OFA04.02.01 (Integrated Surface Management) Final INTEROP

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Abstract

This document represents the Final INTEROP document produced at OFA04.02.01 level by merging P06.07.02 and P06.07.03 contributions. The main intention of this document is to describe the interactions (including the data flow) between the functional blocks covering the operational services described in the OFA04.02.01 Final OSED. Starting point to describe those interactions is the OFA04.02.01 architecture diagram which has been consolidated through the support of P12.01.07.
Furthermore, the status of the concerned interoperability requirements has been updated in order to clarify the ones which have achieved the planned V3 maturity level at the end of SESAR 1 and the ones which require further investigation during SESAR 2020 horizon.

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00.00.02	14/07/2016	Draft	ENAV, INDRA	Integration of OFA04.02.01 Architecture diagram
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00.01.00	16/09/2016	Final	All	Version submitted to the SJU

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This deliverable consists of SJU foreground.

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Executive summary

This document represents the final iteration of the INTEROP document produced at OFA04.02.01 level by merging P06.07.02 and P06.07.03 contributions. Based on the operational requirements defined in the OFA04.02.01 Final OSED [11], this document details the interoperability requirements for the implementation of the OFA04.02.01 related operational services:

1. **Route Generation Integrated with Planning Information** assigning a dedicated taxi route to each mobile on the basis of the inputs provided by external systems;
2. **Airfield Ground Lighting (AGL)** aiming to switch on / off taxiway ground lighting in accordance with the issued taxi route.
3. **Provision of planned and cleared route to mobile by Data Link** to allow Controllers, Flight Crews and Vehicle Drivers to exchange a specific set of instructions / clearances via data link.
4. **Virtual Block Control** which is based on the introduction of the so called Virtual Stop Bars to support Controllers in implementing enhanced block control procedures in low visibility conditions.

The implementation of those operational services is ensured through the interactions between the related functional blocks as illustrated in the OFA04.02.01 Architecture Diagram coordinated with P12.01.07. This diagram allows understanding the data flow required to implement the OFA04.02.01 operational services as detailed by the Information Exchange Requirements and the functional blocks involved in that process. In detail, five functional blocks allocated to the OFA04.02.01 have been identified:

- Surface Routing in charge of generating and assigning surface taxi routes (and the associated taxi time) to each mobile.
- Aerodrome Flight Data Processing sharing taxi routes and related clearances with the Surface Guidance FB.
- Surface Guidance in charge of managing both VSB and AGL status in accordance with the taxi route clearances received from the Aerodrome Flight Data Processing.
- Aerodrome Surveillance responsible for sharing correlated tracks with the Aerodrome Flight Data Processing FB
- Aircraft and Vehicle Datalink Management (partly in the OFA04.02.01) in charge mainly of managing D-TAXI service for the exchange of instructions via data link between ground and airborne systems.

The whole “OFA04.02.01 system” is linked with external functional blocks allocated to other OFAs:

In addition to the inputs coming from the OFA04.02.01 Final OSED, this INTEROP document takes also the outcomes of Release 5 validation activities [16] as inputs to set the current status of the interoperability requirements:

- “Validated” to indicate the ones which have achieved the expected V3 maturity level at the end of SESAR 1.
- “In Progress” to indicate the ones which requires further investigation during SESAR 2020 horizon (e.g. data link for vehicles).
- “Deleted” to indicate the ones which have been considered not relevant to OFA04.02.01 context or not appropriate for this document (see Appendix A).

1 Introduction

1.1 Purpose of the Document

This document represents the final iteration of the INTEROP document in the context of the OFA04.02.01 – Integrated Surface Management. Its purpose is to provide interoperability requirements concerning all the OFA04.02.01 operational services and to analyse the feasibility of current technology in meeting the requirements as described in the OFA04.02.01 Final Operational Service and Environment Definition (OSED) [11].

In the Figure 1, the location of the OSED and INTEROP is depicted within the hierarchy of SESAR concept documents, together with the SESAR Work Package or Project responsible for their maintenance.

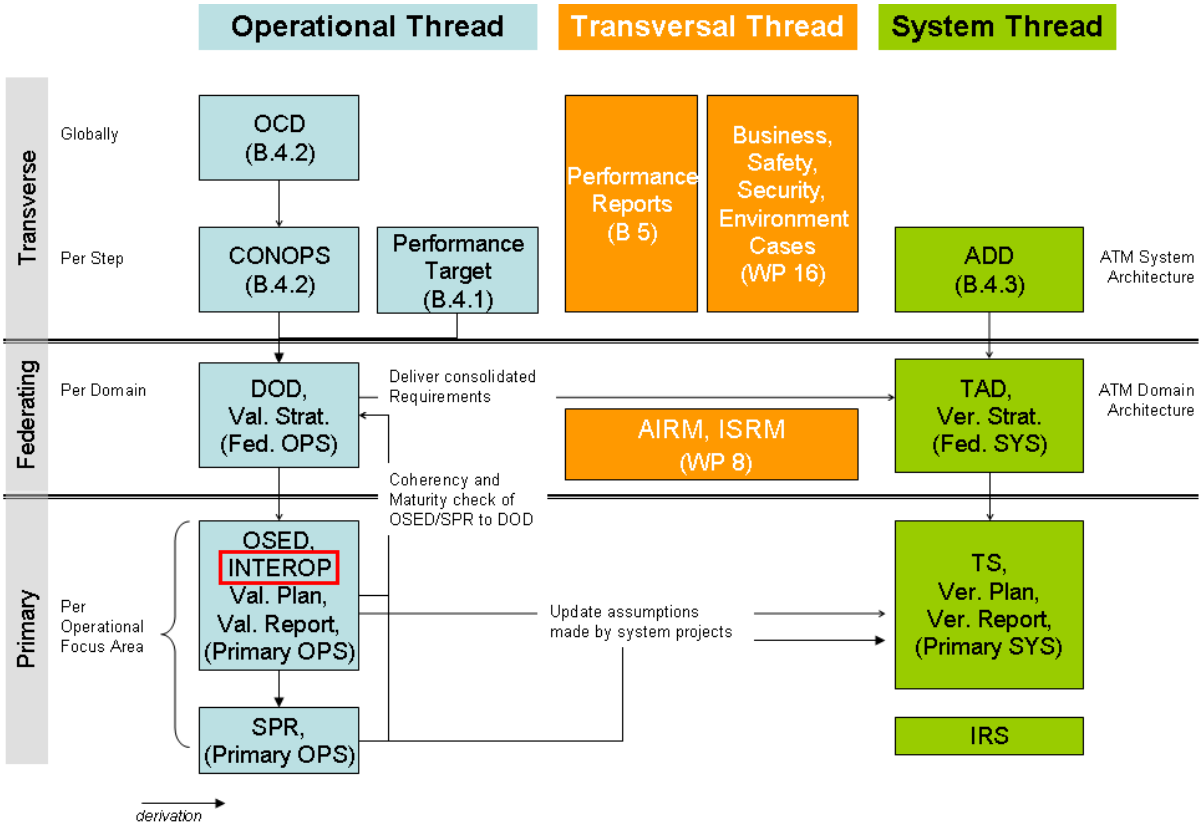

Figure 1: Flow of documentation overview [PMP]

The scope of the document is to ensure and demonstrate that the systems supporting the concept developed in the context of OFA04.02.01 can meet the relevant interoperability requirements for the operational services described in the Final OFA04.02.01 OSED [11], following the approach described in Figure 1 above.

Further inputs have been taken from the previous iteration of the INTEROP documents elaborated respectively at P06.07.02 [24] and P06.07.03 [25] level.

This INTEROP covers the following SESAR Solutions:

1. #22: Automated Assistance to Controller for Surface Movement Planning and Routing
2. #23: D-TAXI service for CPDLC application

3. #47: Guidance Assistance through Airfield Ground Lighting
4. #48: Virtual Block Control in LVPs

In addition to the mentioned SESAR Solutions, it is important to highlight that this document includes references to guidance functionalities for vehicles such as the implementation of data link service for exchanging specific instructions / clearances. However, as the concept has not achieved the expected V3 maturity level, all the vehicles related requirements are set as “In progress” for further evaluation during SESAR 2020 horizon.

This INTEROP is used to define the minimum technical and functional requirements that provide the basis for ensuring compatibility among identified elements of the overall OFA04.02.01 system using existing/available data link and AGL technologies imposed as design constraints. These elements are distributed between aircraft systems, the Airport Operator’s (AO) system and the Air Navigation Service Provider’s (ANSP) system.

Each requirement in this INTEROP is traceable to one or more operational requirements in the Final OFA04.02.01 OSED [11] and safety and performance requirements in the Final OFA04.02.01 SPR [26].

1.2 Intended Readership

The intended readership for this document is mainly:

- OFA04.02.01, including the projects it encompasses, for integrating the developments in A-SMGCS Routing function into the full advanced surface routing concept.
- OFA04.01.01 for the link with the SESAR solution #14 concerning the integration between departure and surface management
- OFA05.01.01 for the interactions with the AOP and the de-icing manager
- Project 06.03.01 is responsible for the V3 integrated validations of several 06.YY.ZZ projects dealing with the airport in the ATM environment.
- Project 06.07.01, since interaction with Safety Nets needs to be assured.
- The project 06.09.02 Advanced integrated CWP (A-CWP), since some information needs to be displayed on the Controller HMI.
- The federating project 06.02, in order to ensure consistency with the operational concept (Step 1 Airport DOD Update 2014 [19].
- The system project 12.01.07 to ensure the coherency of the OFA04.02.01 Architecture with the related Technical Architecture Description (TAD)
- The system project 12.03.03 regarding the Surface Routing Server (SRS).
- The system project 12.03.04 Enhanced Surface Guidance, which has developed the airport system prototypes that will be validated by project 06.07.03.
- The system project 12.04.03 regarding the Enhanced FDP at airports.
- The system project 12.05.04, which is responsible for developing the Controller HMI for the validation of surface guidance.
- The project 09.13 Airport Surface Taxi Clearances, developing the airborne prototype that has implemented requirements described in this document.
- And more generally, the SJU community

1.3 Inputs from Other Projects

The interoperability work performed in the former European Commission project EMMA2 (European Airport Movement Management by A -SMGCS, Part 2) and more particularly the content in [10] has been used as a baseline for the development of interoperability requirements, specifically as a starting point in Phase 1 of OFA04.02.01 activities. Since that point, after increasingly gaining maturity, the concept definition developed in OSED deliverables of both P06.07.02 and P06.07.03 and the DOD deliverable of project 06.02 have also been used to describe the operational environment where the operational services related to the Integrated Surface Management are expected to be implemented. That description constitutes the first step towards the definition of interoperability requirements.

Some specific functionalities have been investigated also in other external projects. Within a German research project (WFF, Competitive Airports) individual guidance via AGL was studied and results considered for the AGL service. Experience with local implementations on segmented guidance at a few airports gave input for further considerations.

For the D-TAXI service, the main inputs are based on the documents coming from the EUROCAE standardization working group WG-78 in cooperation with RTCA SC-214.

1.4 Glossary of Terms

The following definitions are taken from the Final OFA04.02.01 Integrated Surface Management OSED [11].

Term	Definition
Cleared route	The part of a route that has been approved by a Controller for a mobile in his/her area of responsibility.
Pending route	That part of the route assigned to a mobile that has not yet been cleared by a Controller (typically, in the next ground sector than where the mobile is).
Planned route	Route assigned to a mobile that is not yet operating on the movement area of the airport.
Unimpeded taxi time	The unrestricted taxi time calculated by the A-SMGCS Routing function for each generated taxi route. That time corresponds to the time it will take for a mobile to taxi / drive on a given route and it is used by the Departure Manager as input to calculate (pre-)departure sequences.
VSB_{IHP}	Virtual Stop Bar referring to a Virtual Stop Bar positioned on the Controller HMI, corresponding to an Intermediate Holding Position (IHP) already existing on the airport surface
VSB_{NIHP}	Virtual Stop Bar referring to a Virtual Stop Bar NOT related to any physical object/marking on the airport surface. Therefore, it can be used and assigned only to aircraft equipped with an Airport Moving Map (AMM) function

1.5 Acronyms and Terminology

Term	Definition
AeroMACS	Aeronautical Mobile Airport Communications System
AGL	Airfield Ground Lighting
A-CWP	Advanced Controller Working Position
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information Regulation And Control (publication cycle for aeronautical information)
AL	Alerting Layer

Term	Definition
AMDB	Airport Mapping Database
AMM	Airport Moving Map
ANSP	Air Navigation Service Provider
AO	Airport Operator
AoR	Area of Responsibility
APTR	Alternative Parallel Taxi Routing
ASB	Apron Stop Bar
A-SMGCS	Advanced – Surface Movement Guidance and Control System
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATM	Air Traffic Management
ATN	Aeronautical Telecommunications Network
ATSU	Air Traffic Services Unit
C-ATSU	Controlling Air Traffic Services Unit
CentS	Centralised Service
CKDS	Cockpit Display System
CNS	Communication, Navigation, Surveillance
CPDLC	Controller Pilot Data Link Communications
CS	Communication Service
CVS	Combined Vision System
DMAN	Departure Manager
D-TAXI	Digital - Taxi
DTCL	D-TAXI Clearance Layer
ED-228	EUROCAE Document 228 (Safety and Performance Standard for Baseline 2 ATS Data Communications (Baseline 2 SPR Standard))
ED-229	EUROCAE Document 229 (Interoperability Requirements Standard for Baseline 2 ATS Data Communications (Baseline 2 Interop Standard))

Term	Definition
ED-99	EUROCAE Document 99 (User Requirements for Aerodrome Mapping Information)
EFB	Electronic Flight Bag
EMMA	European airport Movement Management by A-SMGCS
FC	Flight Crew
FtG	Follow-the-Green
GIL	Guidance Instruction Layer
GTD	Ground Traffic Display
HMI	Human Machine Interface
ICAO	International Civil Aviation Organization
INTEROP	Interoperability Requirements
LACK	Logical Acknowledgement
LED	Light Emitting Diode
LTE	Long-Term Evolution
LVP	Low Visibility Procedures
MLAT	Multilateration
MS	Mobile Service
ND	Navigation Display
OFA	Operational Focus Area
OSED	Operational Service and Environment Definition
RID	Routing Information Display
R/T	Radio Telephony
RWY	Runway
SB	Stop Bar
SDS	Switchable Directional Sign
SESAR	Single European Sky ATM Research Programme
SJU	SESAR Joint Undertaking (Agency of the European Commission)

Term	Definition
SPR	Safety and Performance Requirements
TAD	Technical Architecture Description
TCL	Taxiway Centreline Light
TLDT	Target Landing Time
TMA	Terminal Control Area
TSAT	Target Start-Up Approval Time
TSB	Taxiway Stop Bar
TTOT	Target Take Off Time
TWY	Taxiway
UMTS	Universal Mobile Telecommunications System
VBC	Virtual Block Control
VD	Vehicle Driver
VDS	Vehicle Display System
VSB	Virtual Stop Bar
WFF	Wettbewerbsfähiger Flughafen (Competitive Airport)
WG	Working Group
WiMAX	Worldwide Interoperability for Microwave Access

2 System Description

2.1 Overall System Description

Starting point for describing the overall OFA04.02.01 system is the description of the operational services as detailed in the OFA04.02.01 Final OSED [11]. As the purpose of this document is to detail the interaction between the related functions, only the concerned systems will be described. Therefore, here below it is provided an overview only of the operational services relevant to the INTEROP document:

- **Route Generation Integrated with Planning Information,** to support the work of the Controller in assigning ground routes to mobiles by developing an automatic generation of taxi routes based on the available constraints.
- **Airfield Ground Lighting (AGL) Service**, to guide each mobile as it progresses along its cleared route by illuminating the taxiway centreline lights and stop bars a specified distance ahead of the mobile in question, switching them on and off automatically, taking into account other traffic and timing constraints.
- **Provision of Planned and Cleared route to mobiles by data link**, to exchange non time-critical messages between ATC and mobiles (Expect Taxi, Departure Clearance, Start Up, Pushback) by data link. About TAXI and TAXI REVISION messages, it is recommended to further investigate their impact on large airports with complex layout. Anyway, to support the provision of that operational service, the on-board availability of an Airport Moving Map is expected to reduce potential misunderstanding and support Flight Crew navigation by displaying cleared taxi routes both in textual and graphical format. In addition, other traffic can be displayed.
- **Virtual Block Control**, which is based on the introduction of the so called Virtual Stop Bars (VSB) to support Controller in implementing enhanced block control procedures in low visibility conditions. In detail, Controllers enter the clearance limit, corresponding to a VSB position which can be linked or not to an already existing intermediate holding position (IHP). The latter can be used and assigned only to the aircraft equipped with an Airport Moving Map (AMM) as well as a data link application that communicates VSB positions and states. The intention is to ensure that both Controllers and Flight Crew have the same level of situational awareness.

The implementation of those operational services is ensured through the interactions between the related functional blocks as illustrated in the Figure 2.

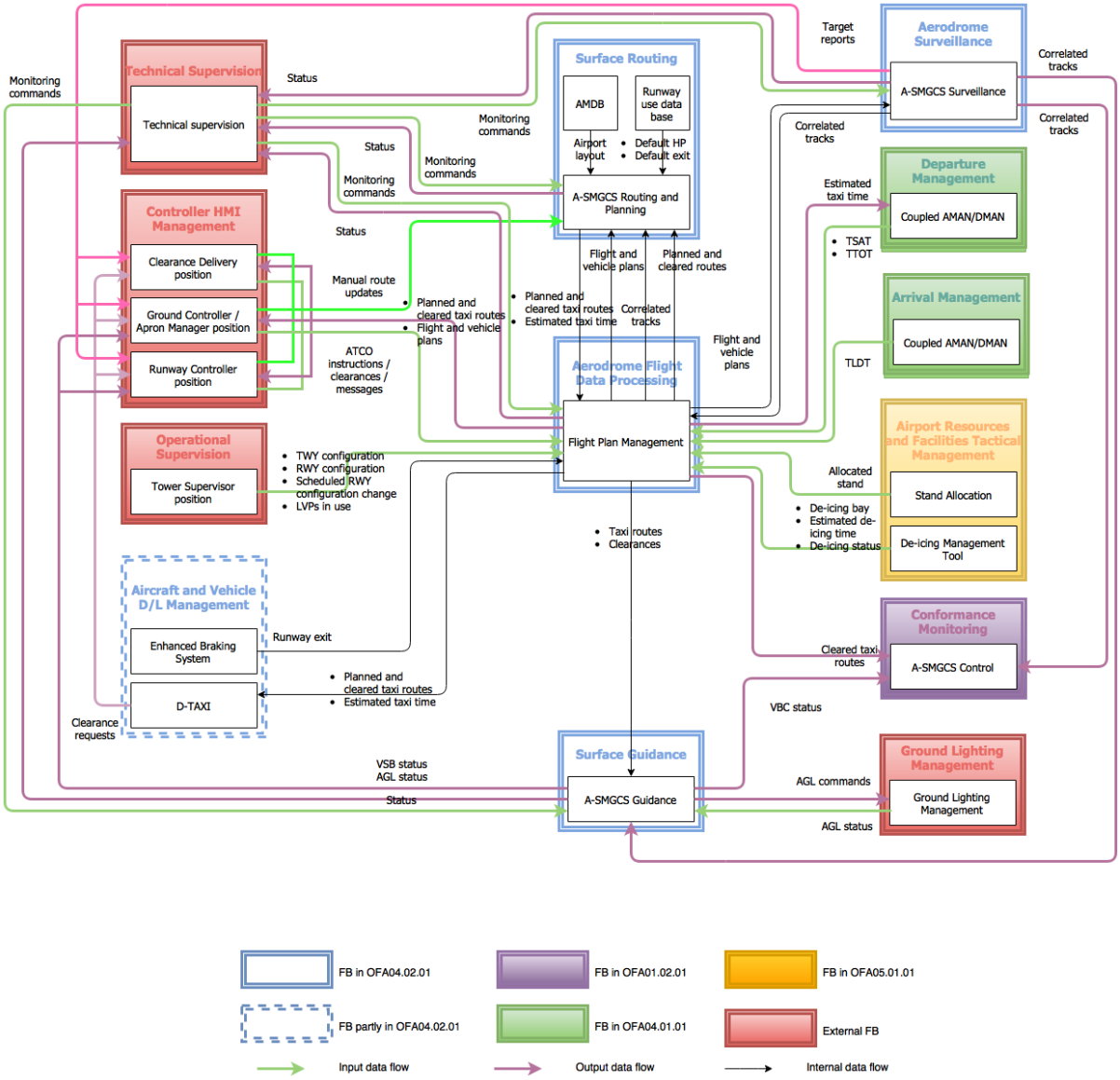

Figure 2: OFA04.02.01 Architecture diagram

It is important to highlight that the architecture diagram has been coordinated with P12.01.07.

The functional blocks allocated to the OFA04.02.01 are the following ones:

- Surface Routing in charge of generating and assigning surface taxi routes (and the associated taxi time) to each mobile.
- Aerodrome Flight Data Processing sharing taxi routes and related clearances with the Surface Guidance FB.
- Surface Guidance in charge of managing both VSB and AGL status in accordance with the taxi route clearances received from the Aerodrome Flight Data Processing.
- Aerodrome Surveillance responsible for sharing correlated tracks with the Aerodrome Flight Data Processing FB
- Aircraft and Vehicle Datalink Management (partly in the OFA04.02.01) in charge mainly of managing D-TAXI service for the exchange of instructions via data link between ground and airborne systems. In addition, any update concerning the RWY exit as calculated by the

Enhanced Braking System is shared with the Aerodrome Flight Data Processing to update the concerned flight plan resulting in a change of the planned taxi-in route.

The whole “OFA04.02.01 system” is linked with external functional blocks allocated to other OFAs:

- Operational Supervision (External Functional Block) providing information about TWY, RWY configurations, scheduled RWY configuration change as well as LVPs in use as inputs to the Aerodrome Flight Data Processing for updating the concerned Flight plans.
- Technical Supervision (External Function Block) providing Aerodrome Flight Data Processing with configuration control and status monitoring of all parts of the system.
- Controller HMI management providing Controllers’ instructions / clearances messages and manual route updates respectively to the Aerodrome FDP and Surface Routing Functional Blocks.
- Conformance Monitoring (as part of the OFA01.02.01) which requires the provision of correlated tracks, cleared taxi routes (including the corresponding VSB limit status) to provide Controllers with both Conflicting ATC Clearances and Conformance Monitoring alerts / warnings.
- Airport Resources and Facilities Management providing Aerodrome Flight Data Processing with information about allocated stand and de-icing bay, de-icing status and related estimated de-icing time.
- Arrival and Departure Management to exchange the needed timing information (i.e. TSAT and TTOT for departing flights, TLDT for arriving flights) to support the generation of taxi routes at the required time. Furthermore, the estimated taxi time associated to the generated taxi routes is provided as input to the Departure Management as input to optimize (pre-)departure sequences.

Further details about the complete data flow between the Provider and the Consumer Functional Blocks are illustrated for each operational service in the corresponding section illustrating the Relations between Functional Blocks based on IERs.

2.2 Route Generation Integrated with Planning Information

The Route Generation Integrated with Planning Information service is intended to support Controllers in assigning the most suitable taxi routes to each mobile. As detailed in the ICAO A-SMGCS Manual [8], the A-SMGCS Routing function envisages three different levels of automation (manual, semi-automatic and automatic) requiring different operational constraints as inputs. Each level of automation relies on specific interfaces with external systems and, therefore, on specific interoperability requirements.

2.2.1 Current Situation and Trend in the Development

The routing of mobiles is currently decided by the Controller (typically the Tower Ground Controller) on the basis of personal skills and knowledge as well as of any known operational constraints.

The research done in the context of the OFA04.02.01 has the objective to support the work of the Controllers in assigning routes to mobiles by developing an automatic generation of routes on the basis of operational constraints as shared by other functions. In this context, the definition of an advanced surface routing function is considering the detection of conflicting situations as a further constraint to ensure an optimised route generation process.

2.2.2 Description of the Operational Environment

The description of the operational environment can be found in the OFA04.02.01 Final OSED [11]. The scope of the INTEROP document is to focus on the technical aspects associated to the implementation of the A-SMGCS Routing function and on the definition of interoperability requirements to establish the needed exchange of information with external systems. To this end, an overview of the three different modes of routing automation supporting Controllers is provided below (further details are provided in the section 2.2.3):

1. **Manual Mode**: free route planning, without any assisting functionalities from the system;
2. **Semi-Automatic Mode**: free route planning, with assisting functionalities from the system to complete the route taking into account constraints such as restricted and construction areas; and
3. **Automatic Mode**: route proposal by the system taking into account information about aircraft type, taxiway rules, restricted and construction areas. Confirmation or modification by the Controller will be possible. This will be the default mode, reverting to one of the others only when necessary.

The importance of defining the correct exchange of information and the appropriate interface with external functions is twofold:

1) The generation of suitable taxi routes requires the availability of several inputs (such as starting / end points, weather, taxiways / runways status) from other functions / systems.
2) The generated taxi routes and the associated taxi times are to be considered as enablers / inputs for other functions (such as Airport Safety Nets, Departure Manager).

2.2.3 Description of the Operational Sub-Services

The ICAO A-SMGCS Manual [8] defines three different levels of automation (manual, semi-automatic and automatic) for the A-SMGCS Routing function, depending on the available technology and environment and which have different interoperability requirements as they rely on more or less external systems to operate.

2.2.3.1 Manual mode

In the context of SESAR, the manual mode is considered to be where the Controller can designate a route by manually creating, either through the Human-Machine Interface (HMI) or by typing text, a

route for a mobile or by modifying an existing route. Due to the workload associated with inputting a manual route it is not foreseen that this form of route calculation will be the standard way of working for all movements at an airport. However, there will always be a need for Controllers to input a manual route, or override a current route, especially in the following situations:

- For a freely operating vehicle that requests a route which requires a specific ATC clearance (e.g. runway crossings, runway inspections); or
- When an aircraft needs to take a taxi route that does not conform to circulation rules (e.g. following a deviation from cleared route the Controller might have to route the flight the wrong way down a taxiway).

The system does not assist this process by any additional logic. However, if the Controller constructs a route that overrides the airport layout rules, the A-SMGCS Routing function will warn him about it. The system supports the Controller to input the route in a very limited manner, taking into account this quite static stock information:

- Starting point for mobiles on the ground;
- End point of taxi route;
- Airport layout (taxiway infrastructure); and
- Position of intersections, holding bars and stop bars.

2.2.3.2 Semi-automatic mode

The semi-automatic mode is considered to be an advanced version of the manual route building mode, providing the Controller with a function that will help to predict the completion of the route based on the known taxiway rules and where the system knows the destination. The advantage of this being that the creation of the route is quicker than having to manually select every portion of the route.

The Controller will initially need the information defined above in the manual mode, and then the system will assist the Controller to complete the route taking into account the same information as defined below for the automatic mode.

2.2.3.3 Automatic mode

The automatic mode corresponds to the system generating planned taxi routes automatically, using known data such as assigned runway, stand, standard routes (when defined) and taxiway rules.

The information as for manual mode and semi-manual mode needs to be considered as well as the following very dynamic information:

- weather (i.e. Low Visibility Procedures (LVP) in use or not, depending on local procedures; it must be discussed if LVP can be adjusted if an A-SMGCS with additional control, routing and guidance functionalities is in operational use);
- planned runway;
- continuously up-to-date information about the position and identity of each mobile on the movement area and aircraft approaching to land;
- prioritisation rules for individual aircraft (State aircraft, emergency flight) and time restrictions (TTOTs);
- areas of responsibility (AoRs) and intermediate/holding points corresponding to the clearance limits where jurisdiction is to be handed over from one Controller to another;
- stands requiring push-back and those which do not, as well as possible push-back or push-pull points for each stand (which may depend on aircraft type);
- de-icing type (on stand or remote) and allocated de-icing area in case of remote de-icing;
- taxi procedures (remote holding);

- constraints (e.g. taxiways/segments unsuitable for certain types of aircraft, one-way usage); and
- downlinked runway exits for EBS-equipped aircraft.

2.2.3.4 Detection of conflicting situation in the planning phase

This advanced feature of the A-SMGCS Routing function takes into account the different conflicting situations that may occur when generating routes in the planning phase. It has been investigated by OFA04.02.01 up to V2 maturity level but has not been considered as mature enough to be included in SESAR Solution #22. Indeed, validation results showed that only a limited amount of route de-confliction can be done by the A-SMGCS Routing function since it is not able to control the speeds of mobiles. This needs to be done in the tactical phase of taxiing either by guidance from the Controller or by AGL guidance.

With this feature, the Route Generation Integrated with Planning Information service can detect and solve (when necessary) conflicting situations occurring during planning Phase with the objective to further optimize surface traffic movements. If planned taxi routes are required to be recalculated depends on how the conflict is classified according to the following definitions:

- **Relevant conflicting situations** when a mobile blocks the movement of another mobile during an extended time period for which the calculated taxi time exceeds a given threshold. Recalculation of planned taxi route for one or both the mobiles involved is required;
- **Non severe conflicting situations** that can be solved by the Controller in the tactical phase, which do not involve a blocking situation for an extended period of time. Recalculation of planned taxi route for one or both the mobiles involved is NOT required as the conflict is expected to be tactically solved by the Controllers (e.g. through a speed adjustment);

In this context, it is important to highlight that the detection and the resolution of conflicting situations by the A-SMGCS Routing function can be ensured only if timing information, including TSAT and TLDT, is available.

2.2.4 Service allocation to systems

The operational service generating taxi routes integrated with planning information entirely belongs to the Ground Domain, as it is supported by ground systems and only exchanges information with other ground systems.

In the case of aircraft equipped with the Enhanced Braking System, the runway exit computed by the aircraft systems will be downlinked to a ground component [21] that is distinct from the A-SMGCS Routing function. There is thus no direct communication between the Routing function and aircraft.

Based on those considerations, the Route Generation Integrated with Planning Information service concerns the Surface Routing functional block allocated to the *Aerodrome ATC Domain System* as defined by B04.03 [20] and, then, detailed in P12.01.07 architecture documents [18].

2.2.4.1 Interfaces with other A-SMGCS functions (Ground Domain)

Within the Ground Domain, the A-SMGCS Routing function interacts with a significant number of other ground functions on the airport, mostly through the Aerodrome Flight Data Processing (A-FDP). Some of these functions can be grouped to ease the link with other services, such as A-SMGCS (composed of Surveillance, Routing, Guidance and Control functions), the Controller Working Position (CWP) (specialised by Controller role) and airport sequencing (Arrival Management, Departure Management and de-icing management). **Figure 3** provides an overview of these functions or groups of functions.

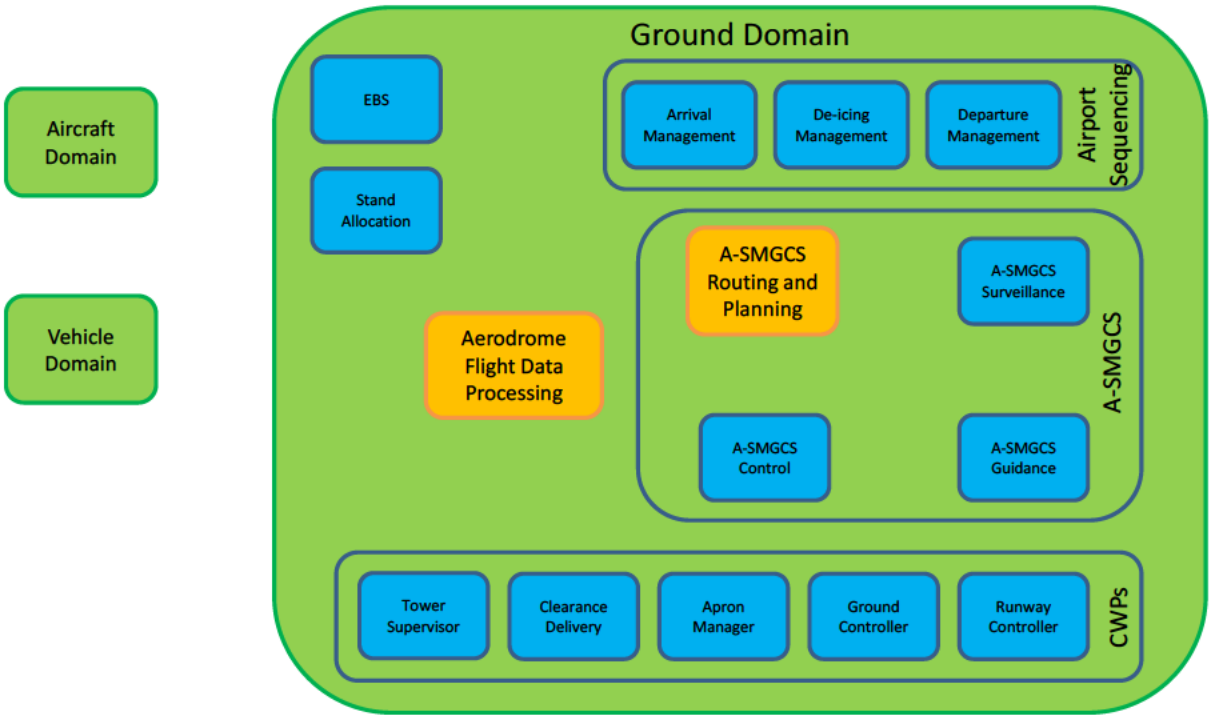

Figure 3: High-level description of A-SMGCS Routing function environment in Ground Domain

Within A-SMGCS, the Routing function receives the positions and identifiers for all cooperative mobiles[1] on the airport from the A-SMGCS Surveillance function (cf. [26], section 4.1). This information enables building a continuously up-to-date picture of the traffic situation. Taxi routes are constructed from the current position of the mobiles and associated to each of them through their identity. This description of the system assumes taxi routes are computed after the mobile is known to the ATC system (e.g. upon the activation of a flight plan), as well as its starting and end points. As a result, the working horizon of the routing and planning service extends to the short-term planning and pre-execution phases only. In the context of OFA05.01.01 (Airport Operations Management), it has been concluded that the information the A-SMGCS Routing function could provide beyond the short-term planning would entail a high degree of uncertainty, thus having limited added-value for mid-term and long-term planning purposes.

Planned routes are provided to the A-FDP, and then to the A-SMGCS Guidance function as an input to D-TAXI services. This is illustrated by Figure 4 below.

[1]Non-cooperative mobiles can also be considered if surveillance means include a primary radar and manual labelling is implemented in the A-SMGCS.

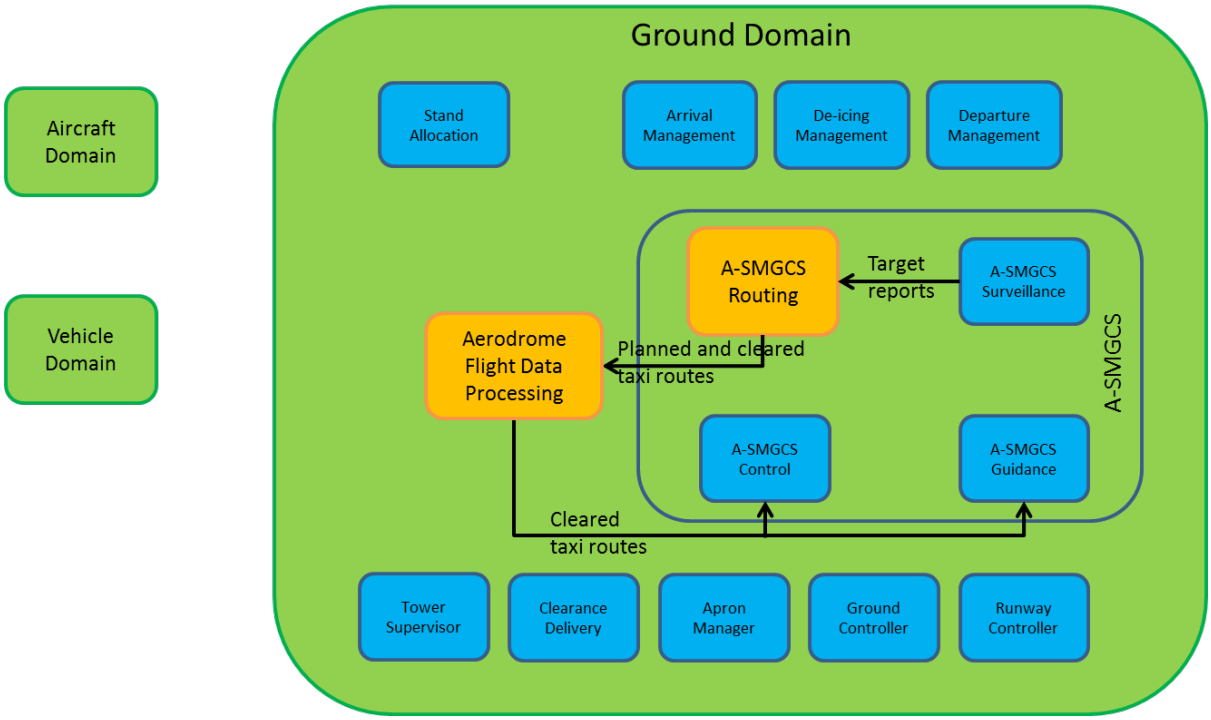

Figure 4: Information flows between A-SMGCS functions

2.2.4.2 Interfaces with other airport systems (Ground Domain)

In order to automatically generate routes, the A-SMGCS Routing function needs the starting point of these routes. Aircraft usually have a pre-assigned runway (e.g. due to ATC procedures or performance limitations) and a pre-assigned runway exit/entry point, which respectively correspond to the starting point of the planned route for an inbound aircraft and to the end point of the planned route for an outbound aircraft. The runway exits are taken from a predefined list like e.g. HIRO (High Intensity Runway Operation), except when the aircraft is equipped with an Enhanced Braking System (EBS – see below) which enables it to downlink a predicted runway exit. This information (pre-defined runway and predicted runway exit) can be accessed through the A-FDP.

The routes generated by the A-SMGCS Routing function have to be stored in a data base, or another system, in order to manage their status (planned, cleared, pending) and the transitions between these statuses, which can be supported by the A-FDP. This enables other services needing routes or taxi times to access the most up-to-date route description for any mobile. The A-FDP is also providing the routing function with the pre-defined runway, pre-defined runway exit and pre-defined runway holding point that enables generating a route, when more accurate information is not available from other systems. This is illustrated by **Figure 5** below.

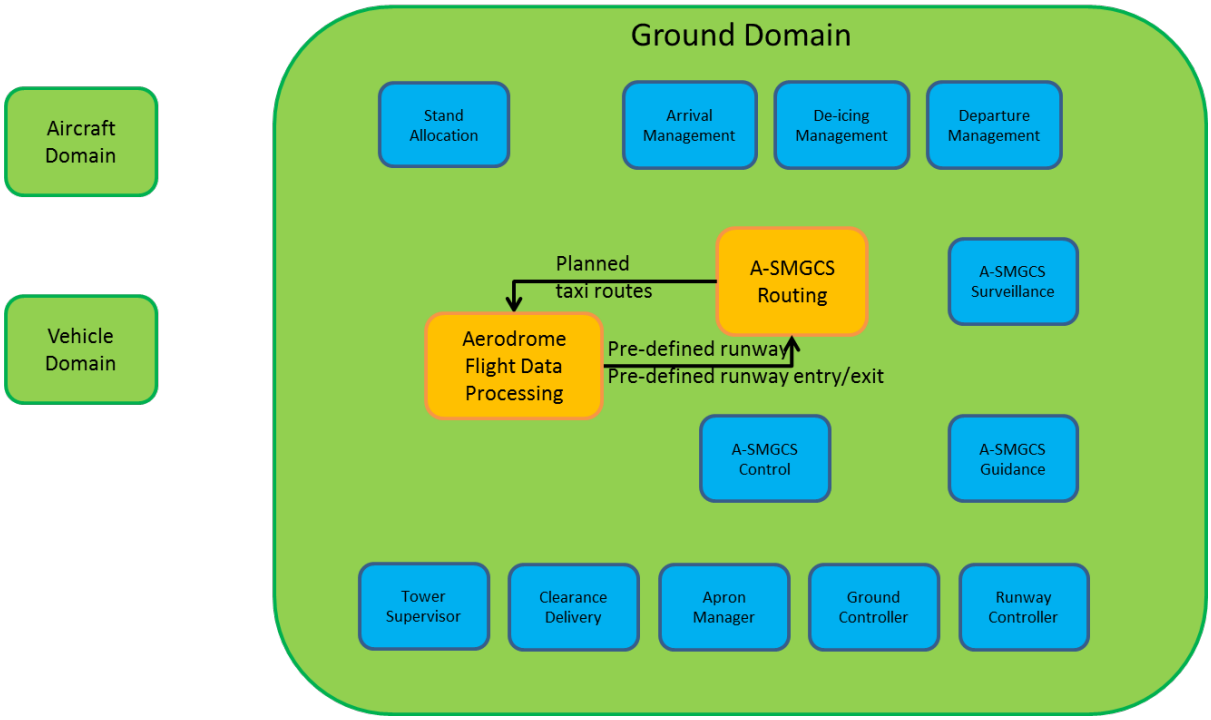

Figure 5: Information flow between A-SMGCS Routing function and A-FDP

The other point (end point for inbound aircraft and starting point for outbound aircraft) of the planned route is provided by the Stand Allocation function, as illustrated by Figure 6 below

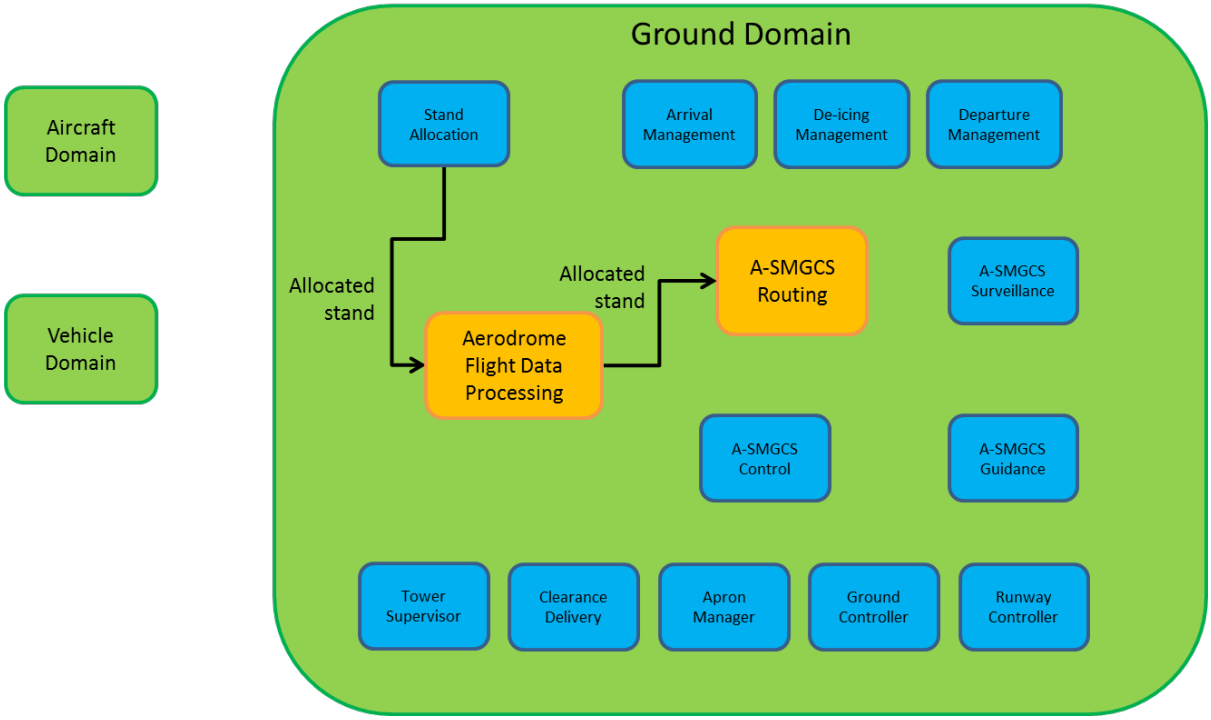

Figure 6: Information flow between A-SMGCS Routing function and Stand Management

In the specific case where an arriving aircraft is equipped with an Enhanced Braking System, this aircraft is able to predict accurately its Runway Occupancy Time and, consequently, the runway exit it will take. This information can be used as the starting point for the planned route. If a planned route is provided to this aircraft before it has computed its predicted runway exit, the planned route will be

automatically updated as soon as the EBS predicted exit is received by the ground system (cf. 06.08.02 OSED [21]). The exchanges between these three functions (EBS, A-FDP and A-SMGCS) are illustrated in Figure 7 below.

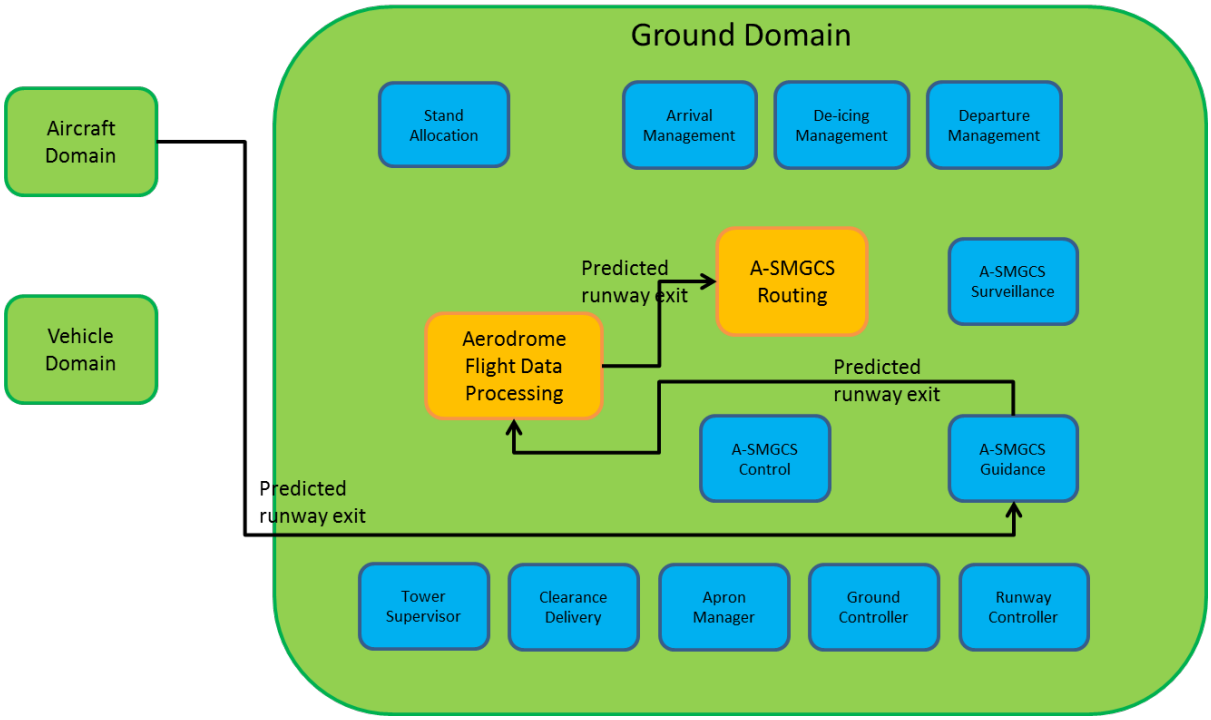

Figure 7: Information flows between A-SMGCS Routing function and EBS

In case of an aircraft not having EBS, the A-SMGCS Routing function will use a default runway exit from a static table and provide it to the aircraft with the planned taxi route. In any case, the A-SMGCS Routing function will always update the planned route according to the actual runway exit used.

The A-SMGCS Routing function provides automatically generated planned routes to the CWP via the A-FDP and also receives CWP requests for modification of these routes or for manual creation of routes via the A-FDP.

When a Controller wants to display on his CWP the route for a mobile, the A-FDP supplies the route allocated to this mobile to the CWP. All dialogue between the CWP and the A-SMGCS Routing function takes place via the A-FDP, including taxi route modification and taxi clearance.

If, for some reason, the new route being constructed by the Controller stops conforming to rules known to the A-SMGCS Routing function, the modification continues in manual mode. The new route resulting from the Controller modification and the new estimated taxi time are stored in the A-FDP and made known to the A-SMGCS Routing function.

This is illustrated by Figure 8 below.

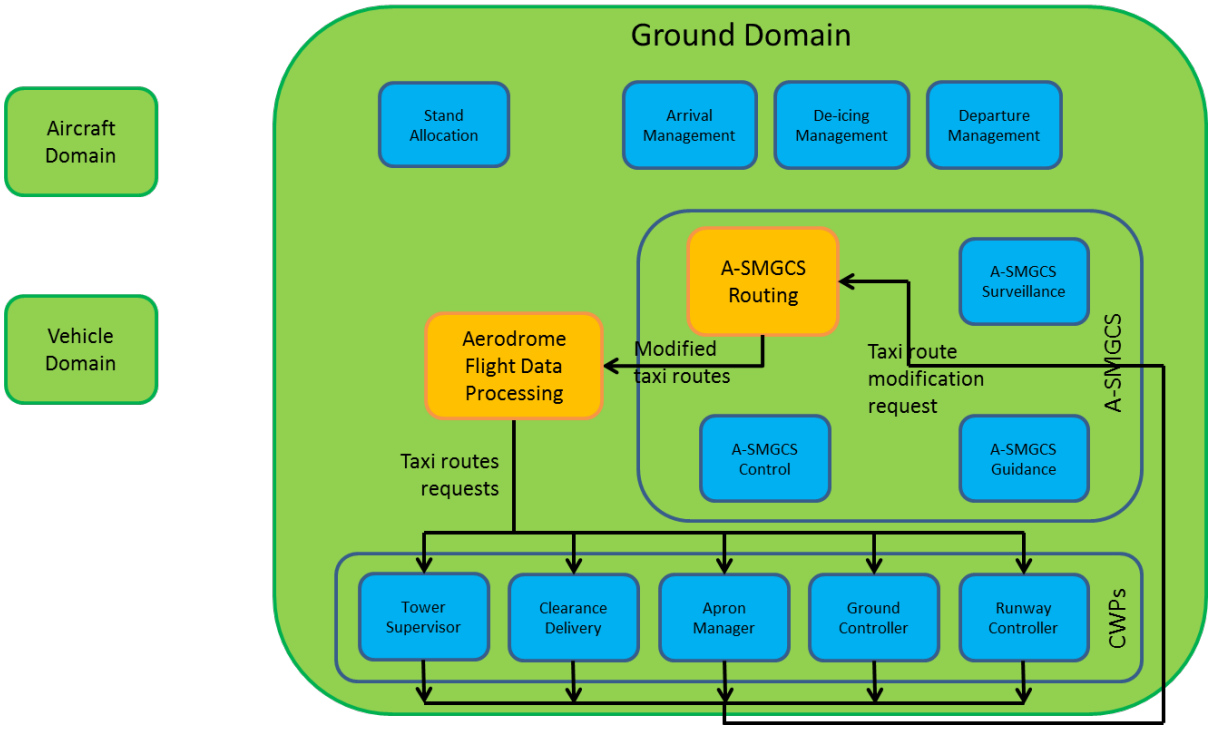

Figure 8: Information flows between A-SMGCS Routing function and the CWPs

In order to help improve the sequencing of departing aircraft and optimise (pre-)departure sequences, the A-SMGCS Routing function provides the estimated unimpeded taxi times associated to planned routes, via the A-FDP, to the Departure Manager (DMAN). The resulting Target Start-up Approval Times (TSAT) and Target Take-Off Times (TTOT) calculated by DMAN are sent to the A-FDP. The updated Flight Plan is then used by the A-SMGCS Routing function to automatically generate planned routes. There may thus be several exchanges between DMAN and the A-SMGCS Routing function around a given flight until the sequence to which it belongs becomes stable. Similar data flow is executed for arriving flights. The resulting Target Landing Time (TLDT) calculated by Arrival Management is shared with the A-SMGCS Routing function via the A-FDP. Such timing constraints are intended to be used by the A-SMGCS Routing function mainly to help improve surface movement efficiency.

The A-SMGCS Routing function receives expected de-icing times from the de-icing manager, defined in 06.06.02 OSED [22], in order to compute the estimated taxi time through a de-icing bay in case an aircraft needs remote de-icing. In addition, the A-SMGCS Routing function may need the aircraft de-icing status and notification of whether de-icing procedures apply, in order to determine the taxi-out route through the de-icing bay (if remote de-icing applies) or to consider on-stand de-icing additional time.

These sequencers are not mandatory for the A-SMGCS Routing function. Not having a de-icing manager on the airport would reduce the accuracy of estimated taxi time when performing remote de-icing operations.

These exchanges of information are illustrated in **Figure 9** below.

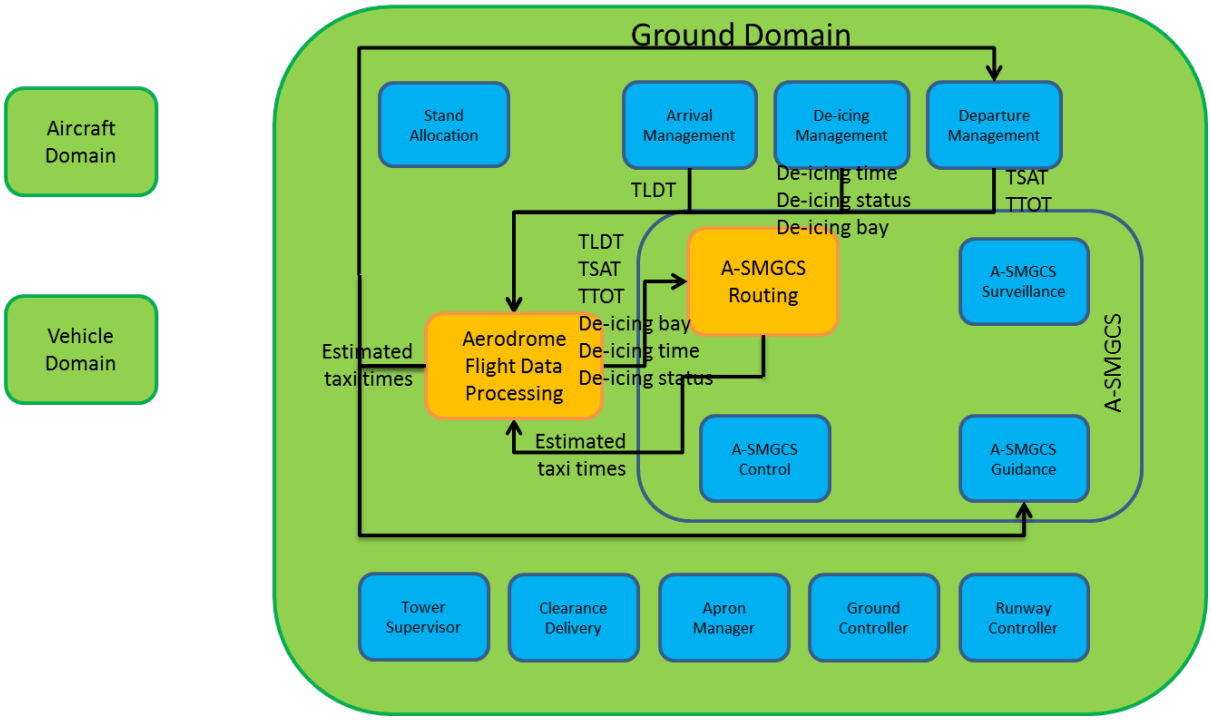

Figure 9: Information flows between A-SMGCS Routing function and airport sequencers

2.2.5 Relations between Functional Blocks based on IERs

The A-SMGCS Routing function mostly interacts with other systems in the Ground domain, as illustrated by the Information Exchange Requirements defined in OFA04.02.01 Final OSED [11]. Based on the description of these IERs, the following table identifies the systems providing and consuming the information corresponding to the IERs, as well as the Functional Blocks to which they are allocated. This is a slight change from the OSED, in which IERs are described in terms of actors issuing and using the information. It also has to be noted that the physical systems mentioned in this table and their allocation to Functional Blocks does not result from any document from WP12, but rather from expert judgement, as no corresponding document has been identified in WP12.

Identifier	Name	Provider	Provider FB	Consumer	Consumer FB
IER-06.07.02-OSED-0001.0001	Airport Layout	AMDB	Surface Routing[2]	A-SMGCS Routing function	Surface Routing
IER-06.07.02-OSED-0001.0002	Taxiway preferred directions[3]	A-SMGCS Routing function	Surface Routing	A-SMGCS Routing function	Surface Routing
IER-06.07.02-OSED-0001.0003	Standard routes[2]	A-SMGCS Routing function	Surface Routing	A-SMGCS Routing function	Surface Routing
IER-06.07.02-OSED-0001.0004	Aircraft Type	Airport FDPS	Aerodrome Flight Data Processing	A-SMGCS Routing function	Surface Routing
IER-06.07.02-OSED-0001.0005	Runway Exit	EBS	Aircraft and Vehicle Datalink Management	A-FDP	Aerodrome Flight Data Processing
		A-FDP	Aerodrome Flight Data Processing	A-SMGCS Routing function	Surface Routing
IER-06.07.02-OSED-0001.0006	Allocated Stand	Stand allocation	Airport Resources and Facilities Tactical Management	A-FDP	Aerodrome Flight Data Processing
		A-FDP	Aerodrome Flight Data Processing	A-SMGCS Routing function	Surface Routing
IER-06.07.02-OSED-0001.0007	Runway Holding	Runway use data	Surface Routing	A-SMGCS Routing	Surface Routing

[2] Project 06.07.02 proposes that this data base be considered as part of the Surface Routing Functional Block. This assumption has yet to be validated in the technical thread (project 12.01.07).
[3] Unless additional consumers of this information are identified in the future, this information is part of the A-SMGCS Routing function configuration and thus internal to the Surface Routing Functional Block.

Identifier	Name	Provider	Provider FB	Consumer	Consumer FB
	Point[1]	base		function	
IER-06.07.02-OSED-0001.0008	Runway Configuration	Tower Supervisor position	Operational Supervision	A-FDP	Aerodrome Flight Data Processing
		A-FDP	Aerodrome Flight Data Processing	A-SMGCS Routing function	Surface Routing
IER-06.07.02-OSED-0001.0009	Scheduled runway configuration change	Tower Supervisor position	Operational Supervision	A-FDP	Aerodrome Flight Data Processing
		A-FDP	Aerodrome Flight Data Processing	A-SMGCS Routing function	Surface Routing
IER-06.07.02-OSED-0001.0010	Taxiway configuration	Tower Supervisor position	Operational Supervision	A-FDP	Aerodrome Flight Data Processing
		A-FDP	Aerodrome Flight Data Processing	A-SMGCS Routing function	Surface Routing
IER-06.07.02-OSED-0001.0011	LVPs in use	Tower Supervisor position	Operational Supervision	A-FDP	Aerodrome Flight Data Processing
		A-FDP	Aerodrome Flight Data Processing	A-SMGCS Routing function	Surface Routing
IER-06.07.02-OSED-0001.0012	TSAT	Coupled AMAN/DMAN	Departure Management	A-FDP	Aerodrome Flight Data Processing
		A-FDP	Aerodrome Flight Data Processing	A-SMGCS Routing function	Surface Routing

Identifier	Name	Provider	Provider FB	Consumer	Consumer FB
IER-06.07.02-OSED-0001.0013	De-icing bay	De-icing Management	Airport Resources and Facilities Tactical Management	A-FDP	Aerodrome Flight Data Processing
		A-FDP	Aerodrome Flight Data Processing	A-SMGCS Routing function	Surface Routing
IER-06.07.02-OSED-0001.0014	Estimated de-icing time	De-icing Management	Airport Resources and Facilities Tactical Management	A-FDP	Aerodrome Flight Data Processing
		A-FDP	Aerodrome Flight Data Processing	A-SMGCS Routing function	Surface Routing
IER-06.07.02-OSED-0001.0015	Target report	A-SMGCS (Surveillance)	Aerodrome Surveillance	A-FDP	Aerodrome Flight Data Processing
		A-FDP	Aerodrome Flight Data Processing	A-SMGCS Routing function	Surface Routing
IER-06.07.02-OSED-0001.0016	Mobile Id	A-FDP	Aerodrome Flight Data Processing	A-SMGCS Routing function	Surface Routing
IER-06.07.02-OSED-0001.0017	TLDT	Coupled AMAN/DMAN	Arrival Management	A-FDP	Aerodrome Flight Data Processing
		A-FDP	Aerodrome Flight Data Processing	A-SMGCS Routing function	Surface Routing
IER-06.07.02-OSED-0002.0001	Planned taxi route	A-SMGCS Routing function	Surface Routing	A-FDP	Aerodrome Flight Data Processing

Identifier	Name	Provider	Provider FB	Consumer	Consumer FB
		A-FDP	Aerodrome Flight Data Processing	Tower Clearance Delivery Controller position	Controller Human Machine Interaction Management Aerodrome ATC
		A-FDP	Aerodrome Flight Data Processing	Tower Ground Controller/Apron Manager position	Controller Human Machine Interaction Management Aerodrome ATC
		A-FDP	Aerodrome Flight Data Processing	Tower Runway Controller position	Controller Human Machine Interaction Management Aerodrome ATC
		A-FDP	Aerodrome Flight Data Processing	A-SMGCS Guidance function	Surface Guidance Management
		A-FDP	Aerodrome Flight Data Processing	Airport Safety Nets	Conformance Monitoring
		A-FDP	Aerodrome Flight Data Processing	Aircraft and Vehicle Data Link Management	D-TAXI
IER-06.07.02-OSED-0002.0002	Estimated taxi time	A-SMGCS Routing function	Surface Routing	A-FDP	Aerodrome Flight Data Processing
		A-FDP	Aerodrome Flight Data Processing	Aircraft and Vehicle Data Link Management	D-TAXI

Identifier	Name	Provider	Provider FB	Consumer	Consumer FB
		A-FDP	Aerodrome Flight Data Processing	Coupled AMAN/DMAN	Departure Management

Table 1: Relations between 06.07.02 IERs and WP12 Functional Blocks

2.3 Airfield Ground Lighting (AGL)

Airfield Ground Lighting comprises all switchable light fixtures on the aerodrome surface, providing Flight Crews and Vehicle Drivers with spatial orientation and situational awareness in various phases of the flight, e.g. during approach, landing, taxi-in, taxi-out and departure or other surface movements. Typical examples for such installations are taxiway centre line lights, stop bars and runway lighting systems.

2.3.1 Current Situation and Trend in the Development

Most aerodromes in Europe have elements of AGL implemented and in use (e.g. stop bars, or manual guidance via switching taxiway centre line lights in segments).

As of now, only a few airports use AGL for providing automated, individual guidance, commonly called "Follow-the-Greens[4]" or "FtG". This may change significantly in the near future, as some airports in Europe have already started to implement FtG; e.g. Hamburg Airport, while others have, at this stage, started projects or pre-project studies[5].

2.3.2 Description of the Operational Environment

The description of the operational environment and the features of the four sub-services (Centralised Service, Ground Service, Mobile Service and the Communication Service) can be found in the OFA04.02.01 Final OSED chapter 3 [11].

This document covers primarily the technical aspects of their interaction and the technical feasibility and interoperability aspects of providing human machine interfaces (HMIs), especially the A-CWP, with relevant data.

With the new SESAR-method deployed, guidance on the aerodrome surface will be provided via Follow-the-Greens at any given time (daytime or night time, summer or winter), in all weather conditions and for all mobiles moving along a cleared route.

2.3.3 Description of the Operational Sub-Services

As described above, the Operational Service consists of four interacting sub-services described hereafter.

2.3.3.1 Sub-Service: Ground Service

The Ground Service (GS) comprises all switchable light fixtures on the aerodrome surface used to provide guidance information to Flight Crews and Vehicle Drivers.

In general, activated lights on the taxiway centre line represent the clearance to follow the route cleared in cooperation between the Controller and the system landscape. In contrast, the absence of activated green lights as well as lit red lights represent the instruction to stop the mobile.

As most lights on the taxiway centre line are green[6], the prevalent name of the guidance concept is "Follow-the-Greens" (abbreviation FtG).

In general, two lighting technologies are currently available: incandescent (halogen) and light emitting diode (LED) lights. Even if, FtG can be implemented based on both technologies, the latter one is more efficient, long-lived and quicker in providing full brightness.

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[4] This term referring to a guidance procedure is used frequently, but it is not (yet) standardized or unambiguously defined.

[5] Some airports outside of Europe have been using FtG for several years now, e.g. Seoul Incheon.

[6] Depending on the airport, some taxiway centre line lights may also be blue, or orange. Nevertheless, the concept is in all cases referred to as "Follow-the-Greens"

The GS is fully dependent on switching commands sent by the Centralised Service.

2.3.3.2 Sub-Service: Centralised Service

The Centralised Service [7] (CentS) triggers the GS to activate or deactivate light fixtures on the aerodrome surface.

In order to guide mobiles along their cleared paths with FtG, the CentS activates rows[8] of centre line lights in front of them. The movement of the mobile emanating from the initial clearance is recognized by the surveillance system and fed into the AGL Service. This data allows the CentS to trigger the forward shift of the row of lit lights along the cleared route[9] and according to the current speed of the mobile.

Furthermore, the CentS establishes the longitudinal spacing according to ICAO Doc 9830 chapter 3.4.4 and the spacing for converging traffic including wingspan clearances. It furthermore switches the stop bars in the field and also dynamic signage such as RIDs and SDSs, if available.

This will be done based on the route as defined by the A-SMGCS Routing function and the cleared route (taxi instruction) issued by the Controller via the HMI. For further operational information on the CentS, see OFA04.02.01 Final OSED [11] chapter.

In case of non-conformance of the mobile with instruction, the system environment displays an alert to the Controller as defined by P06.07.01. As it was not addressed during SESAR 1, it is strongly recommended to address the issue of how to switch the light fixture in such a case during SESAR 2020 horizon.

2.3.3.3 Sub-Service: Mobile Service

The Mobile Service (MS) is intended[10] to deliver all information related to surface traffic management available in the A-CWP to Flight Crews and Vehicle Drivers. This includes airport map data, the position of all mobiles as well as their routes and clearances. The MS is established by providing Flight Crews and Vehicle Drivers with handled devices produced for the consumer market that receive all relevant surface traffic management-related information via an adequate data link such as LTE[11].

2.3.3.4 Sub-Service: Communication Service

The Centralised Service and the Ground Service or the Mobile Service are linked bi-directionally by the Communication Service (CS). While 'uplink'[12] refers to the direction from Centralised Service to to Ground Service, 'downlink'[13] refers to the direction from Ground Service to Centralised Service. Depending on the local implementation, the Communication Service could either comprise one physical data link or alternatively several different ones. In all cases, the CS shall enable the CentS to be able to precisely timely synchronise instructions for GS and MS..

[7] In SESAR 1, the Centralised Service was not developed towards automatic decision implementation. This may be done in SESAR2020 and would reflect the aim of AOs and ANSPs to further reduce Controller workload.
[8] The length of the row varies according to local implementation and should dynamically take into account the prevailing weather and traffic conditions.
[9] The various Validation activities executed in SESAR 1 unveiled that Flight Crew assess FtG very positively in dependent of the number of lights activated and deactivated at a time. Hence, the number of lights per switch may vary between one (single-lamp control) and up to six lights on straights without a negative impact on the feedback.
[10] In SESAR 1, the Mobile Service was only partly developed for Vehicle Drivers. Outside of SESAR, the provision of the full CWP set of surface information including instructions and the map is already under development with the Airspace Users in the lead. Hence, SESAR 2020 could pick this up and help the airlines to complete the ground-based guidance and alerting environment.
[11] These systems may be used for all kinds of communication, e.g. related to fuel services, de-icing requests, TSAT communication, etc.
[12] E.g. the command that activates a stop bar
[13] E.g. the information on the light status (on/off/failure)

2.3.4 Operating Conditions

The AGL Service can be a 24/7 service with the CS redundant. In case of snowfall, newly implemented lights shall be able to melt snow trying to build up on them.

2.3.5 Open Issues and External Requirements

The AGL Service requires adequate surveillance information to safely guide the traffic on the airport surface. As of now, especially the use of AGL to control separation between aircraft in low visibility will impose more stringent requirements on the quality of A-SMGCS surveillance data. In particular, the requirements for probability of detection, accuracy of position determination and continuity of service need to be addressed. Current requirements are specified in EUROCAE document ED-87C. Requirements from the previous ED-87B have been incorporated into the European Community Specification for A-SMGCS (EN 303 213), which needs to be updated.

While most MLAT systems generally comply with ED-87C requirements, specific regions and situations at many airports clearly depict the limitations of the technology in terms of accuracy and reliability. Hence, gap filler technologies such as camera systems or earth magnetic field sensors may be beneficial, or, depending on the local situation, compulsory, in order to allow for the new concept.

2.3.6 Service allocation to systems

This section clarifies the system the AGL service is allocated to. The management of lights and visual aids such as AGL is part of the Guidance function and therefore it mainly concerns the following functional blocks:

- Surface Guidance Management, which is completely part of the OFA04.02.01;
- Ground Lighting Management, which is considered as a functional block external to OFA04.02.01.

Both functional blocks are allocated to the *Aerodrome ATC Domain System* which is defined by B04.03 [20] and, then, detailed in P12.01.07 architecture documents [18].

Further details about the relations between the concerned functional block are provided in the section 2.3.7.

2.3.7 Relations between Functional Blocks based on IERs

Starting from the AGL related IERs defined in the OFA04.02.01 Final OSED [11], this section is intended to summarize the relations between the concerned functional blocks allocated to the Aerodrome ATC Domain System.

The flow reported in the Table 2 identifies both the provider and consumer of the information corresponding to each IER, as well as the Functional Blocks to which they are allocated. However, it is important to highlight that this flow does not result from any document from WP12, but rather from expert judgement, as no corresponding document has been identified in WP12.

Identifier	Name	Provider	Provider FB	Consumer	Consumer FB
IER-06.07.02-OSED-0002.0007	AGL Switching Information	Aerodrome FDP	Aerodrome Flight Data Processing	A-SMGCS Guidance	Surface Guidance

Identifier	Name	Provider	Provider FB	Consumer	Consumer FB
		A-SMGCS Guidance	Surface Guidance	Ground Lighting Management	Ground Lighting Management
		Ground Lighting Management	Ground Lighting Management	A-SMGCS Guidance	Surface Guidance
		A-SMGCS Guidance	Surface Guidance	Controllers	Controller HMI Management
IER-06.07.02-OSED-0002.0008	AGL Operating Status	A-FDP	Aerodrome Flight Data Processing	A-SMGCS Guidance	Surface Guidance
		A-SMGCS Guidance	Surface Guidance	Ground Lighting Management	Ground Lighting Management
		Ground Lighting Management	Ground Lighting Management	A-SMGCS Guidance	Surface Guidance
		A-SMGCS Guidance	Surface Guidance	Runway and Taxiway Usage Management	Runway and Taxiway Usage Management
		A-SMGCS Guidance	Surface Guidance	Technical Supervision	Technical Supervision

107 **Table 2: Relations between AGL related IERs and WP12 Functional Blocks**

108

2.4 Provision of planned and cleared route to mobile by Data Link

2.4.1 Current Situation and Trend in the Development

The objective of this service is to provide the generated **'planned' route** and non-time critical instructions (such as start-up and pushback) to the Flight Crew and, in some cases, to Vehicle Drivers (e.g. tug drivers). However, as the data link for vehicles is a new service and is not mature like the data link service for aircraft, the following sections will focus mainly on the data communications between ground ATC systems and aircraft system. Data Link for vehicles is described in the section 2.4.8.

In the context of SESAR, the use of data link communications to exchange, between Controllers and Flight Crew, clearances / instructions concerning the management of routine operations on the airport movement area has been confirmed to have achieved the V3 maturity level. Therefore, the lists of both uplink and downlink messages reflect that achievement. However, with the objective to fully achieve the V3 maturity for the whole solution, the provision of TAXI clearance on complex airports via data link is recommended to be further investigated during SESAR 2020 horizon to assess the level of workload in a mixed mode environment and for the dynamic operations.

The communications between the "ground" and the "aircraft" systems are represented by the D-TAXI service of the CPDLC application currently under definition by the joint standardisation group RTCA SC-214 / EUROCAE WG-78 [12].

Table 3 provides the list of D-TAXI uplink (i.e. from ATC to aircraft) messages (UM) elements from the SPR for Baseline 2 ATS Data Communications [12] (EUROCAE ED-228) which have been considered as relevant for the research and validation activities conducted in the context of the OFA04.02.01 during SESAR 1 timeframe.

Message ID	Message element	Message intent/use
UM0	UNABLE	Indication that the message cannot be complied with.
UM1	STANDBY	Indication that the message will be responded to shortly.
UM73R	[departure clearance]	Instruction to proceed via the specified departure clearance.
UM117R	CONTACT [unit name] [frequency]	Instruction to establish voice contact with the specified ATS unit on the specified frequency.
UM120R	MONITOR [unit name] [frequency]	Instruction to monitor the specified ATS unit on the specified frequency. The flight crew is not required to establish voice contact on the frequency
UM159R	ERROR [error information]	System-generated notification of an error.
UM227	LOGICAL ACKNOWLEDGMENT	System generated notification that the received message is acceptable for display.
UM249	REVISED [revision reason]	Indication that the associated instruction is either a revision to a previously issued instruction or is different from the requested clearance.
UM270	EXPECT [clearance type] [assigned time]	Notification that the specified clearance type may be issued at the time required to meet the specified time.
UM283	WHEN CAN YOU ACCEPT [clearance type]	Request for the earliest time or position at which the specified clearance can be accepted.
UM302	START UP APPROVED [assigned time]	Instruction that engine start up is approved. A time for start-up may be specified.

UM304	PUSH BACK APPROVED [pushback position] [assigned time]	Instruction to commence pushback. A pushback position(s) and direction, and/or time may be specified.
UM305	EXPECT TAXI [taxi route] [taxi duration]	Notification that a taxi clearance may be issued for the specified taxi route. The estimated taxi duration may be specified.
UM306	RESUME TAXI [taxi resume condition]	Instruction to resume a previously issued taxi. The conditions for resuming the taxi may be specified
UM308	[runway] TAXI [taxi route]	Instruction to taxi to the specified location; may include a hold short position
UM309	DE-ICING APPROVED	Indication the de-icing is approved
UM311	HOLD POSITION	Instruction to hold the current position
UM312	FOR DE-ICING	Indication that the associated instruction is issued in order to perform de-icing.
UM313	CAN YOU ACCEPT INTERSECTION [intersection] FOR DEPARTURE RUNWAY [runway] ([distance ground available] AVAILABLE)	Request to indicate whether or not the specified intersection can be accepted on the specified departure runway and may include the remaining length of the runway.
UM317	[runway] INTERSECTION DEPARTURE [intersection] ([distance ground available] AVAILABLE)	Indication of the intersection departure for the associated taxi instruction or taxi route information and may include the remaining length of the runway.
UM318	HOLD SHORT [ground location]	Instruction to hold short of the specified ground location.

133 **Table 3: Relevant Uplink Messages for the D-TAXI service**

134 Table 4 provides the list of D-TAXI downlink (i.e. from aircraft to ATM) messages (DM) elements from
135 the ED-228 [12] which have been considered as relevant for the research and validation activities
136 conducted in the context of the OFA04.02.01 during SESAR 1 timeframe.

Message ID	Message element	Message intent/usage
DM0	WILCO	Indication that the instruction will be complied with.
DM1	UNABLE	Indication that the instruction cannot be complied with.
DM2	STANDBY	Indication that the message will be responded to shortly.
DM3	ROGER	Indication that the message is understood.
DM4	AFFIRM	Indication of a positive response to a message.
DM5	NEGATIVE	Indication of a negative response to a message.
DM62R	ERROR [error information]	System-generated notification of an error
DM65R	DUE TO [due to reason downlink]	Indication of the reason for the associated message.
DM100	LOGICAL ACKNOWLEDGMENT	System-generated notification that the received message is acceptable for display.
DM108	DE-ICING COMPLETE	Notification that de-icing is complete.
DM125	REQUEST DEPARTURE CLEARANCE [departure clearance request]	Request for the specified departure clearance.
DM127	FOR DE-ICING	Indication that the associated request is issued in order to perform de-icing.

DM128	ABLE INTERSECTION [intersection] FOR DEPARTURE RUNWAY [runway]	Specifies the intersection for the specified departure runway in a taxi request
DM129	READY FOR [clearance type] [assigned time]	Indication that the aircraft will be ready for the specified clearance at the time required to meet the specified time.
DM130	CANCELLING STARTUP	Indication the aircraft is cancelling startup
DM131	REQUEST PUSHBACK [pushback position]	Request to pushback. The pushback position and direction may be specified.
DM132	REQUEST DE-ICING [ground location]	Request for de-icing at the current position or at the specified position
DM134	REQUEST STARTUP	Request to start up
DM135	REQUEST TAXI [taxi request]	Request for taxi clearance. May specify to/from taxi position(s) and/or the ATIS code.
DM136	REQUEST EXPECTED TAXI ROUTING [ground location]	Request for taxi routing information; may specify the taxi start position.
DM137	WE CAN ACCEPT [clearance type] [assigned time]	Indication that the specified clearance type can be accepted at the time required to meet the specified time
DM138	WE CANNOT ACCEPT [clearance type]	Indication that the specified clearance type cannot accepted

Table 4: Relevant Downlink Messages for the D-TAXI Service

On-board and Ground ATM system developments are required to support the D-TAXI service as described in the OFA04.02.01 Final OSED [11]. As illustrated in the Figure 2, the Aircraft and Vehicle Data Link Management Functional Block is expected to provide clearance requests to the Controller HMI Management FB and to receive clearances / instructions by the Aerodrome Flight Data Processing FB.

To operate the **D-TAXI** service, both systems mentioned above are using the Controller–Pilot Data Link Communications (**CPDLC**) application (as defined by ATN baseline 2) to provide communications between the Flight Crew and the ATSU system/ Controller of the C-ATSU during ground operations, and while the aircraft is approaching the airport. In detail, a communication between Flight Crew and the ATSU system / Controller on real Aeronautical Telecommunications Network (ATN) over VDL (VHF Digital Link) Mode 2 network has been successfully tested during a flight trial held in the context of R5 VP-719. Furthermore, in the same context, at a physical level, a new Airport surface datalink technology, the Aeronautical Mobile Airport Communications System (AeroMACS) has been tested for exchanging vehicles related instructions. However, taking into account the maturity of the concept, it is recommended to further investigate it during SESAR 2020 horizon.

2.4.2 D-TAXI message set

All the relevant uplink and downlink messages listed respectively in Table 3 and Table 4 have been tested during both P06.07.02 and P06.07.03 validation activities to confirm their operational usability and utility. Based on R5 outcomes integrating also the collected operational feedback, Table 5 illustrates the messages / instructions which have achieved the highest maturity but that, however, need further studies (together with other messages as TAXI and TAXI revision) to fully achieve the expected V3 maturity level.

#DM	DM (Downlink Messages)	# UM	UM (Uplink Messages)
DMO	WILCO	UM0	UNABLE
DM2	STANDBY	UM1	STANDBY
DM3	ROGER	UM73 R	[*departure clearanceR*]
DM62R	ERROR [*error information*]	UM117 R	CONTACT *[unit name] [frequency]*
DM100	LOGICAL ACKNOWLEDGEMENT	UM120 R	MONITOR *[unit name] [frequency]*
DM125	REQUEST DEPARTURE CLEARANCE [*departure clearance*]	UM159 R	ERROR [*error information*]
DM131	REQUEST PUSHBACK [*pushback position*]	UM227	LOGICAL ACKNOWLEDGMENT
DM134	REQUEST STARTUP	UM270	EXPECT *[clearance typeR] [assigned time]*
DM136	REQUEST EXPECTED TAXI ROUTING [*ground location*]	UM302	START UP APPROVED *[assigned time]*
		UM304	PUSH BACK APPROVED [*pushback position*] *[assigned time]*
		UM305	EXPECT TAXI [*taxi route]* [*taxi duration]*

163 **Table 5: D-TAXI Message set**
164
165

2.4.3 Interoperability Diagram

Figure 10 illustrates the data link message flow and how the involved systems are interconnected.

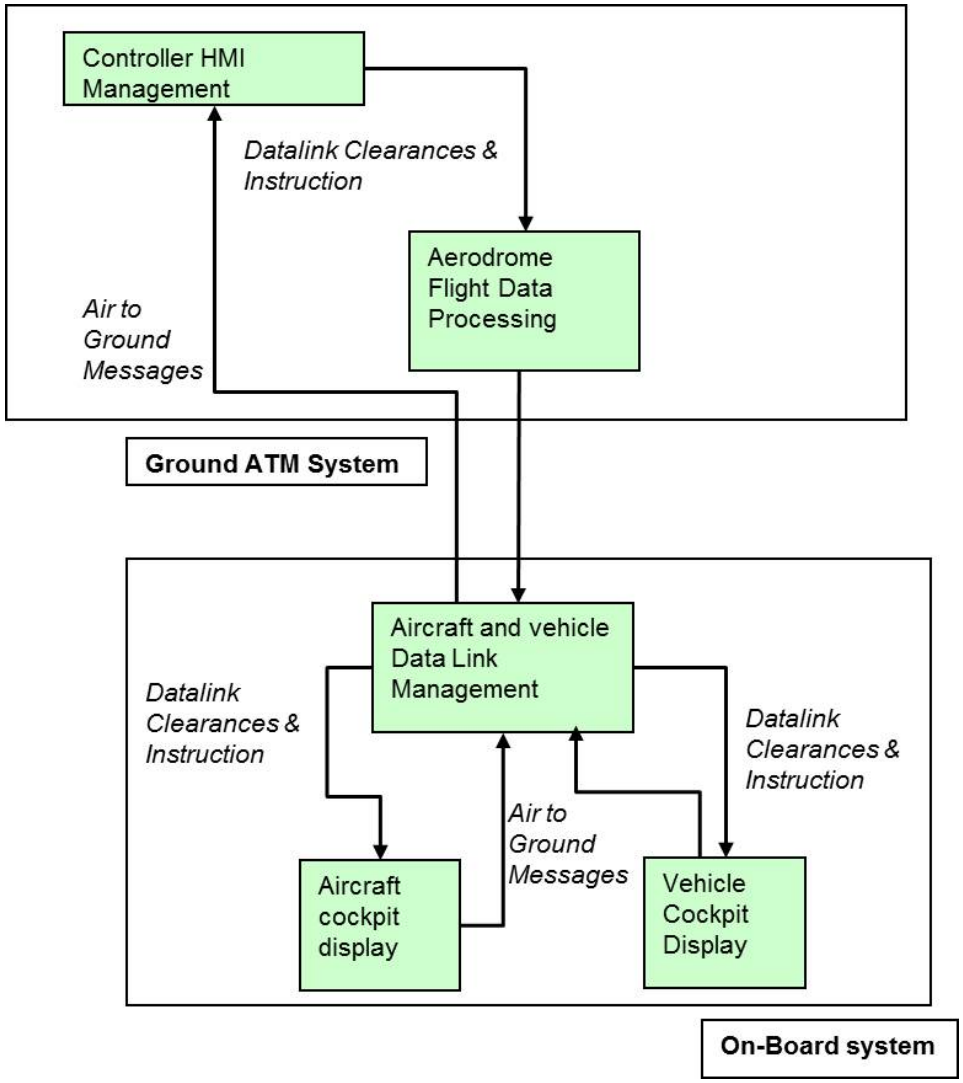

Figure 10: Data link Message Flow and Architecture

It is important to highlight that the interoperability between airborne and ground systems requires the consistency between ground and on-board databases so that the routing information (such as taxiway names, holding point names) contained in the exchanged D-TAXI messages shall have the same definition based on standardised Aerodrome Mapping Database (AMDB) (see REQ-06.07.03-INTEROP-DTAX.0004). To this end, a strong collaboration with EUROCAE WG44 (Aeronautical Databases) is recommended during SESAR 2020 horizon.

2.4.4 Operating conditions

As described in EUROCAE ED-228 [12] and ED-229 [13] , D-TAXI service is used for taxiing operations on airports.

During taxi-in operations (arrival of an aircraft), The D-TAXI service provides:

- The expected arrival taxi route before landing
- The clearances to taxi from runway exit to stand or any other point on airports.

During taxi-out operations (departure of an aircraft), the D-TAXI service provides:

- The expected departure taxi route before start-up
- The start-up and push-back information and clearances
- The de-icing information and clearances
- The clearances to taxi from stand to runway holding point or any other point on airport (e.g. taxiway intersection).

The expected surface-in and surface-out taxi route provided by D-TAXI services are only information and cannot be used as clearances by the Flight Crew. The provision of expected arrival route is the only case where the D-TAXI service operates with an aircraft not on the airport but in flight before the approach (ideally before the Top of Descent.

Due to validated SESAR assumptions[14], the following limitations are added to the usage of D-TAXI in the respective OFA04.02.01 Final OSED [11]:

- D-TAXI services cannot be used for time-critical messages (such as HOLD if the aircraft is taxiing)
- D-TAXI services cannot be used for runway clearances (such as crossing a runway).

The operating conditions described above only concern the management of aircraft on the airport surface using ATN baseline 2 CPDLC.

2.4.5 Timer Management

The timers described in this section refer to the D-TAXI service.

The timers related to data link for vehicles have not been defined yet.

The list of timers as defined in EUROCAE WG-78/RTCA SC-214 is given in the Table 6:

Timer	Description
Tr	Technical response timer. This timer is used by a sending system in LACK regions to detect the absence of an expected LACK response in an acceptable period of time.
Ttr	Termination timer (Receiver). This is used by a receiving system to detect the absence of a response (system or human) to a received message in an acceptable period of time.
Tts	Termination timer (Sender). This timer is used by a sending system to detect the absence of an operational response from the remote system in an acceptable period of time.
t-CPDLC-end	End timer. This timer is used by the ATSU System after generation of a CPDLC-end request to detect the absence of an End Response from the aircraft in an acceptable period of time.

Table 6: List of Timers

Note: Termination timer is referred to as Transaction Expiration Timer in ED-78A/DO-264 [5].

Note: These timers are defined in EUROCAE WG-78/RTCA SC-214 for all CPDLC services. However, in the context of the document, they will be named “D-TAXI timers”.

Figure 11 illustrates graphically the use of D-TAXI timers for a request issued by the Flight Crew on the airborne side. The timers tr, tts and ttr can be implemented on the ground side and/or on the airborne side.

[14] E.g. EXE-06.07.02–VP-665 by Airbus, EUROCONTROL and NATMIG in December 2013.

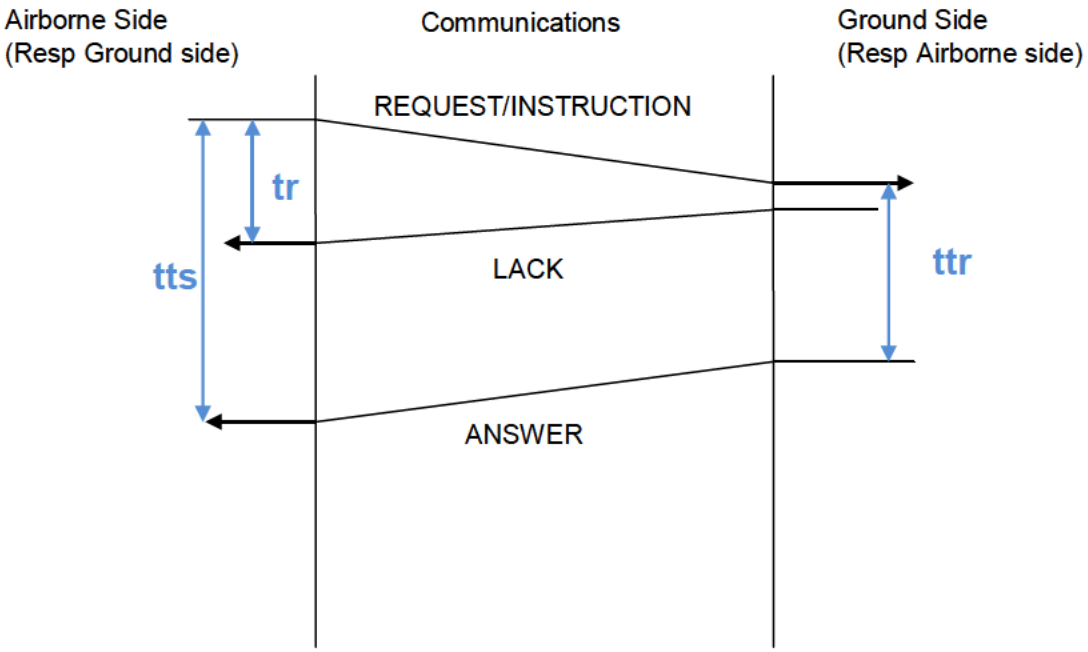

Figure 11: Overview of D-TAXI timers

2.4.5.1 Timer implementation

Table 7 determines if the timer implementation is mandatory for all D-TAXI messages on the ground and on the airborne part:

Timer	WG-78/SC-214		Current SESAR Assumption	
	Ground	Airborne	Ground	Airborne
Tr	No	No	No	No
Ttr	Yes	No	Yes	No
Tts	Yes	No	Yes	No
t-CPDLC-end	No	N/A	No	N/A

Table 7: Timer implementation

All the studies conducted within SESAR programme have not identified changes to rules defined by RTCA Special Committee 214 / EUROCAE Working Group 78. Indeed, the most critical messages are the uplink clearances. In this context, the Controller shall be warned if he has not received an answer (this is the reason why ground tts is considered as mandatory in case of a transaction initiated by the Controller and ground ttr is considered as mandatory in case of a transaction initiated by the Flight Crew).

2.4.5.2 Timer values

Table 8 determines the timer values for all D-TAXI messages on the ground and on the airborne part. We have extracted values from the current version of the INTEROP of WG-78/SC-214. As ED110/DO-280B (ATN Baseline1 INTEROP) also defines values for these timers on the airport, we have added it in the table for information purposes: We are conscious that the value of timers depends on the kind of CPDLC services and that D-TAXI is not in the scope of ED110/DO-280B.

Timer	WG 78/SC 214		ED110/DO-280B		Current SESAR Assumption	
	Ground	Airborne	Ground	Airborne	Ground	Airborne
tr	40 sec	40 sec	40 sec	40 sec	20 sec (To be evaluated)	20 sec (To be evaluated)
ttr	See Table 9	Not def.	100 sec	100 sec	See Table 9 (To be evaluated)	N/A
tts	See Table 9	Not def.	120 sec	120 sec	See Table 9 (To be evaluated)	See Table 9 (To be evaluated)
t-CPDLC-end	6 minutes	N/A			6 minutes	N/A

Table 8: Timer values

Operational values to be used for the ground CPDLC timer ttr and tts are defined in Table 9:

D-TAXI transaction context	Timer value
Start-up	45s
Push-back	45s
Update and simple taxi-out instruction	45s
Simple taxi-in instruction	45s
Simple arrival expected taxi route	45 s
Holding position instruction	45 s
Complex taxi in instruction ()	100 s
Complex arrival expected taxi route ()	100 s
Departure expected taxi route	180s
Complex taxi-out instruction	180s

Table 9: Timer values with respect to D-TAXI transaction

A Complex taxi instruction is composed of more than one taxiway.

Note: the value used by the Eurocontrol ITWP mock-up is 120s for the ttr and tts ground timer.

2.4.5.3 Timer expiration

Table 10 illustrates the consequence of a timer expiration.

Timer	WG 78/SC 214		Current SESAR Assumption	
	Ground	Airborne	Ground	Airborne
tr	Notification Cancellation of subsequent LACK	Notification Cancellation of subsequent LACK	Notification Cancellation of subsequent LACK	Notification Cancellation of subsequent LACK
ttr	Notification	Not defined	Notification	Not def.
tts	Notification revert to alternate procedures (e.g. voice) to complete the dialogue, technically the dialogue remains open.	Notification revert to alternate procedures (e.g. voice) to complete the dialogue, technically the dialogue remains open.	Notification revert to alternate procedures (e.g. voice) to complete the dialogue, technically the dialogue remains open, Validity of clearance	Notification revert to alternate procedures (e.g. voice) to complete the dialogue, technically the dialogue remains open, Validity of Clearance
t-CPDLC-end	Abort CPDLC connection	N/A	Abort CPDLC connection	N/A

Table 10: Timer expiration

2.4.5.4 Timers life-cycle

Table 11 illustrates the Tr Timer life cycle.

Timer tr	WG 78/SC 214		Current SESAR Assumption	
	Ground	Airborne	Ground	Airborne
Timer set	Downlink Lmessage[15] sent	Uplink Lmessage sent	Downlink Lmessage sent	Uplink Lmessage sent
Timer reset	N/A	N/A	N/A	N/A
Timer Cancel	Reception of LACK	Reception of LACK	Reception of LACK	Reception of LACK

Table 11: Tr Timer life cycle

Note: When tr is implemented, and when a LACK is received after expiry of tr, the LACK may be discarded.

[15] A Lmessage is a message requiring a Lack.

The Ground CPDLC ttr Timer

Table 12 illustrates the ttr timer life cycle.

Timer ttr	WG 78/SC 214		Current SESAR Assumption	
	Ground	Airborne	Ground	Airborne
Timer set	Downlink Rmessage[16] received	Not defined	Downlink Rmessage received	N/A
Timer reset	N/A	Not defined	Uplink STANDBY	N/A
Timer Cancel	Uplink message in response to Rmessage Uplink STANDBY	Not defined	Uplink message in response to Rmessage	N/A

Table 12: ttr timer life cycle

The CPDLC tts Timer

Table 13 illustrates the tts timer life cycle.

Timer tts	WG 78/SC 214		Current SESAR Assumption	
	Ground	Airborne	Ground	Airborne
Timer set	Uplink Rmessage[17] sent	Downlink Rmessage sent	Uplink Rmessage sent	Downlink Rmessage sent
Timer reset	Downlink STANDBY Received	N/A	Downlink STANDBY Received	Uplink STANDBY received
Timer Cancel	Downlink message (response to Rmessage) Received	Uplink message (response to Rmessage) Received Uplink	Downlink message (response to Rmessage) Received	Uplink message (response to Rmessage) Received

[16] A Rmessage is a message that does not have a N response attribute (where N response attribute means that no answer is expected to a message)
[17] A Rmessage is a message that does not have an N response attribute (where N response attribute means that no answer is expected to a message)

		STANDBY received		

Table 13: tts timer life cycle

The t-CPDLC-end Timer

Table 14 illustrates the t-CPDLC-end timer life cycle.

Timer ttr	WG 78/SC 214		Current SESAR Assumption	
	Ground	Airborne	Ground	Airborne
Timer set	CPDLC-end request sent	N/A	CPDLC-end request sent	N/A
Timer reset	N/A	N/A	N/A	N/A
Timer Cancel	Reception of the answer from aircraft	N/A	Reception of the answer from aircraft	N/A

Table 14: t-CPDLC-end timer life cycle

2.4.6 Service allocation to systems

This section clarifies to which system the Provision of Planned and Cleared route to mobiles service is allocated. The exchange of data link messages between the Aerodrome ATC and the vehicles and/or the aircraft on ground is handled through the following functional blocks:

- Aerodrome Flight Data Processing (completely part of the OFA04.02.01);
- Aircraft and Vehicle Datalink Management (partly in the OFA04.02.01).

Both concerned functional blocks are allocated to the *Aerodrome ATC Domain System* as defined by B04.03 [20] and detailed in P12.01.07 architecture documents [18]

Further details about the relations between the concerned functional block are provided in the section 2.4.7

2.4.7 Relations between Functional Blocks based on IERs

Starting from the Provision of planned and cleared route to mobiles related IERs defined in the OFA04.02.01 Final OSED [11], this section is intended to summarize the relations between the concerned functional blocks allocated to the Aerodrome ATC Domain System.

The flow reported in the Table 15 identifies both the provider and consumer of the information corresponding to each IER, as well as the Functional Blocks to which they are allocated. However, it is important to highlight that this flow does not result from any document from WP12, but rather from expert judgement, as no corresponding document has been identified in WP12.

Identifier	Name	Provider	Provider FB	Consumer	Consumer FB
IER-06.07.02-OSED-0002.0005	D-TAXI Push-Back Service	Flight Crew	Aircraft and Vehicle Datalink Management	Controllers	Controller HMI Management
		Controllers	Controller HMI Management	A-FDP	Aerodrome Flight Data Processing
		A-FDP	Aerodrome Flight Data Processing	Flight Crew	Aircraft and Vehicle Datalink Management
IER-06.07.02-OSED-0002.0006	D-TAXI Taxi Service	Flight Crew	Aircraft and Vehicle Datalink Management	Controllers	Controller HMI Management
		Controllers	Controller HMI Management	A-FDP	Aerodrome Flight Data Processing
		A-FDP	Aerodrome Flight Data Processing	Flight Crew	Aircraft and Vehicle Datalink Management

Table 15: Relations between D-TAXI related IERs and WP12 Functional Blocks

2.4.8 Datalink Message for vehicles

As detailed in the previous sections, the data link communications between Controllers and Flight Crew are represented by the D-TAXI service of the CPDLC (Controller-Pilot Data Link Communications) application currently under definition by the joint standardisation group RTCA SC-214 / EUROCAE WG-78. The data link for vehicles is a new service and is not as mature as the CPDLC D-TAXI service. At EUROCAE level, a dedicated standard for exchanging data link instructions / clearances between Controllers and Vehicle Drivers has not been defined yet. To fill the gap, projects 06.07.02 and 06.07.03 have successfully performed ad hoc V2 validation testing specific messages to support vehicle operations on the airport surface. In line with the ICAO Doc 9432 Manual of Radiotelephony Chap 5, vehicles should request to PROCEED (if not towing) or request to TOW if they are connected to an aircraft. Therefore, the investigated vehicle operations on the airport surface do not refer to the planning phase but only to the execution phase, that's why the INTEROP only addresses the provision of cleared routes to vehicles. These messages are reported in the Table 16.

#DM	DM (Downlink Messages)	# UM	UM (Uplink Messages)
No number yet defined	REQUEST PROCEED	No number yet defined	PROCEED
No number yet defined	REQUEST TOW	No numbr yet defined	TOW

Table 16: Datalink message set for vehicles

However, it is important to highlight that this service has not achieved the V3 maturity level. Therefore, further work, including the coordination with standardization groups, is recommended to be performed during SESAR 2020 horizon.

Nevertheless, it needs to be considered that a datalink for vehicles is rather a local implementation where less standardisation is required and locally configurable messages are possible.

2.5 Virtual Block Control

2.5.1 Current Situation and Trend in the Development

The implementation of Virtual Block Control is intended as support to ground surface operations during reduced visibility conditions, thus, as support to Controllers when low visibility procedures (LVPs) are in place. However, it is important to highlight that the implementation of LVP varies from one airport to another depending on local conditions, available facilities as well as the time required to prepare the airport. Typically, an RVR less than 550m or a height of cloud base less than 200ft triggers LVP.

Currently, as stated in the ICAO Doc. 9476 SMGCS Manual [7], during VIS 3, surface traffic is handled through blocks or segments along the taxiway, which are occupied by only one aircraft at a time. Boundaries of those blocks represent the clearance limits issued by ATC. The Flight Crew's situational awareness is supported by ground surface markings and visual aids while the responsibility of providing adequate spacing between aircraft is assumed by ATC. What is expected for the future is to give Flight Crews the chance to check the positions of the issued clearance limits directly on the on-board moving map (if equipped also with data link service) resulting in an increased situational awareness. With regard to that, it is important to distinguish between:

- VSB_{HP} referring to a Virtual Stop Bar positioned, on the surveillance HMI, in correspondence of an Intermediate Holding Position (IHP) already existing on the airport surface but not equipped with a stop bar;
- VSB_{NIHP} refers to Virtual Stop Bar NOT related to any physical object/marking on the airport surface and they can be used and assigned only to aircraft equipped with AMM[18].

The use of Virtual Stop Bar linked to already existing intermediate holding position is associated to the implementation of the Virtual Block Control which has achieved the planned V3 maturity level at the end of SESAR 1.

About the following steps, the implementation of a Dynamic Virtual Block Control by means of VSB_{NIHP} is recommended to be further investigated during SESAR 2020 horizon.

2.5.2 Description of the Operational Environment

The description of the operational environment can be found in the OFA04.02.01 Final OSED [11]. The scope of the INTEROP document is to focus more on the technical aspects associated to the implementation of Virtual Block Control by means of Virtual Stop Bars. In terms of infrastructures, no great changes are envisaged on the airport surface for both kinds of virtual stop bars:

- the VBS_{HP} are linked to intermediate holding positions which are already existing (through surface markings and visual aids) on the airport surface;
- the $VSB_{N HP}$ are NOT linked to any intermediate holding positions already existing on the airport surface. With regard to them, no extra ground infrastructures / equipment is needed.

What needs to be considered is the exchange of information between ground and on-board systems.

Focusing on the use of the VSB_{HP}, there is no need to uplink position information as it corresponds to already existing intermediate holding position. What is required to be exchanged between ground and aircraft domains is the issued clearance limit corresponding to a specific VSB status.

[18] As highlighted in the ICAO A-SMGCS Manual, "*for low visibility conditions, the pilot may need suitable avionics, such as a moving map, to monitor progress and compliance with the assigned route*".

For the sake of completeness, it is important to highlight that the future implementation of Dynamic Virtual Block Control by means of VSB_{NIHP} (which is recommended to be part of SESAR 2020 research activities) should require the uplink of both status and position information.

2.5.3 Description of the Operational Service

The provision of the virtual block control service is based on the introduction of the so-called Virtual Stop Bars (VSBs) supporting both Controllers and the Flight Crew in low visibility conditions (referring mainly to VIS 3).

Controller will have the capability, through the A-SMGCS HMI, to input the clearance limit corresponding to a VSB position distinguishing between:

- VSB_{HP} referring to a Virtual Stop Bar positioned, on the surveillance HMI, in correspondence of an Intermediate Holding Position (IHP) already existing on the airport surface but not equipped with a stop bar. In case the aircraft is not equipped with an AMM, from on-board side no significant improvement is expected as the Flight Crew will still rely on visual observations of surface markings / lights. However, with the objective to improve the Flight Crew's situational awareness, the availability of an on-board AMM will ensure Flight Crew to benefit from the display of VSB position and status. From ATC side, the main added value will be the notification of a proper alarm in case of virtual stop bar infringement;
- VSB_{NIHP} referring to a Virtual Stop Bar NOT related to any physical object/marking on the airport surface. Therefore, they can be used and assigned only to aircraft equipped with AMM[19]. In such a case, Flight Crew will be able to see on their AMM the position and the status of the VSBs, as the Controllers on the HMI. Situational awareness is greatly increased and communications between Flight Crews and Controller made clearer and shorter (data link communication will increase the positive effect) with a positive impact on frequency congestion. As $VSB_{N\,HP}$ is not linked to any fixed position on the airport surface, ANSPs can allocate them optimally on the movement area (depending on local needs). As suggestion for the future, it could be useful to publish this type of VSBs on AIPs and/or airport chart to support Flight Crews during navigation by giving them the opportunity to cross check Controller clearances.

Regardless the type of implemented Virtual Stop Bars, it is important to ensure the coherency between the information displayed on Flight Crew's and Controllers' interfaces. To this end, the clearance limit issued by ATC shall be shared with the aircraft domain through the Surface Guidance functional block. With regard to that it is important to highlight the differences between the two steps associated to the implementation of a fully Dynamic Virtual Block Control:

- The implementation of Virtual Block Control by means of Virtual Stop Bars, which has achieved V3 maturity level at the end of SESAR 1 timeframe, is based on the use of VSBs linked to pre-defined positions (i.e. intermediate holding positions).
- The implementation of Dynamic Virtual Block Control by means of Virtual Stop Bars, which is recommended to be further analysed during SESAR 2020 horizon, is based on the use of VSBs not linked to any already existing point. Therefore, $VSB_{N\,HP}$ can be dynamically edited by the Controllers during the taxiing execution and the associated positions could be shared with the airborne part by coordinates (latitude and longitude).

The Virtual Stop Bars shall be displayed on Flight Crew's and Controllers' HMI with a different colour depending on their status:

- Lit status (e.g. RED colour);

[19] As highlighted in the ICAO A-SMGCS Manual, "*for low visibility conditions, the pilot may need suitable avionics, such as a moving map, to monitor progress and compliance with the assigned route*".

- When a specific VSB is assigned to an aircraft as a clearance limit it will be lit on the Flight Crew / Controller HMI, once the aircraft is cleared to a next position, the Controller will switch the VSB off (unlit status);
- Unlit status (e.g. GREEN colour). After an aircraft has crossed a VSB, the VSB may, automatically or not, be lit again depending on local procedures and traffic situation;

Furthermore, the status of Virtual Stop Bars is expected to be shared also with the Conformance Monitoring Functional Block to activate any alert in case of stop bar violation resulting in a significant benefit in terms of safety.

-

2.5.4 Open Issues and External Requirements

The implementation of Virtual Block Control when low visibility procedures are in place requires adequate surveillance information to safely guide traffic on the airport surface. It means that there may be a need to define more stringent requirements on the quality of A-SMGCS surveillance data in terms of accuracy of position determination, probability of detection (e.g. VSB violation) and continuity of service. Current requirements are specified in EUROCAE document ED-87C. Requirements from the previous ED-87B have been incorporated into the European Community Specification for A-SMGCS (EN 303 213), which needs to be updated.

Additionally, the data link message set needed for the ground system to be able to exchange messages with the on-board system to activate and deactivate VSBs on the AMM has not yet been defined.

2.5.5 Service allocation to systems

This section describes how the virtual block control service is allocated to the system defined by B04.03 [20] and, then, detailed in P12.01.07 architecture documents [18].

As the virtual stop bars represent a specific limit associated to the issued clearance, they can be linked to the *Aerodrome ATC Domain System.*

2.5.6 Relations between Functional Blocks based on IERs

Starting from the VSB related IERs defined in the OFA04.02.01 OSED [11], this section is intended to summarize the relations between the concerned functional blocks allocated to the Aerodrome ATC Domain System.

The flow reported in the Table 17 identifies both the provider and consumer of the information corresponding to each IER, as well as the Functional Blocks to which they are allocated. However, it is important to highlight that this flow does not result from any document from WP12, but rather from expert judgement, as no corresponding document has been identified in WP12.

Identifier	Name	Provider	Provider FB	Consumer	Consumer FB
IER-06.07.02-OSED-0002.0011	Virtual Stop Bar positions	Surface Routing	Cleared taxi routes	A-FDP	Aerodrome Flight Data Processing

Identifier	Name	Provider	Provider FB	Consumer	Consumer FB
		A-FDP	Aerodrome Flight Data Processing	Controllers	Controller HMI Management
		A-FDP	Aerodrome Flight Data Processing	Flight Crew	Aircraft and Vehicle Datalink management.
IER-06.07.02-OSED-0002.0012	Virtual Stop Bar status	Surface Routing	Cleared taxi routes	A-FDP	Aerodrome Flight Data Processing
		A-FDP	Aerodrome Flight Data Processing	A-SMGCS (Guidance)	Surface Guidance
		A-SMGCS (Guidance)	Surface Guidance	Controllers	Controller HMI Management
		A-SMGCS (Guidance)	Surface Guidance	Airport Safety Nets	Conformance Monitoring
		A-FDP	Aerodrome Flight Data Processing	Flight Crew	Aircraft and Vehicle Datalink management.

429 Table 17: Relations between VSB related IERs and WP12 Functional Blocks

3 Interoperability Requirements

3.1 Requirements for ATS CNS/ATM Applications

The focus of the requirements found in this section is on the information used or produced by the operational services allocated to the OFA04.02.01 as described in the section 2. About requirements numbering, the following structure is adopted:

- Object type> is **REQ**
- <Project code> is **06.07.03**
- <Document code> is **INTEROP**
- <Reference number 1> reflects the services and the requirements:
  - GENR – to indicate general interoperability requirements
  - RGIP – Route Generation Integrated with Planning information
  - RPDY – Dynamic requirements for Route Generation Integrated with Planning information
  - AGLI – Airfield Ground Lighting
  - AGDY - Dynamic requirements for Route Generation Integrated with Planning information
  - DTAX – Data link
  - DLDY – dynamic requirements for data link
  - VBCL – virtual block control
  - VBDY – Dynamic for virtual block control
  - UNIQ – for unique characteristics
- <Reference number 2> is a sequence number for each series of requirements (in increments of 10).

3.1.1 General Interoperability Requirements

[REQ]

Identifier	REQ-06.07.03-INTEROP-GENR.0010
Requirement	The CS shall communicate with the sub-services via a standardised interface
Title	CS interaction with other systems
Status	<In Progress>
Rationale	In order to guarantee a communication between the CS and all sub-services it is necessary that the interfaces are standardised.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-INT1.0001	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A

3.1.2 Route Generation Integrated with Planning Information

3.1.2.1 Ground domain

3.1.2.1.1 Requirements for A-SMGCS Routing function

The A-SMGCS Routing function shall be able to receive the following information from the ground domain needed for the computation of aircraft and vehicles taxi routes and taxi times.

- Aerodrome Layout
- Runway and Taxiway status
- Taxiway configuration changes
- Standard Taxi Routes
- Intermediate Route Points
- Departure Information
- Arrival Information
- Initial and end Route Points for non-standard Taxi routes
- Tugged Aircraft Information
- Vehicle information
- Conditions for vehicle routing
- De-icing information: position, estimated time and aircraft de-icing status.
- Manual routes inputs
- Surveillance information

[REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0010
Requirement	The A-SMGCS Routing function shall receive aerodrome layout, including runways and taxiways.
Title	Aerodrome layout information
Status	<Validated>
Rationale	A description of the airport runways and taxiways layout in the aerodrome, as well as the connectivity between these elements is needed to generate routes.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0014	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0006	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0007	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0008	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGHM.0008	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGHM.0009	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0006	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0090	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0091	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0050	<Partial>

<SATISFIES>	<Information Exchange Requirements>	IER-06.07.02-OSED-0001.0001	<Full>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0020
Requirement	The A-SMGCS Routing function shall receive runway and taxiway status from the airport tower supervisor, as well as preferred taxiway directions when applicable on the aerodrome.
Title	Runway and Taxiway status
Status	<Validated>
Rationale	The current taxiway and runway status indicate the availability of airport ground resources when determining the aircraft's planned route.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0015	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0012	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0019	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0020	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0008	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0090	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0091	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0050	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0002	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0008	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0009	<Full>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0030
Requirement	The A-SMGCS Routing function shall receive the taxiway configuration changes.
Title	Taxiway configuration changes
Status	<Validated>
Rationale	The operational configuration of an airport will impact the traffic, and the A-SMGCS Routing function will assist the Controller in planning the traffic according to the new situation by providing proposals of new routes and automatically adjusting the taxi directions of taxiways that can only be used in one direction at a time.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0015	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0020	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0050	<Partial>

<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0009	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0019	<Full>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0040
Requirement	The A-SMGCS Routing function shall receive the route points defined by the Controller via the HMI.
Title	Intermediate Route points
Status	<Validated>
Rationale	The introduction of intermediate route points is needed for generating routes in manual or semi-automatic modes, allowing the definition of user-defined route segments.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0001	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0009	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0013	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0050	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0040	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0180	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0270	<Partial>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0050
Requirement	The A-SMGCS Routing function shall receive at least the following information for Departures: aircraft type, allocated stand/parking position, departure runway entry/holding point, TSAT (or TOBT if DMAN is not available), Flight Plan Identifier and, if de-icing procedures apply, de-icing type (on stand or remote), de-icing status, allocated de-icing bay and estimated de-icing time.
Title	Departure Information
Status	<Validated>
Rationale	The A-SMGCS Routing function requires, at least, the specified set of data in order to generate a Taxi-Out route for an aircraft.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0007	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0010	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0030	<Partial>

<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0004	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0006	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0007	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0011	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0012	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0013	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0020	<Full>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0060
Requirement	The A-SMGCS Routing function shall receive at least the following information for Arrivals: aircraft type (from the aircraft operator), allocated stand/parking position (from the stand planner), arrival runway exit (from EBS or Surveillance), TLDT (or ELDT if AMAN is not available, from the Airport CDM Project Manager) and Flight Plan identifier (from the Airport Flight Data Processing System).
Title	Arrival Information
Status	<Validated>
Rationale	The A-SMGCS Routing function requires, at least, the specified set of data in order to generate a Taxi-In route for an aircraft..
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0018	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0006	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0007	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0008	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0009	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0030	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0004	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0005	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0006	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0016	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0017	<Full>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0070
Requirement	The A-SMGCS Routing function shall receive at least the following information needed for generating a route for a tugged aircraft: aircraft type and identifier,

	origin stand/parking position and destination stand/parking position.
Title	Tugged Aircraft Information
Status	<In Progress>
Rationale	The A-SMGCS Routing function requires, at least, the specified set of data in order to generate a route for a tugged aircraft.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

509
510
511 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0030	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0250	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0004	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0006	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0016	<Full>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

512
513 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0080
Requirement	The A-SMGCS Routing function shall receive at least the following information needed for generating a route for a vehicle: identifier, origin position (gate, stand, parking position, runway entry/exit point, taxiway intersection, etc.), destination position (gate, stand, parking position, runway entry/exit point, taxiway intersection, etc.) and, for mobiles part of a moving entity, identifiers of the group of vehicles and of other mobiles in the group..
Title	Vehicles Information
Status	<Validated>
Rationale	The A-SMGCS Routing function requires, at least, the specified set of data in order to generate a route for a vehicle.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

514
515
516 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0017	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0030	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0006	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0020	<Full>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

517
518 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0090
Requirement	The A-SMGCS Routing function shall be able to receive surveillance

	information about on-ground mobiles position, speed and identity, for the computation of the remaining taxi time and the display of cleared taxi routes on the Controller HMI from the current mobile positions.
Title	Surveillance information
Status	<Validated>
Rationale	The integration of the A-SMGCS Routing and Surveillance functions will enable the computation of the remaining taxi time for aircraft that are taxiing and the appropriate display of cleared taxi routes starting from the current aircraft position on the Controller's CWP.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

519
520
521 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0023	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0001	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGHM.0019	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0015	<Full>
<ALLOCATED TO>	<Functional block>	Surface Routing	N/A
<APPLIES TO>	<Operational Focus Area>	OFA04.02.01	N/A

522
523 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0100
Requirement	The A-SMGCS Routing function shall send to the A-FDP the estimated unimpeded taxi time (EXOP or EXIT) associated to aircraft planned taxi routes.
Title	Planned Taxi-Out/Taxi-in Time provision to A-FDP
Status	<Validated>
Rationale	One of the major functions of the A-SMGCS Routing function is to calculate the taxi time associated to specific planned routes. These taxi times are stored by the A-FDP. The Ground domain (DMAN) uses the Taxi-Out times to compute the departure sequence.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

524
525 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0022	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0006	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0030	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0002	<Full>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES TO>	<Operational Focus Area>	OFA04.02.01	N/A

526
527
528 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0110
Requirement	The A-SMGCS Routing function shall send to the A-FDP updates to the estimated unimpeded taxi time (EXOP or EXIT) associated to aircraft planned taxi routes.
Title	Provision of updated Taxi-Out/Taxi-in Time to A-FDP
Status	<Validated>
Rationale	The A-SMGCS Routing function must regularly update the taxi time associated to specific routes, whether this update regards a planned route (new EXOP/EXIT) or a cleared route (remaining taxi time). The Ground domain

	(DMAN) uses these updated Taxi-Out times to update, and possibly recalculate, the departure sequence
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

529
530 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0022	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0024	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0006	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0030	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0002	<Full>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

531
532
533 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0120
Requirement	The A-SMGCS Routing function shall continuously send its status to the ground technical supervision system.
Title	Provision of status to supervision
Status	<Validated>
Rationale	The A-SMGCS Routing function is an operational system, whose availability is critical for other systems such as A-SMGCS Guidance and Safety nets. Its status must thus be monitored continuously by all relevant ATC personnel.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

534
535
536 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGHM.0014	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0010	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0020	<Partial>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

537
538 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0130
Requirement	The A-SMGCS Routing function shall send routes generated automatically or updated by the Controllers to the A-FDP.
Title	Provision of routes to A-FDP
Status	<Validated>
Rationale	The routes computed by the A-SMGCS Routing function have to be centralised by the A-FDP, which manages their status and distribute them to defined users within the Ground, Aircraft and Vehicle domains.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

539
540
541 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0007	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0008	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0009	<Partial>

<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0004	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0010	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0020	<Partial>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0140
Requirement	In case the A-SMGCS Routing function is not in a nominal state, it shall communicate the cause of this state to the supervision.
Title	Provision of reason for non-nominal status to supervision
Status	<Validated>
Rationale	The A-SMGCS Routing function is an operational system, whose availability is critical for other systems such as A-SMGCS Guidance and Safety nets. Appropriate information must be provided to technical supervisors to diagnose a failure of the A-SMGCS Routing function.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGHM.0014	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0010	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0020	<Partial>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0150
Requirement	The A-SMGCS Routing function shall receive notification that LVPs are in use.
Title	Reception of indication that LVPs are in use
Status	<In Progress>
Rationale	When LVPs are in use, routes generated for mobiles and the corresponding estimated taxi times may be different from CAVOK conditions.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0025	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0010	<Partial>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0160
Requirement	The A-SMGCS Routing function shall receive the requested type of de-icing (on stand, after push back or remote)
Title	Reception of de-icing type
Status	<In Progress>
Rationale	Depending on the type of de-icing requested by the Flight Crew, the route and/or the estimated taxi time is impacted.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0026	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0027	<Partial>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0170
Requirement	The A-SMGCS Routing function shall send to the A-FDP the estimated remaining taxi time, at specific moments depending on local implementations
Title	Remaining Taxi Time to A-FDP
Status	<Validated>
Rationale	This corresponds to the estimated remaining taxi time associated to the planned route. This is useful to assess possible changes on the departure sequence or influence other tactical actions by the Controllers. The sending of the remaining taxi time can be periodically (on a time basis) or based on specific events (for instance, taxi time differs over <time parameter to be determined> seconds).
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0023	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0180	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0010	<Full>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0180
Requirement	The A-SMGCS Routing function shall receive preferred taxiway directions when applicable on the aerodrome.
Title	Taxiway directions
Status	<Validated>
Rationale	The current taxiway status and preferred taxiway directions indicate the availability of airport ground resources when determining the aircraft's planned route.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0015	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0012	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0019	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0020	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0008	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0090	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0091	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0050	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0002	<Full>
<SATISFIES>	<Information Exchange	IER-06.07.02-OSED-0001.0008	<Full>

	Requirement>		
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0009	<Full>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

564
565 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0190
Requirement	The A-SMGCS Routing function shall regularly send its status to the Controller
Title	Provision of status to Controller
Status	<Validated>
Rationale	The A-SMGCS Routing function is an operational system, whose availability is critical for other systems such as A-SMGCS Guidance and Safety nets. Its status must thus be monitored continuously by all relevant ATC personnel.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

566
567
568 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGHM.0014	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0010	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0020	<Partial>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

569

570 ### 3.1.2.1.2 Requirements for A-FDP

571

572 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0200
Requirement	For airports equipped with remote de-icing bays, the A-FDP shall receive the de-icing position allocated to an aircraft requiring remote de-icing.
Title	Remote de-icing position information
Status	<In Progress>
Rationale	The need for remote de-icing and the allocated de-icing bay must be known to the A-FDP, as it is part of the departure aircraft data required by the A-SMGCS Routing function.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

573
574 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0030	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0050	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0012	<Partial>
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

575
576
577 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0210
Requirement	The A-FDP shall receive estimated de-icing times for aircraft requiring remote de-icing.

Title	Remote de-icing time information
Status	<In Progress>
Rationale	The estimated time required to perform remote de-icing must be known to the A-FDP, as it is part of the departure aircraft data required by the A-SMGCS Routing function.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

578
579
580 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0030	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0013	<Full>
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

581
582 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0220
Requirement	The A-FDP shall receive notifications of manual modifications to existing routes or manual creations of new routes.
Title	Ground route manual modifications
Status	<Validated>
Rationale	When a Controller modifies an existing route, or created a new route for a mobile, the A-FDP must transmit the user's actions to the A-SMGCS Routing function and associate this route to the mobile.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

583
584
585 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0001	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0013	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0016	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0001.0050	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0040	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0180	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0270	<Partial>
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

586
587 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0230
Requirement	For airports equipped with DMAN, the A-FDP shall receive the TSAT and TTOT for departing aircraft.
Title	Provision of TSAT and TTOT to A-FDP
Status	<Validated>
Rationale	The TSAT and TTOT must be known to the A-FDP, as it is part of the departure aircraft data required by the A-SMGCS Routing function
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

588
589 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0006	<Partial>

<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0001	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0011	<Full>
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

590
591
592 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0240
Requirement	For airports equipped with AMAN, the A-FDP shall receive the TLDT for arriving aircraft.
Title	Provision of ELDT to A-FDP
Status	<Validated>
Rationale	The ELDT must be known to the A-FDP, as it is part of the arriving aircraft data required by the A-SMGCS Routing function
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

593
594 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0006	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0001	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0016	<Full>
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

595
596
597 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0250
Requirement	The A-FDP shall receive the stand allocated to both arriving and departing aircraft.
Title	Provision of allocated stand to A-FDP
Status	<Validated>
Rationale	The stand allocated to arriving and departing aircraft must be known to the A-FDP, as it is part of the aircraft data required by the A-SMGCS Routing function
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

598
599 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0009	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0020	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0002	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0006	<Full>
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

600
601
602 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0260
Requirement	The A-FDP shall send the estimated unimpeded taxi time for each departing aircraft to DMAN when their planned route is generated.
Title	Provision of initial taxi times to DMAN
Status	<Validated>
Rationale	The initial estimated taxi time for a departing aircraft has to be provided to

	DMAN in order to establish the departure sequence.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

603
604 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0022	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0006	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0030	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0002	<Full>
<ALLOCATED TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<APPLIES TO>	<Operational Focus Area>	OFA04.02.01	N/A

605
606
607 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0270
Requirement	The A-FDP shall send the estimated unimpeded taxi time for each departing aircraft to DMAN when this taxi time is updated by the A-SMGCS Routing function.
Title	Provision of updated taxi times to DMAN
Status	<Validated>
Rationale	In case a new taxi time estimate is computed by the A-SMGCS Routing function, it has to be provided to DMAN in order to potentially update the departure sequence.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

608
609 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0022	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0024	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0006	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0002	<Full>
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

610
611
612 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0280
Requirement	The A-FDP shall send to DMAN the estimated remaining taxi time, at specific moments depending on local implementations
Title	Remaining Taxi Time to DMAN
Status	<Validated>
Rationale	This corresponds to the estimated remaining taxi time associated to the planned route. This is useful to assess possible changes on the departure sequence or influence other tactical actions by the Controllers. The sending of the remaining taxi time can be periodically (on a time basis) or based on specific events (for instance, taxi time differs over <time parameter to be determined> seconds).
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

613
614 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0023	<Partial>

<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0180	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0010	<Full>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

615

616 3.1.2.2 Aircraft domain

617 The A-SMGCS Routing function shall be able to receive the aircraft runway exit from the Aircraft
618 domain needed for the computation of aircraft taxi routes and taxi times.

619

620 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0290
Requirement	For aircraft equipped with a functioning EBS, the A-FDP shall be able to receive the predicted runway exit calculated by the EBS to be used as starting point of the planned taxi-in route.
Title	Runway exit computation by EBS
Status	<In Progress>
Rationale	The information computed by the on-board Enhanced Braking System and be downlinked to the A-FDP and used as the starting point for the generation of the planned route by the A-SMGCS Routing function.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

621
622 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0018	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0008	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0030	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0001.0005	<Full>
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

623
624
625 [REQ]

Identifier	REQ-06.07.03-INTEROP-RGIP.0300
Requirement	The reception of the runway exit issued by the aircraft Enhanced Braking System shall be possible even after a planned taxi-in route has been allocated to a specific aircraft.
Title	Runway exit computation by EBS
Status	<In Progress>
Rationale	In the event the aircraft Enhanced Braking System downlinks the runway exit after the Taxi In route has been allocated, the A-SMGCS Routing function shall take the provided runway exit into account in the computation of the updated route.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

626
627 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0018	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0008	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0030	<Partial>
<SATISFIES>	<Information Exchange	IER-06.07.02-OSED-0001.0005	<Full>

	Requirement>		
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

628

629 ### 3.1.3 AGL Interoperability Requirements

630 [REQ]

Identifier	REQ-06.07.03-INTEROP-AGLI.0010
Requirement	The CentS shall be capable of sending commands to control the TCL light segments, stop bars and relevant signs at the particular airport.
Title	CentS interaction with other systems 1
Status	<Validated>
Rationale	On airports, a multitude of different lighting elements may be found, sometimes even mixed in a single circuit. Consequently the CentS has to deal with lights of different manufacturers at the same time.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	

631
632
633 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-AGLG.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-AGLG.0003	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Lighting Management	N/A

634 [REQ]

Identifier	REQ-06.07.03-INTEROP-AGLI.0020
Requirement	The commands shall enable the lights to be switched on and off and to set their intensity.
Title	CentS interaction with lights 1
Status	<Validated>
Rationale	On airports, a multitude of different TCLs may be found, sometimes even mixed in a single circuit. Consequently the CentS has to deal with lights of different manufacturers at the same time.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	

635
636 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-AGLG.0004	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-AGLG.0008	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Lighting Management	N/A

637
638 [REQ]

Identifier	REQ-06.07.03-INTEROP-AGLI.0030
Requirement	The CentS shall be capable to receive monitoring information about the status of the lights (off/on+intensity/unserviceable).
Title	CentS interaction with lights 2
Status	<Validated>
Rationale	On airports, a multitude of different TCLs may be found, sometimes even mixed in a single circuit. Consequently the CentS has to deal with lights of different manufacturers at the same time.
Category	<Interoperability>

Validation Method	<Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-AGLG.0004	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Lighting Management	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-AGLI.0040
Requirement	The CentS shall be able to process all relevant information sent by other A-SMGCS components and by the A-CWP via the A-FDP.
Title	CentS interaction with other systems 2
Status	<Validated>
Rationale	Since it is a basic requirement that the CentS is able to integrate with other A-SMGCS components and with the A-CWP it is important that the CentS is also able to process the different data types which vary between the different systems of the multiple manufacturers.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-AGLG.0003	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Lighting Management	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-AGLI.0050
Requirement	The CentS shall be able to exchange guidance information with mobile end devices.
Title	CentS Information Exchange
Status	<Validated>
Rationale	The end devices shall register with the CentS upon arrival at the airport or when activated. As the Ground Service may be manufactured by different industrial partners, all the layers defined in this document need an interoperability specification so that the data format and other important things such as refresh rate, etc. are fixed
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-AGLG.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-AGLG.0003	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Lighting Management	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-AGLI.0060
Requirement	The CentS shall be able to exchange information (bi-directionally) with the Sub-Services through the Communication Service.
Title	Use of Communication Service
Status	<Validated>

Rationale	The Communication Service is an AGL sub-service that provides a physical data link between the system components.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-AGLG.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-AGLG.0004	<Partial>
<APPLIES TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED TO>	<Functional block>	Ground Lighting Management	N/A

655 ## 3.1.4 Provision of planned and cleared route to mobile by Data Link

656 ### 3.1.4.1 Aircraft and vehicle domains

657 All the planned and cleared taxi routes are sent by the A-SMGCS Routing function to the Aerodrome
658 Flight Data Processing FB which is, then, responsible for their distribution to the Aircraft and Vehicle
659 Datalink Management.

660

661 [REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0010
Requirement	The Aerodrome Flight Data Processing shall be able to send the planned routes to the aircraft domain.
Title	Planned Routes provision to Aircraft domain
Status	<Validated>
Rationale	One of the major functions of the A-SMGCS Routing function is to provide, via the Aerodrome Flight Data Processing, planned routes to the defined users via D-TAXI.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

662
663
664 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0007	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0050	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0180	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0190	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0001	<Full>
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

665
666 [REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0020
Requirement	The Aerodrome Flight Data Processing shall be able to send the cleared routes for each mobile to the Surface Guidance and Conformance Monitoring functional blocks .
Title	Cleared routes provision to Ground domain
Status	<Validated>
Rationale	The integration of the A-SMGCS Routing function with the A-SMGCS Guidance function and aerodrome safety nets is a key functionality of the A-SMGCS. The A-SMGCS Guidance function will guide the Flight Crew through the cleared taxi route, whereas the control function will monitor actual against cleared aircraft positions and raise alerts triggered by aircraft deviations during routing.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

667
668 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0007	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0004	<Partial>

<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0002	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0009	<Full>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0006	<Full>
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

669
670
671 [REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0030
Requirement	The Aerodrome Flight Data Processing shall send a taxi route revision to aircraft and vehicle domains upon manual modification by Controllers.
Title	Provision of taxi route updates to mobiles domain
Status	<In Progress>
Rationale	In case the Controller manually changes an existing taxi route, a revision of this taxi route has to be provided to the A-SMGCS Guidance function, in order to be sent to the mobile via data link or to command the AGL system.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

672
673 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGED.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0007	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0004	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0001	<Full>
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

674
675
676 [REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0040
Requirement	ATSU Systems **shall** conduct the D-TAXI sub-services with Case A regarding the involvement of the Controller: **Case A** The Controller is involved in the D-TAXI transaction. (At least the controller has to validate the proposed clearance).
Title	Controller is involved in the D-TAXI transaction
Status	<Validated>
Rationale	At this step, the assumption is the Controller is still in the loop (not fully automatic mode). This requirement could be changed in next SESAR steps.
Category	<Interoperability>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

677
678 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0401	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A

679
680 [REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0050
Requirement	The Aerodrome Flight Data Processing and the Aircraft and Vehicle Datalink Management functional blocks shall be able to handle the CPDLC message set

	used for D-TAXI services in a single or in a multi-elements message.
Title	D-TAXI message set
Status	<In Progress>
Rationale	This message set was already defined regarding the planning of the route and shall be the same for the execution of the route.
Category	<Interoperability>
Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0060
Requirement	The routing information contained in D-TAXI messages shall be consistent with the airport's AIP (taxiway names, holding point names and category, etc.)
Title	Routing information used in D-TAXI message contained in AIP
Status	<In Progress>
Rationale	The Flight Crew shall be able to check and understand the Controller information and clearances using airport charts in order to navigate on the airport.
Category	<Interoperability>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0070
Requirement	Ground and on-board databases using the routing information contained in D-TAXI messages (taxiway names, holding point names and category, etc…) shall have the same definition based on standardised aerodrome map data, e.g. ED-99 AMDB,
Title	Routing information consistent in ground and on-board database.
Status	<In Progress>
Rationale	The Flight Crew shall be able to check and understand Controller information and clearances using airport charts in order to navigate on the airport.
Category	<Interoperability>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-INT1.0001	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0080
Requirement	The implementation of all timers shall be as follows: GND / Airborne tr: No / No ttr: Yes / No tts: Yes / No t-CPDLC-end: No / N/A
Title	Mandatory implementation of timers
Status	<In Progress>
Rationale	These timers are a first proposal which need to be validated.
Category	<Interoperability>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

694

695 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A

696

697 [REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0090
Requirement	The values of timers shall be set to values as follows: GND / Airborne tr: 20 sec / 20 sec ttr: cf. below / N/A tts: cf. below / cf. below t-CPDLC-end: cf. below / N/A D-TAXI transaction context — Timer value Start-up — 45s Push-back — 45s Update and simple taxi-out instruction — 45s Simple taxi-in instruction — 45s Simple arrival expected taxi route — 45 s Holding position instruction — 45 s Complex taxi in instruction () — 100 s Complex arrival expected taxi route () — 100 s Departure expected taxi route — 180s Complex taxi-out instruction — 180s Complex taxi route contains more than a single taxiway.
Title	D-TAXI Timer values
Status	<In Progress>
Rationale	These timers are a first proposal which need to be validated.
Category	<Interoperability>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

698

699 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Data Link Management	N/A

700

701 [REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0100
Requirement	The timer expiration shall be processed as follows: GND / Airborne tr: Notification / Notification Cancellation of subsequent LACK / Cancellation of subsequent LACK ttr: Notification / not defined tts: * cf. below / * cf. below t-CPDLC-end: abort / N/A CPDLC connection *: Notification, revert to alternate procedures (e.g., voice) to complete the dialogue, technically the dialogue remains open, Validity of clearance.
Title	D-TAXI timer expiration
Status	<In Progress>
Rationale	For safety and performance purposes, any taxi instruction has to be answered in due time and Controller has to be aware if no answer has been received in due time
Category	<Interoperability>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

702

703 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02OSED-DTXI.0003	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Data Link Management	N/A

704

705

706 [REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0110
Requirement	The tr Timer life cycle shall be as follows: GND / Airborne Timer set: Downlink Lmessage sent / Uplink Lmessage sent Timer reset: N/A / N/A Timer cancel: Reception of LACK / Reception of LACK
Title	tr timer life cycle.
Status	<In Progress>
Rationale	Timers are needed to warn the Controller if they haven't received an answer. These timers are a first proposal which need to be validated.
Category	<Interoperability>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

707

708 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Data Link Management	N/A

709 [REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0120
Requirement	The ttr timer life cycle shall be as follows: GND / Airborne Timer set: Downlink Rmessage received / Uplink Lmessage sent

	Timer reset	N/A	N/A
	Timer cancel	Uplink message in response to Rmessage	N/A
Title	ttr timer life cycle.		
Status	<In Progress>		
Rationale	Timers are needed to warn the Controller if they haven't received an answer. These timers are a first proposal which need to be validated.		
Category	<Interoperability>		
Validation Method	<Expert Group (Judgement Analysis)>		
Verification Method			

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Data Link Management	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0130		
Requirement	The tts timer life cycle shall be as follows:		
		GND	Airborne
	Timer set	Uplink Rmessage sent	Downlink Rmessage sent
	Timer reset	Downlink STANDBY received	Uplink STANDBY received
	Timer cancel	Downlink message in response to Rmessage received	Downlink message in response to Rmessage received
Title	tts timer life cycle		
Status	<In Progress>		
Rationale	Timers are needed to warn the Controller if they haven't received an answer. These timers are a first proposal which need to be validated.		
Category	<Interoperability>		
Validation Method	<Expert Group (Judgement Analysis)>		
Verification Method			

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Data Link Management	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0140		
Requirement	The t-CPDLC-end Timer shall be as follows:		
		GND	Airborne
	Timer set	CPDLC-end request sent	N/A
	Timer reset	N/A	N/A
	Timer cancel	Reception of the answer from aircraft	N/A
Title	t-CPDLC-end		
Status	<In Progress>		
Rationale	Timers are needed to warn the Controller if they haven't received an answer. These timers are a first proposal which need to be validated.		
Category	<Interoperability>		
Validation Method	<Expert Group (Judgement Analysis)>		
Verification Method			

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Data Link Management	N/A

720
721 [REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0150
Requirement	The use of D-TAXI service over CPDLC application shall follow the rules & recommendation described in EUROCAE Standard ED-229A [13].
Title	D-TAXI message sequences
Status	<Validated>
Rationale	For worldwide interoperability and standardisation, the use of D-TAXI service needs to be as is described by the respective standardisation working groups.
Category	<Interoperability>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

722
723 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-INT1.0001	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Data Link Management	N/A

724
725 [REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0160
Requirement	The ground and on-board AMDB (airport mapping database) shall be updated at the same time, following AIRAC cycles.
Title	Routing information consistent in ground and on-board database.
Status	<In Progress>
Rationale	The Flight Crews, Vehicles Drivers and Controllers should have the same up-to-date databases
Category	<Interoperability>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

726
727 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.02-DOD-INT1.0001	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Data Link Management	N/A

728
729
730 [REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0170
Requirement	The Aerodrome Flight Data Processing functional block shall send via data link taxi route clearances containing all airport elements composing the taxi route.to the Aircraft and Vehicle Datalink Management FB
Title	Completeness of taxi route clearance uplink
Status	<Validated>
Rationale	So as to avoid a different graphical representation on board in case of any gap in the taxi route, the data link ground clearances shall be issued by the ATC at a level of detail sufficient to ensure that the cleared route is unique and unambiguous when referenced to Airport Map features
Category	<Interoperability>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

731

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Data Link Management	N/A

3.1.4.2 Aircraft domain specific

The A-SMGCS Routing function shall be able to provide the estimated taxi time associated to planned routes to the aircraft domain.

[REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0180
Requirement	The Aerodrome Flight Data Processing shall be able to send the estimated unimpeded taxi time (EXOP and EXIT) associated to an aircraft ground route to the defined users of the aircraft domain.
Title	Planned Taxi-Out and Taxi-In Time provision to aircraft domain
Status	<In Progress>
Rationale	Flight deck could use the Taxi-Out time to determine whether one engine taxi-out can be performed.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-SPR-0002.0030	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0002	<Full>
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0190
Requirement	The on-board aircraft system shall display textually all the datalink taxi uplink messages received.
Title	Textual display of datalink taxi instructions
Status	<Validated>
Rationale	To ensure interoperability On top of that display, the on-board aircraft system should display graphically on airport moving map all the valid datalink taxi routes received
Category	<Interoperability>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Data Link Management	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DTAX.0200
Requirement	The on-board vehicle system shall display textually all the datalink taxi uplink messages received.

Title	Textual display of datalink taxi instructions on the vehicle display
Status	<In Progress>
Rationale	To ensure interoperability, on top of that display, the on-board vehicle system should display graphically on airport moving map all the valid datalink taxi routes received
Category	<Interoperability>
Validation Method	<Expert Group (Judgement Analysis)>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0004	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Data Link Management	N/A

3.1.5 Virtual Block Control

[REQ]

Identifier	REQ-06.07.03-INTEROP-VBCL.0010
Requirement	The Aerodrome Flight Data Processing shall be able to send the clearance limit corresponding to a Virtual Stop Bar position to the defined users of aircraft domains.
Title	VSB as clearance limit provision
Status	<Validated>
Rationale	Clearance limit corresponding to Virtual Stop Bars One is to be distributed to the concerned users.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-VBCL.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-VBCL.0014	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0011	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0012	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink management	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-VBCL.0020
Requirement	The Aerodrome Flight Data Processing shall send a revision of clearance limit corresponding to a Virtual Stop Bar position to the defined users of aircraft and vehicle domains.
Title	Provision of VSB position as update of clearance limit update
Status	<Validated>
Rationale	In case the Controller manually changes the issued clearance limit corresponding to a Virtual Stop Bar, the related revision has to be provided to the A-SMGCS Guidance function and, then, distributed to the concerned users.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

758

759 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-VBCL.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-VBCL.0014	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0011	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0012	<Partial>
<ALLOCATED TO>	<Functional block>	Aerodrome Flight Data Processing	N/A
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink management	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

760

761 [REQ]

Identifier	REQ-06.07.03-INTEROP-VBCL.0030
Requirement	The Aerodrome Flight Data Processing shall be able to send the clearance limit corresponding to a Virtual Stop Bar position to the A-SMGCS Guidance function, for distribution to the Controllers' HMI
Title	VSB as clearance limit provision to the Controllers' HMI
Status	<Validated>
Rationale	Clearance limit corresponding to Virtual Stop Bars One is to be distributed to the concerned users.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

762

763 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-VBCL.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-VBCL.0014	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0011	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0012	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED TO>	<Functional block>	Surface Guidance Management	N/A
<ALLOCATED_TO>	<Functional block>	Controller HMI Management	N/A

764

765

766 [REQ]

Identifier	REQ-06.07.03-INTEROP-VBCL.0040
Requirement	The Aerodrome Flight Data Processing shall send a revision of clearance limit corresponding to a Virtual Stop Bar position to the A-SMGCS Guidance function when the Controller manually modifies it, for distribution to the Controllers' HMI
Title	Provision of VSB position as update of clearance limit update to the Controllers' HMI
Status	<Validated>
Rationale	In case the Controller manually changes the issued clearance limit corresponding to a Virtual Stop Bar, the related revision has to be provided to the A-SMGCS Guidance function and, then, distributed to the concerned users.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

767

768 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-VBCL.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-VBCL.0014	<Partial>
<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0011	<Partial>

<SATISFIES>	<Information Exchange Requirement>	IER-06.07.02-OSED-0002.0012	<Partial>
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management	N/A
<ALLOCATED_TO>	<Functional block>	Controller HMI Management	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

3.2 Dynamic functions / operations

This section collects any interoperability requirements for the dynamic aspects related to the applications in the context of the A-SMGCS Routing and Guidance functions. These interoperability requirements should cover the timing and specific exchange sequences for logging on and establishing technical connectivity, and conducting operational message exchanges, as well as other dynamic aspects of using and managing the applications used.

Most dynamic aspects related to the A-SMGCS Routing and Guidance functions are associated to:

- The availability of input data for the generation of routes and the time they can be generated in relation with the airport CDM process;
- The availability of input data for both the display of cleared routes on mobiles display and the switching off / on of the Airfield Ground Lighting system (AGL) and the time they can be generated.
- The communication between the airport ATSU and the mobiles on the aerodrome surface, as it relies on data link exchanges and requires the application of specific communication protocols that are either already defined (i.e. CPDLC for aircraft) or under definition (i.e. data link for vehicles).

3.2.1 Route Generation Integrated with Planning Information

3.2.1.1 Missing Route Information

[REQ]

Identifier	REQ-06.07.03-INTEROP-RPDY.0010
Requirement	If a Controller selects on the CWP a mobile for which there is no taxi route available, the A-SMGCS Routing function shall inform the CWP that no route is available for this mobile and which data is missing
Title	Notification in case of route unavailability
Status	<In Progress>
Rationale	A Controller trying to display a route that has not yet been generated must be informed that this route is not available and why.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0013	<Full>
<ALLOCATED_TO>	<Functional block>	Surface Routing	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

3.2.2 AGL

[REQ]

Identifier	REQ-06.07.03-INTEROP-AGDY.0010
Requirement	Once received updated surveillance data, the CentS shall accordingly update the AGL lights status along the assigned route in less than <time parameter to be defined>.
Title	Availability of the same information
Status	<Validated>
Rationale	In order to guarantee the availability of the same information for all sub-services at the same time.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-AGLG.0002	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED TO>	<Functional block>	Ground Lighting Management	N/A

3.2.3 Provision of planned and cleared route to mobile by Data Link

The requirements defined in this section assume CPDLC is the communication means to support exchanges around planned and cleared routes between the Ground and Aircraft domains. Consequently, these requirements frequently refer to standardisation material developed jointly by RTCA SC214 and EUROCAE WG78. Notably, the D-TAXI message elements composing CPDLC messages are described through their identifiers in the Safety and performance standard for Baseline 2 ATS data communications [12].

DM (Downlink Message) indicates a message element from the Aircraft Domain sent to the Ground Domain, while UM (Uplink Message) indicates a message element from the Ground Domain sent to the Aircraft Domain.

About the provision of ground instructions to the vehicles via data link, no interoperability requirements are defined in this document as the related operational concept has not achieved the V3 maturity level at the end of R5 timeframe. Therefore, further analysis about vehicles related concept will be executed during the SESAR 2020 horizon.

3.2.3.1 Data link connection establishment

[REQ]

Identifier	REQ-06.07.03-INTEROP-DLDY.0010
Requirement	The Data Link Initiation Capabilities (DLIC) service shall be put in place between ATC ground and mobile systems in order to ensure the exchange of data link communications.
Title	Data link initiations capabilities service
Status	<Validated>
Rationale	The DLIC service provides the log-on procedure to the ATN and exchanges the required application information. The related operational message sequence is illustrated in the ICAO Manual Of Air Traffic Services – Data link Applications (cf. [17]).
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0101	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Data Link Management	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DLDY.0020
Requirement	CPDLC connection between data link-equipped aircraft and the airport ATSU shall be established and managed as defined by RTCA SC214/EUROCAE WG78 in its Interoperability Requirements Standard for Baseline 2 ATS Data Communication ED-229A.
Title	CPDLC connection establishment
Status	<Validated>
Rationale	Aircraft need to have established a CPDLC connection with the airport ATSU before being able to receive route information with this means of communication.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGAU.0014	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DLDY.0030
Requirement	The airport ATSU shall have the ability to send CPDLC messages to aircraft planned to land at this airport and to receive CPDLC messages from these aircraft while they are under the responsibility of another ATSU (TMA or en-route).
Title	CPDLC connection with aircraft in distant ATSU
Status	<In Progress>
Rationale	An aircraft may be controlled by an approach or en-route control centre at the time the planned route has to be sent to this aircraft and an appropriate channel must exist to convey data link messages between the airport and the aircraft.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DLDY.0040
Requirement	In a data link environment, according to their capabilities and services implemented, mobile end devices shall display all the guidance information

	after less than <time parameter to be defined [s]> they have been received on board.
Title	Provision of data link clearance
Status	<In Progress>
Rationale	In order to guarantee the availability of the same information for all sub-services at the same time.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGIN.0004	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Ground Datalink Management	N/A

3.2.3.2 Outbound flights

[REQ]

Identifier	REQ-06.07.03-INTEROP-DLDY.0050
Requirement	The Guidance function shall send planned routes via CPDLC to departing aircraft at the same time as the departure clearance, using concatenated message elements UM305 (EXPECT TAXI) and UM73R.
Title	Provision of planned route to departing aircraft
Status	<Validated>
Rationale	The planned route is sent to departing aircraft with the departure clearance provided by the Tower Clearance Delivery Controller
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DLDY.0060
Requirement	The Guidance function shall send revised planned routes via CPDLC to departing aircraft, using concatenated message elements UM249 REVISED and UM305 EXPECT TAXI.
Title	Provision of revised planned route to departing aircraft
Status	<Validated>
Rationale	Changes to a planned route that has already been sent must be provided to the Flight Crew with an indication that it is revised routing information.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0012	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A

<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DLDY.0070
Requirement	The Guidance function shall not send a planned route and a revision to a planned route to a departing aircraft later than a locally configurable time before TSAT (or TOBT if DMAN is not available).
Title	Time limit on provision of planned route to departing aircraft
Status	<Validated>
Rationale	Planned routes must not be sent too close to the time when the Flight Crew will receive their taxi clearance in order to not generate additional workload for limited benefit to the Flight Crew.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0001	<Full>
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DLDY.0080
Requirement	Start-up approval shall be sent via CPDLC using an UM302 (START-UP APPROVED) message, upon reception of a request in a DM134 (REQUEST START-UP) message.
Title	Provision of start-up approval
Status	<Validated>
Rationale	Start-up approval is sent upon reception of a request from the aircraft.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0200	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0201	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DLDY.0090
Requirement	Push-back approval shall be sent via CPDLC using an UM304 (PUSHBACK APPROVED) message, upon reception of a request in a DM131 (REQUEST PUSHBACK) message.
Title	Provision of push-back approval
Status	<Validated>
Rationale	Push-back approval is sent upon reception of a request from the aircraft.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0300	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0301	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DLDY.0100
Requirement	Taxi clearance shall be sent via CPDLC using an UM308 (TAXI) message, upon reception of a request in a DM135 (REQUEST TAXI) message.
Title	Provision of taxi clearance
Status	<Validated>
Rationale	Taxi clearance is sent upon reception of a request from the aircraft.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0400	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0401	<Partial>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DLDY.0110
Requirement	Revised taxi route shall be sent via CPDLC to both departing and arriving aircraft, using concatenated message elements UM249 REVISED and UM308 TAXI.
Title	Provision of revised taxi route
Status	<In Progress>
Rationale	Changes to a taxi route that has already been sent must be provided to the Flight Crew with an indication that it is revised routing information.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0407	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A

3.2.3.3 Inbound flights

[REQ]

Identifier	REQ-06.07.03-INTEROP-DLDY.0120
Requirement	The Guidance function shall send planned routes via CPDLC, using an UM305 (EXPECT TAXI) message, to arriving aircraft upon reception of a request in a DM136 (REQUEST EXPECTED TAXI ROUTING) message.
Title	Provision of planned route to arriving aircraft
Status	<Validated>
Rationale	The planned route is sent to arriving aircraft upon reception of a request from the aircraft.
Category	<Interoperability>
Validation Method	<Real Time Simulation>

Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DLDY.0130
Requirement	The Guidance function shall send revised (UM249 REVISED) planned routes (UM305 EXPECT TAXI) via CPDLC to arriving aircraft, using concatenated message elements.
Title	Provision of revised planned route to arriving aircraft
Status	<In Progress>
Rationale	Changes to a planned route that has already been sent must be provided to the Flight Crew with an indication that it is revised routing information.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-RGGE.0012	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DLDY.0140
Requirement	If a Flight Crew requests a planned (DM136 REQUEST EXPECTED TAXI ROUTING) or cleared (DM135 REQUEST TAXI) route that has not yet been generated by the A-SMGCS Guidance function due to unavailability of required data, the A-SMGCS Guidance function shall reply that it is unable to meet the request (UM0 UNABLE).
Title	Flight Crew requesting unavailable route
Status	<In Progress>
Rationale	A Flight Crew who has sent a request for a planned route shall be informed in case it has not yet been generated
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

[REQ]

Identifier	REQ-06.07.03-INTEROP-DLDY.0150
Requirement	The Guidance function shall not send a planned route and a revision to a planned route to an arriving aircraft later than a locally configurable time before TLDT (or ELDT if AMAN is not available).
Title	Time limit on provision of planned route to arriving aircraft

Status	<In Progress>
Rationale	Planned routes should not be sent too late during approach as Sterile Cockpit procedures would prevent the Flight Crew from using this information.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0001	<Full>
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

3.2.4 Virtual Block Control

This section identifies interoperability requirements for the dynamic aspects related to the implementation of the Virtual Block Control.

The Virtual Block Control investigated during SESAR 1 timeframe is based on the use of Virtual Stop Bars at pre-defined positions (i.e. Virtual Stop Bars linked to already existing intermediate holding position). Therefore, the dynamic aspect addressed by the below requirement concerns the update of VSB status and its visualization on the Controllers' HMI.

[REQ]

Identifier	REQ-06.07.03-INTEROP-VBDY.0010
Requirement	Upon reception of the issued clearance limit, Surface Guidance shall update the status of the corresponding VSB for its distribution to the Controllers' HMI
Title	Distribution of VSB status
Status	<In Progress>
Rationale	The updated status of VSBs shall be displayed on the Controllers' HMI
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-VBCL.0008	<Full>
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A
<ALLOCATED_TO>	<Functional block>	Surface Guidance	N/A

3.3 Unique characteristics

This section reports unique characteristics required to ensure that all mobiles and ground system elements of the CNS/ATM system can interoperate. The main unique characteristics related to the Guidance function concern the lack of a standard regarding the datalink application for vehicles. Although the requirements described in the previous section assume CPDLC D-TAXI will be the primary communication means for the provision of routing information to aircraft, it is also foreseeable that some airports and airlines will not deploy CPDLC technology or that a transition period will be required for those airports deploying it. In these cases, it is nonetheless possible to provide Flight Crews with part of the benefits expected from the provision of planned route information prior to taxiing, using the existing ACARS technology which is widely deployed on European airports to send digital departure clearances to aircraft (i.e. DCL service). The format for the departure clearance

912 uplink described in EUROCAE ED-85A [23] defines an optional free text field of up to 80 characters,
913 which could be used to describe a planned taxi-out route.

914 Currently, different datalink applications are being used and there is no standard communication
915 protocol to be adhered to. Since vehicles usually operate at one airport only, the data link mainly
916 needs to be compatible with the IT architecture of the respective datalink provider.

917

918 [REQ]

Identifier	REQ-06.07.03-INTEROP-UNIQ.0010
Requirement	The Guidance function may send planned routes via ACARS, using the optional free text field of the departure clearance uplink (DCL) message.
Title	Provision of planned route to departing aircraft via ACARS
Status	<In Progress>
Rationale	The planned route can be sent to departing aircraft with the departure clearance using the DCL data link service.
Category	<Interoperability>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

919

920 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

921

922

Identifier	REQ-06.07.03-INTEROP-UNIQ.0020
Requirement	The data link used to transfer data to and from vehicles to any central system or service shall be compatible with the existing IT architecture.
Title	IT architecture compatibility
Status	<In Progress>
Rationale	To ensure that the needed data can be sent to vehicles.
Category	<Interface><Interoperability>
Validation Method	<Expert Group (Judgement Analysis)><Real Time Simulation>
Verification Method	

923

924 [REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-06.07.02-OSED-DTXI.0003	<Full>
<ALLOCATED_TO>	<Functional block>	Aircraft and Vehicle Datalink Management	N/A
<APPLIES_TO>	<Operational Focus Area>	OFA04.02.01	N/A

925

4 References

4.1 Applicable Documents

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

[1] Template Toolbox 03.00.00
https://extranet.sesarju.eu/Programme%20Library/SESAR%20Template%20Toolbox.dot

[2] Requirements and V&V Guidelines 03.00.00
https://extranet.sesarju.eu/Programme%20Library/Requirements%20and%20VV%20Guidelines.doc

[3] Templates and Toolbox User Manual 03.00.00
https://extranet.sesarju.eu/Programme%20Library/Templates%20and%20Toolbox%20User%20Manual.doc

[4] EUROCONTROL ATM Lexicon
https://extranet.eurocontrol.int/http://atmlexicon.eurocontrol.int/en/index.php/SESAR

4.2 Reference Documents

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

[5] ED-78A Guidelines for Approval of the provision and use of Air Traffic Services supported by Data Communications

[6] ICAO Doc 9694, Manual Of Air Traffic Services Data Link Applications, 1st Edition 1999

[7] ICAO Doc 9476, Manual of Surface Movement Guidance and Control Systems (SMGCS), 1st Edition 1986, 2nd Amdt 1987

[8] ICAO, Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Manual, Doc 9830, First Edition, 2004

[9] ICAO Annex 14, 6th Edition 2013, Vol. I 11th Amdt.

[10]EMMA2, ATM Interoperability Document 2-D1.2.1, version 1.0. 2008

[11]SESAR, DEL-06.07.02-D46 OFA04.02.01 Final OSED, Edition 00.01.00, 08/09/2016
OFA04.02.01 Final OSED - P06.07.02 D46

[12]Safety and Performance Standard for Baseline 2 ATS Data Communications (Baseline 2 SPR Standard), ED-228, March 2014

[13]Interoperability Requirements Standard for Baseline 2 ATS Data Communications (Baseline 2 Interop Standard), ED-229, March 2014

[14]European airport Movement Management by A-SMGCS, Part 2, (EMMA2), Final seminar, Paris 14th April 2008 (Integrated project of the 6th Framework Program of the European Commission)

[15]SESAR DEL-06.07.02-D79-Preliminary INTEROP, Edition 00.00.02, 2015

[16]SESAR DEL-06.03.01-D149-Consolidated DEL Release 5 Validation Report (with P06.09.02 T1031), Edition 00.01.00, September 2nd 2016
Release 5 Validation Report

[17]ICAO GOLD, Global Operational Data Link Document, Second Edition, 26 April 2013

[18]SESAR DEL-12.01.07-D30 Step1 Airport Technical Architecture Description, Edition 00.02.00, 17/06/2016
Step 1 Airport Technical Architecture Description

[19]SESAR DEL-06.02-D122 Step 1 Airport DOD 2014 Update, Edition 00.01.01, 31/03/2015
Step 1 Airport DOD Update 2014

[20]B.04.03, ADD SESAR 1 Edition, D128, Edition 00.01.00, 11/07/2016
B.04.03 ADD SESAR 1

[21]06.08.02, Operational Service and Environment Definition (OSED), D09, 00.02.00, 04/02/2013
https://extranet.sesarju.eu/WP_06/Project_06.08.02/Project%20Plan/Deliverables/Intermediate%20OSED/6%2008%2002_D009_Intermediate%20OSED_v02.doc

[22]06.06.02, De-icing Step1 V2 OSED, D01, 00.01.01, 03/07/2012
https://extranet.sesarju.eu/WP_06/Project_06.06.02/Project%20Plan/OSED/P06_06_02_D01_De-icing_Step_1_V2_OSED_00_01_01.doc

[23]EUROCAE, Data-link application system document (DLASD) for the “Departure Clearance” data-link service, ED-85A, December 2003

[24]P06.07.02 Phase 2 Preliminary INTEROP for advanced surface Routing, D79, Edition 00.01.00, 23/10/2015
Phase 2 Preliminary INTEROP for advanced surface Routing

[25]P06.07.03 Preliminary technical feasibility and interoperability development Phase 2, D65, Edition 00.01.00, 06/08/2015
Phase 2 Preliminary INTEROP for advanced surface guidance

[26]P06.07.02 OFA04.02.01 (Integrated Surface Management) Final SPR, D45, Edition 00.01.00, 16/09/2016
OFA04.02.01 Final SPR

[27]EUROCAE, Minimum Aviation System Performance Specification for Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Levels 1 and 2, ED-87C, January 2015

Appendix B OFA04.02.01 Contributions to standardisation activities

EUROCAE WG-41 (Surface Movement Guidance and Control Systems)

The definition of the A-SMGCS Routing function envisaged the involvement of WG-41 (Surface Movement Guidance and Control Systems). In detail, ad hoc meetings have been organized to investigate how to link WG-41 activities and the SESAR ones, notably on the A-SMGCS Routing function. WG-41 has identified and requested to the SJU the SESAR documents which will be used as an input for the development of new A-SMGCS Minimum Aviation System Performance Standards (MASPS) ([27]) which will include the two A-SMGCS functions retained in the PCP (Routing and Safety nets for controllers).

Standardisation issues raised also about the implementation of the AGL as guidance means. In detail, no standardised wording exists for the guidance via AGL and, therefore, appropriate standardization bodies are required to address the issue and provide a solution (e.g. it should be defined in the ICAO PANS-ATM, Doc. 4444). Furthermore, the AGL "Follow-the-Greens" service is being incorporated in the new A-SMGCS Specification Document being elaborated by EUROCONTROL in collaboration with EUROCAE WG 41 as result of the revision of the A-SMGCS Implementation Package.

EUROCAE WG-78/RTCA SC-214 (Standards for Air Traffic Data Communication Services)

About the implementation of the “provision of planned and cleared route to mobile via data link”, the related operational concept relies on the D-TAXI service of the CPDLC application according to the standard format defined by the joint standardisation groups RTCA and EUROCAE (respectively through SC214 and WG-78). SESAR had set up coordination with SC-214/WG-78 during the development of these documents to provide the standardisation group with early validation results and guide the definition and, then, the implementation of the D-TAXI service.

Coordination was initiated early by project 09.13, in coordination with project 06.07.02. It consisted first of analysing WG-78’s draft SPR & OSED and deriving recommendations on changes to the set of D-TAXI messages (thus ensuring compatibility with 06.07.02 and 06.07.03 operational concepts).

In parallel, one of the verification objectives addressed with 09.13 initial package mock-ups (both regional & mainline) was to assess the initial set of WG78 D-TAXI messages and produce additional recommendations.

These recommendations were communicated to WG-78 through a position paper in May 2011.

This coordination effort was maintained in the following years, with 09.13.00 participating to meetings with WG-78 and SC-214 to progress on the definition of a set of D-TAXI messages that suits SESAR needs..

It culminated with the publication in May 2014 of ED-228 (Safety and Performance Standard for Baseline 2 ATS Data Communications (Baseline 2 SPR Standard)) ([12]) and ED-229 (Interoperability Requirements Standard for Baseline 2 ATS Data Communications (Baseline 2 Interop Standard)) ([13]), respectively DO-350 and DO-351 for RTCA, which define, among others, the D-TAXI application for the CPDLC service.

EUROCAE WG-44/RTCA SC-217 (Aeronautical Databases)

About the opportunity to build a common Airport Mapping Data Base (AMDB), OFA04.02.01 projects had a (limited) cooperation with WG-44 / SC-217 (Aeronautical Databases).

Moreover, 06.07.02 and 09.13 were involved in the review of WG-44s Guidelines for the Verification and Validation of AMDB ASRN for routing applications, ED-220 ([4]), prior to its publication

Following a joint validation exercise with 06.07.03 and 06.07.02 in 2012, 06.07.02 and 09.13.00 submitted an information paper to WG-44 to provide them with relevant results regarding the use of data bases for route generation by A-SMGCS and its display on board the aircraft’s moving map. This information paper notably identified some discrepancies between WG-44 and WG-78 documents,

regarding the definition of some data elements common to routing and D-TAXI. This resulted in a creation of a coordination team between the two groups to resolve these inconsistencies.

In detail, results collected during the executed validation activities about the use of data bases for route generation by A-SMGCS and its display on the on-board aircraft's moving map were submitted, as an information paper, to WG-44. That paper identified some discrepancies between WG-44 and WG-78 documents, regarding the definition of some data elements common to routing and D-TAXI. This resulted in a creation of a coordination team between the two groups to resolve these inconsistencies.

09.31 also contributed extensively to the standards produced by this group, as they identified a number of issues when implementing AMDBs to be used in SESAR validation activities:

1. **ED-76 / DO-200: Standards for Processing Aeronautical Data**

An update of the ED-76 was done and finalised in March 2015. The main achievements include:

- Identify all types of Aeronautical Data that should be covered by the Standard.
- Modify Section 1 of the document to reflect that the Standard applies to the types of Aeronautical Data identified that need to be following the same or a similar data chain as already outlined in the current document.
- Modify the Standards with the aim of ensuring that it covers changes in technology that might be used to move data to an aircraft.
- Ensure that updates and modification are accomplished such that existing implementations of the document such as FAA AC 20-153A or European Aviation Safety (EASA) - Conditions for the Issuance of Letters of Acceptance for Navigation Database Suppliers by the Agency - are not impacted, i.e. forward compatibility is achieved and existing Letters of Agreement are not required to be updated.
- State-of-the-art method applied to process, tools and procedures (e.g. DO-330)
- Apply state-of-the-art DO-330 for tool qualification, defining tool qualification level requirement
- Improved robustness of data quality requirement management process with respect to application intended function
    - Improved robustness of origination process for non-authoritative data, as requested by extending perimeter beyond navigation database

09.31 project ensured that the standard correctly takes into account industrial issues.

09.31 project considers this standard mature for deployment phase.

2. **ED-98 / DO-276: User Requirements for Terrain & Obstacle Data**

The ED-98 update takes into account rotorcraft operations.

09.31 project participated to the discussion and promoted its expertise on the domain.

09.31 could not further assess the need for and benefit of an open format for Terrain and Obstacle database as a replacement for the proprietary formats currently used by Avionics Systems.

3. **ED-99 / DO-272: User Requirements for Aerodrome Mapping Information**

The ED-99 update includes:

- Introduction of SWIM concept

- Enhancement of the features defined in previous version of the ED-99 (implementation feedback taken into account)
- Coverage of the deicing / apron / parking areas for the routing functions (ASRN).

09.31 project was deeply involved in this update. The feedback of SESAR 9.31 (AMDB development) and SESAR 9.13 / 9.14 (Applications that use AMDB) was taken into account. Thanks to this contribution, the maturity of SESAR concepts is enhanced.

09.31 project considers ED-99 mature for manual taxi routing function.

4. ED-119 / DO-291: Minimum Interchange Standards for Terrain, Obstacle and Aerodrome Mapping Data

ED-119 is the interchange format that supports the user requirements defined in ED-98 and ED-99. The update of ED-119 is consistent with ED-98 / ED-99 update.

09.31 project contribute to this standard to support modifications done in ED-98 and ED-99.

AEEC – Aeronautical Data Base (ADB)

ARINC 814

ARINC 814 includes:

- XML based database formats
  - Embedded Interchange Format for Airport Mapping Database – ARINC 816
  - Embedded Interchange Format for Terrain and Obstacle Database – ARINC 815
  - Navigation Data Base Open Standard (NDBX)
- XML based Data Link Protocols
  - Aircraft/Ground Information Exchange (AGIE) – ARINC 830
  - Standards for Air Traffic Data Communication Services – RTCA SC-214
  - AIS & MET Datalink, RTCA SC-206
- Feedback from W3C EXI (Efficient XML Interchange) working group
- Feedback from OGC Binary XML working group

This is the first release of the standard.

9.31 project was involved in the redaction of this standard. The feedback of SESAR 9.31 (AMDB development, NDBX, TOD) was taken into account. Thanks to this contribution, the maturity of SESAR concepts is enhanced.

9.31 project considers A814-0 standard mature for deployment.

ARINC 813

ARINC 813 defines a single open encoding format for Terrain. This standard is similar to ARINC 816 for another domain (Terrain vs Aerodrome Mapping).

This is the first release of the standard.

9.31 project was involved in the redaction of this standard. The expertise of SESAR 9.31 on AMDB was promoted for Terrain domain. 9.31 did not develop any Terrain Database. As a consequence, no prototype feedback was promoted.

The prototype of the standard developed in 2016 may allow to validate the maturity of ARINC 813-0 At this stage, 9.31 project considers A813-0 standard not mature for deployment.

ARINC 815

ARINC 815 defines a single open encoding format for Obstacles. This standard is similar to ARINC 816 for another domain (Obstacle vs Aerodrome Mapping).

This is the first release of the standard.

9.31 project was involved in the redaction of this standard. The expertise of SESAR 9.31 on AMDB was promoted for Obstacle domain. 9.31 did not develop any Obstacle Database. As a consequence, no prototype feedback was promoted.

The prototype of the standard developed in 2016 may allow to validate the maturity of ARINC 815-0 At this stage, 9.31 project considers A815-0 standard not mature for deployment.

ARINC 816

RTCA SC-217 / EUROCAE WG-44 is updating documents ED-99 and ED-119 (versions ED-99D and ED-119C). Supplement 3 to ARINC 816 maintains alignment with the RTCA/EUROCAE standards. The following items are considered:

- Airport lighting (including runway status lighting)
- Taxiway holding position directions and pattern
- Extend Aerodrome Surface Routing Network (ASRN) definition to include apron, parking, and deicing areas
- Identify other taxiways associated with intersections that are not represented in the taxiway identifier
- Text notes
- Attributes to identify TaxiwayElement features as taxiway intersections
- Taxiway markings (e.g., apron entry points, position markings, SMGCS, gate direction markings)
- Container improvements
- Data packaging/file separation

9.31 project was involved in the update of this standard. The feedback of AMDB developed by SESAR 9.31 was promoted. 9.31 also developed partial prototype to include ASRN extension on apron areas.

9.31 project considers ARINC 816-3 mature for manual taxi routing function.

<u>Other standardisation activities</u>

NDBX

It was decided that no NDBX standard will be developed. However, ARINC 424A will include xml encoding.

9.31 project considers that the following issues should be solved before the initiation of other activities on NDBX:

- Interoperability:
  - Use of NDBx by several FMS vendors
- Operational deployment:
  - How to merge LoA type I & II processes?
  - How to ensure FMS software / DB compatibility?
- Load management
  - Who can build the A665 load? => depends on the targeted hardware

1165 o Tailored data management? => linked to an AIP pack

1166 • Global business case and transition to that business case

1167 9.31 project considers NDBX standard not mature for deployment.

1168 **-END OF DOCUMENT-**