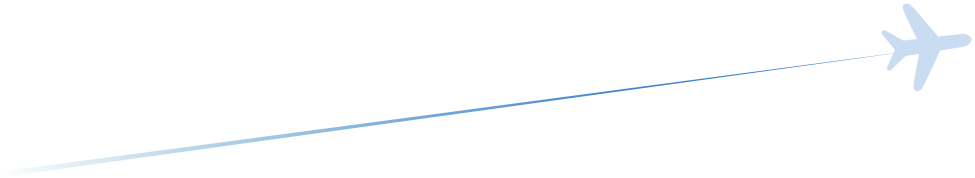

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COSER

PJ15 COMMON SERVICES

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Abstract

The present document is the TRL6 Business Model document– *Deliverable* D7.2.050 Business Model (TRL6) – under the task T7.2.050 ***Business Modelling development*** for Work Package WP7 "Aeronautical Digital Map Service" of PJ.15.

The business model aims to capture and reflect the expectations from the stakeholders regarding the provision of an Aeronautical Digital Map Common Service. It highlights the proposed value, the potential consumers and customers, the quality of service and a rough analysis of performance benefits, among others.

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1 Executive Summary

The Aeronautical Digital Map Common Service provides users the capability to retrieve graphical representation of aeronautical data information. The output is a standard graphic information that can be retrieved by individual requests demanding specific geographical areas. The retrieval can be performed using regular internet protocols or through SWIM services.

PJ.15-11 explores ways of improving overall cost efficiency for delivering the necessary capability to the interested stakeholders under a COSER pattern. This document describes the definition of Business Model and initial CBA considerations for the Aeronautical Digital Map COSER in TRL6. The final Analysis of Costs (CBA) is provided in a separate deliverable.

The business case for Aeronautical Digital Map COSER has a link with the Pilot Common Project which mandates *Aeronautical information exchange* on iSWIM over the yellow profile among the ATM sub-functionalities that need to be implemented by a selected set of European ANSPs.

Assuming that users could consume the capability from a series of competing providers available within Europe, provision of Aeronautical Digital Map Service deploying a COSER could result in:

- the requirement to deploy fewer engineered capabilities - ANSPs will only bear a cost consistent with the services they receive,
- service improvement roadmap across Europe is consistent and the associated costs are spread across common service ANSP consumers,
- facilitation of the extension of the PCP requirements to other States not originally addressed by the Implementing Rule.

Consequently, the benefit relates to:

- cost reduction through lower number of system deployments and lower number of technical systems to be securely maintained in operation,
- synchronisation of the evolutionary roadmap enabling consistency of concept and
- increased geographical coverage of the Solution because new incentives for ANSPs appear.

The primary SESAR KPIs addressed is cost-efficiency via CEF3. However, through the availability of a cost-efficient and validated COSER, additional ANSPs to those obliged by the PCP are encouraged to consume the service and a quicker implementation of Aeronautical Digital Map capabilities could be envisaged. This would have temporary benefits on other SESAR KPAs additional to cost-efficiency.

The various benefits are amplified in the Scenarios and User Stories in the subsequent sections of this document.

2 Introduction

2.1 Purpose of the document

The concept of a Common Service was introduced in SESAR to address the need to reduce the cost of European Air Traffic Management (ATM). ATM is highly fragmented with each State having their own Air Navigation Service Providers (ANSP). Cross border provision of Air Traffic Services being limited to only a few local examples. As each ANSP provides much the same type of service, they all have similar capabilities and deployed systems. Common Services can potentially reduce the overall cost of ATM by making it possible for similar organisations to consume a service from one provider by giving them the same capability they would normally have provided themselves, but at a lower cost. This benefit can either be realised by the direct consumer, in many cases the ANSPs, or by their customers by broadening their choice of supplier.

This document is related to the study of the Aeronautical Digital Map common service. It intends to explore which are the best business options the common service would be useful to fulfil. It follows the method develop by SESAR 1 as part of the document "Common Services Foundation method" to draw the business model. A final level of maturity (TRL6) of the business model is provided. It has been updated according to the outputs of the other activities of the solution during the TRL6 phase.

2.2 Intended readership

The intended audience for this document is the SESAR Joint Undertaking, the partners in the SESAR 2020 programme, the ATM stakeholders (e.g. airspace users, ANSPs, airports, airspace industry) with those third parties directly affected by its findings and the contributors having possible dependencies with the project such as PJ.03a, PJ.10 and PJ.18.

Other ATM projects and/or architectural projects and solutions within the SESAR 2020 programme may also have an interest.

2.3 Glossary of basic concepts

Term	Definition	Source
Business case	A tool to provide decision makers with the information they need to make a fully informed decision on whether funding should be provided and/or whether an investment should proceed	SESAR P16.06.06
Business model	A framework for creating economic, social, and/or other forms of value. The term' business model' is thus used for a broad range of informal and formal descriptions to represent core aspects of a business, including purpose, offerings, strategies, infrastructure, organizational structures, trading practices, and operational processes and policies.	EUROCONTROL ATM Lexicon

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Capability	The ability of one or more of the enterprise's resources to deliver a specified type of effect or a specified course of action to the enterprise stakeholders.	SESAR2020 PJ19.05 EATMA Guidance Material Version 9.0
Centralised (service) - a particular type of Common Service	A Centralised Service is an ANS support service exercised at pan-European and central network level for harmonisation and cost-efficiency purpose avoiding multiplication of investments, leading to reduced infrastructure costs, supporting the ANSPs and the Member States of the EU to come closer or actually achieving the EU cost efficiency performance targets.	EUROCONTROL
Common Service	A service providing a capability in the same form to consumers that might otherwise have been undertaken by themselves'	SESAR B04.05 D02
Consumer	A user of a service	SESAR B04.05 D02
Cost Benefit Analysis	A Cost Benefit Analysis is a process of quantifying in economic terms the costs and benefits of a project or a program over a certain period, and those of its alternatives (within the same period), in order to have a single scale of comparison for unbiased evaluation. A CBA is a neutral financial tool that helps decision-makers to compare an investment with other possible investments and/or to make a choice between different options / scenarios and to select the one that offers the best value for money while considering all the key criteria for the decision. A CBA is a tool used within the Business Case Process to provide financial inputs	16.06.06-D68-New CBA Model and Methods 2015-Part 1 of 2
Customer	A consumer of a service under a specific contract.	SESAR B04.05 D02
Deployment Package	Deployment Packages comprise Operational Improvement Steps and Enablers selected to satisfy Performance Needs of Operating Environments in the European ATM System by providing performance benefits confirmed by validation results.	SESAR WP C, though un-reviewed
Node	A logical entity that performs activities. Note: nodes are specified independently of any physical realisation.	SESAR2020 PJ19.05 EATMA Guidance Material Version 9.0
Security and safety in the context of a Common Service	Non-Functional Requirements (NFR) and Quality of service (QoS) requirements can be specified at various levels of maturity and from different viewpoints such as from the collaborative enterprise, the logical level, technology and engineering perspectives. Conceptually, NFR and QoS are not always distinguishable. Common Services will focus at the first two viewpoints	ISRM – Modelling guidelines
Service	The contractual provision of something (a non-physical object), by one, for the use of one or more others. Services involve interactions between providers and consumers, which may be performed in a digital form (data exchanges) or	SESAR2020 PJ19.05 EATMA Guidance Material Version 9.0

	through voice communication or written processes and procedures.	
Service contract (SLA)	A service contract represents an agreement between the stakeholders involved for how a service is to be provided and consumed. A service contract is specified through the service interface, the QoS and Service policies.	SESAR B.04.03 – Working method on service
Service instance	Service which has been implemented in accordance with its specification in the service catalogue (during the SESAR Development Phase, the service definitions are available in the ISRM) by a service provider (by itself or contracted to a third party).	SESAR B.04.03 – Working method on service
Service Provider	An organisation supplying services to one or more internal or external consumers.	SESAR B.04.05 – D02
Service taxonomy	The service taxonomy describes the categorisation of services provided between ATM stakeholders. It is used to organise the responsibilities of the service design as well as to provide a means of identifying services in the run-time environment.	SESAR B.04.03 – Working method on service
Stakeholder	A stakeholder is an individual, team, or organization (or classes thereof) with interest in, or concerns relative to, an enterprise (e.g. the European ATM). Concerns are those interests, which pertain to the enterprise's development, its operation or any other aspect that is critical or otherwise important to one or more stakeholders.	SESAR2020 PJ19.05 EATMA Guidance Material Version 9.0

2.4 Acronyms and terminology

Term	Definition
ADM	Aeronautical Digital Map
ADQ	Aeronautical Data Quality
AIC	Aeronautical Information Circulars
AIFS	Aeronautical Information Feature on request
AIM	Aeronautical Information Management
AIMAPS	Aeronautical Information MAP Service
AIP	Aeronautical Information Publication
AIS	Aeronautical Information Service
AIXM	Aeronautical Information Exchange Model
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider

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ARES	Airspace Reservation/Restriction
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATS	Air Traffic Services
ATSU	Air Traffic Services Unit
CBA	Cost Benefit Analysis
CEF	Connecting Europe Facility
CFMU	Central Flow Management Unit
COSER	Common Service
DOW	Description of Work
EAD	European AIS Database
EATMA	European ATM Architecture
EATMN	European Air Traffic Management Network
E-ATMS	European Air Traffic Management System
ECAC	European Civil Aviation Conference
FAB	Functional Airspace Block
FOC	Full Operational Capability
FOC	Flight Operation Centre
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IO	Implementation Objective
IOC	Initial Operational Capability
IP1/DB	Implementation Package 1 / Deployment Baseline
IR	Implementing Regulation
ISRM	Information Service Reference model
iSWIM	Initial System Wide Information Management

IT	Information Technology
KPA	Key Performance Area
KPI	Key Performance Indicator
LSSIP	Local Single Sky ImPlementation
MAWP	Multi-Annual Work Programme
MUAC	Maastricht Upper Area Control Centre
NFR	Non-Functional Requirements
NOTAM	NOtice To AirMen
N/A	Not Applicable
NM	Network Manager
OSED	Operational Service Environment Description
OBJ	Implementation Objective
OI	Operational Improvement
PAR	Performance Assessment Report
PCP	Pilot Common Project
PCP IR	Pilot Common Project Implementing Regulation
PENS	Pan-European Network Service
PERM	Permanent
PMB	Project Management Board
PRB	Performance Review Body
QoS	Quality of Service
RBT	Reference Business / Mission Trajectory
RPAS	Remotely Piloted Aircraft System
SDM	Service Delivery Management
SESAR	Single European Sky ATM Research Programme
SJU	SESAR Joint Undertaking (Agency of the European Commission)

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SJU Work Programme	The programme which addresses all activities of the SESAR Joint Undertaking Agency.
SESAR Programme	The programme which defines the Research and Development activities and Projects for the SJU.
SLA	Service-Level Agreement
SOA	Service-Oriented Architecture
SWIM	System Wide Information Management
SWIM-TI	SWIM Technical Infrastructure
TRL	Technology Readiness Level
UAS	Unmanned Aircraft System
UAV	Unmanned Aerial Vehicle
UTM	Unmanned Aircraft System Traffic Management
VFR	Visual Flight Rules
WOC	Wing Operation Centre
WP	Work Package

3 Scope of the Business Model

3.1 Service patterns

The Capabilities can be considered to be provided through standardisation, outsourcing, consolidation or partnerships. It can also be deployed at a single location (centralised service) or at multiple locations (distributed services).

3.2 Expected benefits

Aeronautical Digital Map Service is key for most of the operations related to the ATM HMIs. The Service collects aeronautical data from authorised sources, filters them and produces individual graphical maps depending on the specific usages as geographical area or system functionality. In this sense, configuration management tools should be implemented to better satisfy the consumers requirements.

The following table summarises the benefits identified for the Common Service:

KPA (KPI)		Performance Benefits Expectation Local deployment	Performance Benefits Expectations Sub-Regional Level deployment	Performance Benefits Expectations Regional Level deployment	Performance Benefits Expectations Worldwide Level deployment
Predictability (Flight Duration Variability, against RBT)		None	None	None	None
Flexibility		None	None	None	None
Safety	**Mitigation of safety risk**	Low	Low	Low	Low
Human Performance		None	None	None	None
Interoperability		None	None	None	None
Cost Efficiency	**Cost of operation**	Low	Medium	High	High
Cost Efficiency	**ATCO Productivity**	None	None	None	None
	Technology Cost	Low	Medium	High	Very High

Table 1: Expected Benefits

3.3 Projects involved

Project/Solution	Title	Dependency
PJ.03a-09	Surface operations by RPAS	This solution may make use of the Common service for a validation exercise.
PJ.10-05	IFR RPAS Integration	This solution may make use of the Common service for a validation exercise.
PJ.15-09	Data Centre Service for Virtual Centres Service	This solution may make use of the Common service through SOA approach.

PJ.18-04a	18-04a: AIM information[1]	This solution may make use of the Common service for a validation exercise.

Table 2: Solutions Involved

PJ.15-11 will interact with PJ.03a-09 and PJ.10-05 in order to explore the possibility of using the Aeronautical Digital Map Service within the scenarios of RPAS surface operations and IFR RPAS integration, respectively, in Wave 1. The scope of the interactions relates specifically on the possible usage of the common service by tower or RPAS simulators. However, if the time and resources are not available for using this Common Service in Wave 1, the Solution Leaders will focus on the possibility of using this Common Service in Wave 2. The interaction will be facilitated via regular Solution Lead co-ordination. Escalation of issues will be via the associated PMBs.

PJ.15-10 and PJ.15-11 will interact with PJ.18-04 in order to ensure a consistent approach to the S2020 management and sharing of aeronautical information and aeronautical digital map, taking into account the information available at the beginning of each service definition. PJ.18-04 is the core activity in the SESAR Programme to develop the AIM and MET Enablers. The interaction will be facilitated via regular Solution Lead co-ordination. Escalation of issues will be via the associated PMBs.

3.4 Description of OI steps and related SESAR solutions

3.4.1 SDM-OI Steps

The Common Service does not address operational improvements itself. It is aiming at the improved cost efficiency of the provision of a necessary capability. It is envisaged to create an “SDM” OI Step reflecting this fact.

OI-SDM ID6

Instead of the earlier discussed Business Improvement Steps (BI) currently the creation of Operational Improvement Steps (OI) are foreseen for PJ15 solutions. A Change Request (CR 00264) to create OI-SDM was placed on DS17 to be able to link the PJ.15-11 project deliverables to the Integrated Roadmap and the ATM Masterplan. For now, this OI is not yet approved. For the moment it is seen as a placeholder which will be revised as soon as possible[2].

3.4.2 Related OI Steps and SESAR solutions

The solution PJ15.11 is mainly linked to the solution #46 (SWIM Yellow Profile).

[1] Following the latest version of the PMP (V1.0.0), PJ.18 decided to split the original WP3/18-04 into three independent stand-alone Technological Solutions. The Solution that PJ.15-1110 will interact is the new proposed PJ.18-04a AIM Information.

[2] The Change Request for creation of SDM-OI Id6 for Aeronautical Digital Map COSER has been endorsed during the Joint Review Process for DS17b between PJ.15 and PJ.19. The temporary code included in EATMA (until filnal publication) is OI Step 00150 with the title "Aeronautical Digital Map Common Service (Business Improvement).

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IS-0901-A – SWIM for Step 1

SWIM Step 1 includes the provision of the following capabilities:

- Ground-ground flight coordination and transfer functions between en-route systems based on ED-133 flight object concept (ATC 2 ATC profile).
- Business to Business services to share traffic flow management information (including the capability to fill and validate flight plans) between the Regional NM / AM and APOC, FOC (CFMU B2B Profile).
- Business to Business services to share Aeronautical information between the EAD (as part of Regional NM / AM) and ER-APP-ATC, Airport Airside Operations, FOC/WOC (EAD B2B Profile).

SWIM step 1 also includes the provision of new information exchange standards. The three profiles will still use their own infrastructures (supervision, security), they are not interoperable.

PJ15.11 is related to the 3rd part of IS-0901-A (Ground-ground flight coordination and traffic flow management information are not addressed).

List of enablers linked to IS-0901-A

- AAMS-06b: ASM support systems enhanced to exchange aeronautical information and airspace usage data with NM systems in AIXM format
- ATC-STD-01: Ground-Ground flight data exchange
- ER APP ATC 160: ATC to ATC Flight Data Exchange Using The Flight Object
- MIL-0501: Specifications for the interoperability of military ground systems with SWIM
- MIL-0502: Upgrade of military ground systems to allow bi-directional exchanges with non-military IP networks
- REG-0013: Community Specifications for Aerodrome Mapping Data based on ED-99 and ED-119
- REG-0014: TS 16071 upgrade to EN CS on ATC to ATC flight data exchange updated following validation results
- REG-0519: Regulatory Provisions for the harmonised deployment of technical requirements for iSWIM (PCP)
- STD-007: ED-99D user requirements for Aerodrome Mapping Information
- STD-008: ED-119C interchange standards for terrain, obstacle and aerodrome mapping data
- STD-033: Flight Information Exchange Model v4 incl. ICAO FPL 2012, Extended Flight Plan and Flight Objects elements, in accordance with SESAR FIXM Strategy.
- SWIM-APS-01a: Provision of Aeronautical Information services for Step 1
- SWIM-APS-02a: Consumption of Aeronautical Information services for Step 1
- SWIM-APS-03a: Provision of ATFCM Information Services for Step 1
- SWIM-APS-04a: Consumption of ATFCM Information Services for Step 1
- SWIM-APS-05a: Provision and Consumption of Flight Object Sharing services for Step 1
- SWIM-APS-06a: Provision of Airport Ground Sensor Meteorological Information Services
- SWIM-APS-07a: Stakeholder systems consumption of Meteorological Information services for Step 1
- SWIM-GOV-05a: Regulatory Provisions for SWIM roles and responsibilities (organisational requirements)

- SWIM-INFR-01a: High Criticality SWIM Services Infrastructure Support and Connectivity.
- SWIM-INFR-05a: General SWIM Services Infrastructure Support and Connectivity.
- SWIM-NET-01a: SWIM Network Point of Presence
- SWIM-STD-04: SWIM Technical Infrastructure profiles
- SWIM-SUPT-01a: SWIM Supporting Registry Provisions
- SWIM-SUPT-03a: SWIM Supporting Security Provisions
- SWIM-SUPT-05a: SWIM Supporting IP Network Bridging Provisions

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4 Business Model Approach

PJ.15-11 uses the method described in SESAR B4.5 for processing of Common Services.

The Business Model Canvas Figure 1 defines a business model as describing "the rationale of how an organisation creates, delivers and captures value." It suggests that a business model can be described through nine basic building blocks that show the logic of how a company intends to make money. The nine blocks cover the four main areas of a business: customers, offer, infrastructure and financial viability. The business model is like a blueprint for a strategy to be implemented through organisational structures, processes and systems. The basic canvas is illustrated below.

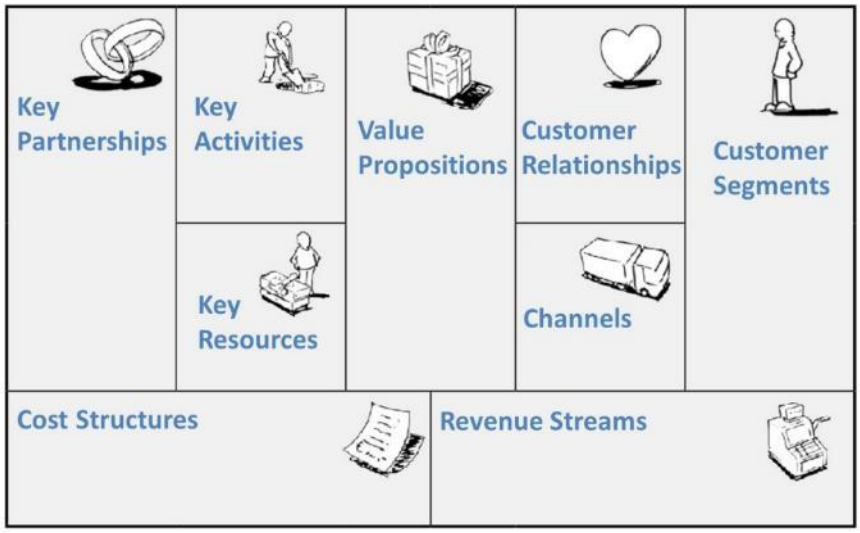

Figure 1: Business Model Canvas

The Business Model Canvas is widely used and many written examples are available on the internet (strategyzer.com). It thus provides a relatively robust approach to examine and describe the main building blocks for a Common Service. More detail is provided in D02 Options for Common Services, the foundation document produced by Project B04.05 and the Reference Material, Business Model Generation.

The building blocks within the canvas are as follows:

- Customer Segments: for who is the Common Service creating value and how does it differentiate its customer segments?
- Value Propositions: what is the value that the Common Services offers to its customers of the different segments?
- Channels: how does the provider of the Common Service interact with its customers and consumers?
- Customer Relationships: what is the provider's relationship with its customers and consumers?
- Revenue Streams: what is the pricing mechanism and where is the revenue derived from?
- Key resources: what resources does the provider require to deliver the Common Service?
- Key Activities: what are the activities and processes that are undertaken on behalf of others, the capability offered as the Common Service?

- Key Partnerships: what capabilities does the provider need from others to enable it to operate?
- Cost Structure: what costs are incurred by the Common Service Provider, how do they relate to each other and the value proposition?

The first step in modelling a Common Services is to clearly identify the business functions being considered and to separate them from other functions that may exist in the same organisation or environment, such as an aerodrome. The separated business function(s) becomes the focus of the Common Service's business model and a guide to the type of business being considered: customer relationship, innovation or infrastructure. Each type of business has different economic, cultural and competitive drivers and the manner for how the business function is separated provides a pattern for delivery. To assist, subject matter experts describe a set of user stories for the business being considered. These are then reviewed by others involved or interested stakeholders. The stories provide a narrative of how the Common Service is seen from different customer perspectives. These perspectives provide an insight into the customer's perceived value of the service and the relationship that they have with the provider. From this overall understanding, the business model can then be described.

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5 Business Model Outline

The goal of this chapter is to provide an overview of the business model, addressing general considerations on which area the service would focus. This general outline will then be refined user story per user story in the next chapters of the document.

Business Model Building Blocks	Description
1. Customer Segments	*For which stakeholders is the Common Service Provider creating value? Are there different types of customer, with different needs?* Customers are all stakeholders that need to consult or use aeronautical maps: pilots, airlines, ATC system manufacturers, software editors for general aviation. *Are needs different depending on the operating environment?* Presentation of graphical information, precision of data, standards of the graphics may be different depending on users. *Is the market limited to a local area (e.g. within a country) or a sub-region or a region or can customers be anywhere in the world (global service)?* Customers may be anywhere in the world and the scope of the service could be worldwide.(Worldwide deployment is out of scope of this solution and needs further work). *What consumer activities are supported by the Common Service and what is the impact upon the Consumers own resource architecture?* Any person or system requiring a digital map related to aeronautical information may need the service. Impact for the customer is easy access to centralised and standard information content (not only standard format).
2. Value Propositions	*What is the Common Service Provider offering: Better performance? Cost reduction? New capability?* *What benefit do the consumers of the Common Services receive? (e.g. lower cost for the availability of a capability)* *What value do the consumer's customers benefit from as a consequence of the Common Service? What is the benefit for airspace users?* The common service offers cost reduction and safety. It offers cost reduction because it reduces the operating costs thought the usage of shared, standard and up-to-date information easier to manipulate. Safety may be improved thanks to the use of homogenous data amongst the stakeholders.
3. Channels	*How are customers accessed / reached by the Common Service Provider?* Service with request/response or notification message pattern. *Which kind of infrastructure is required to reach customers? (Communication channels, SWIM infrastructure, R/T frequencies, etc.)* SWIM yellow profile, regular internet

4. Customer Relationships	*How is the Common Service Provider interacting with the customers? What type of service level agreement is established between them? Which kind of information do they need to exchange? (We should expect to see an operational model of some nature that reflects the interaction between the Common Service provider and the consumer, and this may well introduce new information exchanges and thus services. This should also examine both the normal operations and the non-normal operations that the Common Service Provider needs to support).* *Which kind of customer-provider relationship is established? :* *a) Standardisation? (interfaces are standardised)* *b) Outsourcing? (customer capabilities are transferred)* *c) Consolidation? (providers' capabilities are consolidated)* d) *Partnerships? (providers' capabilities are aggregated).* Customer access to the service using standard interfaces. Access does not need to be real-time but information has to be available anytime. One part of the service level agreement should be related to the freshness of the information: NOTAM, weather information can be included in the digital map information. The provider could aggregate information coming from different sources therefore easing the access to consolidated information by the customers.
5. Revenue Streams	*How is the Common Service Provider paid? (Charging customers? Funding? Pricing mechanisms?)* *Is the payment direct from customer to provider or is it indirect?* There are no specific revenue streams related to the new common service. It is direct payment between customer and provider.
6. Key Resources	*What key resources does the Common Service Provider need? (incl. technical systems, human resources and their combinations in capability configurations)* *How are providers' resources intended to be deployed:* *a) at multiple locations (i.e.; distributed resources)* *b) at single location (i.e.; centralised resources)* It will never be centralised worldwide. So the service consumers will always need to cope with distributed resources, at least at regional level and sometimes at national level.
7. Key Activities	*What are the key activities conducted by the Common Service Provider?* Aeronautical charts distribution consolidating static data and dynamic data such as NOTAM and weather information *What operational nodes (business functions) are used? Are any new ones introduced that may not exist in the current operational architecture? What activities do they undertake?* Aeronautical information management conducting aeronautical information collection, quality checking, consolidation, encoding and distribution activities.
8. Key Partnerships	*Who are the key partners and suppliers of the Common Service Provider?* All aeronautical information data provider: surveyors, airport authorities, ANSP themselves (airspace designer, procedure designer), civil aviation authority, military forces, national mapping agencies, … *Which resources would the provider need to acquire from them? What information flows would the provider need to receive from them?*

	Aeronautical information to be embedded in digital charts.
9. Cost Structure	*What are the most important costs?* *Is the Common Service business model mainly cost-driven or value-driven?* The most important costs are related to the purchase of source aeronautical information to the different countries or providers and integration in the aeronautical charts. The common service is therefore mainly value driven.

6 Business Model Refinement

We have identified three major user stories in which the Aeronautical Digital Map common service would be beneficial:

- Digital Map for Air Traffic Control Systems (ATC/ATM systems)
- Flight Preparation
- Digital Map for Tower Systems

6.1 User story: Digital Map for ATC systems

6.1.1 User story description

Digital mapping is a common service which can provide digital map data to different ATC/ATM systems to support ATCOs with information they need to perform their day to day work. Digital Map data could be an input for trajectory predictions, conflict detection subsystems. For example, it could communicate location of reserved and restricted airspace and to notify on weather conditions.

6.1.2 Business Model Canvas

1. Customer Segments	*For which stakeholders is the Common Service Provider creating value? Are there different types of customer, with different needs?* Customers are all stakeholders using ATC/ATM systems that need to consult aeronautical maps: ATCOS, ANSPs…. *Are needs different depending on the operating environment?* The precision of the aeronautical may be different depending on the type of users; conflict detection tools may need more precise information than ATFM tools. Specific rules may be needed depending on the countries because national regulations could be different. *Is the market limited to a local area (e.g. within a country) or a sub-region or a region or can customers be anywhere in the world (global service)?* The scope of the service may be worldwide as ATC/ATM users can be everywhere in the world.(Worldwide deployment is out of scope of this solution and needs further work). *What consumer activities are supported by the Common Service and what is the impact upon the Consumers own resource architecture?* Any ATC/ATM user, requiring a digital map related to aeronautical information may need the service. The impact for the customer is that the access will be easy to centralised and standard information content.
2. Value Propositions	*What is the Common Service Provider offering: Better performance? Cost reduction? New capability?*

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	What benefit do the consumers of the Common Services receive? (e.g. lower cost for the availability of a capability)? What value do the consumer's customers benefit from as a consequence of the Common Service? What is the benefit for airspace users? The common service offers cost reduction and safety. It offers cost reduction because it reduces the operating costs thought the usage of shared, standard and up-to-date information which is easier to manipulate. Safety may be improved thanks to the use of homogenous data amongst the stakeholders. **Added value of the common service compared to the PCP only implementation:** In comparison to the PCP only implementation the Common Service PJ15-11 provides a harmonised rendering of the airspace situation as a digital map, which can directly be used for ATC/ATM systems.
3. Channels	*How are customers accessed / reached by the Common Service Provider?* A service with request/response or notification message pattern will be used. *Which kind of infrastructure is required to reach customers? (Communication channels, SWIM infrastructure, R/T frequencies, etc.)* SWIM yellow profile, regular internet (if the ATC/ATM system has an internet connection integrated).
4. Customer Relationships	*How is the Common Service Provider interacting with the customers?* *What type of service level agreement is established between them? Which kind of information do they need to exchange? (We should expect to see an operational model of some nature that reflects the interaction between the Common Service provider and the consumer, and this may well introduce new information exchanges and thus services. This should also examine both the normal operations and the non-normal operations that the Common Service Provider needs to support).* *Which kind of customer-provider relationship is established?* Customer access to the service using standard interfaces. Access does not need to be real-time but information has to be available anytime. One part of the service level agreement should be related to the freshness of the information: NOTAM, weather information can be included in the digital map information.
5. Revenue Streams	*How is the Common Service Provider paid? (Charging customers? Funding? Pricing mechanisms?)* *Is the payment direct from customer to provider or is it indirect?* There are no specific revenue streams related to the new common service. It is direct payment between customer and provider.
6. Key Resources	*What key resources does the Common Service Provider need? (incl. technical systems, human resources and their combinations in capability configurations)* *How are providers' resources intended to be deployed:* *a) at multiple locations (i.e.; distributed resources)* *b) at single location (i.e.; centralised resources)*

	The common service will never be centralised worldwide. Therefore, the service consumers will always need to cope with distributed resources, at least at regional level and sometimes at national level.
7. Key Activities	*What are the key activities conducted by the Common Service Provider?* Aeronautical charts distribution consolidating static data and dynamic data such as NOTAM and weather information for operations. *What operational nodes (business functions) are used? Are any new ones introduced that may not exist in the current operational architecture? What activities do they undertake?* Aeronautical information management conducting aeronautical information collection, quality checking, consolidation, encoding and distribution activities.
8. Key Partnerships	*Who are the key partners and suppliers of the Common Service Provider?* *Which resources would the provider need to acquire from them? What information flows would the provider need to receive from them?* All aeronautical information data provider: surveyors, airport authorities, ANSP, civil aviation authority, military forces, national mapping agencies.
9. Cost Structure	*What are the most important costs?* *Is the Common Service business model mainly cost-driven or value-driven?* The most important costs are related to the purchase of source aeronautical information to the different providers and integration in the aeronautical charts. The common service is therefore mainly value driven.

<table>
<tr>
<td rowspan="2">Key Partnerships

All aeronautical information data providers</td>
<td>Key Resources

Distributed servers for usage at regional, sub-regional or national level</td>
<td rowspan="2">Value Proposition

Cost reduction

Improvement of safety</td>
<td>Channels

SWIM yellow profile

Internet</td>
<td rowspan="2">Customer Segments

Civil drones pilots

Military UAS users

ATC systems manufacturers

Software editors for General Aviation</td>
</tr>
<tr>
<td>Key Activities

Aeronautical charts distribution consolidating static and dynamic data</td>
<td>Customer Relationships

Standard interface with Service Level Agreement</td>
</tr>
<tr>
<td colspan="3">Cost Structure

Purchase of source aeronautical information

Labour costs for Integration of the source data into aeronautical charts</td>
<td colspan="2">Revenue Stream

Direct payment between customer and provider</td>
</tr>
</table>

Figure 2: Canvas for the user story "Digital Map for UTM systems"

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6.2 User story: Flight Preparation

6.2.1 User story description

As an airspace user I want to prepare my IFR or VFR flight by consulting digital maps which I want to access over the Internet. As a minimum, I want to see all aeronautical information that is part of the AIXM 5.1 data model with appropriate symbology that is tailored to respect aeronautical standards and which adapts to the zoom level and purpose of the map display. The digital map shall be up-to-date and shall be fed by the Central Aeronautical Database as its reference data source. Dynamic information in the form of digital NOTAM can be provided by the central aeronautical database. Traditional NOTAM and weather information can be included as layers from other sources (e.g. national systems, WAFC etc.).

6.2.2 Business Model Canvas

Business Model Building Blocks	
1. Customer Segments	*For which stakeholders is the Common Service Provider creating value? Are there different types of customer, with different needs?* AIM units, data integrators, data originators, airports procedure designers: review and QA of aeronautical information, visualisation during data entry and maintenance ATC / ATM units: Visualisation of aeronautical infrastructure (aerodrome, airspaces, active procedures, navaids etc.) as background for situational awareness and flight trackers Aircraft operators: Flight Preparation and Briefing requires current status of the aeronautical infrastructure and airspace Software manufacturers or service providers providing software or services to General Aviation pilots for flight preparation. *Are needs different depending on the operating environment?* The needs differ from the operating environment in terms of timeliness. For data management tasks, the data does not need to be updated in real time. It needs to be up to date and synchronised within days or weeks whereas data for flight preparation needs to be current and within seconds or minutes. *Is the market limited to a local area (e.g. within a country) or a sub-region or a region or can customers be anywhere in the world (global service)?* The market is not limited to a local area, but is global. The needs for aeronautical data are the same in the different types of operating environments that are the airports control tower or air traffic control centres. There could be however more specific detailed needs regarding geographical

Business Model Building Blocks	
	area requested, different types of objects requested, different types of filters needed. *What consumer activities are supported by the Common Service and what is the impact upon the Consumers own resource architecture?* The supported activities are listed above under "are there different types of customers". The impact upon the consumers own resource architecture is that the Digital Map service can be fully integrated into consumer systems. Locally provided resources can be seamlessly combined with such resources provided by the common service using web map technologies.
2. *Value Propositions*	*What is the Common Service Provider offering: Better performance? Cost reduction? New capability?* Visualising the aeronautical information in combination with geographical data and dynamic information offers the airspace users a potential for better performance and cost savings by being able to plan optimized flight routes. *What benefit do the consumers of the Common Services receive? (e.g. lower cost for the availability of a capability)? What value do the consumer's customers benefit from as a consequence of the Common Service? What is the benefit for airspace users?* Consumers of the Common service have the benefit of being able to utilize state of the art visualisation technology that can be integrated into existing systems as a service or can be utilized by end-users directly. ANSPs have the benefit of being able to provide digital map services and to utilize the digital map services for their internal needs. This way significant cost savings in comparison to a local solution can be achieved. Another benefit is that the digital map service offers a consolidated and quality assured view of aeronautical information. By this harmonisation it helps to improve the safety of air traffic, as the risk of human error can be reduced. **Added value of the common service compared to the PCP only implementation:** In comparison to the PCP only implementation the Common Service PJ15-11 provides tailored and harmonised visualisation of standard AIXM / AIRM information, which automatically adapts to the zoom level and to the purpose of the map display. Moreover, it provides support both of traditional NOTAM, digital NOTAM and traditional weather information and IWXXM weather information.
3. Channels	*How are customers accessed / reached by the Common Service Provider?* *Which kind of infrastructure is required to reach customers? (Communication channels, SWIM infrastructure, R/T frequencies, etc.)* Customers are reached through SWIM infrastructure, using the yellow profile protocol on the PENS network. Additionally, standard Internet access based on http / https and web map service protocols can be offered to the general public.

Business Model Building Blocks	
4. Customer Relationships	*How is the Common Service Provider interacting with the customers?* The Common Service Provider provides a technical service based on an SLA and a clearly defined interface. *What type of service level agreement is established between them? Which kind of information do they need to exchange? (We should expect to see an operational model of some nature that reflects the interaction between the Common Service provider and the consumer, and this may well introduce new information exchanges and thus services. This should also examine both the normal operations and the non-normal operations that the Common Service Provider needs to support).* The service level agreements between providers and consumers of the information will need to include: availability guarantees, response times, a reliable level of data quality, the availability of meta information to prove the providence of the information and a proven safety case. *Which kind of customer-provider relationship is established?* Standardisation (interfaces are standardised) and Outsourcing (customer capabilities are transferred) (for the aspects covered by COSER) The aeronautical information service provider may consolidate information coming from different countries and different providers in order to answer to various needs coming from various ATC systems. This is performed in the same manner as today except that the number of partnerships with countries may increase due to the nature of the service being common and accessed in a more flexible way by various customers. The Aeronautical Digital Map Service builds on the aeronautical information service and visualises the information for internal users and for external customers. It allows ANSPs to outsource customer capabilities to the COSER.
5. Revenue Streams	*How is the Common Service Provider paid? (Charging customers? Funding? Pricing mechanisms?)* *Is the payment direct from customer to provider or is it indirect?* Typically, the information handled in Aeronautical Information Management is part of the bundled charges. The revenue therefore typically is calculated on the basis of the crossed airspaces / sectors – basically the length of the flight through a controlled airspace. These charges are distributed to the different ATM disciplines by a specified factor to cover all of the bundled services of an ANSP. Alternative revenue streams were analysed but so far not realised by ICAO.
6. Key Resources	*What key resources does the Common Service Provider need? (incl. technical systems, human resources and their combinations in capability configurations)* *How are providers' resources intended to be deployed:* *c) at multiple locations (i.e.; distributed resources)* *d) at single location (i.e.; centralised resources)* The key resources needed by the common service provider are:

Business Model Building Blocks	
	- Technical: servers for hosting the web map service and business logic of the service Common service to be deployed mostly in a centralized location or eventually duplicated in several locations but not in a distributed way. There could be one instance of the common service per country at the beginning in order to ease transition from a national process to a centralised one. A required key resource is also the SWIM Technical Infrastructure, which is the backbone for the data communication with PJ15.
7. Key Activities	*What are the key activities conducted by the Common Service Provider?* *What operational nodes (business functions) are used? Are any new ones introduced that may not exist in the current operational architecture? What activities do they undertake?* The common service provider primarily hosts the IT infrastructure and monitors it – especially including the connection to the aeronautical information service. Being a technical function, this mainly requires IT skills.
8. Key Partnerships	*Who are the key partners and suppliers of the Common Service Provider?* *Which resources would the provider need to acquire from them? What information flows would the provider need to receive from them?* The visualisation function realised within the Digital Map Service does not establish any additional key partners beyond those that are already covered by Solution 15.10.
9. Cost Structure	*What are the most important costs?* Infrastructure costs for hosting the system and SWIM infrastructure, personnel costs for human interventions for validation and consolidation, Software licenses, maintenance, IT operations, training, data migration *Is the Common Service business model mainly cost-driven or value-driven?* The main costs for operating the service is the cost of acquiring the aeronautical data from each country. These acquisitions are done periodically but are already covered by 15.10. Other important costs are related to the first setup of the common service (infrastructure, network, agreements) and the periodic update of the digital data to be uploaded in the servers based on the latest aeronautical data changes. The business model is therefore mainly value-driven.

<table>
<tr>
<td rowspan="2">Key Partnerships

AIM units, data integrators, data originators, airports procedure designers, ATC / ATM units, General Aviation, Airspace Users</td>
<td>Key Resources

Technical: servers for hosting the web map service and business logic of the service

Hosting of the IT Infrastructure (centrally or decentrally)

SWIM Technical Infrastructure as the backbone for the data communication with PJ15.</td>
<td rowspan="2">Value Proposition

Combination of geographical data, static data and dynamic data offers better optimized flight planning. (optimized routing)

→improved safety and efficiency

Cost benefits by utilizing state of the art visualisation technology that can be integrated into existing systems as a service or can be utilized by end-users directly.

Cost savings in comparison to a local solution for digital map services for internal needs.

Improved safety due to consolidated and quality assured view of aeronautical information. Reduced risk for human error due to harmonized view.</td>
<td>Channels

SWIM Yellow Profile Web services / Web Map Service / Web Feature Service</td>
<td rowspan="2">Customer Segments

AIM units, data integrators, data originators, airports procedure designers, ATC / ATM units, General Aviation, Airspace Users</td>
</tr>
<tr>
<td>Key Activities

Hosting of IT Infrastructure

Harmonisation of information</td>
<td>Customer Relationships

Service Provider / Service User relationship</td>
</tr>
<tr>
<td colspan="3">Cost Structure

Infrastructure costs for hosting the system and SWIM infrastructure, personnel costs for human interventions for validation and consolidation, Software licenses, maintenance, IT operations, training, data migration

Costs for acquisition of aeronautical data</td>
<td colspan="3">Revenue Stream

Revenue via bundled AIM service charges and service provision</td>
</tr>
</table>

Figure 3: Canvas for the user story “Flight Preparation”

7 References and Applicable Documents

7.1 Applicable Documents

[1] Applicable Documents SESAR B4.5, D04 Common Services Foundation Method

[2] Final SESAR 1 Maturity Assessment Report Executive Summary, 01.00.00

[3] PCG32 Action Paper Cybersecurity in SESAR 2020

[4] SESAR2020 CBA Template for Enabler projects

[5] SESAR2020 Project Handbook,

[6] Grant Agreement GA-734160 – PJ15 COSER, edition 01.00.00, 27/10/2016

[7] SESAR 16.06.06-D26_04, Guidelines for Producing Benefit and Impact Mechanisms, Edition 03.00.01

[8] SESAR 16.06.06-D26_03, Methods to Assess Costs and Monetise Benefits for CBAs, Edition 00.02.02

[9] SESAR 2020 Multi Annual Work Programme, edition V1.0, 08/07/2015

[10] Foundation Method on Common Services

[11] PJ19.2.1 SESAR 2020 Concept of Operations Edition 2017

7.2 Reference Documents

[10] 08.03.10 D65, European ATM Service Description for AeronauticalInformationMap Service, July 2016

[11] 08.03.10 D65, European ATM Service Description for AerodromeMapInformation Service, July 2016

[12] SESAR 13.02.02 D10, Operational Service and Environment Description for R4 EXE-13.02.02-VP-462, Digital Integrated Briefing

[13] SESAR 13.02.02 D17, Validation Plan for Integrated Digital Briefing - EXE-13.02.02-VP-462

[14] SESAR 13.02.02 D18, Validation Report for Integrated Digital Briefing (VALR)

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[17] Business Model Generation. A. Osterwalder and Y. Pigneur. Wiley, 2010.

[18] SESAR Solution #46 Initial system-wide information management (SWIM) technology solution

- 08.01.01-D55 SWIM Registry design-time requirements
- 08.01.03-D47 AIRM v4.1.0 (for global reference)

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- 08.03.10-D65 ISRM v2.0 (for global reference)
- 14.01.03-D30 SWIM (GG AG) Architectural Definition - Final
- 14.01.03-D39 SWIM Profiles - Final
- 14.01.04-D44-001 SWIM-TI Technical Specifications Catalogue
- 14.01.04-D44-002 SWIM-TI Identity Management Technical Specification
- 14.01.04-D44-004 SWIM-TI Yellow Profile Technical Specification

[19] Business Model Generation. A. Osterwalder and Y. Pigneur. Wiley, 2010.

[12] Common assumptions for CBAs as maintained by PJ19 (provisionally the ones included in the 16.06.06- D68 – New CBA Model and Methods 2015 – Part 1 of 2, Edition 00.01.01 can be used)

[13] EUROCONTROL: Challenges of Growth 2013, Task 4: European Air Traffic in 2035. Edition June 2013.

[14] SESAR B.04.05-D02, Options on Common Services, Edition 00.01.00

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[16] PRB RP2 Annual Monitoring Report 2015. Volume 3 – CAPEX. Version 2.2 from 20/12/2016. Accessed on 11/04/2017 via: https://ec.europa.eu/transport/sites/transport/files/prb_annual_monitoring_report_2015_vol_3_capital_expenditures.pdf

[17] European ATM Portal – Working view. Draft Dataset 17, issued 22 June 2017. Accessed on 04/07/2017 via: https://www.eatmportal.eu/working/rnd/rd-dashboard

[18] SESAR 2020 Common assumptions, Edition 01.00.00 (17 May 2018)

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Appendix A ATSUs falling under the PCP IR

The Appendix of the IR 716/2014 (PCP) [15] lists the ATSUs that are required to "implement services which support the exchange of the following aeronautical information using the yellow SWIM TI Profile".

#	FAB		ANSP/State	ACCs	TMAs and TWRs	APTs	ATSUs	
1	DE-SE	1	Denmark		APP Copenhagen	CPH	2	4
		2	Sweden		APP Arlanda	ARN	2	
2	NEFAB	3	Finland		APP Helsinki		1	3
		4	Norway		TMA Oslo	OSL	2	
3	FABEC	5	Belgium	-	APP Brussels	BRU	2	28
		6	France	ACC Marseille, Paris, Bordeaux, Brest and Reims	TMA Paris	CDG, ORY, NCE	9	
		7	Germany	UAC Karlsruhe, ACC Langen and Munich	ACC Langen, ACC Munich, ACC Bremen	FRA, MUC, DUS, BER	10	
		8	MUAC	ACC MUAC			1	
		9	Netherlands	ACC Amsterdam	TMA Amsterdam	AMS	3	
		10	Switzerland	ACC Zurich	APP Zurich	ZRH	3	
4	FABCE	11	Austria	ACC Wien	APP Wien	VIE	3	4
		12	Hungary	ACC Budapest			1	
5	DANUBE	13	Romania	ACC Bucharest			1	1
6	BLUEMED	14	Italy	ACC Padua and Rome	TMA Roma, TMA Milano, TMA Padua	MXP, FCO	7	7
7	UK-Ireland	15	Ireland		TMA Dublin	DUB	2	10
		16	United Kingdom	ACC London and Prestwick	TMA London, APP Manchester	LHR, LGW, STN, MAN	8	

8	SW FAB	17	Spain	ACC Madrid and Barcelona	TMA Madrid, TMA Barcelona, TMA Palma, TMA Canarias	MAD, BCN, PMI	9	9
-	Outside FABs	18	Serbia & Montenegro	ACC Belgrade			1	1
		19	Turkey	ACC Ankara			1	1
Total			**19**	**22**	**22**	**24**	**68**	

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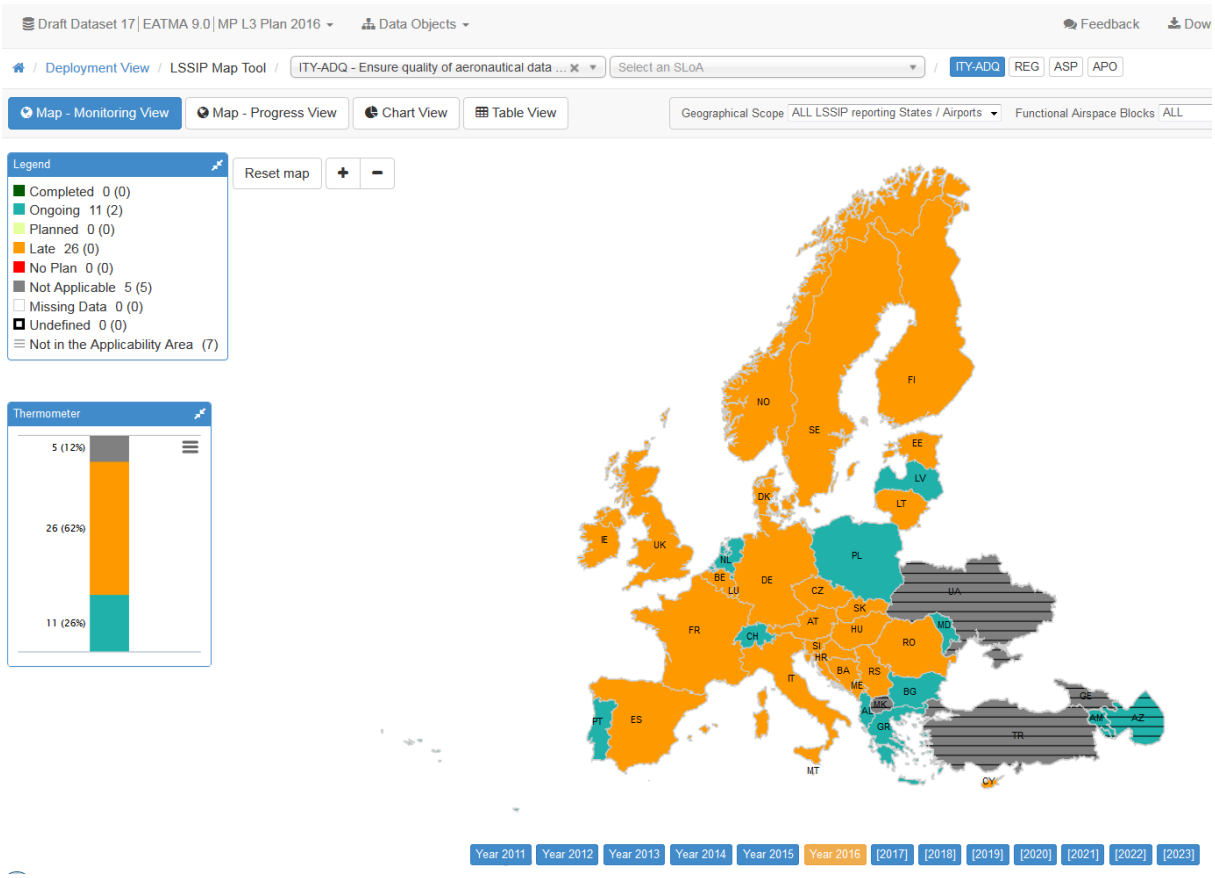
Appendix B FABs outside PCP IR

The following FABs have ANSPs/States that are outside the scope of applicability of the PCP IR 716/2014 [15].

#	FAB	ANSP/State
1	NEFAB	Estonia and Latvia
2	Baltic	Poland and Lithuania
3	FABEC	Luxembourg
4	FABCE	Czech Republic, Slovak Republic, Croatia, Slovenia, Bosnia and Herzegovina
5	DANUBE	Bulgaria
6	BLUEMED	Malta, Greece, Cyprus
7	SW FAB	Portugal

Appendix C LSSIP reporting for IO ITY-ADQ – Ensure quality of aeronautical data

But ITY-ADQ is reported in the LSSIP to be in 2016 (6 months before deadline recommended) only fulfilled at 11%. https://www.eatmportal.eu/working/depl/essip_objectives/map

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