501].**

Development of the AOP (UC 6 13)

As the Medium Term Planning Phase evolves, the AOP is continuously refined and updated. The Mid Term Planning phase will culminate in a reference AOP, committed to by all airport actors the day prior to the day of operations, for execution the next day. This plan will be based on iSBT information made available, at the latest, the day prior to execution - with possible refinements - by airspace users. This extended flight plan will then evolve into the initial iSBT/iSMT. The initial iSBT/iSMT will be a partial implementation of the iSBT/iSMT, which is the published business/mission trajectory that is available for collaborative ATM planning purposes **[AUO-0203-A]**. At that stage, the plan will include, inter-alia, the planned configuration of the airport, allocation of airport resources to flights, etc.

As stated in the previous point, at the first stage the demand is obtained from the IATA Slot Coordination Process. The information contained at this early stage is limited and does not include all the details of the complete flight plans / iSBTs. Due to business characteristics, some flight plans /

iSBTs, like General Aviation and some Charter flights, will not be identified until the day of operation comes close. Each Airport will develop their own strategy to deal with this lack of schedule information in order to maintain the needed flexibility to allocate them as appropriate **[DCB-0206].**

The process allows the airspace users, via their AOC Staff, to allocate new flights or to cancel existing ones. This process will be managed by the Airport Operator in coordination with the AOC Staff of the related airspace user. The Network Manager participates at the network level in these refined flight plans / iSBTs. The NOP will provide access to initial network performance objectives and support to network performance assessment in post-operations **[DCB-0103-A] [DCB-0102].**

The Airport Operator (Airside Operations Control Centre) and ANSP (Airport Tower supervisor) revise the usage rules, possible (runway) configurations, the resource availability and the slot allocation, taking into account the refined traffic demand **[AO-0804]**. They refine their infrastructure and airspace capacity planning, taking into account the most recent traffic updates which will include specific traffic (as charter flights and special event flights) **[DCB-0310].**

At airport level, the Airport Operator, in coordination with the other actors, continuously refines the AOP as appropriate data becomes available. Foreseen airport capacity changes expected to have a significant impact on the traffic demand at the airport will be communicated by the process owner (ANSP; runway, airspace capacity etc., Airport Operator; stand, terminal capacity etc.). This applies to temporary (e.g. runway maintenance) as well as structural capacity modifications. Decision making will remain with the process owner **[DCB-0310].**

In case of a critical event, a European Aviation Crisis Coordination Cell (EACCC) has been established to support the activation and coordination of contingency plans at a State level. This process is established for managing critical events such as industrial actions etc, which can be tailored to the needs/requirements of individual countries. This leads to better utilisation of limited available capacity **[DCB-0207]**. It is based on feed-back, experience, and continuous validation of long term traffic forecasts.

The airport performance assessment that identifies the functional and technical requirements required to manage the airport process **[AO-0804],** in addition to the expected performance of the network, is based on comparing the actual operation (routes flown, usage of allocated airspace, runway utilisation, etc.) against the forecast operation and assessing the adequacy of the capacity provision. **[DCB-0102] [DCB-0103-A] [SDM-0101].** Consequently, the AOP is continuously refined with the application of local airport CDM processes **[DCB-0310]**.

The Airport Operator and ANSP performs the global resource planning, and maps the traffic demand on to the various airport resources (i.e. runways, taxiways, stands and de-icing pads, APP sectors, passenger facilities). In addition, specific resource allocations for planned special events is performed **[AO-0804]**.

The main characteristic is that predictable events, which may have an impact on the AOP, will be analysed by the European Aviation Crisis Coordination Cell (EACCC) **[DCB-0207]**. The plan is consolidated under supervision of the airport operator through a process of demand and capacity balancing based on the flight plans / iSBTs and known capacity constraints at the airport or in the network and which may directly impact airport operations **[DCB-0309]**.

4.2.4.2.3 Short Term Planning Phase

General Description

One day before the day of operation the short term planning phase starts in which the relevant airport actors (Airport Operator, ANSP, Airspace users, Ground handling and de-icing agents, network manager) continue refining the AOP in an iterative manner all the way through to the iRBT/iRMT which is the reference used by all ATM partners during the flight execution **[AUO-0204-A]**. At this stage, as more reliable data becomes available, more detailed figures can be taken into consideration **[DCB-0103-A] [DCB-0206].** Convergence is ensured between airport slots and flight plans together with the airport slot monitoring processes in order to improve consistency on a daily basis **[DCB-0301].**

The airport actors consider the AOP as a reference and establish the time schedule for their own activities in the iRBT/iRMT. In addition, the AOC staff allocates airframes (tail numbers) to the validated iSBTs. The iRBT/iRMT corresponds to the EFPL Extended Flight Plan and the iRMT corresponds to the sharing of the improved OAT Flight Plan, which is a harmonised flight plan containing additional specific military information items **[AUO-0204-A] [AUO-0203-A]**. At this moment the "visit" of a specific aircraft to the airport (Airport Transit View = ATV) is created as an inbound flight can only be connected to an outbound flight through the tail number **[DCB-0302]**. Flights are assigned to airframes (tail numbers) by the owner of the "flights" (trajectories) and the owner of the airframe (often the same Airspace User but not always by definition). This airframe utilisation scheme is provided by the Airspace User no earlier than 1 to 2 days before the day of operation (Short term planning). The information is included in the AOP and also provided to the network to update the NOP **[DCB-0103-A].**

Aircraft changes in the Medium / Short term planning phase are seen as "just" updates of the AOP. Aircraft changes during execution are described in the turn-round OS where a USE CASE is presented. (UC 6 68).

Revise / Update AOP during day of operation (UC 6 14)

The night before the day of operation the reference AOP will be available for next day execution. As the AOP is a "rolling plan" and deviations from this plan will take place during execution, continuous monitoring and updates of the AOP will need to identify, at a minimum, (1) those elements that are common to the Network Operations Plan (NOP) and (2) the procedures to ensure they are effectively shared and commonly updated within a "Rolling NOP structure" **[AO-0801].** The first steps of the interactive Rolling NOP have already been implemented through the deployment of the NOP portal **[DCB-0102].**

Shortly before execution (often 12 to 24 hours before operation) the airport operator and the tower supervisor allocate the airport resources to each flight (i.e. runways, taxiways, associated standard taxi routes and APP sectors by the ANSP and stands and de-icing pads, passenger facilities by the airport operator). This process repeats when the execution comes closer and more detailed information becomes available.

Based on flight schedule information from the AOP, an initial (pre-) departure sequence is determined. Both users and providers are able to assess the actual operation (routes flown, usage of allocated airspace, runway utilisation, the estimated corresponding taxi time, etc.) against the forecast operation and to assess the adequacy of the capacity provision **[SDM-0101].**

The establishment and maintenance of the pre-departure sequence is a collaborative process involving the tower ground controller and airport CDM partners involved in taking into account agreed principles to be applied for specified reasons (e.g. slot compliance, airline preferences, night curfew, evacuation of stand/gate for arriving aircraft, etc.) who may propose sequence swaps or negotiate a new rank in the sequence **[AO-0602].** The iSBT/iSMT is published as the iRBT/iRMT at the moment when, due to the proximity of the execution phase, iSBT/iSMT is sufficiently reliable to become the trajectory the Airspace User agrees to fly and the Airspace Service Providers agree to facilitate. **[AUO-0204-A] [AUO-0203-A]**.

Environmental rules and restrictions are taken into account where applicable. This might be applied on the use of runway combinations, a (temporary) ban on night operations or refusal of late flight plan / iSBT submissions (e.g. business aviation and/or charter flights) as mitigation measures to reduce atmospheric emission and aircraft noise at/around the airport **[AO-0703].** Those measures are initiated if airports environmental performance reaches the limits set by the local and/or national authority **[AO-0706].**

Automated assistance provides the controller with the best calculated surface movement route by minimising the delay according to planning, ground rules, and potential conflicting situations with other mobiles **[AO-0205]**. When meteorological forecasts are available **[MET-0101]**, the airport operator (Airside Operations Control Centre) and the ANSP (Airport Tower Supervisor) identify the special actions to be taken during the day of operations and take action accordingly **[AO-0501] [AO-0502].**

All unforeseen occurrences (such as abrupt changes in weather conditions, emergency repairs, but also the late measures taken to keep the actual operation within the legal environmental boundaries) are identified and analysed for their impact on capacity. The consequences on flight / iSBT planning and execution for the next hours (up to 24 hours) are evaluated and processed in a collaborative way with all relevant actors including the Airspace Users. For managing critical events a pan-European procedure is established **[DCB-0206] [DCB-0207] [AUO-0203-A]**.

Where necessary, flight schedules are adapted to the actual situation and reduced capacity by delaying or even cancelling flights, taking into account the priorities of the Airspace Users. The iSBT/iRMT is published as the iRBT/iRMT at the moment when, due to the proximity of the execution phase, iSBT/iSMT is sufficiently reliable to become the trajectory the Airspace User agrees to fly and the Airspace Service Providers agree to facilitate **[AUO-0204-A] [AUO-0203-A]**. The local situation is extended to include interconnected regional destination airports **[DCB-0304].** The swapping of regulated flights on departure, arrival, and en-route, which is already possible for the flights of the same Airspace User (AU) sharing the same Most Penalising Regulation (MPR), will be extended to all regulated flights without any constraints due to AU (or MPR if possible) **[AUO-0101-A]**.

The Network Manager allocates TTAs for all regulated flights. For those flights where the allocated constraints will have a negative impact (e.g. disturbing airport/airline operations), the Network shall take this information into account in order to possibly re-allocate TTAs. This results in improved efficiency in the management of Airport and ATFCM Planning [**DCB-0310**].

The APOC Supervisor (or the Airport Tower Supervisor in an airport with no APOC) performs Demand and Capacity assessments for the next few hours. He pro-actively assess the balance between available airport capacity and scheduled/forecast demand given the prevailing and/or forecast weather and other operational conditions and pro-actively makes suggestions for runway configuration and capacity distribution according to performance management priorities **[DCB-0309].** Inclusion of outputs from landside processes (passenger and baggage flow) allows for improved accuracy and predictability of the airside operations **[AO-0802].** In case of upcoming capacity reductions having a significant impact on the schedules of the airspace users, airspace users should express their preferences and priorities regarding their flights. Next, the new target times are written into the AOP to be exchanged with the NOP and assessed by the Network Manager **[AO-0801].**

The Airport Tower Supervisor is continuously aware of changes to the aerodrome capacity (e.g. as a result of changes in meteorological conditions, system(s) serviceability etc.) and acts to maintain a constant balance with demand [**DCB-0309**]. Thus, in the nominal case, changes to the Target Landing Time (TLDT) are minor, reflecting a change in sequence priorities and not as a result of over-demand**.**

Changing the flight priority between 2 arrival flights where at least one flight is not regulated can occur. The AUs' requests for these changes in flight priority will be introduced at the initiative of the AUs themselves, to the airport authorities or to the Network Management function. The Network Management function may propose ATFM slot exchanges that satisfy the network performance targets [**AUO-0101-A**].

ATFCM keeps track of changes to the aircraft iSBT/iSMT including route changes and diversions to ensure that a dynamic demand/capacity balance is maintained**.**

The ATM System updates the arrival sequence and the TLDT. By using fixed arrival-departure patterns (on mixed-mode runways) for defined periods, overall delay can be reduced and predictability of TTOT and TLDT is increased [**TS-0308**].

During the Medium and short term planning phases, and also during the day of operation, all data (including flight data) will be recorded as input to the Post-Operation Analysis. Based on this data, the Post-Operations Analysis will analyse the pre-defined scenarios / solutions used during the Medium / short term planning phase and also during the execution of operations. Where appropriate, these pre-defined scenarios / solutions are fine-tuned / optimized or even new ones are defined. This is also described in the Operational Scenario "Post-Operations".

Use Cases Identified

Use cases describe nominal conditions and topics that deviate from the nominal conditions. These use cases should be assigned to specific WP6 (sub-)work packages.

Use Case ID	Use Case title	Use Case description
UC 6 12	Creation of AOP	Refer to Section 4.2.4.2.2 of this Document
UC 6 13	Development of the AOP	Refer to Section 4.2.4.2.2 of this Document
UC 6 14	Revise / Update AOP during day of operation	Refer to Sections 4.2.4.2.3 and 4.2.5.2 of this Document

Use Case ID	Use Case title	Use Case description
UC 6 69 (from OS “Turn-round”)	Change of assigned outbound Business Trajectory to aircraft	The delay of an inbound Business Trajectory (BT) often results in the delay of the allocated outbound BT to that aircraft. If delay of that outbound BT is not desired by the airline (AOC) it could be decided to allocate another aircraft to the outbound BT. This could be a spare aircraft or a swap of previously assigned outbound BT with one (or even more) other aircraft. The AOC shares the information through the system. The iSBT for both outbound flights are accordingly updated and propagated to Airport Operations Plan (AOP) and the Network Operations Plan (NOP).

Table 4-4 Identified Use Cases for Medium to Short Term Planning

4.2.5 Operational Scenario Execution Phase

4.2.5.1 General Description

One day before the day of operation the short term planning phase starts in which the relevant airport actors (Airport Operator, ANSP, Airspace users, Ground handling and de-icing agents, network manager) continue refining the AOP in an iterative manner all the way through to the actual execution of the specific operation. At this stage, as more reliable data becomes available, more detailed figures can be taken into consideration. **[AUO-0204-A] [DCB-0103] [DCB-0206] [DCB-0301]**

The airport actors consider the AOP as a reference and establish the time schedule for their own activities. In addition, the AOC staff allocates airframes (tail numbers) to the validated flight plans / iSBTs. At this moment the “visit” of a specific aircraft to the airport (Airport Transit View = ATV) is created as an inbound flight can be connected to an outbound flight only through the tail number; in some cases, the ATV can be created with only one leg (inbound or outbound), for instance when there is night stop or maintenance. Flights are assigned to airframes (tail numbers) by the owner of the "flights" (trajectories) and the owner of the airframe (often the same Airspace User but not always by definition). This airframe utilisation scheme is provided by the Airspace User no earlier than 1 to 2 days before the day of operation (Short term planning). Nevertheless, the ATV can be known in advance in case of non-based airlines (i.e. the most simple case: when there is only one inbound flight and one outbound flight during the day for one airline operator). The information is included in the AOP and also provided to the network to update the NOP. **[AUO-0204-A] [DCB-0103A] [DCB-0302]**

Aircraft changes in the Medium / Short term planning phase are seen as "just" updates of the AOP. Aircraft changes during execution are described in the turn-round OS where a USE CASE is presented (UC 6 68).

4.2.5.2 Revise / Update AOP during day of operation (UC 6 14)

The night before the day of operation the reference AOP will be available for execution the next day. As the AOP is a “rolling plan” and deviations from this plan will take place during execution, continuous monitoring and updates of the AOP will be needed.

Shortly before execution (often 12 to 24 hours before operation) the airport operator and the tower supervisor allocate the airport resources to each flight (i.e. runways, taxiways, associated standard taxi routes and APP sectors by the ANSP and stands, de-icing pads and passenger facilities by the airport operator). This process repeats when the execution comes closer and more detailed information becomes available, such as the runway configuration in use.

Based on flight schedule information from the AOP, an initial (pre-) departure sequence is determined, supported by the Airspace User (FOC) **[TS-0202]**. Where appropriate, interferences with other airports (e.g. in the same or connecting TMA) is taken into account to adhere to the agreed airport and network performance. **[SDM-0101]**

The establishment and maintenance of the pre-departure sequence is a process involving the tower ground controller and in some cases also the AOC Staff, who may propose sequence swaps or negotiate a new rank in the sequence. **[AUO-0102] [AUO-0204-A]**

The Tower Supervisor performs Runway Demand and/or Capacity assessments for the next few hours. In case of upcoming capacity reductions having a significant impact on the schedules of the airspace users, airspace users should express their preferences and priorities regarding their flights. Next, the impact of the proposed solutions is then assessed at the Network level by the Network Manager. **[DCB-0207]**

Environmental rules and restrictions are taken into account where applicable. This might be applied in the runway – taxiway – parking stand planning to minimize taxi time / fuel burn / gaseous and particulate emissions but also on the use of runway combinations, (temporary) ban on night operations or refusal of late flight plan / iSBT submissions (e.g. business aviation and/or charter flights) as mitigation measure to ban aircraft noise at/around the airport. **[AO-0703]** Those measures are initiated if airports environmental performance reaches the limits set by the local and/or national authority. **[AO-0706]**

When meteorological forecasts are available, the airport operator (Airside Operations Control Centre) and the ANSP (Airport Tower Supervisor) identify the special actions to be taken during the day of operations and take action accordingly. **[AO-0501] [AO-0502]**

All unforeseen occurrences (such as abrupt changes in weather conditions, emergency repairs, but also late measures taken to keep the actual operation within the legal environmental boundaries) are identified and analysed on their impact on capacity. The consequences on flight / iSBT planning and execution for the next hours (up to 24 hours) are evaluated and processed in a collaborative way with all relevant actors including the Airspace Users. **[DCB-0206] [DCB-0207]** Where necessary, flight schedules are adapted to the actual situation and demand reduced by delaying or even cancelling flights taking into account the priorities of the Airspace Users **[AUO-0103] [AUO-0204-A]** as also the local situation at possibly all the destination airports. **[DCB-0304]**

During the Medium and Short term planning phases, as also during the day of operation, all data (including flight data) will be recorded as input to the Post-Operation Analysis. Based on these data, the Post-Operations Analysis will analyse the pre-defined scenarios / solutions used during the Medium / short term planning phase and also during the execution of operations. Where appropriate, these pre-defined scenarios / solutions are fine-tuned / optimized or even new ones are defined. This is also described in the Operational Scenario "Post-Operations".

Use cases Identified

Use Cases describe nominal conditions and topics that deviate from the nominal conditions. These use cases should be assigned to specific WP6 (sub)work packages.

Use Case ID	Use Case title	Use Case description
UC 6 14	Revise / Update AOP during day of operation	See sections 4.2.4.2.3 and 4.2.5.2 of this Document

Table 4-5 Identified Use Cases for Execution Phase

4.2.5.3 Operational Scenario Execution Phase: Arrival

4.2.5.3.1 Scope of scenario

This Arrival[29] scenario describes the processes and interactions that a flight encounters from the preparation of the landing phase (some 10-15 minutes before Top of Descent) until the aircraft arrives in-block at the parking stand (CDM milestone: AIBT), for SESAR Concept Story Board Step 1.

The scenario assumes a generic airport configuration; scenarios concerning specific configurations, e.g. single runway mixed mode operations, may be developed as an alternative flow.

It is not the purpose of the scenario to identify tools which support specific actions but to generally refer to the "system" (ground or air). However, where there is a specific and unique tool functionality, this may be mentioned.

[29] Although referred in this DOD as "ARRIVAL", this operational scenario covers the « arrival », « approach », « final approach » and « landing & taxi-in » flight phases as defined in WP B4.2 ConOps.

Where appropriate, Operational Improvement (OI) steps have been cross-referenced in the text to verify the feasibility of the scenario.

The Scenario covers all nominal and non-nominal procedures and is applicable from CAVOK to Low Visibility Conditions (LVC).

IMPORTANT: In this 6.2 DOD, all processes and interactions described between the start of the arrival scenario (some 10-15 minutes before Top of Descent) until touch down will only focus on airport-related operations. All other processes and interactions occurring at the same time but relating purely to En-Route/TMA operations are not described (as it is assumed that those will be covered by the 5.2 DOD).

4.2.5.3.2 Scenario text

4.2.5.3.2.1 Preparation of the landing phase

General (UC 6 99)

At a specified time before Top of Descent (10-15 minutes), the Flight Crew initiates their landing briefing taking into account the uplinked[30] information to the flight deck of the relevant airport operational parameters (ATIS, METAR, OFIS) [**IS-0402**][31].

The aircraft being equipped with an Enhanced Braking System, the Flight Crew arms[32] it. This action results in a calculation of the AROT (Arrival Runway Occupancy Time) and Airborne Intended (or preferred) runway exit taking into account possible ROT (Runway Occupancy Time) requirements [**AUO-0701**]. Both AROT and preferred runway exit are automatically downlinked to the Ground System to allow the ATC System to confirm or propose a different planned runway exit [**AUO-0703**] (taking into account the list of appropriate runway exits [**AO-0305**]). Once the runway exit is agreed, the Flight Crew will "trigger and manage" optimum braking all the way through landing in order to vacate the runway at the agreed exit.

Taxi-in route information (i.e. aircraft's best routing calculated by minimising the delay according to planning, ground rules, and potential conflicting situations with other mobiles and the estimated corresponding taxi time [**AO-0205**]) will be uplinked upon request from the aircraft system, which occurs at some time between the top of descent and a limit (usually FL100) when flight crews start applying sterile cockpit procedures in consistency with the (either assigned or agreed) runway exit [**AUO-0308**].

Any update of the runway exit and/or the ground routing is communicated to the Flight Crew either via data link [**AUO-0308**] or via voice communication (R/T)[33].

During descent until final approach, the Flight Crew will be able to operate in Low Visibility Conditions thanks to enhanced ATC procedures and/or navigation systems (e.g. smaller ILS sensitive and critical areas in CAT II/III or use of MLS) [**AO-0502**]. The Flight Crew will also be able to use GBAS CATII/III based on GPS L1 for precision approaches [**AO-0505-A**]. Advanced RNP transitions with curved procedures connecting directly to the final approach can provide improved access in obstacle rich environments and can reduce environmental impact [**AOM-0605**][34].

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[30] It is assumed that, even though the control of the aircraft hasn't been handed over to the airport controllers, the datalink connection, when needed, will be available between the aircraft and the airport ATC services without having to go through the TMA controllers. This issue is recorded in the appropriate section of this DOD Sect 8.

[31] According to B4.2 STEP1 CONOPS, there will be no ATIS via ATN due to already existing via ACARS and no OTIS via ATN in step 1

[32] Should the aircraft not be equipped with an Enhanced Braking System, the Flight Crew will directly request via data-link the expected taxi-in route (computed by the ATC system according to the Planned Taxi route using an assigned runway exit based on statistical recorded data according to aircraft type and operator).

[33] Beyond a certain point in the descent, using datalink might raise safety issues and thus voice communication will be preferred, as long as this communication does not involve the TMA controller or radio interference.

[34] Advanced RNP with transition from RNP procedures in initial and intermediate approaches to "xLS" CAT I/II/III procedures in final approach with "xLS" meaning "ILS", "MLS", "SLS" (Satellite Landing System e.g. GPS/SBAS) or "GLS" (GBAS Landing System)

The Tower Runway Controller monitors the landing runway and adjacent traffic visually and supported by the ATM System [**AO-0201-A**] [**AO-0208-A**] to ensure that the traffic complies with instructions, specifically with respect to separation requirements (e.g. Time Based Separations [**AO-0303**]**,** Weather Dependent Separation [**AO-0310**]**,** RECAT2 [**AO-0306**]) and that the runway is clear of potential conflicts [**AO-0102**]. In addition, the Tower Runway controller is informed by the ground system when debris is detected on the surfaces of the runway or connected taxiways [**AO-0202**].

The assigned runway can be changed on short notice, e.g. "Swing-over Procedure" in case of parallel or near parallel runways. This can only be done in agreement with the Flight Crew.

During final approach, the Flight Crew is assisted by an on-board system that detects potential and actual risk of collision with other traffic during runway operations and provides the Flight Crew with the appropriate alert [**AUO-0605-A**].

The Tower Runway Controller communicates the "Landing Clearance" via voice (R/T).

Note: there may be cases where the Aerodrome Control Service or the Aerodrome Flight Information Service is provided from a remote location, i.e. not from a control tower local to the aerodrome [**SDM-0201**]. This note is applicable to all operations relating to this ARRIVAL scenario.

4.2.5.3.2.2 Landing

General (UC 6 15)

The Flight Crew lands the aircraft on the assigned runway**.** The Ground System detects touchdown, records the information and makes this information available to other users.

On roll-out the aircraft's automatic braking system manages the deceleration to achieve the planned runway exit [**AUO-0703**].

In case the Tower Runway Controller has previously made the specific request[35] to the Flight Crew, the later reports that their aircraft has vacated the runway when this manoeuvre is indeed completed. Otherwise, the Tower Runway Controller verifies, either by using the ATM System [**AO-0201-A**], or visually, that the aircraft has vacated the runway.

The Tower Runway Controller instructs the Flight Crew to contact the Tower Ground Controller, transferring control of the aircraft. The ATM System records the runway exit taken by the aircraft and that it has vacated the runway.

Optional

Touch and go (UC 6 16)

If, for whatever reason, the aircraft has to perform a touch and go, the general landing procedure starts again (or, in exceptional cases, the aircraft might start the execution of a diversion to an alternate airport).

Go Around (UC 6 17)

If, for whatever reason, the aircraft has to perform a go around, the general landing procedure starts again (or, in exceptional cases, the aircraft might start the execution of a diversion to an alternate airport).

Aircraft not leaving the runway as expected (UC 6 18)

The aircraft did not leave the runway at the planned exit for technical reasons, e.g. speed too high (not intended), a new route has to be recalculated and distributed [**AO-0205**]**.**

[35] This occurs in case of inability of the controller to determine, either visually or via an ATS surveillance system that a vacating or crossing aircraft has cleared the runway.

Exits not available (UC 6 19)

Exits might not be available due to blocking by an aircraft / vehicle or short maintenance. That means, aircraft will not be able to exit the runway(s) as usual/ planned, and an alternative route has to be recalculated and distributed [**AO-0205**]**.** Also, should the runway still be occupied by the aircraft that could not use the intended runway exit, the downstream runway traffic will have to be re-organised accordingly.

Violation

Unplanned blockage of assigned exit (UC 6 20)

For whatever reason, an assigned exit might be blocked on short notice (on purpose), a new route has to be recalculated and distributed [**AO-0205**]**.**

4.2.5.3.2.3 Taxi-In

General (UC 6 21)

The Flight Crew contacts the Tower Ground Controller by voice[36]. The Tower Ground Controller informs the flight crew of the assigned / planned stand and provides the taxi-in instructions. The taxi instructions will be issued by the Tower Ground Controller either by using Data link [**AUO-0308**] capability (provided that the tactical situation permits) or by voice. The taxi routing data is provided by the ATM system [**AO-0205**], based on the runway exit actually taken by the aircraft, the assigned stand and taxi routes designed to primarily adhere to pre-calculated target times, to minimize the taxi distance or other criteria (e.g. emissions [**AO-0703**]) in addition to potential conflicting situations with other mobiles.

In detecting potential conflicting situations, the Tower Ground Controller is assisted by a Surface Management function which constantly monitors the overall ground traffic situation [**AO-0201-A**]. It informs the Tower Ground Controller of any detected deviation from the route/plan [**AO-0104-A**] and warns the Tower Runway Controller of any potential runway incursion [**AO-0102**] or infringement of closed / restricted areas [**AO-0104-A**].

The Flight Crew acknowledges and executes the taxi instructions supported by the on-board display of the airport layout (showing taxiways, runways, fixed obstacles), the own aircraft position and the route to stand as well as ground signs (stop bars, centreline lights, etc.) that are triggered automatically according to the route issued by ATC [**AUO-0603-A**].

While taxiing, the Flight Crew may have to use an enhanced vision capability in Low Visibility Conditions [**AUO-0403**] and may have to comply with local rules to minimize aircraft fuel use and gaseous and particulate emissions if such exist [**AO-0703**]. ADS-B equipped aircraft and vehicles are displayed on the Flight Deck HMI, providing the Flight Crew with graphical information on adjacent surface traffic [**AUO-0401**]; supplementing visual observations and enhancing see-and-be-seen procedures.

Likewise, the ground vehicles will have a display with dynamic traffic context information, including status of runways, taxiways, obstacles and route (potentially by application of an airport moving map) and ground signs (stop bars, centreline lights, etc.), which are triggered automatically according to the route issued by ATC [**AO-0206**]. There will also be a possibility to have an automated exchange between Vehicle Drivers and Tower Controllers using Data link for ground-related clearances and information [**AO-0215**]. The ATM system detects and informs the vehicle driver of any potential and/or actual risk of collision with aircraft as well as any infringement of closed / restricted areas [**AO-0105**].

The Tower Ground Controller, with the assistance of the ATM System, monitors the traffic situation [**AO-0201-A**] trying to anticipate potentially hazardous situations (e.g. converging airport traffic, temporary obstructions, etc…)**.**

The Flight Crew correlates the traffic information (provided by an on-board display [**AUO-0401**]) with the instructions received from the Tower Ground Controller and manoeuvers the aircraft accordingly.

[36] The assumption made in OFA04.02.01 is that the first contact between ATC and an aircraft/vehicle will be performed via voice, while subsequent messages can be done either via voice or data link.

Instructions with regard to other aircraft or ground vehicles are issued via voice communication (R/T).

The instructed taxi route will extend to the Taxi Clearance limit approved by the Tower Ground Controller. If necessary (additional routing, or continuing taxi after a hold) subsequent routing information and taxi instructions may be provided [**AUO-0308**].

The Flight Crew stops the aircraft at the stop line/stop bars on the taxiway system or holding point presented on the moving map and awaits further clearance/instructions [**AUO-0603-A**].

To prevent runway incursions, the Flight Crew (and Vehicle Drivers) share Improved Procedures and Best Practices on the Ground [**AO-0101**].They will be directly warned though Runway Status Lights when the runway is unsafe to cross or enter (illuminated Runway Entrance Lights) [**AO-0209**].

If the Aircraft proceeds across an illuminated stop bar, the ATM System provides the Tower Ground and Tower Runway Controller with an automated alert [**AO-0104-A**]. In case of potential collision with mobiles/obstacles, the ATM System also alerts the concerned mobile(s) (e.g. Vehicle Driver(s) [**AO-0105**]) and the Tower Ground Controller [**AO-0102**]. A solution (i.e. revised clearances which will then be executed by the concerned mobile(s)) is proposed by the Tower Ground Controller, to Flight Crew and/or Vehicle Driver.

If the aircraft moves from one area of responsibility to another, the accountability for the flight is handed over from one control position to another control position. This process is assisted by the ATM System. The hand over instruction can be provided by the controller either via data-link or via voice communication (R/T).

If the Taxi Clearance Limit is an active runway, the Tower Ground Controller instructs the Flight Crew to contact the responsible Tower Runway Controller who will issue clearance to cross (or enter) via voice communication (R/T).

The Tower Runway Controller verifies, either visually or using the ATM System [**AO-0201-A**] [**AO-0208-A**] that the aircraft is crossing the runway. Once vacated, he instructs the Flight Crew to contact the Tower Ground Controller responsible for this ground surface area, again transferring control of the aircraft.

The Tower Ground Controller supported by ground automation, issues further taxi route clearance(s) to the stand via the ATM System to provide the aircraft HMI with further routing information, in order to ensure that the aircraft reaches the allocated stand [**AUO-0308**].

The Tower Ground Controller checks visually and uses the ATM System to monitor the aircraft movement and track its progress against the issued taxi-in route [**AO-0205**] and its position with respect to other surface traffic [**AO-0201-A**] [**AO-0104-A**].

Optional

Cooling time (UC 6 22)

If for whatever reason an aircraft requires cooling time after touchdown, before being parked at a stand, this has to be considered and planned within the taxi routing. Cooling time may be required either for brakes or for the engines.

Remote Holding (UC 6 23)

A remote hold can be a planned action, if a parking stand is not yet available and has therefore to be planned within the taxi routing. On the other hand, blockage of taxiways or part of the apron can be necessary for whatever reason; also technical reasons can be a factor.

Return to stand (UC 6 24)

If for whatever reason, the Flight Crew of an outbound flight requests to return to a stand on the apron during the taxi-out procedure, this issue must then be handled as a general arrival process.

Alternative Parallel Taxi routing (UC 6 25)

On several airports, this procedure is in use. Additional lines are marked parallel to an existing taxi line, giving the possibility to taxi and/or tow two aircraft on one taxiway up to an specific ICAO-Category (e.g. at Munich Airport ICAO Category "C") at the same time.

Towing (UC 6 26)

An aircraft can also be towed, either from maintenance or from another stand to the final parking stand, where the turn-round process will be handled, this issue must then be handled as a general arrival process

Low visibility procedures (UC 6 27)

In condition of LVP the Tower Ground and Tower Runway Controller will apply appropriate procedures, supported by the Tower Supervisor, according to the AIP.

Violation

Deviation from Taxi route (UC 6 28)

If for whatever reasons an aircraft deviates from its assigned taxi route, the Tower Ground Controller is warned by the ATM System [**AO-0104-A**] and may assign a new taxi route (possibly assisted by the ATM System [**AO-0205**]), or instruct the aircraft to be towed to a position from where it can proceed as previously planned. Alternatively, the Tower Ground Controller may assign a new taxi route to other potentially conflicting aircraft. Whatever solution is taken, it might create a delay for either the affected aircraft or for the potentially conflicting aircraft or both. If one of the aircraft is departing and if the delay causes the expected take-off time to go outside the TTOT tolerance band, the system will calculate a new TTOT.

Deadlock situation on Taxiway (UC 6 29)

If for whatever reasons there is a head-on situation between two aircraft on a taxiway, the Tower Ground Controller will instruct one of the aircraft to be towed to a position from where it can proceed. He will give a revised taxi instruction and assign a new route to one of the aircraft [**AO-0205**]. There will be a delay while a tow tug reaches the relevant aircraft. Both aircraft will be delayed. If one of the aircraft is departing and if the delay causes the expected take-off time to go outside the TTOT tolerance band, the system will calculate a new TTOT.

Holding position overrun (UC 6 30)

If for whatever reason an aircraft might overrun its assigned holding position, the Tower Ground Controller is warned by the ATM System [**AO-0104-A**] and may instruct the affected aircraft to stop and assign a new taxi route (possibly assisted by the ATM System [**AO-0205**]), or the Tower Ground Controller may assign a new taxi route to other aircraft, which is affected by the overrun. Whatever solution is taken, it might create a delay for either the affected aircraft or for the obstructing traffic or both. If one of the aircraft is departing and if the delay causes the expected take-off time to go outside the TTOT tolerance band, the system will calculate a new TTOT.

Runway incursion (UC 6 31)

If for whatever reason one or more mobiles (aircraft and/or vehicles) enter the protected area of an active runway, the Tower Runway Controller is warned by the ATM System [**AO-0102**] will take all subsequent action to resolve the runway incursion. If no incident or accident has happened, this situation at least implies a delay for taxi-out and taxi-in, because the planned traffic has to be re-sequenced. If one of the aircraft is departing and if the delay causes the expected take-off time to go outside the TTOT tolerance band, the system will calculate a new TTOT.

4.2.5.3.2.4 Arriving at stand

General (UC 6 32)

As the Aircraft approaches the stand, the Automated Visual Docking system will be activated according to local procedures and checks if the allotted stand is free from obstacle. The Flight Crew follows the instructions given by the docking system and manoeuvers the aircraft accordingly.

The System detects “in block”, records the event and disseminates the information to the ATM System. The ATM system updates the AOP.

Optional (UC 6 33)

As the Aircraft approaches the stand, ground staff checks if the allotted stand is free from obstacle. The Flight Crew follows the instructions given by the “Follow-Me” and manoeuvres the aircraft accordingly.

Violation (UC 6 34)

Aircraft entering the stand ignoring the docking instructions.

4.2.5.3.3 Use Cases Identified

Use cases describe nominal conditions and topics that deviate from the nominal conditions. These use cases should be assigned to specific WP6 (sub)work packages.

Use Case ID	Use Case title	Use Case description
UC 6 99	Preparation of the landing phase	Refer to Section 4.2.5.3.2.1
UC 6 15	Landing	Refer to Section 4.2.5.3.2.2
UC 6 16	Touch and go	If, for whatever reason, the aircraft has to perform a touch and go, the general landing procedure starts again
UC 6 17	Go around	If, for whatever reason, the aircraft has to perform a go around, the general landing procedure starts again
UC 6 18	Aircraft not leaving the runway as expected	The aircraft did not leave the runway at the planned exit for technical reasons, e.g. speed too high (not intended), a new route has to be planned and distributed
UC 6 19	Exit not available	Exits might be on maintenance that means, aircraft will not be able to exit the runway(s) as usual, an alternative route has to be planned and distributed
UC 6 20	Unplanned blockage of assigned exit	For whatever reason, an assigned exit might be blocked on short notice (on purpose), a new route has to be planned and distributed
UC 6 21	Taxi-in	Refer to Section 4.2.5.3.2.3
UC 6 22	Cooling Time	If for whatever reason an aircraft requires cooling time after touchdown, before being parked at a stand, this has to be considered and planned within the taxi routing. Cooling time may be required either for brakes or for the engines
UC 6 23	Remote Holding	A remote hold can be a planned action, if a parking stand is not yet available and has therefore to be planned within the taxi routing. On the other hand, blockage of taxiways or part of the apron can be necessary for whatever reason; also technical reasons can be a factor.
UC 6 24	Return to stand	If for whatever reason, the Flight Crew of an outbound flight requests to return to a stand on the apron during the taxiout procedure, this issue must then be handled as a general arrival process.
UC 6 25	Alternative Parallel Taxi Routing	On several airports, this procedure is in use. Additional lines are marked parallel to an existing taxi line, giving the possibility to taxi and/or tow two aircraft on one taxiway up to an specific ICAO-Category (e.g. at Munich Airport ICAO Category "C") at the same time.
UC 6 26	Towing	An aircraft can also be towed, either from maintenance or from another stand to the final parking stand, where the turn-round process will be handled. This issue must then be handled as a general arrival process
UC 6 27	Low visibility procedures	In LVP conditions the Tower Ground and Tower Runway Controller will apply appropriate procedures, supported by the Tower Supervisor, according to the AIP.
UC 6 28	Deviation from Taxi route	If for whatever reasons an aircraft deviates from its assigned taxi route, the Tower Ground Controller is warned by the ATM System and may assign a new taxi route (possibly assisted by the ATM System, or instruct the aircraft to be towed to a position from where it can proceed as previously planned, or assign a new taxi route to other potentially conflicting aircraft. Whatever solution is taken, it might create a delay for either the affected aircraft or for the potentially conflicting aircraft or both.
UC 6 29	Deadlock situation on Taxiway	If for whatever reasons there is a head-on situation between two aircraft on a taxiway, the Tower Ground Controller will instruct one of the aircraft to be towed to a position from where it can proceed. He will give a revised taxi instruction. There will be a delay while a tow tug reaches the relevant aircraft. Both aircraft will be delayed.
UC 6 30	Holding position overrun	If for whatever reasons an aircraft might overrun its assigned holding position, the Tower Ground Controller may instruct the affected aircraft to stop and assign a new taxi route, or the Tower Ground Controller may assign a new taxi route to other aircraft, which is affected by the overrun. Whatever solution is taken, it might create a delay for either the affected aircraft or for the obstructing traffic or both.

Use Case ID	Use Case title	Use Case description
UC 6-31	Runway incursion	If for whatever reason one or more mobiles (aircraft and/or vehicles) enter the protected area of an active runway, the Tower Runway Controller is warned by the ATM System will take all subsequent action to resolve the runway incursion. If no incident or accident has happened, this situation at least implies a delay for taxi-out and taxi-in, because the planned traffic has to be re-sequenced.
UC 6 32	Arriving at stand	Refer to Section 4.2.5.3.2.4
UC 6 33	Follow me for parking	As the Aircraft approaches the stand, ground staff checks if the allotted stand is free from obstacle. The Flight Crew follows the instructions given by the “Follow-Me” and manoeuvres the aircraft accordingly.
UC 6 34	Aircraft ignoring docking instructions	Aircraft entering the stand ignoring the docking instructions.
Other Use Cases for topics that deviate from the nominal conditions.		
UC 6 35	Runway with middle exit only	The aircraft might have to do a back track to vacate the runway (mostly at civil use of military fields). That implies a larger separation between the actual and the next arrival and therefore eventually produces an inbound delay during unplanned peaks.
UC 6 36	Runway used for opposite departures	Mostly used on airports with obstacles. That implies a larger separation between the departure and the arrival and therefore eventually produces an inbound delay.
UC 6 37	UC 6 38 with only one taxiway connected	Opposite traffic also on the taxiway, that produces either inbound or outbound delay, and results in taxi-in delays.
UC 6 38	Runway change	A change of the landing runway may be initiated caused by closures of taxiways or the dimensions of an aircraft might not allow the use of specific taxiways to the assigned stand. That might cause a delay for succeeding flights.
UC 6 39	Runway Inspection	A runway inspection is done on a regular basis, or if requested by Tower Runway Controller or Airport Tower Supervisor. The movement of the inspection car has to be handled as an aircraft movement as long as it moves on the runway or within the safety boundaries of it. This therefore implies a delay on succeeding air-traffic.
UC 6 40	Bird Control on active runway	Bird control is done on a regular basis, or if requested by Tower Runway Controller or Airport Tower Supervisor. The movement of the bird control car has to be handled as an aircraft movement as long as it moves on the runway or within the safety boundaries of it. This therefore implies a delay on succeeding air-traffic.
UC 6 41	Aborted Take-off	If a flight aborts its take off, the runway occupancy will be longer than expected. When the flight is clearing the runway, the Tower Runway Controller transfers the flight to the Tower Ground Controller (instructing a frequency change). If the flight is ready to depart, the Tower Ground Controller may re-sequence the affected aircraft into the departures. If not, the flight will taxi back to a stand (assigned by Airport Operations after coordination with Airport Tower Supervisor).
UC 6 42	Aircraft blocking the active runway due to technical reasons	If an aircraft is unable to vacate the runway (e.g. nose wheel steering is unserviceable), there is a major delay expected, because first technicians have to inspect the aircraft, if it can be towed away and a tow tug has to be ordered and make its way to the aircraft.
UC 6 43	Aircraft blocking the active runway with an emergency	Aircraft is blocking the runway, e.g. due to one or more flat tires after touchdown, there is a longer delay expected, because first fire fighters have to secure the aircraft, second technicians have to inspect the aircraft, if it can be lifted up and later be towed away and a tow tug has to be ordered and make its way to the aircraft, etc.
UC 6 44	Major accident on active runway	Aircraft is blocking the runway, e.g. due to one or more flat tires after touchdown, there is a longer delay expected, because first fire fighters have to secure the aircraft, second technicians have to inspect the aircraft, if it can be lifted up and later be towed away and a tow tug has to be ordered and make its way to the aircraft, etc.
UC 6 45	Aircraft blocking a taxiway due to technical reasons	If an aircraft is unable to continue taxi (e.g. nose wheel steering is unserviceable), there is a delay to be expected, because first technicians have to inspect the aircraft, if it can be towed away and a tow tug has to be ordered and make its way to the aircraft.

Use Case ID	Use Case title	Use Case description
UC 6 46	Aircraft blocking a taxiway with an emergency	Aircraft is blocking a taxiway, e.g. due to an engine fire, there is a longer delay expected, because first fire fighters have to secure and maybe evacuate the aircraft, second technicians have to inspect the aircraft, if it can be lifted up and later be towed away and a tow tug has to be ordered and make its way to the aircraft, etc.
UC 6 47	Major accident on a taxiway	Aircraft is/are blocking a taxiway after e.g. a collision.
UC 6 48	Unplanned closure of part of the airport infrastructure	Considered infrastructures in arrival scenario: runway(s), taxiways, aprons and aircraft parking stands Two cases to address: When the closed taxiway/runway(s) is part of the taxi-in route issued to the aircraft. When the closed taxiway/runway(s) is not part of the issued taxi route and the closure generates a concentration of traffic on the taxi route on the considered aircraft.
UC 6 49	"Follow-me" requested by Flight Crew (not for parking)	For whatever reason, the Flight Crew might request guidance by a "Follow-me" after vacating the runway. That implies a delay for the flight or even for succeeding flights, because the aircraft will wait for the arrival of the "Follow-me" and maybe blocking the only available exit of the runway.
UC 6 50	Winter conditions with on- going winter operations (snow/ice removal)	Analysis of a situation of serious winter phenomenon overwhelming winter operations (heavy snow storm, freezing rain) happening on short notice. Analysis of a situation of "medium" winter phenomenon with on-going winter operations triggering restrictions to use certain infrastructures (limitation to some aircraft types) and infrastructures unavailability (intermediate line up taxiway not available, part of taxiways closed, …) and difficulties to enter parking stand etc.
UC 6 51	Apron Control	Information regarding stand, etc. is transferred to the Flight Crew when entering the apron area, together with a taxi routing to the stand, that shortens the instruction of the Tower Ground Controller and might therefore be more efficient.
UC 6 52	Aircraft arrives at wrong parking stand	Due to whatever reasons the aircraft arrives at a wrong parking stand. The solution can be different, re-planning of the parking stand, if possible, or towing of the aircraft to position it on the planned parking stand. Whatever solution is taken, it might imply a delay for the affected aircraft and also for other traffic.
UC 6 53	Aircraft arrives at engaged parking stand	Due to whatever reasons the aircraft arrives at an engaged parking stand. The solution can be different, re-planning of the parking stand and taxiing to the new assigned parking stand, or waiting until the aircraft blocking the stand is vacating the latter. Whatever solution is taken, it might imply a delay for the affected aircraft and also for other traffic.

Table 4-6 Identified Use Cases for Arrival

4.2.5.4 Operational Scenario Execution Phase: Turn-round

4.2.5.4.1 Scope of scenario

This scenario describes the processes and interactions during the ground handling of an aircraft when parked at the stand as well as the preparation of the aircraft to perform the next part of the trajectory or to start a new trajectory. The scenario assumes a generic aircraft stand configuration; nose in parking position. It is not the purpose of the scenario to identify tools which support specific actions but to generally refer to the "system". However, where there is a specific and unique tool functionality, this may be mentioned.

According to A-CDM[37] the turn-round scenario starts at the moment the aircraft is parked (AIBT - Actual In-Block Time) and ends at the moment the aircraft is being pushed back or vacates the parking position (AOBT – Actual Off-Block Time).

AIBT	Actual In-Block Time	Time the aircraft stops at the parking position and the chocks are positioned

AOBT	Actual Off-Block Time	Time the aircraft pushes back / vacates the parking position

The scenario scope is determined based on the physical process. Part of the information related to the physical process of turn-round might be available before the start of the physical process. The detailed description of the process defining this information is included in preceding scenario(s). This will be the planning scenario where the information is made available during the planning of the BT but also the scenarios of the preceding flight phase's taxi-out/take-off and climb at origin airport, en-route, approach and landing/taxi-in during the execution of the inbound flight.

During the execution of the trajectory, many issues can occur that will have an impact on the planned trajectory. Revisions, modifications and updates of the trajectory will take place continuously. As an example related to the turn-round scenario, the way Estimated In-Blocks Time (EIBT) is defined and updated during the whole execution of all preceding phases can be mentioned, as well as the update of the Target Off-Block Time.

Although the determination of EIBT takes place within other phases, it is described as an information process in this scenario as the EIBT is a milestone for the preparation of the turn-round process. All planning for the events in this scenario has taken place in the medium / short term planning phase.

4.2.5.4.2 Scenario text

4.2.5.4.2.1 Operations prior to Turn-round

Preparation for the turn-round process takes place before the actual arrival of the aircraft at the parking stand. In fact the turn-round process for the ground handler, airspace user and airport operator starts while the aircraft is still airborne, or even on the ground at the origin airport.

The ATM system continuously updates the ELDT and EIBT during the progress of the aircraft along its trajectory. Progress updates are uploaded through SWIM to the Network and the relevant airport **[DCB-0302] [IS-0101] [IS-0901-A]**.

Monitoring of the progress of the aircraft along its trajectory towards the airport is essential to have the resources (equipment and staff) timely available as well as having the passengers, baggage and/or cargo for the next trajectory of the aircraft "ready into position" at boarding time for the execution of the next flight segment of the trajectory or a new trajectory. **[AO-0601] [AUO-0203-A]**

At the first determination of the EIBT the ATM system assesses the expected on-time performance of the connected outbound flight segment (be it the continuation of the Trajectory or a new Trajectory **[AUO-0203-A]**). If the EIBT plus the Minimum Turn-round Time exceeds the SOBT/EOBT an alert is raised to the aircraft operator.

At EOBT (which could still be equal to SOBT) minus a predefined number of hours (e.g. -3 hours), the ATM system generates the first Departure Planning information and communicates that information through the Network **[DCB-0302]**. If necessary the milestones (TOBT, TSAT and TTOT) for the next "outbound" segment of the trajectory (same or new one) are updated and re-planned accordingly. The update of the "outbound" segment is uploaded to the network **[TS-0308] [IS-0101] [IS-0901-A]**.

At a predefined number of minutes before the ELDT the Ground Handling Agent (equipment and human), the Airport Operator (stand/gate) and the Airspace User / AOC organise their resources to match the plan **[IS-0101]**.

[37] Airport Collaborative Decision Making (A-CDM) processes are introduced to assure the best overall system outcome while paying due attention to the business goals of the airport and of individual aircraft operators.

4.2.5.4.2.2 In-block

General (UC 6 54)

The AOC/Aircraft Operator or its Ground Handling Agent determines an estimate of the turn-round time **[IS-0101]**. The feasibility of the Target Off-Block Time (TOBT) is checked and where necessary updated in the system. **[DCB-0302]**

The integration and exploitation of new ATC functions such as virtual stop bars during Low Visibility Procedures will result in enhanced situational awareness for ATCOs and flight crews, improved safety nets and will integrate the Tower with external units **[AO-0208-A]**.

Based on the available TOBTs a pre-departure sequence (TSATs) and a TTOT is determined/updated, taking into account local constraints at the airport (on apron, taxiways and/or runways) **[TS-0308] [AO-0205].** Next to local aspects (like the expected departure runway, the taxi routing and traffic situation), possible constraints at the destination airport (like the NMOC slots) are also taken into account in updating TSAT **[TS-0202] [IS-0101] [DCB-0302]**.

At every milestone, the ATM-system propagates the updated outbound trajectory (iSBT) information to the Network **[AO-0601] [AUO-0203-A] [IS-0101] [IS-0901-A]**.

4.2.5.4.2.3 Aircraft Handling

General (UC 6 55)

After placing blocks, connecting ground power supply and engine shutdown the Ground Handling Agent further executes the aircraft handling process to complete the inbound business trajectory and to prepare for the next outbound business trajectory **[AUO-0203-A]**. Main actions of the Ground Handling Agent during the turn-round process include:

Ground handling of a passenger aircraft	Ground handling of a full freighter aircraft
• Placing blocks,	• Placing blocks,
• Connecting ground power systems,	• Connecting ground power systems,
• Positioning stairs / boarding bridge,	• Positioning stairs,
• Opening doors,	• Opening doors,
• De-boarding passengers,	
• Crew (de-boarding) services,	• Crew (de-boarding) services,
• Unloading baggage (and cargo / mail),	• Unloading cargo / mail,
• Waste water services,	• Waste water services,
• Catering services,	• Catering services,
• Fresh water service,	• Fresh water service,
• Re-fuelling,	• Re-fuelling,
• Loading baggage (and cargo / mail),	• Loading cargo / mail,
• Crew (boarding) services,	• Crew (boarding) services,
• Boarding passengers,	
• Closing doors ,	• Closing doors,
• Reposition stairs and boarding bridge,	• Reposition stairs,
• Disconnect ground power systems (after engine or APU start-up),	• Disconnect ground power systems (after engine or APU start-up),
• Connecting Tow Tug (in case of a parking position that require a pushback operation),	• Connecting Tow Tug (in case of a parking position that require a pushback operation),
• Removing blocks.	• Removing blocks.

Table 4-7 Ground Handling actions during Turn-round

Within the turn-round process the boarding process is an important element. A boarding status is included in the turn-round process to monitor the synchronism performance of the major airport processes: the passenger process (check-in, security, etc.), baggage/cargo process (sorting, transport to stand, etc.) and the aircraft process (loading, refuelling, etc.) **[AO-0601].**

Optional

Use of remote parking stand (UC 6 56)

In case of an open stand at a remote distance from the terminal, passengers will be transported between aircraft and terminal (and vice versa) with the use of apron busses. Active taxiways may need to be crossed by ground handling vehicles **[AO-0601]**.

Violation

Unable to respect TOBT (UC 6 57)

Missing passengers, late boarding of passengers and/or late loading of baggage and cargo may result in not achieving the TOBT. Close monitoring of the handling process must assure that in case of late boarding / loading the impact on TOBT is recognized in an early stage and when necessary an updated TOBT determined, the AOP updated and a new TSAT provided **[DCB-0302].** In case of a new TSAT, an updated pre-departure sequence and TTOT is determined, taking into account local constraints at the airport (on apron, taxiways and/or runways) **[TS-0202] [TS-0308] [IS-0101]**.

4.2.5.4.2.4 Pre-departure

General (UC 6 58)

The pre-departure sequence refers here only to the organisation of flights from the stand/parking position. Pre-departure sequences are established collaboratively with the concerned airport CDM partners taking into account agreed principles to be applied for specified reasons (e.g. slot compliance, airline preferences, night curfew, evacuation of stand/gate for arriving aircraft, etc.). The resulting pre-departure list is used by ATC while sequencing departing aircraft, and when feasible **[AO-0602] [IS-0101]**.

Based on the TOBT of the Reference Business Trajectory (iRBT) **[AUO-0203-A]**, the ATM System updates the Target Take-Off Time (TTOT). The TTOT takes into consideration the NMOC slot or, when available, the Target Time of Arrival (TTA) at the destination airport. With knowledge of the NMOC slot (or TTA), the elapsed time derived from the trajectory, the expected departure runway and the departure and arrival demand for the runway(s) (coupled AMAN/DMAN) **[DCB-0302] [TS-0308]**. The local departure management process will calculate backwards from the TTOT the associated start-up/ push-back time and taxi routing **[TS-0202] [IS-0101].**

In case of mixed mode runway operations, the ATM System also considers the dependency between pre-departure management (TSAT sequence) and arrival metering so that arrival and departure flows are efficiently integrated (coupled AMAN/DMAN) **[TS-0308]**.

The ATM System issues the Target Start-up Approval Time (TSAT) and the relevant TTOT, taking into consideration the taxi route from the flight's stand to the holding point and the associated taxi time **[AO-0205] [TS-0202]**. Based on the last iteration of the TTOT and TSAT, the AOC updates the iRBT/iRMT **[IS-0101]** and will contain target times (TTO/TTA) when they are deemed necessary **[AUO-0204-A]**.

Once on board, the Flight Crew establishes a data link D-OTIS contact to receive ATIS, weather and NOTAM updates **[IS-0402] [IS-0201].**

The Tower Ground Controller uses the ATM System to provide the "Departure Clearance" including updated departure time (i.e. TSAT) and planned taxi route **[AO-0205]**. According to local procedures, Start-up Approval and Departure clearance can be issued together **[AUO-0103] [AUO-0308]**.

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The Flight Crew uploads the constituting elements (routes, constraints) of the iRBT/iRMT into the ATM system (aircraft FMS) as well as the aircraft parameters (gross weight, cost index, etc.) and forecast weather data (winds/temperatures) **[AUO-0204-A]**. **[IS-0101]**.

The Flight Crew may transmit their preference/capabilities limitations for his take off. These data are being considered by the controller and the ATM System during its optimisation process **[AUO-0101-A] [AUO-0103]**.

The Tower Clearance Delivery Controller uses the ATM System (AMAN/DMAN) to determine push-back and taxiing priorities in order to optimise runway throughput **[TS-0202] [AO-0205]**.

The Flight Crew requests “Departure Clearance” from the ATM System via data link **[AUO-0103]**. The Flight Crew acknowledges receipt of the clearance using the ATM System **[AUO-0308] [AUO-0101-A].**

Optional

Adverse conditions like fog, snow or runway blockage, will have a significant impact on runway capacity **[IS-0402]**. Outbound traffic will be delayed not only due to reduced departure capacity but also due to late arrival of the inbound flight. Special procedures need to be in place to facilitate the planning and sequencing of (outbound) flights **[AO-0501].**

Continuous updates of the (pre-) departure sequence are required based on the actual conditions and the most up to date airport and network process information **[AO-0501] [AO-0601] [IS-0101] [IS-0402].**

De-icing on stand (UC 6 59)

De-icing on stand **[IS-0402]**, is managed through CDM procedures enabling airport and ANSP to know the flights to de-ice and establish sequences accordingly **[AO-0603]**, The TOBT shall take into account the required process time to de-ice the aircraft. This process time shall be provided by the de-icing agent to the ground handling agent or the AOC in order to update the TOBT accordingly **[DCB-0302].**

Prioritization of outbound flights (UC 6 60)

UDPP (User Driven Prioritization Process) will allow the Airspace Users to change (via the pre-departure management process) the priority order of flights in the pre-departure sequence among themselves. **[AUO-0103]**. In coordination with ATC and the Airport Operator, flight / iSBT planning is refined / adjusted according to the collaboratively agreed scenario to deal with the capacity shortage **[IS-0101]**.

The expectations of UDPP, however, are limited due to conflicting commercial interest. The prioritization of outbound flights / trajectories may only be possible within the operations of a single Airspace User (airline) or a group of users (e.g. Skyteam, Star Alliance etc.).

Violation

Aircraft is not ready or not foreseen ready at TOBT (UC 6 61)

If for whatever reason (e.g. de-icing on stand takes longer) the aircraft is not ready at TOBT a new TOBT and TSAT has to be determined **[IS-0101].**

4.2.5.4.2.5 Off-blocks

General (UC 6 62)

At the TSAT window, the Flight Crew contacts the Tower Ground Controller[38] (or Tower Clearance Controller) and requests Start-Up via data link. The Tower Ground Controller (Tower Clearance Delivery Controller) identifies the aircraft and checks the Start-Up request prior to providing the Start-Up approval to the Flight Crew via data link **[AO-0208-A]**. The Flight Crew acknowledges the Start-Up clearance **[AUO-0308]** and may start up the engines with the assistance of the Ground Handling Agent according to local procedures. At a fixed time before off-block, the iSBT/iSMT would have been updated and converted to the iRBT/iRMT, becoming the reference used by all ATM partners during the flight execution **[AUO-0204-A] [IS-0101].**

The Clearance Delivery Controller will instruct the flight crew to contact the Tower Ground Controller (or Apron Manager at some airports) for Push Back instructions **[AUO-0308]**.

The Flight Crew contacts the Tower Ground Controller (or Apron Manager) and requests a Push-back approval via data link. The Tower Ground Controller (or Apron Manager) provides the Push-back approval via data link or via voice **[AUO-0308].**

[38] Sometimes the control of the activities and the movement of aircraft and vehicles on an apron rests with the Apron Manager instead of the Tower Ground Controller. When there is an Apron Manager and the activities of the aircraft and vehicles take place within the boundaries of the apron area, then the Tower Ground Controller mentioned in the text shall be read as Apron Manager.

The Flight Crew acknowledges the push-back clearance and gives instructions for the push back procedure to the Ground Handling Agent.

Optional

Open stands (UC 6 63)

Open stands often require no push-back operation. Forward taxiing of the aircraft from the stand to the taxi lane / taxiway on its own power is applied without the need for a push back tug. However guidance by ground staff is still required to assure that the stand and the taxi lane is clear of obstacles. The ATM System recognises the start of the aircraft movement and AOBT is recorded **[AO-0601].**

Power back (UC 6 64)

At a limited number of airports the backwards taxing of aircraft from the stand by using engine reverse power is allowed for dedicated aircraft and aircraft operators. Even though there is no need for a push back tug, guidance by staff of the ground handler is still mandatory. Although no push back tug is involved, the procedure is in general not different than a push back operation. The ATM System recognises the start of the aircraft power back operation and AOBT is recorded **[AO-0601].**

4.2.5.4.3 Use Cases Identified

Use cases describe nominal conditions and topics that deviate from the nominal conditions. These use cases should be assigned to specific WP6 (sub)work packages.

Use Case ID	Use Case title	Use Case description
UC 6 54	In-Block	Refer to Section 4.2.5.4.2.2 of this document
UC 6 55	Aircraft Handling	Refer to Section 4.2.5.4.2.3 of this document
UC 6 56	Use of remote parking stand	In case of an open stand at remote distance from the terminal, passengers will be transported between aircraft and terminal (and vice versa) with the use of apron busses. The timely availability of a sufficient number of busses needs to be planned based on TOBT / TSAT.
UC 6 57	Unable to respect TOBT	Missing passengers, late boarding of passengers and/or late loading of baggage and cargo may result in not achieving the TOBT. Close monitoring of the handling process must assure that in case of late boarding / loading the impact on TOBT is recognized in an early stage and an updated TSAT is requested.
UC 6 58	Pre-departure	Refer to Section 4.2.5.4.2.4 of this document
UC 6 59	De-icing on stand	In case of de-icing on stand, the TOBT shall take into account the required process time to de-ice the aircraft. This process time shall be provided by the de-icing agent to the ground handling agent or the AOC in order to update the TOBT accordingly.
UC 6 60	Prioritization of outbound flights	Through UDPP (User Driven Prioritization Process) the user can prioritize its outbound trajectories in case of severe capacity shortages at the airport or en-route.
UC 6 61	Aircraft is not ready or not foreseen ready at TOBT	If for whatever reason (e.g. de-icing on stand takes longer) the aircraft is not ready at TOBT a new TOBT and TSAT have to be determined.
UC 6 62	Off Blocks	Refer to Section 4.2.5.4.2.5 of this document
UC 6 63	Open stands	Open stands often require no push-back operation. Forward taxiing of the aircraft from the stand to the taxi lane / taxiway on its own power is applied without the need for a push back tug. However guidance by ground staff is still required to assure that the stand and the taxi lane is clear of obstacles. The ATM System recognises the start of the aircraft movement and AOBT is recorded.
UC 6 64	Power back	At a limited number of airports the backwards taxing of aircraft from the stand by using engine reverse power is allowed for dedicated aircraft and aircraft operators. There is no need for a push back tug however guidance by staff of the ground handler is still mandatory. Although no push back tug is involved, the procedure is in general not different than a push back operation. The ATM System recognises the start of the aircraft power back operation and AOBT is recorded.
Other Use Cases for topics that deviate from the nominal conditions		

Use Case ID	Use Case title	Use Case description
UC 6 65	Late arrival at parking stand	Late arrival at the parking position is identified by a large difference between Actual In-Blocks Time (AIBT) and planned (Scheduled) In-Blocks Time (SIBT). The next Business Trajectory (iSBT) allocated to the aircraft will, due to the late arrival of the aircraft, also be delayed. During the Turn-round process some of the delay may be recovered. The ground handler, in coordination with the airline (AOC) may decide to shorten the turn-round process by eliminated / cancelling specific activities (e.g. cabin cleaning) or allocate more resources and staff to the handling of the specific aircraft. The airline (AOC) may even decide to change the outbound BT assigned to the aircraft (see UC 6 73) For the next Business Trajectory a new Target Off-Block Time (TOBT) and Target Take-Off Time (TTOT) are determined based on a revised Target Time of Arrival (TTA) at the destination airport. The iSBT is updated by the Airline (AOC) based on the new TTA and TTOT. An updated TSAT is assigned as well as a revised initial departure sequence.
UC 6 66	Late boarding of passengers / late loading of cargo	Late boarding of passengers (or late loading of cargo) may result in not achieving the previous agreed Target Off Block Time (TOBT). In that case a new TOBT will be determined as well and the Target Start-up Approval Time (TSAT) & Target Take Off Time (TTOT) will be recalculated based on a revised Target Time of Arrival (TTA) at destination.
UC 6 67	Unloading baggage of not/late shown passengers	If not all passengers show up at the gate for boarding, the departure may be delayed if those passengers have checked-in luggage. For security reasons this luggage has to be unloaded. This unloading takes time with a result that the Target Off-Block Time (TOBT) as well as the Target Start up Approval Time (TSAT), if already assigned, will not be achieved. In that case a new TOBT, TSAT and Target Take-Off Time (TTOT) must be determined based on a revised Target Time of Arrival (TTA) at the destination airport. The iSBT is update by the Airline (AOC) based on the new TTA and TTOT. An updated TSAT is assigned as well as a revised initial departure sequence.
UC 6 68	Change of assigned outbound Business Trajectory to aircraft	The delay of an inbound Business Trajectory (BT) often results in the delay of the allocated outbound BT to that aircraft. If delay of that outbound BT is not desired by the airline (AOC) it could be decided to allocate another aircraft to the outbound BT. This could be a spare aircraft or a swap of previously assigned outbound BT with one (or even more) other aircraft. The AOC shares the information through the system. The iSBT for both outbound flights are accordingly updated and propagated to Airport Operations Plan (AOP) and the Network Operations Plan.
UC 6 69	Delayed start-up approval	Even if the Target Off-Block Time (TOBT) is achieved the Target Start-up Approval Time (TSAT) can still be delayed or even cancelled. Unplanned and sudden reduction in capacity could be the reason for re-planning the outbound sequence based on the new capacity situation. New TTOT will be determined based on the new capacity situation as well on the acceptance capabilities at the destination airports (TTAs).
UC 6 70	Change in allocated parking position	The Airport Operator may decide for a change in parking position even at a late moment when the inbound aircraft has already landed. This parking position change may take place in order to minimize sequential delay for other flights as due to late arrival the planned stand may not be available anymore for the total duration of the turn-round The airline / AOC and the Ground Handler are informed and the system is updated. The ground handler relocates or re-allocates its resources (equipment and staff) to allow for the change in parking position. The inbound iRBT and the linked outbound iSBT are updated in the system.

Use Case ID	Use Case title	Use Case description
UC 6 71	Linked outbound Trajectory is ground movement Trajectory (towing) or a long period of inactivity	Preparation of aircraft ground processes. Preparation of this turn-round is equal to basic turn-round process (two business trajectories linked) be it that no immediate resources (equipment and humans) are required for the preparation and loading of the aircraft for the next trajectory. Start execution of the aircraft ground processes. This scenario in execution of the aircraft ground process is equal to the basic turn-round process, except that the turn-round ends at the moment the aircraft Is unloaded, being towed to a remote parking stand / maintenance area or placed idle for night stop or long period of inactivity.
UC 6 72	Linked inbound Trajectory is ground movement Trajectory (towing) or a long period of inactivity	Preparation of aircraft ground processes. Preparation of this turn-round process is not based on target landing and block-in times but on the planned arrival time of the towed aircraft at the parking position or based at a predefined number of minutes/hours before planned departure time and/or the agreed Target Off-blocks Time (TOBT) if the aircraft is already at the parking position and has been placed idle for night stop or a period of inactivity. Start execution of the aircraft ground processes. This scenario in execution of the aircraft ground process is equal to the previous described departure segment of the base turn-round scenario description. The scenario starts when the aircraft, being towed from the maintenance area or remote parking, arrives at the parking stand or, in case of a night stop, when the ground handler “awakes” the aircraft. At start of execution a Target Off-Blocks Time (TOBT) is determined and uploaded in the system.
UC 6 73	De-icing on parking position	If weather conditions require de-icing of the aircraft to take place shortly before take-off. De-icing activity knows two different scenario’s; 1. De-icing at the parking position, shortly before push-back, and 2. De-icing at a centralized and dedicated position where the aircraft has to taxi to or to be towed to. In the last scenario de-icing takes place during the taxi-out where in the first scenario de-icing takes place as an extension of the turn-round process as the ground handler activities are only finished when the aircraft has been pushed back and disconnected.
UC 6 74	Adverse Weather Conditions	Adverse weather conditions can have a negative impact on the ground handling of an aircraft. Extreme wind conditions may require the aircraft being positioned with its nose into the wind, possibly limiting the possibilities for boarding passengers and loading baggage and cargo. Thunderstorm conditions near or at/above the airport will result in a halt of the ground handling activities due to safety regulations.
UC 6 75	Early arrival	Early arrival of the aircraft may be problematic for the ground handler and as well for the airport resources (e.g. stands). At congested airports stands are often scarce items and the availability for an early arrival may not be guaranteed. Holding the aircraft at a remote parking position (which may be a position on the taxiway system) until its assigned stand is available might be necessary. Handling the aircraft at another stand will have ground handling implications, not only in relocation of handling equipment and staff but also for the handling of the outbound flight. (relocation of outbound passengers and baggage / cargo of towing the aircraft to its original assigned stand later on.

Table 4-8 Identified Use Cases for Turn-round

4.2.5.5 Operational Scenario Execution Phase: Departure

4.2.5.5.1 Scope of scenario

The Departure[39] scenario describes the processes and interactions that an aircraft encounters from the time the aircraft is off block (CDM milestone: AOBT) till the aircraft is airborne (CDM milestone: ATOT) as anticipated for SESAR Concept Story Board Step 1, Service Level 2.

The Scenario covers all nominal and non-nominal procedures and is applicable for both VMC and Low Visibility Conditions (LVC).

The scenario assumes a generic airport configuration; scenarios concerning specific configurations, e.g. single runway mixed mode operations, may be developed as required.

It is not the purpose of the scenario to identify tools which support specific actions but to generally refer to the “ATM System” (ground or air). However, where there is a specific and unique tool functionality, this may be mentioned.

Where appropriate, Operational Improvement (OI) steps for SL2 have been cross-referenced in the text to verify the feasibility of the scenario.

The definition of AOBT and ATOT according to Airport CDM Implementation – The Manual”, version 4, April 2012[3] are:

AOBT	Actual Off-Block Time	Time the aircraft pushes back / vacates the parking position
ATOT	Actual Take Off Time	The time that an aircraft takes off from the runway.

4.2.5.5.2 Scenario text

4.2.5.5.2.1 Pushback

General Procedures (UC 6 76)

The Ground Handling Agent, after visually verifying that there are no vehicles or other objects in proximity, communicates to the flight crew that no obstacles are present in the critical area for the pushback. The flight crew acknowledge and instructs the ground handler to start the pushback after checking the on-board Traffic Situational Awareness display **[AO-0206-A].** The ATM System recognizes the start of the aircraft pushback operation and AOBT is recorded **[AO-0601].**

With the AOBT, the ATM System updates the planned pre-departure sequence and TTOT, taking into account the aircraft type mix, runway in use and the departure route of each flight in order to maximise efficiency **[TS-0202].** This pre-departure sequence is indicative for the Tower Runway Controller and is not the runway sequence. The Tower Runway Controller remains responsible for the safe and efficient runway use and will therefore create an appropriate runway sequence based on the actual situation.

An A-DPI message is sent when the aircraft progresses and gets off-blocks, serving to supply the NMOC with a more accurate Target Take-Off Time (TTOT). AOBT always triggers an A-DPI message by the ATM system to NMOC or in the case of remote holding at a defined time prior to TTOT. After the first A-DPI is sent, NMOC is only informed with a new A-DPI if updates of the TTOT are outside a certain TTOT tolerance band.

The ATM System (Airport Safety Nets) shall raise a non-conformance alert when the ATM System detects potential conflicting situations/incursions involving aircraft and vehicles on the airport manoeuvring area. **[AO-0104-A]**

Potentially, the aircraft can then be transferred from the Apron Manager to the Tower Ground Controller

Violations

Deviation from pushback route (UC 6 77)

[39] Although referred in this DOD as “DEPARTURE”, this operational scenario covers the « pre-departure », « taxi-out » and « take-off » flight phases as defined in WP B4.2 ConOps; the WP6 is not impacted by the "climb" flight phase.

If for whatever reason an aircraft deviates from its assigned push back route, there may be a number of solutions. The Tower Ground Controller may assign a new push-back route, or clear the aircraft to a position from where it can proceed as previously planned, or assign a new taxi route to other obstructing traffic **[AO-0205].** Whatever solution is taken, it might create a delay for either the affected aircraft or the obstructing traffic or both. If the delay causes the expected take-off time to go outside the TTOT tolerance band, the system will calculate a new TTOT.

Deviation from expected pushback moment (UC 6 78)

Pushback time deviation occurs when an aircraft starts the push-back later than expected. The Tower Ground Controller may instruct the Flight Crew to stop the push-back in case and/or may contact the Flight Crew to find out why the push-back was started too late. Such a situation creates a delay for either the affected aircraft or the obstructing traffic or both. If the delay causes the expected take-off time to go outside the TTOT tolerance band, the system will calculate a new TTOT.

4.2.5.5.2.2 Taxi-out

General Procedures (UC 6 79)

The Flight Crew requests the taxi clearance from the Tower Ground Controller by data link. The ATM System displays a proposed routing to the Tower Ground Controller **[AO-0205].**

The Tower Ground Controller checks the planned route created by the ATM System, assesses the tactical situation and, if needed, may update the taxi routing through the ATM System **[AO-0208-A].** This may include holding and / or intermediate stops.

The Tower Ground Controller issues a taxi clearance[40] to the Flight Crew, by data link (D-TAXI) or voice**.** The Flight Crew acknowledges the taxi instructions[41] and the related routing is depicted on the aircraft's Airport Moving Map.

The Flight Crew proceeds to taxi following the designated route displayed on-board the Aircraft HMI and using visual navigation aids (e.g. taxiway lighting) **[AUO-0603-A].** While taxiing, the Flight Crew may have to use an enhanced vision capability in Low Visibility Conditions **[AUO-0403]** as well as may have to comply with local rules for minimization of aircraft fuel use and gaseous / particulate emissions if such exist. On-board avionic systems will provide alert for conflicting surface traffic **[AUO-0605].**

During taxi-out, the Airport Tower Supervisor or Tower Runway Controller will create an appropriate runway sequence taking into account the actual traffic situation at/near the departure runway **[TS-0202].** The ATM System (AMAN/DMAN) may update the TTOT accordingly.

The Tower Ground Controller, possibly in response to a request from the Tower Runway controller, may alter at any moment the ground routing **[AO-0205] [AO-0208-A]** to prepare for the line-up sequence and, with the support of the ATM System, uplink the new taxi routing instruction to the Flight Crew. Once acknowledged by the Flight Crew, the routing is updated on the aircraft HMI **[AUO-0603-A]** and confirmed within the ATM System.

The Flight Crew may transmit through data link, at any moment during the taxi routing, his preference/capabilities limitations for the take-off distance required and thus the runway access point. The Tower Ground Controller with the support of the ATM System may consider them and issue an updated ground routing instruction if required to modify the arrival sequence at the runway hold or vary the departure point on the runway **[AUO-0302-A].**

The aircraft (ADS-B in and out) and ground vehicles (ADS-B out) are displayed, on the on-board display of the Flight Crew, providing information on adjacent surface traffic, supplementing visual observations and enhancing see-and-avoid procedures **[AUO-0401].** The status of runways, taxiways, obstacles and route to runway are displayed on-board **[AUO-0603-A]**[42]**.**

Likewise the ground vehicles will have a display with dynamic traffic context information, including status of runways, taxiways, obstacles and airport moving map **[AO-0206][AO-0105]**. Information of related clearances and other relevant issues will be automatically transferred to vehicles **[AO-0215].**

[40] The taxi instructions part of the taxi uplink message is limited to the first point at which the Tower Ground Controller requires the aircraft to stop, unless flight crew has received its next taxi or crossing runway clearance.

[41] If datalink is used, then the acknowledgement is also provided via datalink.

[42] Refer to footnote above

The Tower Ground Controller continually monitors the aircraft movement, either visually or from the ATM System display **[AO-0208-A][AO-0102][AO-0201-A]** and tracks its progress against the issued taxi-out route and its position with respect to other surface traffic **[AO-0205].** Ground signs (stop bars, centreline lights, etc.) are triggered automatically according to the route issued by ATC **[AUO-0603-A].**

The Tower Ground Controller detects and resolves potentially hazardous situations for the aircraft (e.g. conflict with fixed and mobile obstructions, incursion into protected areas or movement on a closed taxiway) by giving instructions to Flight Crew.

The ATM System automatically alerts the Tower Ground Controller if the aircraft proceeds across a clearance limit or an illuminated stop bar **[AO-0104-A].**

When the aircraft moves from one area of responsibility to another, the Tower Ground Controller will either give an instruction to the flight crew or there will be a silent frequency change according to the instructions in the AIP. In case of a runway crossing, the flight crew requests a clearance to cross the runway to the Tower Runway Controller.

When the clearance limit is an active runway, the Tower Ground Controller transfers the control of the flight (he instructs frequency change to the flight crew via data link [AUO-0308] or voice) to the Tower Runway Controller who issues the runway crossing clearance by R/T.

To prevent runway incursions, the Flight Crew (and Vehicle Drivers) share Improved Procedures and Best Practices on the Ground **[AO-0101].** They also might be directly warned though Runway Status Lights when the runway is unsafe to cross (illuminated Runway Entrance Lights **[AO-0209].** With the support of the ATM System (A-SMGCS), the Tower Runway Controller detects that the aircraft has crossed and cleared the active runway **[AO-0208-A]** and transfers the control of the flight back to the Tower Ground Controller in charge of related area on the airport.

An aircraft waiting at an intermediate hold must await further taxi instructions from the Tower Ground Controller.

At any time the Tower Controller may choose to re-sequence the departure traffic to optimise the flow rate subject to wake-vortex **[AO-0304]**, speed differential and immediate routing constraints in addition to en-route restrictions.

The aircraft reaches the assigned departure runway holding position (or at a point before the holding position) and the Tower Ground Controller transfers control to the Tower Runway Controller and provides a frequency change to the flight crew, using R/T.

The ATM system provides the Tower Ground Controller with information on Foreign Object Debris (FOD) detected on the movement area **[AO-0202] [AO-0208-A].**

Optional

Remote de-icing (UC 6 80)

Remote de-icing is handled as a holding procedure. The Tower Ground Controller instructs the Flight Crew to taxi to the appropriate remote de-icing point and, at some point, gives instruction to the flight crew to contact the De-icing agent (via data link [AUO-0308] or voice)and transfers the aircraft to the latter's control. After de-icing, the Agent transfers the aircraft back to the Tower Ground controller using the appropriate transfer protocol.

Violations

Deviation from taxi route (UC 6 28)

If for whatever reason an aircraft deviates from its assigned taxi route, the Tower Ground Controller is warned by the ATM System [**AO-0104-A**] and may assign a new taxi route (possibly assisted by the ATM System [**AO-0205**]), or instruct the aircraft to be towed to a position from where it can proceed as previously planned, or assign a new taxi route to other potentially conflicting aircraft [**AO-0205**]. Whatever solution is taken, it might create a delay for either the affected aircraft or for the potentially conflicting aircraft or both. If one of the aircraft is departing and if the delay causes the expected take-off time to go outside the TTOT tolerance band, the system will calculate a new TTOT.

Deadlock situation on Taxiway (UC 6 29)

If for whatever reason there is a head-on situation between two aircraft on a taxiway, the Tower Ground Controller will instruct one of the aircraft to be towed to a position from where it can proceed. He will give a revised taxi instruction. There will be a delay while a tow tug reaches the relevant aircraft. Both aircraft will be delayed. If one of the aircraft is departing and if the delay causes the expected take-off time to go outside the TTOT tolerance band, the system will calculate a new TTOT.

Holding position overrun (UC 6 30)

If for whatever reason an aircraft might overrun its assigned holding position, the Tower Ground Controller may instruct the affected aircraft to stop and assign a new taxi route, or the Tower Ground Controller may assign a new taxi route to other aircraft, which is affected by the overrun. Whatever solution is taken, it might create a delay for either the affected aircraft or for the obstructing traffic or both. If one of the aircraft is departing and if the delay causes the expected take-off time to go outside the TTOT tolerance band, the system will calculate a new TTOT.

Runway incursion (UC 6 31)

If for whatever reason one or more mobiles (aircraft and/or vehicles) enter the protected area of an active runway, the Tower Runway Controller is warned by the ATM System [**AO-0102**] and will take all subsequent actions to resolve the runway incursion. If no incident or accident has happened, this situation at least implies a delay for taxi-out and taxi-in, because the planned traffic has to be re-sequenced. If one of the aircraft is departing and if the delay causes the expected take-off time to go outside the TTOT tolerance band, the system will calculate a new TTOT.

Aircraft blocking a taxiway (UC 6 85)

If an aircraft is unable to continue taxi (e.g. due to technical, emergency, accident reasons), delay is to be expected. In case of emergency, fire fighters have to secure and maybe evacuate the aircraft. Technicians have to inspect the aircraft, if it can be towed away and a tow tug has to be ordered and make its way to the aircraft. The Tower Ground Controller will coordinate the temporary closure of the taxiway. If the delay causes the expected take-off time to go outside the TTOT tolerance band, the system will calculate a new TTOT.

4.2.5.5.2.3 Take-off

General Procedures (UC 6 86)

The Tower Runway controller is provided with the necessary tools to enable the application of Time Based wake turbulence radar Separation rules (TBS), Weather Dependant Separation reduction (WDS) and/or Pair Wise Separation (RECAT2) through taking into account aircraft characteristic of the leader and the follower aircraft so as to aid towards minimizing the overall time spacing between departing aircraft and optimising the runway usage [AO-0303] [AO-0304] [AO- 0306].

The Tower Runway Controller may optimize the line-up sequence thanks to multiple runway entries.

The Tower Runway Controller checks that the departing aircraft can comply with its TTOT **[TS-0202]** and that the runway approach area is clear **[AO-0208-A]** prior to providing by R/T the line-up instruction to the aircraft. In case of entry to the departure runway through an intersection, the runway controller checks of no other aircraft is in take-off or has been issues a take-off clearance on that part of the runway before the intersection.

The airport safety net will trigger an alert in case conflicting clearances are input by the controller (e.g. Cleared to Line-Up versus Land)" **[AO-0104-A].** Additionally, to prevent runway incursions, the Flight Crew and Vehicle Drivers might be directly warned though Runway Status Lights when the runway is unsafe to enter or take-off on (Runway Entrance Lights, Take-Off Hold Lights).

The Flight Crew confirms the line-up instruction. If the Flight Crew sees illuminated red Runway Entrance Lights (RWSL system), they hold short of the runway and contacts ATC for further instructions" **[AUO-0603-A].** Otherwise, they taxi the aircraft to the line-up position.

The flight crew will not unduly delay their response to either line-up or take-off clearances in view of the importance of safely minimising the runway occupancy time (ROT) [AUO-0701]

The Vehicle Drivers will get an alert directly on board the vehicle (dedicated equipment) in case a risk of conflict with the aircraft is detected, or in the case of infringement of restricted/closed areas **[AO-0104-A].**

By visual reference and using the ATM system, the Tower Runway Controller verifies that the runway is clear of other aircraft, ground traffic and FOD **[AO-0202]** and the aircraft will meet departure separation requirements **[AO-0304][AO-0306].** The Tower Runway Controller issues the take-off clearance to the Flight Crew using R/T.

The Flight Crew acknowledges the take-off clearance, and if the Take-off Hold Lights from the RWSL system are not illuminated they initiate the take-off roll and lift-off. The ATM System detects the wheels-off and records the ATOT.

The initial climb away from the airport into the immediate TMA completes the Airport Transit View.

Optional

Runway Inspection (UC 6 39)

A runway inspection is done on a regular basis, or if requested by the Tower Runway Controller. The movement of the inspection car has to be handled as an aircraft movement as long as it moves on the runway or within the safety boundaries of it. This therefore implies a delay on succeeding air-traffic.

Handle bird control on an active runway (UC 6 40)

Bird control is done on a regular basis, or if requested by Tower Runway Controller. The movement of the bird control car has to be handled as an aircraft movement as long as it moves on the runway or within the safety boundaries of it. This therefore implies a delay on succeeding air-traffic.

Violations

Aircraft blocking an active departure runway (UC 6 89)

If for whatever reason (e.g. technical, emergency, accident) an aircraft blocks an active departure runway, intervention is required - technicians, fire fighters - before being towed away, implying delay for taxi-out. The Tower Controller will coordinate the temporary closure of the departure RWY.

Aborted take-Off (UC 6 90)

If a flight aborts its take off, the runway occupancy will be longer than expected. When the flight is clearing the runway, the Tower Runway Controller transfers the flight to the Tower ground Controller (instructing a frequency change). If the flight is ready to depart, the Tower Ground Controller may re-sequence the affected aircraft into the departures. If not, the flight will taxi back to a stand (assigned by Airport Operations after coordination with Airport Tower Supervisor).The result could be an unplanned and inefficient usage of the airport infrastructure and consequently produces delay.

4.2.5.5.3 Use Cases Identified

Use cases describe nominal conditions and topics that deviate from the nominal conditions. These use cases should be assigned to specific WP6 (sub)work packages. A number of use cases are shared between Arrival and Departure scenarios.

Use Case ID	Use Case title	Use Case description
UC 6 76	Pushback	This use case describes how The Ground Handling Agent handles the aircraft push-back.
UC 6 77	Deviation from Pushback Route	Pushback route deviation occurs when an aircraft deviates from its assigned push back route. In such cases The Tower Ground Controller may assign a new push-back route, clear the aircraft to a position from where it can proceed as previously planned, or assign a new taxi route to other obstructing traffic. This might create a delay for either the affected aircraft or the obstructing traffic or both.
UC 6 78	Deviation from expected Pushback moment	Pushback time deviation occurs when an aircraft starts the push-back later than expected. The Tower Ground Controller may instruct the Flight Crew to stop the push-back in case and/or may contact the Flight Crew to find out why the push-back was started too late. Such a situation creates a delay for either the affected aircraft or the obstructing traffic or both.

Use Case ID	Use Case title	Use Case description
UC 6 79	Taxi-Out	This use case describes how the Tower Ground Controller, with the support of the flight crew, assures safe movements of aircraft from the aircraft stand to the runway holding point, prior to take-off.
UC 6 80	Remote de-icing	Remote de-icing is handled as a holding procedure, where The Tower Ground Controller hands over the aircraft to the De-icing Agent, then the De-icing Agent hands over the aircraft to the Tower Ground Controller after de-icing.
UC 6 28	Deviation from Taxi Route	If for whatever reason an aircraft deviates from its assigned taxi route, the Tower Ground Controller is warned by the ATM System and may assign a new taxi route (possibly assisted by the ATM System, or instruct the aircraft to be towed to a position from where it can proceed as previously planned, or assign a new taxi route to other potentially conflicting aircraft. Whatever solution is taken, it might create a delay for either the affected aircraft or for the potentially conflicting aircraft or both.
UC 6 29	Deadlock situation on taxiway	If for whatever reason there is a head-on situation between two aircraft on a taxiway, the Tower Ground Controller will instruct one of the aircraft to be towed to a position from where it can proceed. He will give a revised taxi instruction. There will be a delay while a tow tug reaches the relevant aircraft. Both aircraft will be delayed.
UC 6 30	Holding position overrun	If for whatever reason an aircraft might overrun its assigned holding position, the Tower Ground Controller may instruct the affected aircraft to stop and assign a new taxi route, or the Tower Ground Controller may assign a new taxi route to other aircraft, which is affected by the overrun. Whatever solution is taken, it might create a delay for either the affected aircraft or for the obstructing traffic or both.
UC 6 31	Runway incursion	If for whatever reason one or more mobiles (aircraft and/or vehicles) enter the protected area of an active runway, the Tower Runway Controller is warned by the ATM System will take all subsequent action to resolve the runway incursion. If no incident or accident has happened, this situation at least implies a delay for taxi-out and taxi-in, because the planned traffic has to be re-sequenced.
UC 6 85	Aircraft blocking a taxiway	If an aircraft is unable to continue taxi (e.g. due to technical, emergency, accident reasons), delay is to be expected. In case of emergency, fire fighters have to secure and maybe evacuate the aircraft. Technicians have to inspect the aircraft, if it can be towed away and a tow tug has to be ordered and make its way to the aircraft. The Tower Ground Controller will coordinate the temporary closure of the taxiway.
UC 6 86	Take-Off	This Use Case describes how a Tower Runway Controller uses the System to control that the aircraft takes off in a safe manner and according to the departure sequence.
UC 6 39	Runway Inspection	A runway inspection is done on a regular basis, or if requested by Tower Runway Controller. The movement of the inspection car has to be handled as an aircraft movement as long as it moves on the runway or within the safety boundaries of it. This therefore implies a delay on succeeding air-traffic.

Use Case ID	Use Case title	Use Case description
UC 6 40	Bird Control on active runway	Bird control is done on a regular basis, or if requested by Tower Runway Controller. The movement of the bird control car has to be handled as an aircraft movement as long as it moves on the runway or within the safety boundaries of it. This therefore implies a delay on succeeding air-traffic.
UC 6 89	Aircraft blocking an active departure runway	If for whatever reason (e.g. technical, emergency, accident) an aircraft blocks an active departure runway, intervention is required (e.g. by technicians, fire fighters) before being towed away, implying delay for taxi-out. The Tower Controller will coordinate the temporary closure of the departure RWY.
UC 6 90	Aborted Take-off	If a flight aborts its take off, the runway occupancy will be longer than expected. When the flight is clearing the runway, the Tower Runway Controller transfers the flight to the Tower ground Controller (instructing a frequency change). If the flight is ready to depart, the Tower Ground Controller may re-sequence the affected aircraft into the departures. If not, the flight will taxi back to a stand (assigned by Airport Operations after coordination with Airport Tower Supervisor).

Table 4-9 Identified Use Cases for Departure

4.2.6 Operational Scenario Post-Operations Analysis Phase

4.2.6.1 Scope of scenario

The Airport Post-Operations analysis phase is seen as the means to capture performance based information to examine if agreed local performance targets have been achieved and to provide feed-back to the planning (both mid and short term) as well to the actual operations, enabling a learning cycle.

Airport Post-Operations analysis is designed to support other Operational Scenarios – within the Airport DOD – in achieving their objectives in terms of Operational Improvements.

The main purpose of Airport Post-Operations analysis is two-fold. First, to support the creation and maintenance of the AOP based on locally defined agreements (e.g. periodically or format of reporting) and, second, to ensure that superior reporting, e.g. required by the European Commission or the Performance Review Body, is appropriately facilitated.

After the execution of the flight, Airport Post-Operations analysis will be performed to measure the achieved performance with the objective to improve local airport and overall network performance. **[AO-0804], [DCB-0103-A], [SDM-0101]**

Within the Airport Post-Operations analysis phase, key performance indicators are assessed. Evaluations will be performed and opportunities for further improvements and quality enhancements from local to European level will be identified over all stakeholders. Airport Post-Operations analysis for inbound flights may be carried out once the Reference Business Trajectory (iRBT) has been terminated (= Actual In-Block Times) which is also defined as the period after the conclusion of the flight (on block) and, for outbound flights, once the flight has left the TMA at Departure Fix. All data and events related to the iRBT are stored for Airport Post-Operations analysis by a data & event recording function.

Once the performance analysis has been carried out, a process reengineering function should provide refinements of performance framework, monitoring, impact assessment, scenarios or decision making rules.

4.2.6.2 Scenario text

4.2.6.2.1 General

The Operational Scenario describes, as anticipated in 2013 for SESAR Service Level 2 (SESAR Concept Story Board Step 1), the processes and interactions among airport actors during the Airport Post-Operations analysis phase.

It covers the performance analysis of all processes belonging to the airport segment of the Business Trajectory, known as the "Airport Transit View" (ATV). This scenario aims at being able to assess the effectiveness of each of the related processes within the ABT.

4.2.6.2.2 Phase 1: Data Collection and Aggregation.

All data related to existing reference planning (AOP), maintenance and its execution, including all updates for historiography and related events regarding resources, BT, etc. shall be recorded for analysis purposes. Agreed local performance targets as determined for Airport Post-Operations analysis phase will be analysed in a collaborative process and any non-achieved target may generate specific corrective actions regarding any of the previous planning phases. Prior to Airport Post-Operations analysis, the Medium and Short-term planning and the respective execution phases have to be executed and finalised. Data and events from these phases are retrieved and captured by Airport Post-Operations analysis for further analysis. Although data aggregation may take place, storage of all raw data is required for any unforeseen analysis in the future.

In order to carry out Airport Post-Operations analysis, an appropriate analysis service has to be established. Among other things, this service should be capable of:

- receiving information (data & events),
- enabling historiography (save all updates without overwriting previous values),
- automatically creating pre-defined reports to assess effectiveness of ATM flight phases concerned.

4.2.6.2.3 Phase 2: Data Analysis and Presentation

The Post-Operations analysis service should also be capable of:

- offering templates available in a report repository,
- developing new templates,
- allowing additional manual reporting (eventually including special remarks),
- distributing reports periodically (e.g. daily/weekly/monthly, etc. basis),
- distributing reports ad-hoc/on-demand,
- measuring airport-related KPAs/KPIs/PDIs.

If necessary, a process reengineering function will develop and propose additional pre-defined scenarios which should be used by other operational scenarios for further process improvement.

The main purpose of Post–Operations is to provide the airport actors with analysis to:

- measure actual operational ANS performance at airports,
- measure operational ANS performance at airports – post season,
- provide the reporting according to EC requirements IR691/2010,
- provide input to the network management function (network manager),
- develop and propose new pre-defined operational scenarios,
- support ATM business reference models.

Trajectory level (UC 6 91)

The following table might be used as an example for an airport oriented view on Airport Post-Operations analysis of the trajectory of an individual flight at the airport level. Any deviations (e.g. actual to schedule or target to schedule) can be detected and analysed in further detail. At the trajectory level, each individual flight can be analysed along the different ATM-flight phases to see if actual process times (for instance taxi times) differ from default values used for planning.

ATM flight phase	Descent	Landing	Taxi-In	Turn-round	Taxi-Out	Climb
Description	Out of scenario scope. Terminates when the aircraft crosses the Initial Approach Fix (IAF) – or any other pre-defined point within the TMA (e.g. TMA entry point)	Terminates when the aircraft has landed on the runway	Terminates at In-block	Terminates at Off-block	Terminates at “take-off” (airborne)	Out of scenario scope when the aircraft has reached its respective departure fix
Reference	Initial Approach Fix – or any other pre-defined point within the TMA (e.g. TMA entry point)	Landing Runway Threshold	Position	Position	Departure Runway	Departure Fix
Scheduled /Shared Times	Scheduled Initial Approach Fix Time (SIAT)	Scheduled Landing Time (SLDT)	Scheduled in-Block Time (SIBT)	Scheduled Off-Block Time (SOBT	Scheduled Take-off Time (STOT)	Scheduled Departure Fix Time (SDFT)
Estimated Times	EIAT	ELDT	EIBT	EOBT	ETOT	EDFT
Target Times	TIAT	TLDT	TIBT	TOBT / TSAT	CTOT / TTOT	TDFT
Actual Times	AIAT	ALDT	AIBT	AOBT	ATOT	ADFT

Table 4-10 Post-Operations Analysis on Trajectory Level - ATM Flight Phases

In addition, future systems may enable detailed surface movement tracking to provide other measures of interest, e.g. additional inbound taxi time due to lack of inbound stand capacity.

Implementing Environmentally Sustainable Operations

Airport Post-Operations analysis records environmental performance data from various sources, analyses actual emissions alongside the Airport Transit View and compares actual data to commonly agreed performance targets or European-wide standards.

- Aircraft noise emissions on the ground **[AO-0703]**, provided by appropriate noise measurement infrastructure,
- Aircraft fuel usage and gaseous / particulate emissions management at Airports **[AO-0704]**, provided by aircraft performance data or data retrieved from an airport operational data base.

Planning the Shared Business Trajectory (iSBT)

All data changes or events with regard to Agreed Reference Business / Mission Trajectory through Collaborative Flight / iSBT Planning **[AUO-0204-A]** are retrieved and recorded by Airport Post-Operations analysis. This service also analyses the number of updates per iRBT/iRMT and compares iRBT/iRMT-stability to commonly agreed KPIs or European-wide standards.

Management/Revision of Reference Business Trajectory (iRBT)

All controller´s clearances and pilot´s request for the Succesisive Authorisation of the iRBT Segments using Datalink [**AUO-0308]** are retrieved and recorded by Airport Post-Operations analysis.

Improving Flight Data Consistency and Interoperability

Any inconsistency between airport slots, flight plan / iSBT and ATFM-slots **[DCB-0301]** is retrieved and recorded. It is assumed that CDM-airports will generate automated alerting and warning messages once an imbalance has been detected and that Airport Post-Operations analysis can easily store these messages.

Period level (UC 6 92)

After the day of operation data will be analysed from a performance oriented perspective.

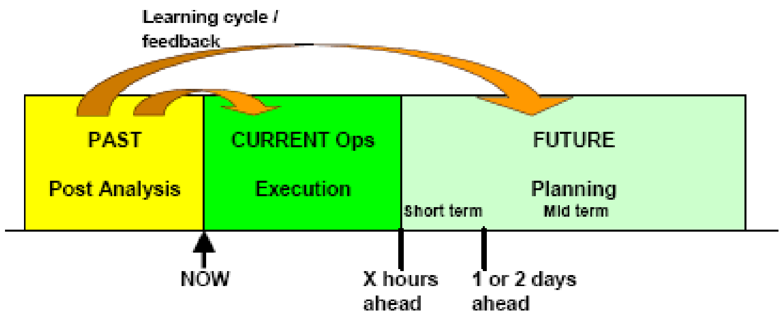


Figure 4.6: Phases of an operational airport planning

Implementing Environmentally Sustainable Operations

Airport Post-Operations analysis, at period level, aggregates data from trajectory level analysis in order to determine if commonly agreed KPIs or European-wide standards have been reached.

Local Monitoring of Environmental Performance **[AO-0706]** facilitates a continuous improvement process by measuring the environmental performance at an airport and the determination of the amount of airport related versus external pollution.

Management/Revision of Reference Business Trajectory (iRBT)

Airport Post-Operations analysis will monitor the current utilisation level of automatically transmitted clearances and requests **[AUO-0308]**

Collaborative Layered Planning Supported by Network Operations Plan

All transactions between AOP and the SWIM enabled NOP **[DCB-0103-A]** as well as respective data content exchanged are retrieved and recorded.

Improving Network Capacity Management Process

Capacity shortfall occurrences at airport level and the respective responses **[DCB-0206]** are retrieved and recorded in order to facilitate a continuous improvement process.

Occurrence of critical events and their management, either pro-active (known events) or reactive (unplanned, but prepared) **[DCB-0207]**, are retrieved and recorded in order to facilitate a continuous improvement process.

Monitoring airport-performance in the network (ATM–system)

Within the Network Performance Assessment **[SDM-0101]**, Airport Post-Operations analysis monitors respective KPIs to determine how effective the total ATM system in general and in particular airports, are meeting users' demands and to facilitate a continuous improvement process. Airport Post-Operations analysis will act as a trigger to develop new or alternative scenarios with regard to airport configurations, system efficiency, etc.

The results will have an influence on the long-term and medium/short-term planning phases to improve processes related to AOP, ensuring a feed-back life cycle service.

It can also have an influence on the long-term planning by stating some requests to the concerned stakeholder. In addition, the impact of mitigation actions should be analysed in order to improve the pro-active management. Other possible scenarios raised during operations can be identified in order to improve the airport operations management, too.

4.2.6.3 Associated Use Cases

Use Case ID	Use Case title	Use Case description
UC 6 91	Trajectory level	Analysis of Trajectories may include any segment of the en-route to en-route process, when all necessary data is available.

UC 6 92	Period level	Period level analysis usually starts after the day of operation and analyses the performance of a determined traffic period by both aggregating individual flight performance and taking existing operational conditions into consideration, e.g. weather or disruptions which have occurred during the period under analysis.
UC 6 93	Support ATM Business Reference Model	As part of the Performance Management, a Performance Analysis service analyses performance compliance with KPIs and KPAs, reporting on a regular basis.
UC 6 94	Measuring Operational ANS Performance at Airports	According to [5]: The following three indicators Capacity, Predictability and (Flight) Efficiency – incl. punctuality – are addressed for "Measuring Operational ANS Performance at Airports" Four of the ATMAP flight efficiency indicators have been adopted as airport capacity indicators for Reference Period 1 (2012 – 2014) in the SES II performance scheme: -ATC local Pre-departure delay -ATFM Arrival delay -Taxi-out additional time -ASMA additional time
UC 6 95	Measuring Operational ANS Performance at Airports – post season	After the season is over, a post-season analysis will reveal the highest throughput value that the airport has been able to accommodate. This can be determined by analysing all actual traffic during the season, and looking at the traffic levels during the busiest hours. This indicator is called the peak service rate. The peak airport operational capacity is the highest throughput the airport can achieve, assuming there is sufficient demand, i.e. during periods of congestion. In other words: at airports which are congested at least some time during the year, the peak airport operational capacity is equal to the peak service rate.
UC 6 96	IR 691/2010	According to [11], airport operators providing services at community airports with more than 150,000 commercial air transport movements per year and to all coordinated and facilitated airports with more than 50,000 commercial air transport movements per year. -Voluntary reports at any time -Flight by flight datamonthly basis -Capacity and coordination parameters twice a year See: Airport Operator data set specification using csv.file or txt.file is mailed to IR691@eurocontrol.int
UC 6 97	Network Management Function	Contribution to Consolidated Forecast and Analysis of the Operational Performance of the Network [7] by providing airport operational performance figures.
UC 6 98	Develop and Propose new pre-defined scenarios	Triggered by the Process Reengineering Function and based on the result from the Performance Analysis Function, new pre-defined scenarios will be developed in accordance with existing pre-defined scenarios leading to an increased set of pre-defined scenarios for various flight phases.

2856 **Table 4-11 Identified Use Cases for Post-Operations Analysis Phase**

5 Processes and Services (P&S)

This chapter lists the high level Airport Processes. In this DOD, the methodology developed by B4.1 and described in "European ATM Architecture (EATMA) Guidance Material" has been followed and applied.

Airport Processes are partly based on the ATM Top Level Processes from the 7th release of the B4.2 models. Detailed modelling of the Airport Processes is available at the EATMA portal (https://www.atmmasterplan.eu/architecture/). The EATMA structure is based upon the NAF v3.0 meta-model. The most important part of the Airport Operational Architecture is developed into the NAF views NOV-2, NOV-3 and NOV-5.

Operational Services are not part of this DOD. Their development is still under discussion and will probably be led by WP8.

5.1 Operational Nodes

The EATMA NOV-2 view describes the organization of the operational nodes of the ATM system. In this DOD, we will use different operational nodes, which are sub-nodes of the four B4.2 nodes.

- Airspace User Operations
  - Flight Deck (FD). It performs all the on-board Airspace User (AU) operations including flight execution/monitoring according to agreed trajectory, compliance with ATC clearances/instructions, etc. The main related actor is Flight Crew.
  - Airspace User Ops Operations (AUOO). It performs all the necessary activities to support AU ops, including the strategic and tactical planning of AU operations, participation to related CDM processes and UDPP, update of AOP with AU information, ground handling.
- Airport Airside User Operations
  - Airport Ops Support (AOS). It performs all the airport ops support activities, including analysis of airport resources, long term planning of infrastructures, coordination of airport slots, management of airport resources on the day of operation (gates, vehicles, stands, de-icing...), information sharing and CDM, etc.
  - Airport Vehicle (AV). It performs all the operational activities related to a support vehicle (not aircraft) in the airport manoeuvring area.
- Network Operations

  This node is not listed in the Airport Processes.
- Air Traffic Services Operations (ATS)
  - Aerodrome ATS (AATS). It performs all the aerodrome ATS operations. This node is associated to the actors Tower Runway Controller or Tower Ground Controller.
  - En-route/Approach ATS (EAATS). It performs all the en-route and approach ATS operations.

5.2 Operational Processes

The following sub-sections present the high-level airport operational processes. For each process, we present a table with the following data:

- Process: name of the high level airport operational process;
- Node: node which is responsible for the activities in the process;
- Activity: sub-process called to realize a part of the process;
- Description: description of the activity;
- OI step: OI step addressed by the activity or associated (only Step 1);

- Associated Use Cases: Use Cases associated to the current activity.

For the moment, the tables only present the processes for the OFAs under the responsibility of 6.2. In a future update of this DOD and after alignment with 5.2 and 7.2, they should also refer processes from other OFAs and related to Airport.

5.2.1 Manage Airport Operations

The following table lists the processes to manage airports all along its life cycle.

Process	Node	Activity	Description	OI step	Associated Use Cases
Plan over Long Term horizon	AOS	Establish the Airport Performance Targets	Establish the operational and performance framework, determine the performance targets and associated levels and publish them.		UC 6 01
		Forecast Airport Demand	Forecast the future traffic demand.		UC 6 02
		Establish Airport Operational Configuration	Define all the possible Airport Configurations (runway uses, airport circulations…) that could be applied during the next season.		UC 6 03
		Forecast Airport Capacity			UC 6 04
		Determine Airport Demand & Capacity Imbalance	Considering the future airport demand, identify the enhancements that will be necessary to achieve new performance targets or achieve the same level of performance.	DCB-0309	UC 6 05
		Revise Airport Plan	Prepare revisions and enhancements to optimise the performance of the airport.		UC 6 06
		Revise ATM systems plan	Ensure improvement of the airport performance by facilitating the installation of new ATM systems.		UC 6 07
		Identify external issues associated with enhancement plans			UC 6 08
		Define and update response to emergency			UC 6 09
		Declare pre-seasonal capacity	Define the appropriate capacity for the next season (rules for taxiway usage, stand allocation…).		UC 6 10
		Publish seasonal schedule via NOP			UC 6 11
		Create AOP		AO-0801 AO-0803 AO-0804 AUO-0801	UC 6 12
		Revise AOP		AO-0801 AO-0802 AO-0803 AO-0804 AUO-0801 DCB-0304 DCB-0310	UC 6 13
Manage Airport Operations Plan	AOS	Update AOP	Update AOP during the day of operation	AO-0801 AUO-0801 DCB-0310	UC 6 14 UC 6 32 UC 6 57 UC 6 65 UC 6 66 UC 6 67 UC 6 68
Monitor Airport Performance	AOS	Record Airport Data			Too many Use Cases to be listed here
Manage Post-Operations	AOS	Collect Airport Data			
		Analyse data			UC 6 91 UC 6 92 UC 6 93 UC 6 94 UC 6 95
		Create reports			

Process	Node	Activity	Description	OI step	Associated Use Cases
		Distribute reports			UC 6 96 UC 6 97
		Develop new predefined operational scenarios			UC 6 98

2907 ## 5.2.2 Manage Runway

2908 The following table lists the processes providing guidance to aircraft or vehicles in the runway volume.

Process	Node	Activity	Description	OI step	Associated Use Cases
Prepare and Execute Landing	FD	Prepare Runway Exit	Send preferred runway exit to ATC or check if exit given by ATC is applicable.	AUO-0702 AUO-0703	UC 6 99
		Execute final approach		AO-0505-A	UC 6 99
		Execute Landing	Land.		UC 6 15 UC 6 35
		Execute Touch and Go	Touch and go.		UC 6 16
		Execute Go Around	Perform a go around.		UC 6 17
		Execute roll-out and vacate runway.	Brake to vacate the runway at the intended runway exit.	AUO-0702 AUO-0703	UC 6 15 UC 6 18 UC 6 19
	EAATS	Negotiate Runway Exit	Receive preferred runway exit, accept it or propose another exit. Publish agreed exit.	AUO-0702 AUO-0703	UC 6 99
	AATS	Record and distribute landing information	Record ALDT and publish aircraft position on airport surface.		UC 6 15
		Plan and provide taxi-in route	If the aircraft does not vacate the runway at another exit, recalculate a new surface route and distribute it.	AO-0205 AO-0208-A SDM-0201	UC 6 18 UC 6 19
		Provide tactical instruction	Give instruction during final approach.	AO-0310	UC 6 99
Prepare and Execute Take-Off	AATS	Manage runway sequence	Optimize sequence, provide line-up clearance, check that the runway is clear and provide take-off clearance.	AO-0304 AO-0306 TS-0308	UC 6 79 UC 6 86 UC 6 90
	AOS	Inspect runway	Inspect runway.		UC 6 39 UC 6 40
	FD	Execute Line-Up			UC 6 86
		Execute Take-Off			UC 6 41 UC 6 86 UC 6 90

2909 ## 5.2.3 Manage Turn-round

Process	Node	Activity	Description	OI step	Associated Use Cases
Prepare and execute in-block	ATS	Monitor aircraft trajectories	Monitor the progress of the aircraft through its ATV and update EIBT. Generate an alert if EOBT can not be respected.		-
		Provide Departure Planning information	Some time before EOBT, generate and publish departure planning information.		-
	AATS	Manage in-block	Determine a pre-departure sequence, update TTOT and propagate iSBT.	TS-0202 AUO-0203	UC 6 54 UC 6 57
	AOS	Manage airport resources	Organise resources (equipment and operators) to handle arriving aircraft.		-
	AUOO	Execute handling	Execute the different ground handling actions (de-board, unload, refuel, board…).		UC 6 55 UC 6 56 UC 6 66 UC 6 67
	FD	Manage airline resources	Organise resources (equipment and operators) to handle arriving aircraft.		-

Process	Node	Activity	Description	OI step	Associated Use Cases
		Execute in-block	Determine turn-round time and update TOBT.	AUO-0203-A	UC 6 54
Prepare and execute off-block	AATS	Manage pre-departure	Compute TSAT, issue TSAT and TTOT, publish the iRBT/iRMT, determine priorities and provide departure clearance.	TS-0202 AUO-0204-A AUO-0308	UC 6 58 UC 6 59 UC 6 61
		Provide start-up instruction	Check start-up and provide push-back clearance.	AUO-0308 AO-0208-A SDM-0201	UC 6 62
	FD	Plan departure	Receive take-off information, uploads the aircraft part of the iRBT/iRMT and requests departure clearance.	AUO-0308 AUO-0204-A IS-0402	UC 6 58
		Execute start-up	Start-up and request push-back clearance.	AUO-0308	UC 6 62
		Prioritize flights	Adjust iSBT planning for its own flights.	AUO-0103	UC 6 60

5.2.4 Manage Movement on Airport Surface

The following table lists the processes providing guidance to aircraft or vehicles on the airport surface.

Process	Node	Activity	Description	OI step	Associated Use Cases
Prepare and execute taxi-in routing	AOS	Provide guidance on apron			UC 6 32
	FD	Prepare taxi-in route		AUO-0308 AUO-0603-A	UC 6 99
		Execute taxi-in	Manoeuvre the aircraft from the runway exit point to the stand following the taxi in guidance, using taxi aids and following the route displayed in the cockpit.	AUO-0403 AUO-0603-A	UC 6 21
		Park aircraft			UC 6 32 UC 6 33 UC 6 34
	EAATS	Provide taxi-in route	Provide a taxi-in route to the aircraft during the approach phase.	AUO-0308 SDM-0201	UC 6 99
	AATS	Plan Taxi-in route	Plan a taxi-in route for an aircraft.	AO-0205 AO-0208-A	
		Provide taxi-in routing guidance	After vacating the runway, guide the aircraft until it reaches a stand. The taxi route may be revised.	AO-0205 AUO-0308 AUO-0603 AO-0208-A SDM-0201	UC 6 21 UC 6 22 UC 6 23 UC 6 24 UC 6 25 UC 6 27
Prepare and execute taxi-out routing	AOS	Facilitate push-back execution		AUO-0308	UC 6 76
	FD	Prepare taxi-out route		AUO-0308 AUO-0603-A	UC 6 76 UC 6 77 UC 6 78
		Execute start-up and exit from the stand	Execute start-up. Execute push back. In some cases, aircraft may forward to exit from an open stand or use engine reverse power.	AUO-0308	UC 6 63 UC 6 64 UC 6 69 UC 6 76 UC 6 77 UC 6 78
		Execute taxi-out		AUO-0308- AUO-0603-A AUO-0403	UC 6 79
		Execute runway crossing		AUO-0603-A AUO-0403	UC 6 21 UC 6 79
	AUOO	De-ice aircraft			UC 6 80
	AATS	Plan and provide taxi-out route	Plan and provide a taxi-out route to the aircraft during the turn-round phase.	AO-0205 AUO-0308 AO-0208-A SDM-0201	UC 6 76 UC 6 77 UC 6 78

Process	Node	Activity	Description	OI step	Associated Use Cases
		Provide instruction to exit from the stand	Provide instruction for push-back. In some cases, guide aircraft out of an open stand.	AUO-0308 AO-0208-A SDM-0201	UC 6 63 UC 6 64 UC 6 76 UC 6 77 UC 6 78
		Manage remote de-icing			UC 6 80
		Provide taxi-out routing guidance	Guide the aircraft until it reaches the holding point for take-off. The taxi route may be revised.	AO-0205 AUO-0308 AUO-0603 AO-0208-A SDM-0201	UC 6 79
		Provide runway crossing		AO-0208-A SDM-0201	UC 6 21 UC 6 79
Plan and provide routing for a vehicle	AV	Execute runway crossing			UC 6 21 UC 6 79
		Execute vehicle route	Execute a route on the airport surface.	AO-0206	UC 6 21 UC 6 40
		Plan ground movement	Plan the movement of a ground vehicle (aircraft excluded).		UC 6 26
		Execute ground movement	Execute a planned route (aircraft towing manoeuvre for example).	AO-0206	UC 6 26
	AATS	Plan Vehicle route	Plan a route for the movement of a ground vehicle (aircraft excluded).	AO-0205	UC 6 40
		Provide vehicle routing guidance	Guide a ground vehicle (aircraft excluded) on the airport surface.	AO-0206 AO-0208-A AO-0215 SDM-0201	UC 6 21 UC 6 39 UC 6 40 UC 6 79
		Provide runway crossing clearance		AO-0208-A AO-0215 SDM-0201	UC 6 21 UC 6 79

5.2.5 Manage Safety at Airport

The following table lists the processes ensuring the safety of the aircraft on the airport surface as well as the airport vehicles.

Process	Node	Activity	Description	OI step	Associated Use Cases
Perform Conformance Monitoring	AATS	Monitor Airport–related Conformance	The system detects any non-conformance to procedures or clearances for traffic on airport surface.	AO-0104-A	UC 6 76 UC 6 79 UC 6 28 UC 6 29 UC 6 30 UC 6 31 UC 6 85
		Manage Airport Conformance Alert	Do everything which is necessary to cancel a non-conformance alert.	AO-0104-A AO-0208-A SDM-0201	UC 6 76 UC 6 79 UC 6 28 UC 6 29 UC 6 30 UC 6 31 UC 6 85 UC 6 89
Manage safety nets systems for airport vehicles	AV	Manage Alert for Vehicle Drivers	When an alert is triggered, vehicle drivers must do everything which is necessary to cancel it.	AO-0105	UC 6 76 UC 6 31
	AATS	Provide Alert to Vehicle Drivers	If alerts are not triggered onboard, they may be provided by ATS.	AO-0105	UC 6 76 UC 6 31
Manage safety on flight deck	FD	Monitor surrounding traffic		-	UC 6 99
		Manage traffic alert for pilots		AUO-0605-A	UC 6 79
		Provide Traffic Indication		-	-

Process	Node	Activity	Description	OI step	Associated Use Cases
		Provide Runway Status Indication		-	-
Perform RWSL Operations	AATS	Provide RWSL lights	Determine REL, RIL or THL lights to be lit or not.	AO-0209	UC 6 86
		Manage RWSL issues	Solve conflicting clearances or any issues with the system.	AO-0209 AO-0208-A SDM-0201	UC 6 86
		Disable RWSL	In some cases (bad weather conditions, malfunctioning…), RWSL may be disabled and airport users must be informed.	AO-0209	-
	FD AV	Manage clearance conflicting with RWSL lights	The flight crew or the vehicle drivers report any contradiction with RWSL.	AO-0209	UC 6 86

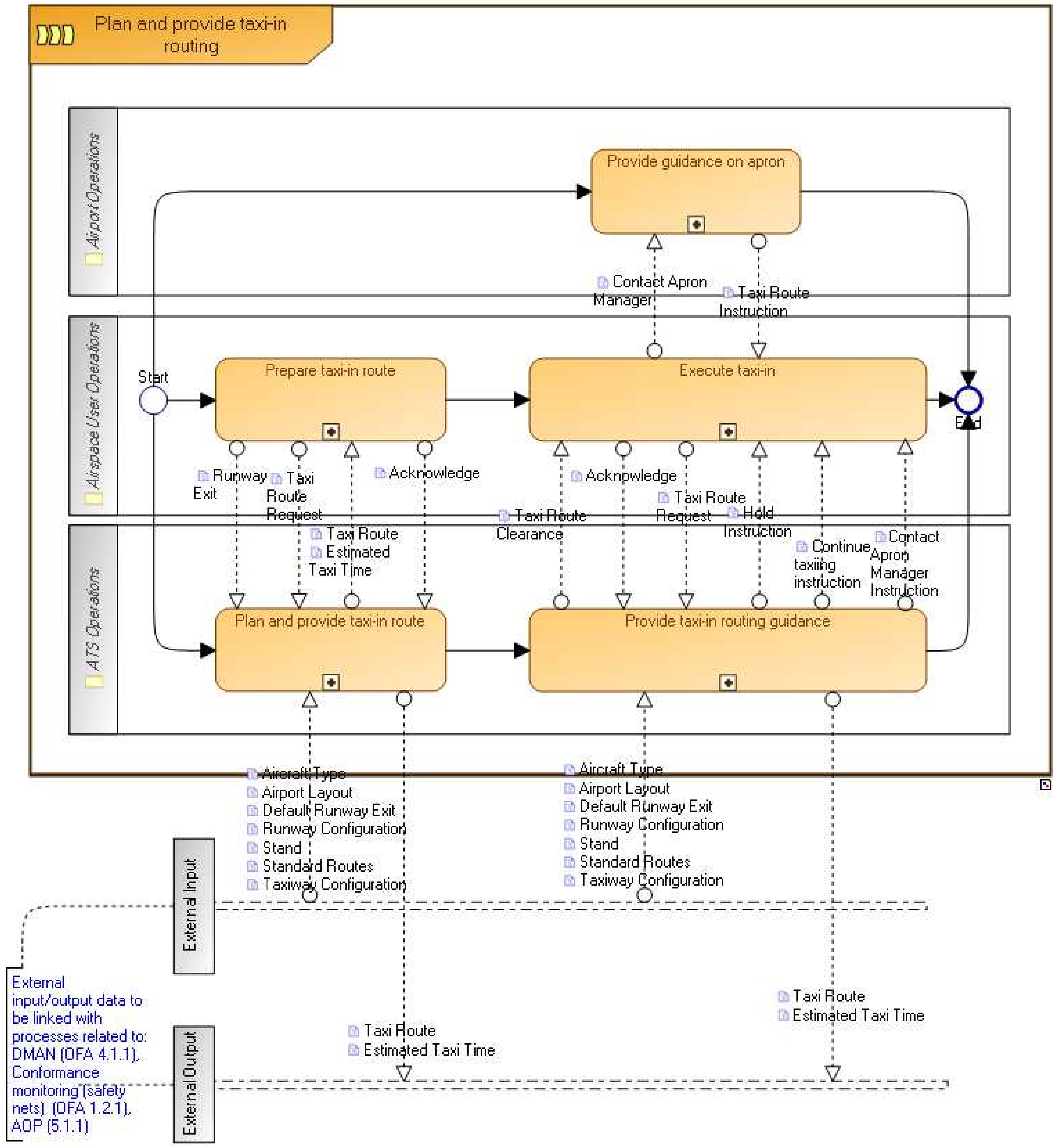
5.2.6 Operational Architecture

Once completed, the High Level Airport Operational Processes should be fully detailed on the EATMA portal (https://www.atmmasterplan.eu/architecture/).

They are each described in the context of an OFA. To browse through the different models of an OFA, you can follow the following instructions. They will guide you to a root operational model.

1. Sign in the portal (https://www.atmmasterplan.eu/architecture/signin). You can use your OneSky account or the generic login/password eatmatest/eatma,
2. Click on "Views",
3. Select an OFA for which the type is ACT (ACTivities),
4. Click on the table view.

Below is an example of Operational Process ("Plan and provide taxi-in routing") that can be found on the portal. Each Operational Activity of this process (e.g. "Provide guidance on apron") is mapped to an ATM Top Level Process. On the portal, you can see the mapping by clicking on an activity: one of the parent activities of this activity should be an ATM Top Level Process.



The main BPMN (Business Process Model and Notation) elements used in the operational models are presented in Appendix B.

The basic BPMN modelling Rules can be found in the BPMN specification document available at the following website address: http://www.bpmn.org/.

5.3 Operational Services Identification and Definition (optional)

Operational Services are not part of this DOD. Their development is still under discussion and will probably be led by WP8.

6 Requirements

6.1 Introduction

The development and introduction of the future Airport Step 1 operational concept should seek substantial benefits within a range of Key Performance Areas (KPA). This chapter describes a set of high level quantitative Operational and Performance requirements for Step 1.

The aim of the airport concept is to fulfil the SESAR expectations for the future ATM system as closely as possible. The targets that have been set require a 3-fold increase in capacity whilst reducing delays; improving safety by factor 10; at least a 10% reduction of the aviation environmental impact per flight and an ATM cost reduction for the airspace users of 50%. The airport concept will focus on the total process in which the airport stakeholders are involved. This is not only the flight's ground movement and ground handling process but also includes the part of the flight being executed within the airspace around the airport (TMA). For this the airport concept and its objectives include:

- Increased surface and runway safety,
- Optimum surface management and arrival and departure sequence planning,
- Accurate arrival and departure times and separation,
- Optimum use of existing airport infrastructure and available capacity,
- Reducing noise pollution and gas and particulate emission through operational improvements,
- Better relations with neighbours,
- Improved collaborative work between ANSP, users and Airport on environmental issues,
- Additions and changes to airport infrastructure,
- Optimum use of on-board devices / systems,
- Improved efficiency by shared information and collaborative decision making,
- Improved weather forecasts.

While the above are essentially issues local to the airport they will be implemented to support the system wide goals and benefits.

<u>Requirement Identifier Convention</u>

The requirements must be written and identified according to general rules. General rules to write requirements and identify them into the SESAR program have been developed. Each requirement must be uniquely labelled and expressed with respect to the other requirements so you can refer to it unambiguously.

The adoption of a standard for naming requirements is necessary to avoid ambiguities while referring to requirements. The naming convention is the following:

[Object_type]-[Project_code]-[Document_code]-[Reference number 1]- [Reference number 2],

where:

- Object Type will be a fixed text indicating requirement (REQ),
- Project_code will be 06.02, indicating that the requirements specified are associated to P6.2,
- Document_code: according to Requirements and V&V guidelines v1.0, the document code can take 26 values, one of them being DOD (Detailed Operational Description),
- Reference number is a sequence of digits split between reference number 1 and reference number 2. In the case of our project, the reference number 1 will indicate the section where the requirement is placed and the reference number 2 will be a sequence number identifying the requirement into the section.

For example, the identifier REQ-06.02.DOD-6300.0001 refers to a requirement written by the 06.02 project, reported inside the DOD document section 6.3 with the reference 0001.

6.2 Operational Requirements

This section presents the high-level requirements that correspond to the operational concept elements (Operational Services or Processes) addressed inside this DOD, including the requirements trace. OI steps that are predecessors have been given Operational Requirements in order that their validation activities can link to a requirement.

Some requirements based on Development Baseline OI Steps have been retained because it has not been determined yet if any project has referred to them when building their scenarios or use cases. Deleting these requirements without making that check might lead to incompatibility problems, so for the moment, they have been kept. This will be addressed within the next update cycle.

Identifier	REQ-06.02-DOD-6200.0001
Requirement	ECAC Airports and Aircraft Operators shall develop and apply recommendations contained in the European Action Plan for the prevention of runway incursions.

Identifier	REQ-06.02-DOD-6200.0064
Requirement	The Tower Runway Controller and Tower Ground Controller shall be provided with alerts of conflicts for runway incursion and intrusion into restricted areas (also temporarily restricted or forbidden – e.g. closed taxiway, ILS or MLS critical area).
	Provision of a safety net for runway operations, capable of detecting and preventing most dangerous hazards resulting from deviations or errors

Identifier	REQ-06.02-DOD-6200.0003
Requirement	The Tower Runway Controller and Tower Ground Controller shall be able to detect conflicting ATC clearances during operations and non-conformance to procedures or clearances for traffic in their area of responsibility.

Identifier	REQ-06.02-DOD-6200.0005
Requirement	The Vehicle Driver shall be able to detect if they are involved in a potential or actual risk of collision with an aircraft or infringement into restricted or closed areas.

Identifier	REQ-06.02-DOD-6200.0006
Requirement	The Flight Crew shall be able to detect if involved in potential or actual risk of collision with other traffic during runway operations.

Identifier	REQ-06.02-DOD-6200.0066
Requirement	The Tower Controllers shall be provided with position and automatic identity of all relevant aircraft and vehicles on the movement area, with the use of ADS-B applications.

Identifier	REQ-06.02-DOD-6200.0007
Requirement	The Controller shall be able to detect the FOD presence on the movement area to avoid accidents.

Identifier	REQ-06.02-DOD-6200.0008
Requirement	The Vehicle Driver shall have the awareness of surrounding traffic situation (vehicles and aircraft) on ground taxi and runway by displayed information in the vehicle driver's cockpit.

Identifier	REQ-06.02-DOD-6200.0009
Requirement	The Tower Clearance Delivery, Ground and Runway Controllers shall be provided with the most operationally relevant surface route available for any

	aircraft.

Identifier	REQ-06.02-DOD-6200.0011
Requirement	The Vehicle Driver shall have the awareness of traffic context information including at least the status of runways and taxiways, obstacles, and an airport moving map displayed on a vehicle's driver cockpit.

Identifier	REQ-06.02-DOD-6200.0014
Requirement	The situational awareness of The Tower Runway Controller / Ground/Apron Manager and of the flight crew shall be improved with the integration and exploitation of new ATC functions with current elements into an Advanced - Controller Working Position (A-CWP):

Identifier	REQ-06.02-DOD-6200.0067
Requirement	Runway usage awareness of Flight Crews and Vehicle Drivers shall be improved thanks to the presence of airfield lights that visually indicate when it is unsafe to enter the runway

Identifier	REQ-06.02-DOD-6200.0074
Requirement	The final approach controller and Tower Runway Controller shall be able to reduce separations by 0.5 NM for arrivals under defined crosswind conditions.

Identifier	REQ-06.02-DOD-6200.0075
Requirement	The final approach controller and Tower Runway Controller shall be able to reduce separations by 0.5 NM for arrivals under specified headwind conditions.

Identifier	REQ-06.02-DOD-6200.0015
Requirement	The final approach controller and the Tower runway controller shall be able to use reduced aircraft separations using consistent and accurate TBS (time based wake turbulence radar separation) rules on final approach.

Identifier	REQ-06.02-DOD-6200.0016
Requirement	The Tower Runway Controller shall be able to take reduced or suspended WT separations into account thanks to stable weather conditions that either ensures transport of the WT away from the path of following a/c or ensures rapid decay of the WT.

Identifier	REQ-06.02-DOD-6200.0077
Requirement	The Tower Runway Controller shall be able to take into account reduced or suspended WT separations for departures for the initial common path, thanks to stable weather conditions that either ensure the transport of the WT away from the path of following a/c or ensures rapid decay of the WT.

Identifier	REQ-06.02-DOD-6200.0017
Requirement	The Tower Runway Controller shall be able to use appropriate runway exits in order to optimise the ROT.

Identifier	REQ-06.02-DOD-6200.0078
Requirement	The approach controller and Tower Runway Controller shall apply pair wise separation for arrivals on final approach, and for departures on initial common departure path, taking into account aircraft characteristics of the lead and follower aircraft.

Identifier	REQ-06.02-DOD-6200.0018
Requirement	The Tower Runway Controller shall be able to use appropriate multiple runway entries and a wide holding area to optimize the sequencing process for departing aircraft.

3060

Identifier	REQ-06.02-DOD-6200.0020
Requirement	Tools and more accurate surveillance techniques shall assist the Tower Runway Controller to enlarge the capabilities of existing (and dependent) runway combinations.

3063

Identifier	REQ-06.02-DOD-6200.0021
Requirement	All Involved partners shall agree and apply systematic strategies exchanging and sharing information to improve the sequencing of operations (e.g. de-icing) in the Pre-Departure Phase.

3066

Identifier	REQ-06.02-DOD-6200.0022
Requirement	The Tower Runway/Ground Controller shall use adequate LVP (Low Visibility Procedures) implemented at applicable airports involving in particular a harmonised application across airports and the use of optimised separation criteria.

3069

Identifier	REQ-06.02-DOD-6200.0023
Requirement	The landing procedure shall be improved by tuning of ILS to increase runway capacity during already limiting visibility conditions.

3072

Identifier	REQ-06.02-DOD-6200.0024
Requirement	The capacity of the airport in Low Visibility Conditions shall be improved by using MLS and/or interim application of GLS (GPS only) instead of ILS for precision approaches during landing procedures.

3075

Identifier	REQ-06.02-DOD-6200.0025
Requirement	The Flight Crew shall be able to perform precision approaches in Low Visibility Conditions using GBAS CAT II/III (based on GPS L1)

3078

Identifier	REQ-06.02-DOD-6200.0026
Requirement	All Involved partners shall share information on the progress of turn-round, not only at the airport concerned but also in other relevant units such as the NMOC and destination airport to support the Departure/Arrival management.

3081

Identifier	REQ-06.02-DOD-6200.0027
Requirement	Progress of turn-round shall be made available to all involved partners not only at the airport concerned but also in other relevant units such as the NMOC and destination airport to support the Departure/Arrival management.

3084

Identifier	REQ-06.02-DOD-6200.0028
Requirement	Aircraft Environmental Impact Management and Mitigation shall be taken into account during all airport operations in order to guarantee optimum environmental performance

3087

Identifier	REQ-06.02-DOD-6200.0030
Requirement	The De-icing Agent shall be able to improve the anti-icing treatment on aircraft at the stands with technical solutions for the bio-degradation of de-icing fluids.

3090

Identifier	REQ-06.02-DOD-6200.0031
Requirement	The Airport Operator shall be able to access to the environmental performance of the ATM stakeholders in support of continuous improvement process.

3093

Identifier	REQ-06.02-DOD-6200.0081
Requirement	The Airport stakeholders shall make the relevant information through time

	available to the AOP.

3096

Identifier	REQ-06.02-DOD-6200.0082
Requirement	Airport Operators shall make the outputs of landside (passenger and baggage flow) process that can affect ATM performances available through A-CDM in both planning and execution phase.

3099

Identifier	REQ-06.02-DOD-6200.0083
Requirement	Airport Operators shall be able to monitor the aircraft movements at an airport in both the planning and execution timeframe.

3102

Identifier	REQ-06.02-DOD-6200.0084
Requirement	Airport stakeholders shall be provided with Decision Support tools capable to propose tactical changes to operational inputs, rules and procedures that facilitate the collaborative decision making during both planning and execution timeframes.
	Collaborative Airport Performance Management
	Airport Performance is directly impacted by the stakeholders operating at the airport in order to improve airport performance in line with EU ATM Network Performance Objectives.

3105

Identifier	REQ-06.02-DOD-6200.0032
Requirement	The flight crew shall be able to follow simple descent profiles in order to optimise the performance in case of low density traffic.

3108

Identifier	REQ-06.02-DOD-6200.0037
Requirement	The Airline Operations Centre shall be able to refine iteratively the iSBT using new and more accurate information in order to increase the accuracy of the Business Trajectory

3111

Identifier	REQ-06.02-DOD-6200.0038
Requirement	The Tower Clearance Delivery, Ground and Runway Controllers shall be able to send information to aircraft through data link on expected route and clearances related to DCL, start-up, push back and taxi (D-TAXI service)

3114

Identifier	REQ-06.02-DOD-6200.0039
Requirement	The Flight Crew shall be able to send requests for information on expected route and for clearances related to DCL, start-up, push back and taxi (D-TAXI service) to controllers through data link

3117

Identifier	REQ-06.02-DOD-6200.0069
Requirement	The Tower Runway/Ground/delivery controllers shall be able to send the ground-related clearances and information to vehicles through datalink.

3120

Identifier	REQ-06.02-DOD-6200.0070
Requirement	The vehicle driver shall be able to send the ground-related clearance requests to Tower Controllers though datalink.

3123

Identifier	REQ-06.02-DOD-6200.0042
Requirement	The pilot shall be aware regarding the surrounding traffic (incl. both aircraft and airport vehicles) during taxi and runway operations, provided with information on moving map display.

3126

Identifier	REQ-06.02-DOD-6200.0043
Requirement	The pilot shall be assisted by visual enhancement technologies in Low Visibility Conditions.

3129

Identifier	REQ-06.02-DOD-6200.0044
Requirement	The pilots shall be provided with (dynamic) traffic context information

	including status of runways and taxiways, obstacles, route to runway or stand according to the route issued by Tower Runway/Ground/Delivery Controller.

Identifier	REQ-06.02-DOD-6200.0045
Requirement	Airport operations design shall take into account not only braking distance or runway/taxiway design but also pilot's awareness of ROT requirements, pilot's reaction times to line-up/departure clearances, pre-departure actions in order to reduce the Runway Occupancy Time (ROT).

Identifier	REQ-06.02-DOD-6200.0079
Requirement	The Tower Ground Controller shall be able to coordinate by voice automated braking to vacate at a pre-selected runway exit, based on avionic BTV.

Identifier	REQ-06.02-DOD-6200.0046
Requirement	The Tower Ground Controller shall be able to coordinate automated braking to vacate at a pre-selected runway exit through datalink, based on avionic BTV.

Identifier	REQ-06.02-DOD-6200.0047
Requirement	For the execution and planning of the business trajectories of aircraft operators the Aircraft Operator and Airport Operator shall take into account environmental restrictions in the early phase of flight / iSBT planning.

Identifier	REQ-06.02-DOD-6200.0048
Requirement	The Airport stakeholders, via the appropriate applications, shall be able to view an image of the state of the ATM environment for past, present and future, moving the window along the timeline and focusing on any particular aspect or aspects he or she is interested in.
Identifier	REQ-06.02-DOD-6200.0063
Requirement	shall be able to access

Identifier	REQ-06.02-DOD-6200.0049
Requirement	Relationship and processes between all involved stakeholders shall be improved especially during the anticipating and reacting phases to optimise capacity throughput in sector groups based upon current improvement of ATFM activities.

Identifier	REQ-06.02-DOD-6200.0050
Requirement	In case of critical events, involved stakeholders shall take immediate action to minimise consequences and to retrieve network stability.
	Critical events refers to a sudden and usually unforeseen event leading to a high drop in ATFCM capacity.

Identifier	REQ-06.02-DOD-6200.0051
Requirement	The Airport Slot Coordinator shall be assisted by monitoring processes to assure Convergence between airport slots, ATFM slots, and flight plan / iSBT to improve consistency on a daily basis.

Identifier	REQ-06.02-DOD-6200.0052
Requirement	Air Traffic Control, Aircraft Operators and Airport Operators shall collaborate with ATFCM in a genuine partnership.

Identifier	REQ-06.02-DOD-6200.0054
Requirement	The Airport Operations shall take into account information from airports at a regional level to improve the estimated time of arrival for all flights bound to the region.

Identifier	REQ-06.02-DOD-6200.0085
Requirement	The airport operator shall be provided with available airport capacity and scheduled/forecast demand given the prevailing and/or forecast weather and other operational conditions.
	Airport Demand-Capacity Balancing
	The objective is to enhance the monitoring and management of demand at an individual airport given the real available capacity. Through incorporating METEO forecast and actual data, along with other airport resource levels, actual achievable airport capacity levels can be determined with greater accuracy.

Identifier	REQ-06.02-DOD-6200.0086
Requirement	Airport stakeholders shall continuously refine airport planning to improve local airport CDM process and consequently overall network planning.
	Airport Demand-Capacity Balancing
	The overall network planning proposes CTOT / TTA for all regulated flights. For those flights where the allocated constraints will have a negative impact (e.g. disturbing airport/airline operations), the Network shall take into account CDM information in order to possibly re-allocate CTOT / TTA. This results in an improved efficiency in the management of Airport and ATFCM Planning.

Identifier	REQ-06.02-DOD-6200.0076
Requirement	a consistent view of the filed flight plan including late updates until departure.
	Improved Flight Plan Consistency Pre-Departure

Identifier	REQ-06.02-DOD-6200.0073
Requirement	the data required during the pre-flight phase in an integrated and flexible manner.
	Integrated Pre-Flight Briefing
	The user can access various/information sources such as AIS, ARO, MET and ATFM which provide NOTAM, SNOWTAM, MET messages, FPL and related messages or network management messages.

Identifier	REQ-06.02-DOD-6200.0072
Requirement	aeronautical information supported by electronic publication (eAIP). Updates to the aeronautical information are disseminated in electronic/digital form.

Identifier	REQ-06.02-DOD-6200.0071
Requirement	data available from the FOC/WOC to improve the performance.
	Provision and use of FOC/WOC data to enhance ATM ground system performance

Identifier	REQ-06.02-DOD-6200.0068
Requirement	improvement in ATC operations and in the performance of ground-based

	systems subject to quick variations and/or frequent updates related the use of ADD.

Identifier	REQ-06.02-DOD-6200.0055
Requirement	The pilot shall be provided with easy access to the widest possible range of meteorological and operational information derived from ATIS, METAR and NOTAMs/SNOWTAMs, specifically relevant to the departure, approach and landing flight phases to support the decision making process .

Identifier	REQ-06.02-DOD-6200.0056
Requirement	The users and providers shall be 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.

Identifier	REQ-06.02-DOD-6200.0057
Requirement	The Tower Runway and Ground controllers and AFISO shall be provided with the information collected from remote tower sensor systems in order to perform Air Traffic Services from a facility located elsewhere than at the relevant airport.

Identifier	REQ-06.02-DOD-6200.0080
Requirement	The Tower Clearance Delivery Controller shall be provided with a pre-departure sequence (TSAT sequence), built having taken into account accurate taxi time forecasts, to issue start-up approval.

Identifier	REQ-06.02-DOD-6200.0060
Requirement	Tower controllers shall be able to choose arrival-departure patterns for a defined period, coordinating with Approach controller and considering arrival and departure flows on the same or dependent runways.
Identifier	REQ-06.02-DOD-6200.0061
Requirement	The Tower Runway Controller shall be provided with Arrival and Departure sequences calculated by a fixed arrival-departure pattern for defined periods to integrate Arrival and Departure flows to the same runway (or for dependent runways).

Identifier	REQ-06.02-DOD-6200.0062
Requirement	The Tower Runway Controller shall have the possibility to choose a fixed arrival-departure pattern for defined periods to integrate Arrival and Departure flows to the same runway (or for dependent runways).

6.3 Performance Requirements

Introduction

The Validation targets come from B4.1 and are aligned with DS10. Currently, there is no plan to update the targets to DS11; that can lead to some discrepancies in the Performance Requirements with the other sections of the document. This issue is being addressed at the SJU level.

The KPIs that should be used to measure the performance associated with these targets are detailed in the Airport Step 1 VALS**Error! Reference source not found.**

6.3.1 Safety

Airport Safety Requirements address means to reduce the risk and the occurrence of air traffic accidents.

Identifier	REQ-06.02-DOD-SAF1.0112
Requirement	Improve Safety in OFA01.01.02 by 2,50%

Identifier	REQ-06.02-DOD-SAF1.0121
Requirement	Improve Safety in OFA01.02.01 by 4,92%

Identifier	REQ-06.02-DOD-SAF1.0122
Requirement	Improve Safety in OFA01.02.02 by 1,62%

Identifier	REQ-06.02-DOD-SAF1.0421
Requirement	Improve Safety in OFA04.02.01 by 1,24%

Identifier	REQ-06.02-DOD-SAF1.0411
Requirement	Improve Safety in OFA04.01.01 by 0,05%

Identifier	REQ-06.02-DOD-SAF1.0611
Requirement	Improve Safety in OFA06.01.01 by 0,96%

6.3.2 Security

Airport Security requirements address 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.

Identifier	REQ-06.02-DOD-SEC1.0001
Requirement	The security of airport operations shall be maintained at or above the current level.
	preserve the business continuity of the air transport industry by reducing the risk of unauthorised access to and disclosure of ATM information.

6.3.3 Environment Sustainability

Identifier	REQ-06.02-DOD-ENV1.0001
Requirement	Airports shall respect both the local and European standards set for noise, local air quality, emissions and contaminants at and around airports.

6.3.4 Cost effectiveness

Airport Cost Effectiveness requirements address the cost of gate-to-gate ATM in relation to the volume of air traffic that is managed. They cover the total direct gate-to-gate ATM costs incurred by ATM stakeholders (regulatory and governmental authorities, intergovernmental organisations, service providers, airspace users, Airport Operators etc.). This includes ATM/CNS costs, MET costs, payments made to regulatory and governmental authorities, and European ATM design function costs (e.g. EUROCONTROL today). From an organisational perspective they include staff costs, infrastructure, equipment (ground, air and space based), software, maintenance, training etc.

Identifier	REQ-06.02-DOD-CEF1.0611
Requirement	in OFA06.01.01 by 0,27%
	Through progressive implementation of new procedures the European gate-to-gate ATM costs shall reduce.

Identifier	REQ-06.02-DOD-CEF1.0631
Requirement	in OFA06.03.01 by 0,27%
	Through progressive implementation of new systems and procedures the European gate-to-gate ATM costs shall reduce.

6.3.5 Capacity

Identifier	REQ-06.02-DOD-CAP1.0111
Requirement	in OFA01.01.01
	Runway Throughput shall be increased by new procedures, technology and, where ever possible, infrastructure.

Identifier	REQ-06.02-DOD-CAP1.0131
Requirement	in OFA01.03.01 by 5,99%
	Runway Throughput shall be increased by new procedures, technology and, where ever possible, infrastructure.

Identifier	REQ-06.02-DOD-CAP1.4111
Requirement	in OFA04.01.01 by 0,84%
	Runway Throughput shall be increased by new procedures, technology and, where ever possible, infrastructure.

Identifier	REQ-06.02-DOD-CAP1.4112
Requirement	in OFA04.01.01 by 2,96%
	TMA capacity shall be increased by reducing the need for and length of all buffer times.

Identifier	REQ-06.02-DOD-CAP1.4113
Requirement	in OFA04.01.01 by 1,63%
	capacity shall be increased by reducing the need for and length of all buffer times.

Identifier	REQ-06.02-DOD-CAP1.0421
Requirement	in OFA04.02.01 by 0,54%
	Runway Throughput shall be increased by new procedures, technology and, where ever possible, infrastructure.

Identifier	REQ-06.02-DOD-CAP1.5111
Requirement	in OFA05.01.01 by 0,22%
	TMA capacity shall be increased by reducing the need for and length of all buffer times.

Identifier	REQ-06.02-DOD-CAP1.5112
Requirement	in OFA05.01.01 by 0,332%
	capacity shall be increased by reducing the need for and length of all buffer times.

6.3.6 Airport Fuel Efficiency

Identifier	REQ-06.02-DOD-EFF1.0131
Requirement	in OFA01.03.01 by 0,22%

Identifier	REQ-06.02-DOD-EFF1.0411
Requirement	in OFA04.01.01 by 0,01%

Identifier	REQ-06.02-DOD-EFF1.0421
Requirement	in OFA04.02.01 by 0,14%

Identifier	REQ-06.02-DOD-EFF1.0511
Requirement	in OFA05.01.01 by 0,02%

6.3.7 Flexibility

These requirements cover 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 iRBT (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.

These requirements also cover the ability of the ATM system and airports to accommodate airspace user requests for iRBT updates of scheduled and non-scheduled flights, ranging from simple time translation (depart/arrive earlier/later) to full iRBT redefinition (changes to aircraft, route, vertical profile, destination, etc.).

The initial indicative Flexibility design targets are:

- Of the scheduled flights requesting a change in departure time, no more than 2% (European-wide annual average) will suffer a delay penalty of more than 3 minutes (with respect to their requested time) as a consequence of the request.
- The average delay (European-wide annual average) of such scheduled flights (with a delay penalty of more than 3 minutes) will be less than 5 minutes.
- At least 95% (European-wide annual average) of the (valid) requests for full iRBT redefinition of scheduled and non-scheduled flights will be accommodated, albeit possibly with a time penalty (i.e., departure and/or arrival delay).
- Of the scheduled and non-scheduled flights with a successfully accommodated request for full Reference BT redefinition, no more than 10% (European-wide annual average) will suffer a delay penalty (i.e., departure and/or arrival delay) of more than 3 minutes (with respect to their requested time) as a consequence of the request.
- The average delay of such scheduled and non-scheduled flights with a successfully accommodated request for full Reference BT redefinition (with a delay penalty of more than 3 minutes) will be less than 5 minutes.

- At least 98% (European-wide annual average) of the non-scheduled flight departures will be accommodated with a delay penalty less than 3 minutes.
- The average delay (European-wide annual average) of such non-scheduled flight departures (with a delay penalty of more than 3 minutes) will be less than 5 minutes.
- At least 98% (European-wide annual average) of the VFR-IFR change requests will be accommodated without penalties.

Flexibility targets at the OFA level have not yet been developed by SESAR. The targets listed above are at the Program level and apply to all phases of flight. As these targets cannot be easily allocated to individual OFAs, there are listed here in the introduction to this section. However, one could assume that they are shared between the airport and network. As such a general requirement, without numerical targets, could be assigned to airport OFAs.

Identifier	REQ-06.02-DOD-FLX1.0001
Requirement	Airspace Users shall maintain the ability to make amendments to filed requests without suffering excess delays or route changes.

6.3.8 Predictability

Airport Predictability requirements cover the variability of the flight operation: departure (off-block) and arrival (on-block) punctuality, and the variability of flight phase durations (turnaround time, taxi time, airborne time).

Identifier	REQ-06.02-DOD-PRE1.0131
Requirement	in OFA01.03.01 by 2,77%

Identifier	REQ-06.02-DOD-PRE1.0411
Requirement	in OFA04.01.01

Identifier	REQ-06.02-DOD-PRE1.0421
Requirement	in OFA04.02.01 by 4,95%

Identifier	REQ-06.02-DOD-PRE1.0511
Requirement	in OFA05.01.01 by 0,27%

6.3.9 Access and Equity

Airport Access and Equity requirements address 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.

Identifier	REQ-06.02-DOD-ANE1.0001
Requirement	Shared use of airports by different classes of airspace users will be significantly improved
	Classes of airspace users defined by type of user, type of aircraft, type of flight rule

Identifier	REQ-06.02-DOD-ANE1.0002
Requirement	Where shared use is conflicting with other performance expectations, viable airport alternatives will be provided to satisfy the airspace users' needs, in consultation with all affected stakeholders.
	safety, security, capacity, etc.

Identifier	REQ-06.02-DOD-ANE1.0003
Requirement	Priority management, will not be based on just the 'first come first serve' rule.

Identifier	REQ-06.02-DOD-ANE1.0004
Requirement	Priority rules will always be applied in a transparent, correct manner.

6.3.10 Participation

Airport Participation requirements address the aim of how to achieve a balanced approach to ATM community involvement.

Identifier	REQ-06.02-DOD-PRT.0001
Requirement	Participation by the ATM community shall be improved during all ATM phases:
	planning, development, deployment, operation and evaluation.

Identifier	REQ-06.02-DOD-PRT.0002
Requirement	Participation by the ATM community shall be improved through collaborative decision-making and consensus building.

6.3.11Interoperability

Airport Interoperability requirements address the facilitation of homogeneous and non-discriminatory global and regional traffic flows.

Identifier	REQ-06.02-DOD-INT1.0001
Requirement	Interoperability of airport systems shall be increased through the application of standards and uniform principles, together with improved technical and operational interoperability of aircraft and ATM Systems

7 Operational Focus Areas and OSED mapping

The goal of this section is to provide all required information concerning the scope and elements of this Airport Step 1 DOD and their allocation to the *Operational Focus Areas* that will develop the corresponding detailed operational material.

Hence, this section:

- Identifies the Operational Focus Areas (OFAs) that should be addressed in the scope of this **Airport Step 1 DOD** and the corresponding OI Steps
- Allocates Environment Definition, Scenarios and Processes and Services inside the DOD to each relevant Operational Focus Area.

7.1 Mapping of Operational Focus Areas to OI Steps and other X.2

The reference material for establishing the list of OI Steps to consider in the Step 1 DOD is the official ATM roadmap maintained by WP B1 through SESAR D79-WPB.01-Integrated Roadmap Dataset 11-release Note-00.01.00 – 11/10/2013[4].

The eligible **OI steps** for the **Airport Step 1 DOD** hold the following characteristics:

- o The **Airport DB OI steps that are still applicable** in Concept Step 1;
- o The **STEP 1 OI Steps** (shown in colour in the table below).

Operational Focus Area name / identifier	OI Step (coming from the Integrated Roadmap)	OI step title	Story Board Step	Other X.02
ENB02.01.01 SWIM	IS-0101	Improved Flight Plan Consistency Pre-Departure	DB	
ENB02.01.01 SWIM	IS-0102	Improved Management of Flight Plan After Departure	DB	
ENB02.01.01 SWIM	IS-0201	Integrated Pre-Flight Briefing	DB	
ENB02.01.01 SWIM	IS-0901-A	SWIM for Step1	S1	5.2 7.2
ENB02.01.02 AIM/MET	IS-0402	Extended Operational Terminal Information Service Provision Using Datalink	S1	5.2
ENB02.01.02 AIM/MET[43]	MET-0101	Enhanced operational planning decisions through MET information integration	S1	11.2
OFA01.01.01 LVPs using GBAS	AO-0403	Optimised Dependent Parallel Operations	DB	
OFA01.01.01 LVPs using GBAS	AO-0502	Improved Operations in Low Visibility Conditions	DB	
OFA01.01.01 LVPs using GBAS	AO-0505-A	Improved Low Visibility Operations Using GBAS CATII/III based on GPS L1	S1	
OFA01.01.02 Pilot enhanced vision	AUO-0403	Enhanced Vision on Head-Up display for the Pilot in Low Visibility	S1	

[43] OFA assignment to be confirmed (no assignment in Integrated Roadmap version DS10)

Operational Focus Area name / identifier	OI Step (coming from the Integrated Roadmap)	OI step title	Story Board Step	Other X.02
		Conditions		
OFA01.02.01 Airport safety nets	AO-0101	Reduced Risk of Runway Incursions through Improved Procedures and Best Practices on the Ground	DB	
OFA01.02.01 Airport safety nets	AO-0102	Automated Alerting of Controller in Case of Runway Incursion or Intrusion into Restricted Areas	DB	
OFA01.02.01 Airport safety nets	AO-0104-A	Airport Safety Nets for Controllers in Step 1	S1	
OFA01.02.01 Airport safety nets	AO-0105	Airport Safety Net for Vehicle Drivers	S1	
OFA01.02.01 Airport safety nets	AO-0202	Detection of FOD (Foreign Object Debris) on the Airport Surface	DB	
OFA01.02.01 Airport safety nets	AO-0209	Enhanced Runway Usage Awareness	S1	
OFA01.02.01 Airport safety nets	AUO-0605-A	Airport Safety Nets for Pilots in Step 1	S1	
OFA01.02.02 Enhanced situational awareness	AO-0201-A	Enhanced Ground Controller Situational Awareness in all Weather Conditions for Step 1	S1	
OFA01.02.02 Enhanced situational awareness	AUO-0401	Airborne Traffic Situational Awareness on the Airport Surface (ATSA-SURF)	DB	
OFA01.03.01 Enhanced Runway Throughput	AO-0303	Time Based Separation for Final Approach - Full Concept	S1	
OFA01.03.01 Enhanced Runway Throughput	AO-0304	Weather Dependent Reduced Wake Turbulence Separations for Departure	S1	
OFA01.03.01 Enhanced Runway Throughput	AO-0305	Additional Rapid Exit Taxiways (RET) and Entries	DB	
OFA01.03.01 Enhanced Runway Throughput	AO-0306	Wake Turbulence Separations based on Static Aircraft Characteristics	S1	
OFA01.03.01 Enhanced Runway Throughput	AO-0310	Weather-dependent Reduced Wake Turbulence Separations for Final Approach	S1	
OFA01.03.01 Enhanced Runway Throughput	AUO-0701	Use of Runway Occupancy Time (ROT) Reduction Techniques	DB	
OFA01.03.01 Enhanced Runway Throughput	AUO-0703	Optimised braking to vacate at a pre-selected runway exit coordinated with Ground ATC by Datalink	S1	
OFA02.02.04 Approach Procedures with Vertical Guidance	AOM-0605	Enhanced terminal operations with automatic RNP transition to XLS/LPV	S1	5.2

Operational Focus Area name / identifier	OI Step (coming from the Integrated Roadmap)	OI step title	Story Board Step	Other X.02
OFA03.01.04 Business and Mission Trajectory	AUO-0201	Enhanced Flight Plan Filing Facilitation	DB	
OFA03.01.04 Business and Mission Trajectory	AUO-0203-A	Shared Business / Mission Trajectory (iSBT) in Step 1	S1	7.2
OFA03.01.04 Business and Mission Trajectory	AUO-0204-A	Agreed Reference Business / Mission Trajectory (RBT/iRMT) in Step 1	S1	7.2
OFA04.01.01 Integrated Arrival/Departure Management at Airports[44]	TS-0202	Pre-Departure Sequencing supported by Route Planning	S1	
OFA04.01.01 Integrated Arrival/Departure Management at Airports	TS-0308	Flow based Integration of Arrival and Departure Management	S1	
OFA04.02.01 Integrated Surface Management	AO-0205	Automated Assistance to Controller for Surface Movement Planning and Routing	S1	
OFA04.02.01 Integrated Surface Management	AO-0206	Enhanced Guidance Assistance to Airport Vehicle Driver Combined with Routing	S1	
OFA04.02.01 Integrated Surface Management	AO-0215[45]	Airport ATC provision of ground-related clearances and information to vehicle drivers via datalink	S1	
OFA04.02.01 Integrated Surface Management	AUO-0308	Datalink services used for provision of ground related clearances and information	S1	
OFA04.02.01 Integrated Surface Management	AUO-0603-A	Enhanced Guidance Assistance to Aircraft on the Airport Surface Combined with Routing in Step 1	S1	
OFA05.01.01 Airport Operations Management	AO-0501	Improved Operations in Adverse Conditions through Airport Collaborative Decision Making	DB	
OFA05.01.01 Airport Operations Management	AO-0601	Improved Turn-round Process through Collaborative Decision Making	DB	
OFA05.01.01 Airport Operations Management	AO-0602	Collaborative Pre-departure Sequencing	DB	
OFA05.01.01 Airport Operations Management	AO-0603	Improved De-icing Operation through Collaborative Decision Making	DB	
OFA05.01.01 Airport Operations Management	AO-0703	Aircraft Environmental Impact Management and Mitigation at and around	DB	

[44] New OFA name (as anticipated for Integrated Roadmap version DS11 – October 2013)

[45] In anticipation of Integrated Roadmap version DS11 (October 2013)

Operational Focus Area name / identifier	OI Step (coming from the Integrated Roadmap)	OI step title	Story Board Step	Other X.02
		Airports		
OFA05.01.01 Airport Operations Management	AO-0705	Reduced Water Pollution	DB	
OFA05.01.01 Airport Operations Management	AO-0706	(Local) Monitoring of Environmental Performance	DB	
OFA05.01.01 Airport Operations Management	AO-0801	Collaborative Airport Planning Interface	S1	
OFA05.01.01 Airport Operations Management	AO-0802	A-CDM process enhanced through integration of landside (passenger and baggage) process outputs	S1	
OFA05.01.01 Airport Operations Management	AO-0803	Integration of Airports into ATM through Monitoring of Airport Transit View (Extension of Performance Monitoring building on A-CDM)	S1	
OFA05.01.01 Airport Operations Management	AO-0804	Collaborative Airport Performance Management	S1	
OFA05.01.01 Airport Operations Management	AUO-0801	Environmental Restrictions Accommodated in the Earliest Phase of Flight Planning	S1	
OFA05.01.01 Airport Operations Management	DCB-0301	Improved Consistency between Airport Slots and Flight Plans	DB	
OFA05.01.01 Airport Operations Management	DCB-0304	Airport CDM extended to Regional Airports	S1	
OFA05.01.01 Airport Operations Management	DCB-0309	Airport Demand-Capacity Balancing	S1	
OFA05.01.01 Airport Operations Management	DCB-0310[46]	Improved Consistency between Airport and ATFCM Planning	S1	7.2
OFA05.03.04 Enhanced ATFCM processes	DCB-0206	Coordinated Network Management Operations Extended Within Day of Operation	DB	
OFA05.03.04 Enhanced ATFCM processes	DCB-0207	Management of Critical Events	DB	
OFA05.03.06 UDPP	AUO-0101-A	ATFM Slot Swapping for STEP1	S1	7.2
OFA05.03.06 UDPP	AUO-0103	UDPP-Departure	S1	7.2
OFA05.03.07 Network Operations Planning	DCB-0101	Enhanced Seasonal NOP Elaboration	DB	
OFA05.03.07 Network Operations Planning	DCB-0102	Interactive Rolling NOP	DB	
OFA05.03.07 Network Operations Planning	DCB-0103-A	Collaborative NOP for Step 1	S1	7.2
OFA05.03.07 Network Operations Planning	DCB-0201	Interactive Network Capacity Planning	DB	
OFA05.03.07 Network Operations Planning	DCB-0302	Collaborative Management of Flight	DB	

[46] In anticipation of Integrated Roadmap version DS11 (October 2013)

Operational Focus Area name / identifier	OI Step (coming from the Integrated Roadmap)	OI step title	Story Board Step	Other X.02
		Updates		
OFA05.03.07 Network Operations Planning	SDM-0101	Network Performance Assessment	DB	
OFA06.01.01 CWP Airport	AO-0208-A	Advanced Information Management and System Integration in the ATC Tower for Step1	S1	
OFA06.03.01 Remote Tower	SDM-0201	Remotely Provided Air Traffic Service for Single Aerodrome	S1	

Table 7-1 Mapping of Operational Focus Areas to OI Steps and other X.02

7.2 Allocation of DOD elements to Operational Focus Areas

7.2.1 Allocation of Environment to Operational Focus Areas

(cf. chapter 3.1.2 which already provides a mapping from environment elements to OFAs)

7.2.2 Allocation of Scenarios to Operational Focus Areas

Scenario identification	Use Case Identification	Operational Focus Areas allocation
Long-Term Planning	UC 6 01 UC 6 02	OFA05.01.01 Airport Operations Management
	UC 6 11	OFA05.03.07 Network Operations Planning
Medium/Short-Term Planning	UC 6 12 UC 6 14	OFA01.01.01 LVPs using GBAS
	UC 6 13 UC 6 14	OFA03.01.04 Business and Mission Trajectory
	UC 6 14	OFA04.01.01 Integrated Arrival/Departure Management at Airports
	UC 6 14	OFA04.02.01 Integrated Surface Management
	UC 6 12 UC 6 13 UC 6 14	OFA05.01.01 Airport Operations Management
	UC 6 13 UC 6 14	OFA05.03.04 Enhanced ATFCM processes
	UC 6 14	OFA05.03.06 UDPP
	UC 6 12 UC 6 13 UC 6 14	OFA05.03.07 Network Operations Planning
Execution Phase	UC 6 14	OFA01.01.01 LVPs using GBAS
	UC 6 14	OFA03.01.04 Business and Mission Trajectory
	UC 6 14	OFA04.01.01 Integrated Arrival/Departure Management at Airports
	UC 6 14	OFA05.01.01 Airport Operations Management
	UC 6 14	OFA05.03.04 Enhanced ATFCM processes
	UC 6 14	OFA05.03.06 UDPP
	UC 6 14	OFA05.03.07 Network Operations Planning
Arrival	UC 6 99	OFA01.01.01 LVPs using GBAS
	UC 6 99	OFA01.01.02 Pilot enhanced vision

Scenario identification	Use Case Identification	Operational Focus Areas allocation
	UC 6 21 UC 6 28 UC 6 30 UC 6 31 UC 6 99	OFA01.02.01 Airport safety nets
	UC 6 15 UC 6 21 UC 6 99	OFA01.02.02 Enhanced situational awareness
	UC 6 15 UC 6 99	OFA01.03.01 Enhanced Runway Throughput
	UC 6 99	OFA02.02.04 Approach Procedures with Vertical Guidance
	UC 6 18 UC 6 19 UC 6 20 UC 6 21 UC 6 28 UC 6 29 UC 6 99	OFA04.02.01 Integrated Surface Management
	UC 6 21	OFA05.01.01 Airport Operations Management
	UC 6 21 UC 6 99	OFA06.01.01 CWP Airport
	UC 6 99	OFA06.03.01 Remote Tower
Turn round	UC 6 54 UC 6 55 UC 6 58	OFA03.01.04 Business and Mission Trajectory
	UC 6 54 UC 6 57 UC 6 58	OFA04.01.01 Integrated Arrival/Departure Management at Airports
	UC 6 54 UC 6 58	OFA04.02.01 Integrated Surface Management
	UC 6 54 UC 6 55 UC 6 56 UC 6 58 UC 6 59 UC 6 63 UC 6 64	OFA05.01.01 Airport Operations Management
	UC 6 58 UC 6 60	OFA05.03.06 UDPP
	UC 6 54 UC 6 57 UC 6 58 UC 6 59	OFA05.03.07 Network Operations Planning
	UC 6 54 UC 6 62	OFA06.01.01 CWP Airport
Departure	UC 6 79	OFA01.01.02 Pilot enhanced vision
	UC 6 28 UC 6 31 UC 6 79 UC 6 86	OFA01.02.01 Airport safety nets
	UC 6 79	OFA01.02.02 Enhanced situational awareness
	UC 6 79 UC 6 86	OFA01.03.01 Enhanced Runway Throughput
	UC 6 76 UC 6 79 UC 6 86	OFA04.01.01 Integrated Arrival/Departure Management at Airports
	UC 6 76 UC 6 79 UC 6 86	OFA04.02.01 Integrated Surface Management
	UC 6 76 UC 6 79	OFA05.01.01 Airport Operations Management

Scenario identification	Use Case Identification	Operational Focus Areas allocation
	UC 6 79 UC 6 86	OFA06.01.01 CWP Airport
Post Flight Phase	UC 6 91	OFA03.01.04 Business and Mission Trajectory
	UC 6 91 UC 6 92	OFA04.02.01 Integrated Surface Management
	UC 6 91 UC 6 92	OFA05.01.01 Airport Operations Management
	UC 6 92	OFA05.03.04 Enhanced ATFCM processes
	UC 6 92	OFA05.03.07 Network Operations Planning

Table 7-2: List of Associated Scenarios and Use Cases to OFA.

7.2.3 Allocation of Processes and Services to Operational Focus Areas

At the moment of writing:

- the process identification is still underway,

- the service identification has not started.

As a consequence, the table below only presents the list of processes currently known. When new / additional information becomes available within the lifecycle of this DOD Step 1, the allocation of Processes and Services will be completed.

Besides, the following activities are not presented in the table since they are considered irrelevant for this STEP1 Airport DOD:

- activities that do not relate to any OI step or relate to DB OI steps,

- activities that relate to OFAs that are not federated/managed by WP 6.2.

DOD Element Category / Title	Elements identification	Elements *short* description	Reference to DOD section where it is described	OFA allocation
Process	Steer Airport Performance	(All activities)	5.2.1	05.01.01
	Manage Airport Performance	Update AOP	5.2.1	05.01.01
	Monitor Airport Performance	Record Airport Data	5.2.1	05.01.01
	Manage Post Operations	(All activities)	5.2.1	05.01.01
	Prepare and Execute Landing	Prepare Runway Exit	5.2.2	01.03.01
		Execute Approach	5.2.2	01.01.01 01.03.01
		Execute roll-out and vacate runway	5.2.2	01.03.01
		Negotiate Runway Exit		
		Plan and provide taxi-in route	5.2.2	04.02.01
	Prepare and Execute Take-Off	Manage Runway Sequence	5.2.2	01.03.01 04.01.01
	Prepare and Execute In-Block	Manage In-Block	5.2.3	04.01.01
	Prepare and Execute Off-Block	Manage Pre-departure	5.2.3	04.01.01

DOD Element Category / Title	Elements identification	Elements *short* description	Reference to DOD section where it is described	OFA allocation
		Provide start-up instruction	5.2.3	04.02.01
		Plan Departure		
		Execute start-up		
	Prepare and execute taxi-in routing	Provide guidance on apron	5.2.4	04.02.01
		Prepare taxi-in route		
		Plan and provide taxi-in route		
		Provide taxi-in routing guidance		
		Execute taxi-in	5.2.4	04.02.01 01.01.02
	Prepare and execute taxi-out routing	Facilitate push-back execution	5.2.4	04.02.01
		Prepare taxi-out route		
		Execute start-up and exit from the stand		
		Plan and provide taxi-out route		
		Provide instruction to exit from the stand		
		Provide taxi-out routing guidance		
		Execute taxi-out	5.2.4	04.02.01 01.01.02
		Execute runway crossing		
	Plan and provide routing for a vehicle	(all activities)	5.2.4	04.02.01
	Perform Conformance Monitoring	(all activities)	5.2.5	01.02.01
	Manage safety net systems for airport vehicles			
	Manage safety on flight desk			
	Perform RWSL operations			

Table 7-3: List of the associated Processes and Services to OFA

Note: OFA06.01.01 and 06.03.01 are transversal OFAs and applicable to all processes involving ATS.

8 Issues

This chapter is used to describe issues that appeared during the development of the Operational Scenario.

Actors

It has to be clarified with WP B4.2 how the function "Follow-me" should be integrated. Is it a new actor, or should it be handled as being a part of "Vehicle Driver", "Ground Handler" or "Airport Operator/ Airport Duty Officer"?. For modelling continuity, it has been decided to handle "Follow-me" as part of "Vehicle Driver".

iRBT Definition in Step 1

The D66-B4.2 – SESAR Concept of Operations Step 1 ed 2013 – 01.01.00-22/11/2013 [11] states that the iRBT is defined as being between of- blocks to in-blocks. While the moment of transition from an iSBT to an iRBT is still being debated, from an airport point of view, the iRBT starts with the start-up approval and ends with the on-blocks (engines off). This includes A-CDM milestones that would otherwise be left out by using the definition currently in the CONOPS. A clear definition of the start of the iRBT is required to prevent misunderstandings and possible gaps.

B4.1 targets

In the yearly update process, the X.2s are scheduling their updates to take into consideration the latest Release results. This implies using the odd numbered DS set (11, 13, etc.). The B4.1 target updates, however, are scheduled to be delivered in the summer. This implies using the evenly numbered DS sets (10, 12, etc.). This causes an inherent misalignment between the B4.1 Validation targets and the performance requirements in the DODs. This issue has been escalated to the SJU.

In addition, various OFAs have stated that OI Steps, or the entire OFA, will not contribute to the performance requirements that they have been allocated. As the performance requirements are referencing the B4.1 OFA targets, 6.2 feels that they should stay as they are until there are new targets. This issue will be taken into account in B4.1 and the future update to the DOD. The affected OFAs are: OFA01.01.01, OFA04.01.01 and OFA04.02.01

OFA 01.01.01 does not have an Airport Capacity target associated with this requirement. This is deliberate as there is no expectation that Low Vis procedures will increase the declarable capacity and best-in-class airports. However, it is recognised that this OFA (OI Step AO-0505-A) has the potential to increase capacity in degraded conditions, but this is a resilience point and something B.4.1 is currently developing. We will send an initial version of the influence diagrams and proposed expression of the Resilience and Flexibility areas early in the new year for your input.

Airport Services

Currently, the modelling activity within 6.2 has been limited to processes. Work to define and develop Airport Services is ongoing with WP8.

Datalink Issues

There is an on-going issue in SESAR to determine the appropriate time (before landing) at which the taxi routing will be uplinked to the Flight Crew. It is assumed that the datalink connection, when needed, will be available between the aircraft and the airport ATC services so that the taxi routing information - as well as the appropriate runway exit - can be transmitted to the flight crew, without involving the TMA controller. The specifics of how to achieve this are yet to be determined.

9 References

This section identifies the documents (name, reference, source project) the DOD has to comply with or those that are used as sources of additional inputs for the DOD.

9.1 Applicable Documents

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

[1] IS SESAR Template Toolbox Latest version

[2] IS SESAR Requirements and V&V Guidelines Latest version

9.2 Reference Documents

The following documents provide input/guidance/further information/other:

[3] Airport CDM Implementation – The Manual", version 4, April 2012

[4] SESAR D79-WPB.01-Integrated Roadmap Dataset 11-release Note-00.01.00 – 11/10/2013

[5] ATMAP ANS_Airport_Indicators_v0-7_clean.doc

[6] European Commission Implementing Rule 691/2010

[7] NMF IR SSC 40 item 2

[8] SESAR P6.5.1 D004 Identification of Key Performance Areas and Focus Areas, version 00.01.01, 27 May 2010

[9] SESAR P6.5.1 D005/D006 Identify Airport KPIs and Performance Drivers for the selected KPAs / Focus Areas, version 00.01.00, (6 separate documents) – 30 September 2010

[10] EUROCONTROL Challenges of Growth 2013

[11] SESAR– D66-B4.2 – SESAR Concept of Operations Step 1 ed 2013 – 01.01.00-22/11/2013

[12] SESAR D02-WPC02- Performance Plan – Airports Classification-00.00.01, 28/11/2011

[13] DEL-06.05.04 D08_OFA050101_OSED 00.02.02

Appendix A: OIs changes

The excel sheet below presents all differences between the list of OI steps that was referenced in the previous version of this DOD and the current updated version:

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The table below presents the differences (compared to the previous version of this DOD) in definition (**<u>title</u>** and description) of the OI steps referenced in both section 2 and section 7.1.

OI Step code	OLD definition	UPDATED definition	Comment
AO-0104-A	**<u>Airport Safety Nets including Taxiway and Apron</u>** The systems detect potential conflicting situations/incursions involving mobiles (and stationary traffic) on runways, taxiways and in the apron/stand/gate area. Appropriate alerts are provided to controllers and also to the relevant pilots/vehicle drivers.	**<u>Airport Safety Nets for Controllers in Step 1</u>** The System detects conflicting ATC clearances during runway operations, and non-conformance to procedures or clearances for traffic on runways, taxiways and in the apron/stand/gate area. Appropriate alerts are provided to controllers.	Reduced scope (to controllers only) due to overlap with existing AUO-0605-A (alerts for pilots) and new AO-0105 (alerts for vehicle drivers). OI step code has been changed from AO-0104 to AO-0104-A
AO-0205	**<u>Automated Assistance to Controller for Surface Movement Planning and Routing</u>** The System provides the controller with the best route calculated by minimising the delay according to planning, ground rules, and potential conflicting situations with other mobiles. The System informs the appropriate controller (ground or runway) of any deviation from the cleared route.	**<u>Automated Assistance to Controller for Surface Movement Planning and Routing</u>** The System provides the controller with the best route calculated by minimising the delay according to planning, ground rules, and potential conflicting situations with other mobiles.	Reduced scope (to route generation only) due to overlap with existing AO-0104-A (non-conformance alerts).
AO-0206	**<u>Automated Assistance to Controller for Surface Movement Planning and Routing</u>** The system provides to vehicle drivers the display of dynamic traffic context information including status of runways and taxiways, obstacles, and an airport moving map.	**<u>Enhanced Guidance Assistance to Airport Vehicle Driver Combined with Routing</u>** The system provides to the Vehicle Drivers the display of dynamic traffic context information including status of runway and taxiways, obstacles, route (potentially by application of an airport moving map). Ground signs (stop bars, centreline lights, etc.) are triggered automatically according to the route issued by ATC.	Enlarged scope to include AGL (airfield ground lighting)
AO-0304	**<u>Weather Dependent Reduced WV Separations for Final Approach and Departure</u>** The application of weather dependent separation (WDS) for arrivals on final approach, and for departures from the runway for the initial common departure path, through a reduction or a suspension of the wake turbulence separation, over the duration of identified and stable forecast weather conditions, that either ensures transport of the wake turbulence out of the path of the follower aircraft, or ensures decay of the wake turbulence so that it is no longer a hazard to the follower aircraft.	**<u>Weather Dependent Reduced Wake Turbulence Separations for Departure</u>** The application of weather dependent separation (WDS) for departures from the runway for the initial common departure path, through a reduction or a suspension of the wake turbulence separation, over the duration of identified and stable forecast weather conditions, that either ensures transport of the wake turbulence out of the path of the follower aircraft, or ensures decay of the wake turbulence so that it is no longer a hazard to the follower aircraft.	Reduced scope (to departures only) due to split with new AO-0310 (for arrivals).
AO-0502	**<u>Improved Operations in Low Visibility Conditions through Enhanced ATC Procedures</u>** LVP (Low Visibility Procedures) are collaboratively developed and are implemented at applicable airports involving in particular a harmonised application across airports and the use of optimised separation criteria.	**<u>Improved Operations in Low Visibility Conditions</u>** Improved Operations in Low Visibility Conditions through enhanced ATC procedures and/or navigation systems. LVP (Low Visibility Procedures) are collaboratively developed and are implemented at applicable airports involving in particular a harmonised application across airports and the use of optimised separation criteria. Navigation systems can be enhanced through	Enlarged scope of the OI Step (result of the merging of AO-0502, AO-0503 and AO-0504)

OI Step code	OLD definition	UPDATED definition	Comment
		changes applied to ILS antenna (smaller ILS sensitive and critical areas in CAT II/III) or use of MLS.	
AO-0703	**Aircraft Noise Management and Mitigation at and around Airports** 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 strategic gain can be won by the voluntary adoption of lesser restrictions, those 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 Environmental Impact Management and Mitigation at and around Airports** The objectives are to ensure that decisions taken at the local level achieve the optimum environmental performance from aircraft operations at and around airports, by achieving the most appropriate balance between social, economic and environmental imperatives. A key aim will be to balance sometimes conflicting needs for noise and atmospheric emissions reduction and to account for system wide implications of local decisions. A correctly balanced environmental regime at an airport can help to ensure that legal compliance to regulation is maintained, that the rules are harmonised to the extent possible, and the global and local impacts are minimised to the extent possible. Most importantly, a key objective is to ensure that non optimal environmental procedures and constraints are avoided and where such constraints are being considered that the least damaging options are selected. Optimum environmental efficiency and capacity can be achieved at and around airports through the collaborative local selection of the most appropriate ATM capabilities and OIs available, within an overarching and harmonising framework. This framework must involve all operational stakeholders.	Enlarged scope of the OI Step (result of the merging of AO-0703 and AO-0704)
AUO-0203-A	**Shared Business / Mission Trajectory (iSBT)** The Shared Business / Mission Trajectory (iSBT/SMT) is the trajectory published by the Company / Wing Operation (FOC/WOC) that is available for collaborative ATM planning purposes. The subsequent iSBT is then available for iterative refinement of the intended trajectory allowing the user to take into account current weather forecasts and ATM constraints, which may be the result of Network Management Demand & Capacity Balancing activity. In the Medium/Short Term planning phase, in addition to the flight plan as currently filed by the Aircraft Operator, a Shared Business/Mission Trajectory (iSBT/MT) will be created and published by the Aircraft Operator to authorised users subject to appropriate subscription mechanisms. The iSBT/MT will be subject to an iterative revision process, as time moves towards the execution phase and latest information affecting the flight becomes available. The iSBT/MT will describe the flight intentions and will include the following: flight's city pair, user preferred 2D route, ATM constraints if any, flight's performance and user preferred 4D Trajectory that takes into accounts the ATM constraints (including TTA). Note that, the user preferred 4D Trajectory will be generated by the FOC/WOC systems and included in the iSBT/MT as soon as becomes ready for publishing.	**Shared Business / Mission Trajectory (iSBT) in Step 1** The current flight plan will first be extended to include flight performance and 4D profile information. This extended flight plan will then evolve into the initial iSBT/SMT (iSBT/iSMT). The iSBT/iSMT will be a partial implementation of the iSBT/SMT, which is the published business/mission trajectory that is available for collaborative ATM planning purposes. The iSBT/iSMT will be published when the flight intentions (schedules, airport slots and routing) of the airspace user have stabilized sufficiently (in the medium-term planning). The iSBT/iSMT will include all extended flight plan information. The iSBT/iSMT will additionally include a unique flight identification (GUFI). The iSBT/iSMT will be progressively refined with incoming information from the airspace user, following a layered collaborative ATM planning process, as time moves towards the execution phase and latest information affecting the flight becomes available.	Enhanced description
AUO-0204-A	**Agreed Reference Business / Mission Trajectory (iRBT/iRMT)** An initial Reference Business/Mission Trajectory is the result of the collaborative planning process that revises the iSBT/SMT. It is published as the initial Reference Business/Mission Trajectory (iRBT/iRMT) at the moment when, due to the proximity of the Execution Phase, all data revelant to the iSBT is sufficiently reliable and agreed. At this point it becomes	**Agreed Reference Business / Mission Trajectory (iRBT/iRMT) in Step 1** The iRBT/iRMT will be the partial implementation of the RB/MT, which is the reference used by all ATM partners during the flight execution. The iSBT/iSMT will change to the iRBT/iSMT either at a fixed time before off-block or when a specific A-CDM milestone occurs. The iRBT/iRMT will include all iSBT/iSMT information. The iRBT/iRMT will contain, among other information, target times (TTO/TTA).	Enhanced description

OI Step code	OLD definition	UPDATED definition	Comment
	an agreed parameter of the iRBT that the airspace users agree to fly and the ANSPs and airports agree to facilitate.		
AUO-0401	**Air Traffic Situational Awareness (ATSAW) on the Airport Surface** Information regarding the surrounding traffic (incl. both aircraft and airport vehicles) during taxi and runway operations is displayed in the cockpit, superimposed to the airport layout on a moving map.	**Airborne Traffic Situational Awareness on the Airport Surface (ATSA-SURF)** In addition to display of the airport layout (showing taxiways, runways, fixed obstacles) and the own aircraft position, the Flight Crew has an improved situational awareness thanks to the additional display of surrounding traffic (incl. both aircraft and optionally airport vehicles). A decrease in flight crew and controller workload is expected by reducing requests for repeated information with respect to surrounding traffic. An improvement of safety is also expected, especially at taxiway and runway intersections, as well as for aircraft landing and taking off.	Enhanced description
AUO-0403	**Enhanced Vision for the Pilot in Low Visibility Conditions** Out the window' positional awareness is improved through the application of enhanced vision of external environment in low visibility condition.	**Enhanced Vision on Head-Up display for the Pilot in Low Visibility Conditions** 'Out of the window' positional awareness is improved through the application of visual enhancement technologies thereby reducing the difficulties of transition from instrument to visual flight operations	Enhanced description
DCB-0103-A	**SWIM enabled NOP** The Network Operations Plan (NOP) is in fact a 4 dimensional real time virtual representation of the European ATM environment. It is a unique, dynamic, rolling picture (rather than a series of discrete daily plans) that provides a relational image of the state of the ATM environment for past, present and future. ATM stakeholders, via the appropriate applications, have visibility of the demand and capacity situation, the agreements reached, detailed business/mission trajectory information, resource planning information as well as access to simulation tools for scenario modelling. The NOP draws on the latest available information being shared in the system. It includes scenarios to assist in managing diverse events that may threaten the network in order to restore stability of operation as quickly as possible.	**Collaborative NOP for Step 1** The NOP will be enhanced to achieve collaborative planning with the support of services which can be automated (B2B services are initial examples). The NOP will provide information on stakeholders' agreements and related justifications. To enhance the planning process, the NOP will use available information provided by the airports (available from the AOPs). The NOP will continuously provide up-to-date information on the Network situation. This is especially important in the case of crisis. Furthermore, the NOP will provide access to initial network performance objectives and support to network performance assessment in post-operations.	Enhanced description
DCB-0207	**Management of Critical Events** Critical events refers to a sudden and usually unforeseen event leading to a high drop in ATFCM capacity, involving many partners and requiring immediate action to minimise consequences and to retrieve network stability. A pan-European procedure is established for managing Industrial Action events which can be tailored to individual countries needs/requirements thus leading to better utilisation of limited available capacity.	**Management of Critical Events** Critical event means an unusual situation or crisis involving a major loss of EATMN capacity, or a major, imbalance between capacity and demand, or a major failure in the information flow involving many partners and requiring immediate action to minimise consequences and to retrieve network stability. A pan-European procedure is established for managing critical events such, as industrial actions etc, which can be tailored to the needs/requirements of individual countries thus leading to better utilisation of limited available capacity. Since the impact of some events goes beyond ATM a European Aviation Crisis Coordination Cell (EACCC) has been established supporting the activation and coordination of contingency plans at State level.	Enhanced description
SDM-0101	**Network Performance Assessment** 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	**Network Performance Assessment** 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. In particular for RP1, the	Enhanced description

OI Step code	OLD definition	UPDATED definition	Comment
	capacity provision.	agreed NM KPIs on en-route delay and flight efficiency/route extension will be monitored and reported by NM and PRB.	
TS-0202	**Departure Management Synchronised with Pre-departure Sequencing** Departure management has the objective of maximising traffic flow on the runway by setting up a runway sequence with minimum separations. Tower Clearance Delivery Controllers will follow TSAT (pre-departure sequencing) when issuing the startup approval and Tower Runway Controllers will follow as much as possible the TTOT (departure sequencing) given by the DMAN when establishing the departure sequence.	**Pre-Departure Sequencing supported by Route Planning** Pre-Departure management has the objective of delivering an optimal traffic flow to the runway. Accurate taxi time forecasts provided by route planning are taken into account for TSAT-Calculation while the flight is off-block. Pre-Departure sequence (TSAT sequence) is set up by Tower Clearance Delivery Controllers who will follow TSAT-window when issuing start-up approval.	Re-scoping (to pre-departure management) and enhanced description
TS-0308	**Co-ordination of Departure Management and Arrival Metering (Co-ordination of Arrival and Departure Flows)** Metering arrivals and pre-sequencing departures will consider the dependency between arrivals and departures on a runway operated in mixed mode in order to minimise or better manage delay.	**Flow based Integration of Arrival and Departure Management** Integrated Arrival and Departure management aims at increasing throughput and predictability at an airport by improved co-ordination between Approach and Tower controllers. Arrival and Departure flows to the same runway (or for dependent runways) are integrated by setting up fixed arrival-departure pattern for defined periods. The successive pattern might be chosen by the operators or provided by an optimization algorithm considering arrival and departure demand. Departure flow to the runway is managed by pre-departure sequencing (integrating route planning) while arrival flow to the runway is managed by arrival metering.	Enhanced description

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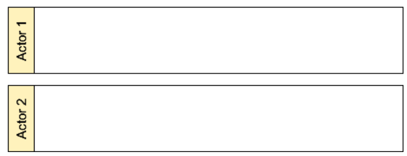
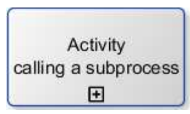
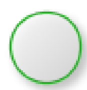
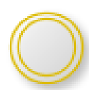
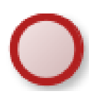
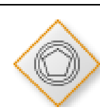
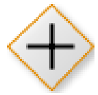
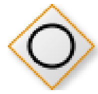
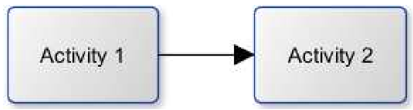
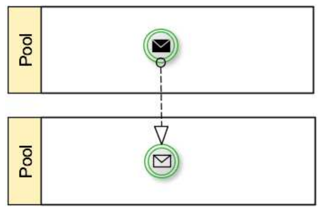
Appendix B: Business Process Model and Notation (BPMN)

A succinct description of the main BPMN elements used in the operational models is presented below:

Swimlanes	Pool		Represent responsibilities for activities in a process. A pool can represent an organization, a role or an actor.
Activities	Task		Unit of work to be performed
	Sub-process		Decomposable activity
	Loop Activity		Iterated activity
Events	Start		Start of the flow
	Intermediate		Intermediate event in the process
	End		End of the flow
	Catching message		Receiving message
	Timer		Timer event, point in time
Gateways	Exclusive (data-based)		When splitting it routes the sequence to exactly one of the outgoing branches based on conditions
	Exclusive (Event-based)		Is always followed by catching events or receive tasks

Gateways	Parallel		When used to split the sequence flow, all outgoing branches are activated simultaneously
	Inclusive		When splitting, one or more branches are activated based on branching conditions
Connectors	Sequence Flow		Sequence Flow defines the execution order of activities
	Message Flow		Message/Information Flow symbolizes information flow across organizational boundaries
Artefacts	Annotation		Text annotation associated to any object to provide information
	Data Object		Information flowing through the process

The basic BPMN modelling rules can be found in the BPMN specification document available at the following website address: http://www.bpmn.org/.

Appendix C: List of deleted Operational Requirements

In this appendix are all the Operational Requirements that have been deleted with respect to previous version of the document.

Identifier	REQ-06.02-DOD-6200.0002
Requirement	Reduction of the runway incursion risks shall be achieved by 'Improvements in lay-out of taxiway system as well as location of runways with respect to the terminal/apron.

Identifier	REQ-06.02-DOD-6200.0004
Requirement	The Tower Runway Controller shall be able to detect alerts in case of unauthorized / unidentified traffic

Identifier	REQ-06.02-DOD-6200.0010
Requirement	The Tower Runway/Ground/Clearance Delivery controllers shall be able to issue relevant information and clearances to the aircraft.

Identifier	REQ-06.02-DOD-6200.0012
Requirement	Taxiing process shall be fully integrated into arrival and departure management at the same airport.

Identifier	REQ-06.02-DOD-6200.0013
Requirement	Arrival and departure management shall be integrated with CDM processes between airport operator, aircraft operators and air traffic service provider at the same airport.

Identifier	REQ-06.02-DOD-6200.0019
Requirement	Where appropriate and approved by local / national regulations, interlaced take-off and landing procedures shall also be applied on airports with multiple runways.

Identifier	REQ-06.02-DOD-6200.0029
Requirement	Aircraft Fuel Use and Emissions Management shall be taken into account during all airport operations in order to guarantee performance improvements.

Identifier	REQ-06.02-DOD-6200.0033
Requirement	Tower Runway Controller shall be able to monitor the optimum descent profile for each aircraft under his responsibility.

Identifier	REQ-06.02-DOD-6200.0034
Requirement	Flight crew shall be able to send to the ANSP actual aircraft information (like weight, speed, weather etc.) and to receive cleared route (STAR) from the ANSP.

Identifier	REQ-06.02-DOD-6200.0035
Requirement	The Departure controller shall be assisted by system support to trajectory management in order to manage continuous climb departure.

Identifier	REQ-06.02-DOD-6200.0036
Requirement	The airspace users shall be fully involved in airport/network CDM through UDPP

Identifier	REQ-06.02-DOD-6200.0040
Requirement	The pilot shall be informed through datalink about the proposed revision of Reference Business / Mission Trajectory (iRBT).

Identifier	REQ-06.02-DOD-6200.0041
Requirement	The Tower Runway/Ground/delivery controllers shall be informed through datalink by pilot about the aircraft preferences in terms of STAR, ETA, ETA min/max, runway exit in case proposed revision of Reference Business / Mission Trajectory (iRBT).

Identifier	REQ-06.02-DOD-6200.0053
Requirement	Involved partners shall manage the traffic considering local situation and reduce the ATFM delays (pre-coordinated measures with airports). [procedure Tower-FMP-NMOC]

Identifier	REQ-06.02-DOD-6200.0058
Requirement	The Tower Clearance Delivery shall be provided with pre-departure sequence (TSAT sequence) to issue start-up approval.

Identifier	REQ-06.02-DOD-6200.0065
Requirement	The TMA Supervisor shall be able to manually adjust the departure sequence to enable a more consistent and manageable delivery into the En route phase of flight.

Identifier	REQ-06.02-DOD-6200.0059
Requirement	The Departure and Arrival management shall be taking into account the information exchanged between close airports.

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