SESAR DEPLOYMENT MANAGER



DEPLOYMENT PROGRAMME 2017

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LET'S DELIVER TOGETHER



SESAR Deployment Programme

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SESAR: DELIVERING BENEFITS TO EU AVIATION



1. SESAR: delivering benefits to EU Aviation

1.1 The Single European Sky pillars

Air Traffic Management is a **pivotal component of the European air transport industry**, which is in turn one of the **strongest drivers of economic growth**, trade and mobility for the European Union. A safe, efficient and integrated ATM infrastructure at European level is **a** necessary **enabler** to ensure that European aviation sector maintains its overall competitiveness and continue to deliver the **highest standards of services to EU citizens**.

The creation of a single aviation market, the availability for passengers of an unprecedented choice of air travel opportunities, the significant developments witnessed by aviation at global level in the last 20 years, and most importantly the remarkable air traffic growth experienced across Europe have contributed to build a **highly challenging scenario**, urgently **asking for EU joint and extensive action**: the **Single European Sky (SES)** initiative is the answer to such call.

The Single European Sky is an ambitious initiative launched by European Commission in 2004 to reform the architecture of the European Air Traffic Management as a whole, in order to **cope with sustained air traffic growth** under the **safest, most cost-and-flight-efficient and environmentally friendly conditions**.

The push towards increasing efficiency and competitiveness of the Air Traffic Management in Europe was confirmed by the **definition of four High-level Goals**, which set the optimum performance levels to be reached and drive the efforts to achieve them:

- Enable a **3-fold increase in** capacity, by reducing delays both on the ground and in the air;
- Enable a 10% reduction of the effects of the air transport on the environment, in terms of CO₂ and noise emissions;
- Reduce the costs of ATM Services to Airspace Users across Europe by at least 50%;
- Improve safety performances by a factor of 10.



Fig. 1 - Single European Sky High-level Goals

Since its inception and through its different phases, the effort to achieve such challenging objectives has been the blend of two principal **interlinked streams of activities**:

- the **institutional stream**, aiming at building the adequate **regulatory framework to enforce growth and the improvement of the overall performance**, rationalizing and harmonizing the institutional landscape;
- the **technological stream**, targeting the **industrial development and implementation of an innovative and interoperable ATM infrastructure throughout Europe**, that enables the achievement of the identified performance objectives.

In order to build such technological infrastructure, a pivotal enabler is represented by the **harnessing and integration of the widespread expertise and resources** from the whole ATM community, joining forces towards the modernization of systems, operations and procedures at European level.

The **SESAR (Single European Sky ATM Research) Programme** was set up as the main channel to coordinate such a harmonized modernization effort which **involves and engages civil and military operational stakeholders**, from the Airspace Users to Air Navigation Service Providers, from Manufacturers to the ATM industry, from Staff Associations to National Supervisory Authorities, from Airport Operators to the Network Manager.



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1.2 SESAR: at the core of the modernization of ATM infrastructure

SESAR aims at defining, developing and finally deploying innovative technological and operational solutions (i.e. SESAR solutions) that would lead to increase the European ATM capacity, reduce costs and positively impact on the environment, maintaining the highest safety standards.



Fig. 2 - The SESAR phases

Since its establishment in 2004, the SESAR Programme has been structured and **conducted through three interconnected phases**:

- the Definition Phase, aiming at identifying the expected performance requirements of the next generation ATM systems, as well as the most suitable solutions to achieve them. These activities are also complemented by the definition of a high-level plan to organize the subsequent activities, which resulted in the first European ATM Master Plan in 2008;
- the Development Phase, which consequently puts in place the necessary Research and Development activities to produce the necessary technological elements, identified during the Definition Phase;
- the Deployment phase, aiming at deploying throughout Europe the results of the ATM solutions developed and validated by the SESAR Joint Undertaking. It is through such phase that SESAR results are progressively deployed, finally allowing the achievement of the performance improvements that contribute to the High-level Goals of the SES initiative.

In other words, by combining all expertise and resources of the European ATM stakeholders, the SESAR Programme was set up to build a common and agreed roadmap to steer modernization efforts, coordinating research and development activities, leading to a synchronized deployment of technologies that - in the end – enable the achievement of the SES objectives.

The Definition Phase

The roadmap to support operational stakeholders and to ensure that the SESAR concept becomes an operational reality in the longer run is represented by the European ATM Master Plan, which outlines the overall vision and performance ambitions for the future ATM system (within a timeframe up to 2035, also with an outlook to 2050). The ATM Master Plan outlines those operational changes that are required to support the full achievement of the Single European Sky initiative and



Fig. 3 - SESAR performance ambitions

constitutes the **overarching reference for the whole SESAR project**, ensuring a deployment and performance oriented R&D.

Within the ATM Master Plan, the **aspirational performance ambitions** of SESAR have been defined by identifying the **performance gains** stemming from the **deployment of the SESAR Solutions**, thus



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outlining the expected contribution to the High-Level goals (safety, environment, capacity, cost efficiency), along with the contribution to new **performance areas** (**operational efficiency and security**)¹.

The **definition phase has also the responsibility** to **maintain the European ATM Master Plan** and **expand its time horizon and scope** in the light of R&D and implementation progress as well as new ATM priorities (e.g. UAS, cyber security).

The Development Phase

Building on the ATM Master Plan, the **SESAR Joint Undertaking** is in charge of **coordinating the research**, **development and validation activities**, aiming at developing **new equipment**, **systems and standards** that help converging towards the SESAR Target identified in the Definition Phase.

Under SJU oversight, the development phase aims at ensuring that specific groups of **ATM operational functions or services** – included within the ATM Master Plan – reach an **appropriate level of maturity for implementation**. The SESAR Joint Undertaking published a first edition of the **SESAR Solutions**, drawing together more than 60 SESAR Solutions so far delivered by SESAR JU members and partners to modernize Europe's air traffic management system.

Developed in line with the European ATM Master Plan these solutions serve as a basis for deployment activities and further research in SESAR 2020. They address all parts of the ATM value chain, from airports, air traffic services to the network, as well as the underlying systems architectures and technological enablers, which are validated in real day-to-day operations. **Several of these solutions are already in operation**, demonstrating SESAR's role in transforming Europe's ATM network into a modern, cohesive and performance-based operational system.

The **ATM functionalities** – proven their positive contribution to the Network performance, that they have an overall positive business case and the need and added value of a synchronized deployment at European level – will be included in **Common Projects**, i.e. a **Regulation issued by the European Commission**, following the assistance of the appropriated SES bodies², and consulting both Airspace Users and ground operational stakeholders.

A first set of SESAR Solutions was packaged by decision of the European Commission into a **Pilot Common Project** (PCP). These Solutions, translated into ATM functionalities, are ready for industrialization and for synchronized deployment across Europe.

The **SESAR Deployment Programme** is working to ensure that solutions delivered by the SESAR JU enter into everyday operations across Europe, resulting in significant benefits for airspace users and the environment.

The Deployment Phase

The final result of the SESAR Programme is represented by the **deployment via local implementation projects of the innovative solutions** identified in the ATM Master Plan, **developed and validated through the SJU-coordinated activities**, on the basis of the provisions set forth within the Common Projects.

The modernization of the European ATM system – after its careful planning, its journey towards an adequate level of maturity and its formalization into the Commission Regulation – finally **becomes an operational reality** through the aforementioned steps.

It is therefore within the Deployment phase that the **operational changes are actually deployed** across Europe, delivering those improvements that lead to the expected performance benefits.

In order to make sure that the implementation is highly synchronized and coordinated, the *deployment phase* – steered by a dedicated **Deployment Programme** – requires the fruitful cooperation of **European**

² According to Article 5 of Regulation (EU) no. 409/2013, the Network Manager, the European Aviation Safety Agency, the Performance Review Body, the SESAR Joint Undertaking, Eurocontrol, the European standardization organisations, Eurocae and the SESAR Deployment Manager. These bodies shall then involve the operational stakeholders and the manufacturing activities.



¹ It is worth mentioning that the achievement such aspirational performance ambitions is strictly related to the availability of SESAR Solutions through R&D activities, their timely and, when needed, synchronized deployment and their operational use at full potential.

Commission, of the **SESAR Deployment Manager** and of **operational stakeholders**, according to the overall framework defined within Regulation (EU) no. 409/2013.



Fig. 4 - SESAR Programme: from High-level Planning to Performance Improvements

1.3 The Governance of SESAR Deployment Phase

Article 7 (2) of Regulation (EU) no. 409/2013 clearly states that the overall **governance structure of the SESAR Deployment Phase** is composed of three levels: "*policy level, management level and implementation level*". Such threelayered structure identifies the involved stakeholders, openly defines their role and allocates them clear responsibilities:

 European Commission, assisted and supported by the appropriate SES institutions and organizations, is responsible for the oversight of the deployment of SESAR, ensuring that the latter is carried out in line with the SES framework and supports the public interest. This means that – following the adoption of Common



Fig. 5 - The Governance of the SESAR Deployment Phase

Projects through Regulations binding for Member States³ – EC is also in charge of **managing the Union funds** to support its implementation through the appropriate funding Programmes, whilst also identifying the appropriate **incentives mechanisms to support the deployment activities**. Most importantly, the European Commission is in charge of selecting the SESAR Deployment Manager, which is the body responsible for the **management level**.

- 2) SESAR Deployment Manager, which is composed of groupings of operational stakeholders, is in charge of effectively managing the deployment across Europe, essentially through the development, proposal, maintenance, implementation and monitoring of the SESAR Deployment Programme, which constitutes the "operational view" of the Common Projects.
- 3) The overall arrangement of the SESAR Deployment Phase is completed by the operational stakeholders, which are bound by the relevant Regulation to implement the Common Projects at local, regional and Network level, in accordance to the provisions set forth in the Deployment Programme. Such implementation can be supported and boosted by the relevant Union funding programmes.

³ The geographical scope of the Pilot Common Project also extends over non-EU Member States (e.g. Switzerland and Norway) that are included within its geographical scope and have committed to implement the Single European Sky through bilateral and multilateral agreements



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WHAT IS THE SESAR DEPLOYMENT PROGRAMME



2. What is the SESAR Deployment Programme?

2.1 The regulatory framework

In line with the overall arrangement of the SESAR Programme (depicted within the previous Chapter) and in accordance with the provision laid down by Regulation (EU) n. 409/2013, the SESAR Deployment Phase started with the adoption of the **Pilot Common Project** by European Commission on June 27th, 2014. The PCP therefore triggered **the need for a unique and widely agreed implementation plan**, illustrating how to get organized to ensure a synchronized, coordinated and timely deployment.



Fig. 6 - Regulation (EU) no. 409/2013 and the SESAR Deployment Programme

This implementation plan is the SESAR Deployment Programme, developed by the SESAR Deployment Manager, building on the technical contribution of the SESAR Joint Undertaking, the Network Manager and the European Defense Agency, whilst also taking into consideration the outcomes of a wideranging consultation of the ATM Community.

More specifically, **Article 11 (1) of Regulation (EU) n. 409/2013** states that the Deployment Programme shall provide "a comprehensive and structured work plan of all activities necessary to implement technologies, procedures and best practices required to implement common projects".

The Programme therefore aims at organizing local, regional and European-wide implementation activities for both civil and military operational stakeholders in order to comply with the requirements stated in the Pilot Common Project in the most

performance driven manner, considering the **readiness of the technological elements to be deployed**. The Regulation also outlines the elements that the Deployment Programme shall identify, namely "*all the associated risks and mitigation actions, the geographical scope, the timeframe and the operational stakeholders responsible*".

In other words, whereas the Pilot Common Project sets out at very high level, **what** has to be implemented, **where** it should be implemented, **which stakeholders** are called to invest to implement and **when** this implementation shall be completed, the **SESAR Deployment Programme** illustrates and details **how** the implementation shall be carried out, supporting a coherent planning and the sound sequencing of the deployment.

As indicated within Article 11 (2) of the Regulation (EU) No 409/2013, the SESAR Deployment Programme shall **indeed represent the reliable** "*reference for the work*" of all stakeholders involved in the implementation of SESAR.



2.2 The blueprint for Stakeholders' ATM modernization plans

In this perspective, the SESAR Deployment Programme fulfils the role of providing the **blueprint for the investment plans of all operational stakeholders** impacted by the Pilot Common Project Regulation and required to participate in

the implementation of its ATM Functionalities.

Through the Deployment Programme, all ATM Stakeholders are provided with a common reference to support optimization the and synchronization of their investments within the scope of the Pilot Common Project. More specifically, the Programme flags implementation activities to be performed, identifies the optimum timing for such implementation and supports the definition of the most suitable approach in order to achieve the objectives set forth in the Regulation.



In addition, considering the co-funding support to Common Projects implementation available through the CEF Framework, the **SESAR Deployment Programme** also represents the **main reference document to specify the priorities of CEF Transport Calls for Proposals** for the priority SES / SESAR / CP.

Finally, the Programme is also a **reporting tool** at disposal of the EU Institutions and States together with their related Agencies and as Authorities, as well as all involved stakeholders to monitor the **status of PCP implementation** across Europe, allowing also the **identification of those activities** that still need to be performed to steer deployment and ensure the achievement of the expected performance benefits.

2.3 SESAR Deployment Programme and complementary functional views

The latest developments in the Single European Sky environment – and especially the evolutions stemming from the SESAR as a whole – are continuously **transforming and re-shaping the European ATM infrastructure**, its main features and its operational setting.

In this evolving picture, the **need for a common stable reference work plan** able to consistently steer the PCP Implementation across the years shall be **complemented with the adequate flexibility to ensure a constant alignment with the necessary living PCP and future CPs optimum deployment scenario**; this flexibility is highly needed, in order to make sure that all operational stakeholders can adapt their investments and their implementation activities on the basis of the most updated strategic developments, to be identified on a yearly basis.

These double requirements led to the definition of the **tailored structure of the Deployment Programme** to allow stakeholders to access to data and information that is **most relevant to their area of interest**.

The **SESAR Deployment Programme** is developed in order to provide all necessary information to operational stakeholders impacted by the Pilot Common Project and involved in its deployment: it includes a **summary of all activities to be undertaken**, their **scope** and **timeframe**, its **geographical scope**, as well as information on associated **Risks and Mitigation Actions**.



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The SESAR Deployment Programme is stable by nature. It represents the translation into technical and operational terms of the business view identified within the PCP, which requires updates only as a result of the review of the Pilot Common Project, or after the adoption of a new Common Project. In this perspective, Article 12 (3) of Regulation (EU) no. 409/2013 explicitly states that "Upon adoption of each common project the Commission shall request the Deployment Manager to adapt the Deployment Programme".

The SESAR Deployment Programme is further complemented by specialized functional views, which - on the basis of yearly updates and a periodical consultation process involving all relevant operational stakeholders - plan and report on specific topics and subjects, ensuring the availability of the most up-to-date information to the benefit of the ATM Community. In particular, the SESAR **Deployment Programme** works as a stable host structure to which evolving specialized views connect:

- The **DP Planning View**, a more detailed planning tool to Operational Stakeholders involved in the deployment of PCP Regulation, clearly defining the scope of the implementation activities, as well as the suggested approach to be followed in the implementation of the technological elements associated to the ATM Functionalities listed in Reg. (EU) n. 716/2014;
- The **DP Monitoring View Full PCP**, a constantly evolving reporting instrument to illustrate the status of implementation of the Pilot Common Project across its geographical scope, to keep track of the deployment progress on a yearly basis, and to identify those implementation activities that still need to be undertaken (i.e. implementation gaps);
- The DP Monitoring and Performance View / SESAR FPA, which reports on the progress of CEF-funded and SDM-coordinated Implementation Projects; this document provides a wide-ranging outlook on the progress and achievements, also referring to the performance benefits enabled by the Implementation Projects (IPs) and including the associated Cost Benefit Analysis. Finally, it features the registry of all risks associated to SDM-coordinated Implementation Projects, and supports the identification of the most appropriate Mitigation Actions.



DP Planning View updated yearly

DP Monitoring View Full PCP updated yearly

DP Monitoring and Performance View SESAR FPA updated three times per year

Fig. 8 - The lifecycle of the SESAR **Deployment Programme and of its** complementary functional views

The presented views – which are **tightly linked with this** document and represent a further breakdown of its content – require a **periodical update**. That is to maintain their alignment with the European ATM scenario and to include the latest information (for instance, in terms of newly available documents and guidance material).

In this perspective, the **DP Planning View** and the **DP** Monitoring View / Full PCP will be updated on a yearly basis, whilst the DP Monitoring and Performance View / SESAR FPA – which demands for a tighter monitoring on the progress of the CEF-funded Implementation Projects will be issued three times per year.

More specifically, the update of the **DP Planning View** is essential to provide stakeholders with a common reference which clearly identifies those activities to be urgently undertaken, on the basis of the latest strategic developments registered within the ATM scenario, whilst also encompassing the latest information on available standards and/or any other supporting document. On the other hand, the **DP Monitoring View Full PCP** has to be considered as a truly *living document*, as it aims at reporting the progresses achieved by stakeholders from all EU Member States and to timely identify any potential delay which might hinder the achievement of the overall performance benefits.



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Finally, the **DP Monitoring and Performance View SESAR FPA** builds on the continuous provision of data by Stakeholders participating in the CEF-funded Implementation Projects and on the monitoring activities performed by SDM, thus allowing for the **constant tracking of the implementation successes**.

2.4 The buy-in of ATM Community through consultation

In order to ensure the full **commitment of the ATM community** to implement the Pilot Common Project, the SESAR Deployment Programme is the result of a **wide-ranging and thorough consultation process**, involving all impacted categories of **operational and non-operational stakeholders**, so as to make sure that the document takes into duly consideration their standpoints and perspectives.

The engagement mechanisms established by the SESAR Deployment Manager fall into **two different but closely inter-related fields**:

- The cooperation and coordination initiatives with other relevant SES bodies and non-operational stakeholders;
- The direct involvement of operational stakeholders in the elaboration and maintenance of the Programme and its views.



Stakeholders' consultation

Cooperation with the relevant SES bodies and non-operational stakeholders

With regard to the first area, Article 9(7) and 12(2) of Regulation (EU) no. 409/2013 establishes that the **elaboration of the SESAR Deployment Programme and its maintenance** shall be "*coordinated with the Network Manager, the SESAR Joint Undertaking and the military*", in order to exploit their specific expertise on specific topics, so as to:

- Carefully address the PCP-related deployment aspects deemed to impact on the European network infrastructure and on its airspace organization, as well as to ensure coherence with the Network Strategy Plan and the Network Operations Plan;
- Ensure the alignment of the Programme with the ATM Master Plan, as well as guarantee adequate continuity between the different ATM innovation lifecycle phases, with specific regard to the progress made in the industrialization phase and their impact on deployment activities;
- Foster the coordination between civil and military stakeholders to synchronize implementation, in order to **avoid any adverse impact on national and collective defense capabilities**.

Taking into account the pivotal role of the SESAR Deployment Programme in the ATM context, SDM has activated all **required cooperation streams**, also expanding the coordination effort by **involving other critical organizations and Agencies in the process**, including:

- **EASA** and the main **Standardization bodies**, which ensure the integration in the Programme of the **most updated references**, **specifications**, **standards and supporting Regulations**, to steer a harmonized and safe deployment of the PCP;
- the **National Supervisory Agencies**, to ensure that the progress in the PCP deployment are appropriately **acknowledged in the National Performance Plans**;
- the Manufacturing Industry, to ensure the alignment between the outcomes of the industrialization phase and the optimum planning identified in the Programme, seeking their cooperation to ensure the timely development of the appropriate standards and marketing of the required hardware and software;
- the **staff associations**, to ensure that human factors, competency and change management issues are duly taken into account in the **SESAR Deployment Programme**.



The engagement of European operational stakeholders

In order to complement its own expertise and the inputs stemming from other SES bodies with operational inputs and insights from the ATM field, SDM set up and currently manages a dedicated **Stakeholders' Consultation Platform (SCP)**, opened to all European ATM operational stakeholders impacted by the Common Projects' deployment and/or benefiting from their implementation. In order to keep the SCP within a manageable size and to ensure smooth consultation campaigns, the participation of stakeholders is organized at **groupings' level** and/or at **Functional Airspace Blocks (FAB) level**.

The purpose of such Platform is to seek **stakeholders' point of view on the SESAR Deployment Programme** and on the update of its **evolving views**, through the elaboration of specific **opinions on proposals** made by the SESAR Deployment Manager, consisting into a **set of recommendations**. The final goal of such recommendations is to **improve and expand stakeholders' buy-in on the Programme** and on its periodic updates.

Taking into account the wide scope of the Programme, as well as the span of its technical content, the Stakeholders' Consultation Platform is composed by **Thematic Sub-Groups** – which are responsible for targeted discussion and analysis on specific aspects – and by a **Steering Group** at its main level, which issues the **opinions and recommendations** to the SESAR Deployment Manager.

2.5 Tracking the progress in implementing PCP

Considering the SESAR Deployment Manager responsibility to "*implement the Commission's Decisions and monitor their implementation by the implementation level*" - as stated by Article 9 of Reg. 409/2013, the **SESAR Deployment Programme** aims at providing **a common reference to operational stakeholders on the status of PCP implementation** and at identifying all **implementation activities that still need to be undertaken** in order to achieve its full deployment.

A clear, reliable and constantly **evolving picture of the current status of PCP implementation** throughout Europe is built and provided to European Commission, to other SES bodies and to operational stakeholders, through the yearly updates of the **DP Monitoring View – Full PCP**.

In particular, the picture built in the **Programme** provides different views, allowing to report on the **status of the implementation of PCP-related technological elements** within a dedicated Member State or within one of the 25 PCP-listed airports. In addition, **specific information are provided also at stakeholder level**, keeping track of their involvement in the deployment activities.

Such comprehensive outlook is a valuable tool to guide future investments and activities by the stakeholders, as well as to identify potential delays and issues to be mitigated and to avoid significant gaps in the Programme's implementation, thus supporting performance expectations. The elaboration of such detailed monitoring picture and the identification of the most urgent activities still to be undertaken relies on the strict cooperation amongst the SESAR Deployment Manager and the operational stakeholders, as well as on the support of the Network Manager and of the European Defence Agency.

Such cooperation has resulted in a **wide-ranging Monitoring Exercise**, performed on a yearly basis, aiming at providing an **up-to-date picture of the implementation of the Programme**. By integrating inputs and feedback coming from all stakeholder categories involved in the deployment of the Programme, the Exercise supports the identification of **what has still to be implemented**, where and by whom (i.e. the existing implementation *gaps*). It is worth underlying that the Exercise is organized to involve and directly engage:

- ground stakeholders, organized and clustered on a geographical scope-basis;
- **Airspace Users**, organized on a fleet-centric approach, for those elements whose deployment requires their direct involvement, with specific reference to the PCP-related airborne capabilities, as well as the flight-planning capabilities.

The dedicated yearly **SDM Monitoring Exercise** directly involves operational stakeholders, gathering information and data through *ad-hoc* templates and surveys **aiming at detailing the current status of**



implementation, identifying those Families which have already been implemented, those whose deployment is in progress and/or planned, as well as those whose implementation is still to be planned (also specifying the expected date of completion, when available). The update of **such snapshot on the status of implementation** is provided within the yearly releases of the **DP Monitoring View – Full PCP**.



THE PROJECT VIEW OF THE PILOT COMMON PROJECT



3. The Project View of the Pilot Common Project

3.1 Translating PCP into operational reality

Whereas the Pilot Common Project – as laid down by Regulation (EU) no. 716/2014 – sets forth the ATM functionalities required to be implemented across the European Air Traffic Management infrastructure in the timeframe 2014-2026, the **SESAR Deployment Programme** aims at translating these groups of operational improvements and their sub-sets into coherent **Families of implementation projects**. A Family therefore represents a **more specific set of homogeneous technological and operational elements**, which shall be deployed within a defined geographical scope in order to **make sure that the operational scenario defined by the PCP Regulation** becomes reality and **the associated performance improvements** are delivered to the ATM Community and – in turn – to European passengers.

The **48 Families** identified in the Programme therefore regroup **all local implementation initiatives** which contribute to **pursue the deployment** of the **20 Sub-ATM Functionalities**, and – subsequently – of the **6 ATM Functionalities** currently included in the PCP. In order to better organize the PCP implementation and support stakeholders in the refinement of their investment plans, the 48 families of the Programme have been clustered into three categories:

- **36 core PCP families**, which regroups all operational and technological improvements that are explicitly mentioned within the text of Regulation (EU) n. 716/2014;
- **7** *facilitating families*, which includes the implementation activities linked to PCP Sub-AFs, which can facilitate the full deployment as an intermediate step to achieve the operational concept. They are not mandatory by PCP Regulation;
- 5 complementary families, which are linked to the PCP Sub-AFs and are deemed necessary to cover an existing gap not explicitly addressed in the PCP Regulation; they are not mandatory by Regulation (EU) n. 716/2014, although they can be mandatory in accordance to other EU Regulations (such as Aeronautical Data Quality Regulation and Data Link Services Regulation⁴);

After the initial iterations in 2015 and 2016, the **full list of the 48 Families** – including their clusterization into *core PCP*, *facilitating* and *complementary families* – has been finally defined and shall be considered as stable. Whilst the number and technical scope of the families will no longer be modified, their readiness for implementation is still expected to evolve, thanks to the growing **technological maturity** of the elements to be deployed and the **progresses in the industrialization phase**, with a specific focus on the availability of standards and recommended practices for the deployment.

Detailed information on the readiness for deployment of each Family, as well as on their status of **implementation throughout the PCP geographical scope**, are **included in the yearly detailed functional views that support the SESAR Deployment Programme**, namely the DP Planning View and the DP Monitoring Full PCP.

As a stable reference, the **full list of the 48 families** is **reported below**, clustered by ATM Functionality.

AF1 – Extended AMAN and Performance Based Navigation in the High Density TMAs

- **Family 1.1.1** Basic AMAN *facilitating family*
- Family 1.1.2 AMAN Upgrade to include Extended Horizon function
- **Family 1.2.1** RNP Approaches with vertical guidance
- Family 1.2.2 Geographic Database for Procedure Design- complementary family
- **Family 1.2.3** RNP 1 Operations in high density TMAs ground capabilities
- **Family 1.2.4** RNP 1 Operations aircraft capabilities *facilitating family*
- **Family 1.2.5** RNP routes connecting Free Route Airspace (FRA) with TMA *complementary family*

AF2 – Airport Integration and Throughput

- Family 2.1.1 Initial DMAN
- Family 2.1.2 Electronic Flight Strips (EFS)
- Family 2.1.3 Basic A-CDM

⁴ Respectively, *Regulation (EU) n. 73/2010 laying down requirements on the quality of aeronautical data and aeronautical information for the Single European Sky* and *Regulation (EU) 2015/310 amending Regulation (EC) n. 29/2009 laying down requirements on data link services for the single European Sky*



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- **Family 2.1.4** Initial Airport Operations Plan (AOP)
- Family 2.2.1 A-SMGCS Level 1 and 2
- Family 2.3.1 Time Based Separation (TBS)
- Family 2.4.1 A-SMGCS Routing and Planning Functions
- Family 2.5.1 Airport Safety Nets associated with A-SMGCS (Level 2)
- Family 2.5.2 Aircraft and vehicle systems contributing to Airport Safety Nets facilitating family

AF3 – Flexible Airspace Management and Free Route

- Family 3.1.1 ASM Tool to support AFUA facilitating family
- Family 3.1.2 ASM management of real time airspace data
- Family 3.1.3 Full rolling ASM/ATFCM process and ASM information sharing
- **Family 3.1.4** Management of Dynamic Airspace configurations
- Family 3.2.1 Upgrade of ATM systems (NM, ANSPs, AUs) to support Direct Routings (DCTs) and Free Routing Airspace (FRA)
- Family 3.2.3 Implement Published Direct Routings (DCTs) facilitating family
- Family 3.2.4 Implement Free Route Airspace

AF4 – Network Collaborative Management

- **Family 4.1.1** STAM Phase 1 *facilitating family*
- Family 4.1.2 STAM Phase 2
- Family 4.2.2 Interactive Rolling NOP
- Family 4.2.3 Interface ATM systems to NM systems
- Family 4.2.4 AOP/NOP Information Sharing
- Family 4.3.1 Target times for ATFCM purposes
- **Family 4.3.2** Reconciled Target Times for ATFCM and arrival sequencing
- **Family 4.4.2** Traffic Complexity Tools

AF5 – Initial System Wide Information Management

- Family 5.1.1 PENS 1: Pan-European Network Service version 1
- Family 5.1.2 NewPENS: New Pan-European Network Service
- **Family 5.1.3** Common SWIM Infrastructure Components
- Family 5.1.4 Common SWIM PKI and cyber security
- **Family 5.2.1** Stakeholders Internet Protocol Compliance *facilitating family*
- Family 5.2.2 Stakeholders SWIM Infrastructure Components
- **Family 5.2.3** Stakeholders' SWIM PKI and cyber security
- **Family 5.3.1** Upgrade/Implement Aeronautical Information Exchange System / Service
- Family 5.4.1 Upgrade/Implement Meteorological Information Exchange System / Service
- Family 5.5.1 Upgrade/Implement Cooperative Network Information Exchange System / Service
- Family 5.6.1 Upgrade/Implement Flight Information Exchange System / Service supported by Yellow Profile
- Family 5.6.2 Upgrade/Implement Flight Information Exchange System / Service supported by Blue Profile

AF6 – Initial Trajectory Information Sharing

- Family 6.1.1 ATN B1 based services in ATSP domain complementary family
- Family 6.1.2 ATN B2 based services in ATSP domain
- **Family 6.1.3** A/G and G/G Multi Frequency DL Network in defined European Service Areas *complementary family*
- **Family 6.1.4** ATN B1 capability in Multi Frequency environment in aircraft domain *complementary family*
- Family 6.1.5 Implementation of ATN B2 in Aircraft domain

The **Work-Breakdown Structure (WBS)** reported in the following page reflects the structure of the Pilot Common Project and its breakdown into AFs, Sub-AFs and Families. It is worth noting that the WBS includes both the **PCP families**, which are explicitly derived from the PCP Regulation text, and the **DP families**,



which have been added at the initiative of the Deployment Manager with the **full support of the operational stakeholders** in order to de-risk full PCP implementation.



Fig. 10 - The full Project View of the Pilot Common Project

In the following paragraphs, the content of the Project View will be expanded and the 6 ATM Functionalities of the PCP will be broken down, illustrating the **full structure of each ATM functionality** through a further detailing of the Work Breakdown Structure, as well as providing an overview on the **technical content of each Family**. Such overview is further detailed through a fully developed **Family description** within the yearly-updated **DP Planning View**.





AF #1 – Extended AMAN and PBN in high density TMA

Fig. 11 - AF#1 Extended AMAN and PBN in high density - Work Breakdown Structure

The ATM Functionality #1 includes **Extended Arrival Management** and **Performance Based Navigation (PBN)** in high density Terminal Manoeuvring Areas. AF 1 will allow for more optimal route structures with closer spaced routes supporting deterministic profiles, improve the precision of the approach trajectory and facilitate air traffic sequencing at an earlier stage.

More in detail, Extended AMAN supports the **extension of the planning horizon out to a minimum of 180-200 Nautical Miles**, well beyond the Top of Descent of arrival flights. PBN in high density TMAs covers the development and **implementation of fuel efficient and/or environmentally friendly procedures for Arrival and Departure RNP1** (Required Navigation Performance 1) **Standard Instrument Departures** (RNP 1 SIDs), **Standard Arrival Routes** (STARs), and **RNP approach with vertical guidance** (RNP APCH).

Optimisation of airspace design is in most cases necessary to obtain full benefit from PBN. This includes **all phases of flight from en-route down to landing and from take-off to en-route** in support of operations like CDO and CCO etc. Consistent navigation based on RNP connecting Free Route Airspace (FRA) with TMAs is expected to be facilitated by Advanced RNP (A-RNP).

Accordingly, AF1 is structured in two Sub-AFs, including respectively two and five Families, as follows:

Sub-AF 1.1 – Arrival Management extended to en-route Airspace

- **Family 1.1.1:** Basic AMAN *facilitating family*
- Family 1.1.2: AMAN upgrade to include Extended Horizon function

Sub-AF 1.2 – Enhanced Terminal Airspace using RNP-Based Operations

- Family 1.2.1: RNP APCH with vertical guidance
- **Family 1.2.2:** Geographic Database for procedure design *complementary family*
- Family 1.2.3: RNP 1 operations in high density TMAs ground capabilities
- Family 1.2.4: RNP 1 operations aircraft capabilities facilitating family
- Family 1.2.5: RNP routes connecting Free Route Airspace (FRA) with TMA complementary family



1.1.1 – Basic AMAN
Implementation of Basic AMAN service to support synchronization of arriving traffic in high density TMAs. Basic AMAN is used as a controller support tool to smooth the flows at TMA border and ensure a stable sequence which the TMA controllers then maintain and optimize towards the runway.
The implementation typically involves changes to ATM system configuration – hardware, software, interfaces, possibly a new controller role, new controller procedures and associated training.

1.1.2 - AMAN Upgrade to include Extended Horizon function

Implementation of Extended AMAN service to support synchronization of arriving traffic in high density TMAs. The AMAN service horizon is extended to 180-200 nautical miles, equivalent to about 35 to 40 minutes before landing, which means that adjacent En-Route sectors get involved in sequence implementation and maintenance.

The implementation typically involves ATM systems configuration, new interfaces, new controller roles, procedures and training.



Family 1.2.2 - Geographic Database for Procedure design

Provision of geographic database to support procedure design including obstacle data as part of Aeronautical Information Management.

A high integrity geographic database is a facilitator for PBN procedure construction. The implementation involves system configuration – hardware, software, interfaces, database population and staff training.



Family 1.2.3 - RNP1 Operations in high density TMAs (ground capabilities)

Implementation of RNP 1 departure and arrival routes (SIDs and STARs) in TMA including the use of the Radius to Fix (RF) turns where benefits are enabled for noise exposure, emissions and/or flight efficiency (reducing environmental impact). A SID-STAR structure designed on the basis of a RNP 1 airspace concept allows routes spaced closer to each other, repeatable and accurate turns and deterministic routes which in turn enable greater flexibility for aircrews to plan and execute a predictable, environmentally optimized descent.



Family 1.2	2.4 - RNP 1 Operations (aircraft capabilities)	
Implementation of aircraft RNP navigation capability that enables efficient and environmentally friendly operations (noise and GHG emissions) in departure (SID), arrival (STAR), approach (RNP APCH) and connecting airports to En-Route airspace.		
	Family 1.2.5 - Family 1.2.5 - RNP routes connecting F	ree Route Airspace (FRA) w ith TMA

Connectivity between Free Route Airspace and TMAs through the implementation of navigation specifications covered by Advanced RNP (A-RNP).

The intention is to provide consistent PBN navigation from departure to landing.

Advanced RNP is a recent addition to PBN and may undergo further evolution; this family will be updated accordingly once the PBN Manual Edition 5 has been published.







Fig. 12 - AF #2 Airport Integration and Throughput - Work Breakdown Structure

Airports are the nodes of the air-traffic network in Europe. It is therefore of great importance to achieve a **seamless integration of airports in the pan-European network management** and to ensure that airports do not become bottlenecks, limiting the capacity of the European ATM-system. The Pilot Common Project, set forth in Regulation (EU) no. 716/2014, identifies **25 airports that are critical to the network**, either because they play a significant role for the air-transport in their region or because they are located in a high-density Terminal Manoeuvring Area (TMA).

The ATM Functionality #2 was created to ensure that these airports and TMAs will be able to **manage the growing traffic demand of the future in a safe and efficient manner**, whilst taking on-board environmental aspects and guaranteeing a **maximum degree of interoperability for airspace users**.

Together with aspects from other AFs (mainly AF1– Extended AMAN and PBN in high density TMA, AF4 – Network Collaborative Management, and AF5 – Initial SWIM), the objectives of AF2 shall be achieved through the following Sub-AFs and related Families:

Sub-AF 2.1 Departure Management synchronised with Pre-Departure Sequencing

- Family 2.1.1 Initial DMAN
- Family 2.1.2 Electronic Flight Strips (EFS)
- Family 2.1.3 Basic A-CDM
- Family 2.1.4 Initial Airport Operations Plan (AOP)



Sub-AF 2.2 Departure Management integrating Surface Management Constraints

- Family 2.2.1 - A-SMGCS Level 1 and 2

Sub-AF 2.3 Time Based Separation for Final Approach

- Family 2.3.1 - Time Based Separation (TBS)

Sub-AF 2.4 Automated Assistance to Controller for Surface Movement Planning and Routing

- Family 2.4.1 – A-SMGCS Routing and Planning Functions

Sub-AF 2.5 Airport Safety Nets

- Family 2.5.1 Airport Safety Nets associated with A-SMGCS (Level 2)
- Family 2.5.2 Vehicle and aircraft systems contributing to Airport Safety Nets facilitating family



Family 2.1.1 - Initial DMAN
Initial Departure Manager (DMAN) is a planning tool to improve the departure flows at airports. This system elaborates a collaborative sequence and provides both Target Start Up Approval Time (TSAT) and Target Take Off Time (TTOT), taking into account agreed principles to be applied.

Family 2.1.2 - Electronic Flight Strips (EFS)

Electronic Flight Strips (EFS) is the automated assistance to air traffic controller.

EFS shall integrate the instructions given by the air traffic controller with other data such as flight plan, surveillance, routing, published rules and procedures. The system supports coordination dialogue between controllers and transfer of flights between units or different locations within one unit.





Family 2.1.3 - Basic A-CDM

Airport Collaborative Decision Making (A-CDM) is the concept, which aims at improving operational efficiency at airports and improves their integration into the Air Traffic Flow and Capacity Management (ATFCM) by increasing information sharing and improving cooperation between all relevant stakeholders (local Air Navigation Service Providers, airport operator, aircraft operators, Network Manager, other airport service providers).

Family 2.1.4 - Initial Airport Operations Plan (AOP)

The Airport Operations Plan (AOP) is a single, common and collaboratively agreed rolling plan available to all airport stakeholders whose purpose is to provide common situational awareness.

The AOP reflects the operational status of the airport.





Family 2.2.1 - A-SMGCS Level 1 and 2

A-SMGCS level 1 provides ATC with the position and identity of all relevant aircraft within the movement area and of all relevant vehicles within the manoeuvring area.

A-SMGCS level 2 is a level 1 system complemented by the A-SMGCS function to detect potential conflicts on runways, taxiways and intrusions into restricted areas and provide the controllers with appropriate alerts.



Family 2.3.1 - Time Based Separation (TBS)

Time Based Separation (TBS) consists in the separation of aircraft in sequence on the approach to a runway using time intervals instead of distances.

The objective is to recover loss in airport arrival capacity currently experienced in headwind conditions on final approach under distance-based wake turbulence radar separation rules.





Family 2.4.1 - A-SMGCS Routing and Planning Functions

A-SMGCS Routing and Planning Functions provide ATC with:

- Optimised route designation for each aircraft or vehicle within the movement area:
- The detection of all route conflicts on the movement area as well as improved routing and planning for use by controllers.

Family 2.5.1 – Airport Safety Nets associated with A-SMGCS (Level 2)

Airport safety nets consist of the detection and alerting of conflicting ATC clearances to aircraft and deviation of vehicles and aircraft from their instructions, procedures or routing which may potentially put the vehicles and aircraft at risk of a collision.

The scope of this sub-functionality includes the Runway and Airfield Surface



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Movement area.

amily 2.5.2 - Vehicle and aircraft systems contributing to Airport Safety Nets

The scope of this Family includes:

- aircraft technology in the scope of avionic or electronic flight bag based systems with the objective to conclude the ground based airport safety net with specific airborne systems and technology;
- on-board vehicle displays including on-board vehicle safety nets, including alerting functions, with the objective to support the ground based airport safety net with specific vehicle systems and technology;

Under Family 2.5.2, it is not foreseen to provide the complete "aircraft picture" to the "Air Traffic Controller", nor to provide the complete "Air Traffic Controller picture" to the cockpit.



AF #3 – Flexible ASM and Free Route



Fig. 13 - AF #3 Flexible ASM and Free Route – Work Breakdown Structure

The management of airspace in terms of **advanced flexibility and free route** is the future for its optimization. The main aims of ATM Functionality #3 are to produce **benefits to the environment**, in terms of **emissions reduction**, as well as to the Airspace Users, with respect to the desired trajectories and with due consideration of the impact on airspace capacity. These objectives may be achieved by combining the following operations:

- Implementation of ASM management systems, tools, airspace structure, and procedure that support an advanced Flexible Use of Airspace. The aim is to ease, to facilitate segregations and reservations of portions of airspace when required for exclusive usage, avoiding, as much as possible, to hamper the military mission effectiveness and providing, at the same time, minimum impact on other airspace users.
- Implementation of **harmonised DCTs and Free Route Airspace throughout Europe**, with necessary support by system upgrades and tools. This shall enable flights to as far as possible to fly their **preferred route without the typical constraints of fixed route network** and rigid airspace structure.

For this reason, AF3 is structured in two Sub-AFs with their related Families:

<u>S-AF3.1 – Airspace Management and Advanced Flexible Use of Airspace</u>. This requires close coordination and cooperative decision making among all stakeholders (civil and military), ASM tools, real time data management and exchange for **most flexible airspace use and configuration for best adaptation to users' needs**.

- Family 3.1.1 ASM Tool to support AFUA facilitating family
- Family 3.1.2 ASM management of real time airspace data
- Family 3.1.3 Full rolling ASM/ATFCM process and ASM information sharing
- Family 3.1.4 Management of Dynamic Airspace Configurations

S-AF3.2 – Free Route This requires important changes in **airspace structure and significant upgrade of all stakeholders' systems** to support DCTs and Free Route implementation operations, in a synchronised European scenario, regardless of border limitations.

- Family 3.2.1 Upgrade of ATM Systems (NM, ANSPs, AUs) to support Direct Routings (DCTs) and Free Route Airspace (FRA)
- Family 3.2.3 Implement Published Direct Routings (DCTs)– facilitating family
- Family 3.2.4 Implement Free Route Airspace





Family 3.1.1 - ASM Tool to support AFUA

The deployment of automated AirSpace Management (ASM) Systems and their interoperability with Network Manager systems and neighbouring ASM systems to manage ARES (Airspace REServations) will lead to improved civil-military coordination and greater flexibility according to Airspace Users' needs.

Family 3.1.2 – ASM Management of real time airspace data

Airspace management (ASM) is enhanced by the automated exchange services of ASM data during the tactical and execution phases, continuously in real time.

ASM information (real-time ARES status) are shared between ASM systems, civil and military ATS units/systems and communicated to the Network Manager in the tactical and execution phases.





Family 3.1.4 - Management of Dynamic Airspace Configurations

Airspace configurations are based on pre-defined, coordinated airspace structures and ATC dynamic sector management.

Dynamic Airspace Configuration focuses on defining the concept, including roles and responsibilities in an advanced Collaborative Decision Making process.





Family 3.2.1 - Upgrade of ATM systems to support DCT and FRA

The upgrades of ATM systems belonging Network Manager, Airspace Users and Air Navigation Service Providers necessary to support the implementation of Direct Routings and Free Route Airspace



Family 3.2.3 - Implement Published Direct Routings Implementation of published Direct Routings (DCTs) may be carried out within a	
State or between States on a cross border basis. The Stakeholders may choose to implement Free Route Airspace without implementing Direct Routings as an intermediate step.	

	Family 3.2.4 – Implement Free Route Airspace	
		Free Route Airspace (FRA) is a specified airspace within which users may freely plan a route between defined FRA entry points and defined FRA exit points, with the possibility to route via intermediate (published or unpublished) waypoints, without reference to the ATS route network.





AF #4 – Network Collaborative Management

The ATM Functionality #4, Network Collaborative Management, has the objective of **enhancing the European ATM network performance**, notably optimized capacity and flight efficiency, through the **exchange, modification and management of aircraft trajectory information**. Flow Management shall move to a **Cooperative Traffic Management (CTM) environment**, optimizing the delivery of traffic into sectors and airports whilst acknowledging the requirement for **Air Traffic Flow and Capacity Management (ATFCM) measures**. AF4 is structured in four Sub-AFs with their related Families, as follows:

Sub-AF4.1 – Enhanced Short Term ATFCM Measures

Family 4.1.1 – STAM Phase 1, mainly related to what already exists – facilitating family Family
4.1.2 – STAM Phase 2, with coordination between local entities – such as ANSP, Airport and AU – and NM tools

<u>Sub-AF4.2 – Collaborative NOP</u>, through the exchange of information between Stakeholders via a central repository.

- Family 4.2.2 Interactive Rolling NOP (NM platform and its usage)
- Family 4.2.3 Interface ATM Systems to NM Systems (information exchange between ANSP, AU and NM)
- **Family 4.2.4** AOP/NOP Information Sharing (information exchange between Airports see Family 2.1.4 for AOP and NM)

Sub-AF4.3 – Calculated Take-off Time to Target Times for ATFCM purposes

- **Family 4.3.1** Target Time for ATFCM purposes (including the validated part)
- **Family 4.3.2** Reconciled Target Times for ATFCM and arrival sequencing (including a more ambitious yet still to be fully validated concept)

Sub-AF4.4 – Automated Support for Traffic Complexity Assessment

- Family 4.4.2 – Traffic Complexity Tools



Fig. 14 - AF#4 Network Collaborative Management - Work Breakdown Structure



Family 4.1.1 - STAM Phase 1

The target of the Short Term ATFCM Measures (STAM) phase 1 is to replace systematic usage of En Route CASA regulations for situations when imbalances are manageable via local operational procedure.

The aim is to improve the efficiency of the system using flow management techniques close to the real time operations with direct impact on tactical capacity management, occupancy counts and tactical action on traffic.

Family 4.1.2- STAM Phase 2

The second phase tactical capacity management using STAM requires the deployment of additional tool and procedures in order to ensure a close and efficient working relationship between NM, FMP and airspace users.





Family 4.2.2 – Interactive Rolling NOP

Network operations are driven by enhanced stakeholders' participation in a rolling cooperative process (Civil & Military airspace users, ANSPs, Airports, NM, outside EUR interfaces). This rolling view of the network situation (rolling NOP) and the support to the collaborative processes is based on an information management platform, accessible online by all stakeholders for consultation

Family 4.2.3 - Interface ATM systems to NM systems

This Family addresses the message exchange between NM systems, ANSPs ATM system and AU/FOC /WOC flight plan fling systems in respect of collaborative flight planning, improving flight plan distribution and enhanced tactical flow management. Those messages are for example AFP/ACH from ATM and Extended Flight plan from Airspace Users



Family 4.2.4 – AOP/NOP Information Sharing

In order to improve the European ATM network performance, notably capacity and flight efficiency through exchange, modification and management of trajectory information there is a clear need for information sharing between the Airports and the Network Manager.

This could be done via the automatic sharing of data between AOP (Airport Operation Plan) and the NOP (Network Operation Plan). This family is limited to the PCP airport.



Family 4.3.1 - Target Time for ATFCM purposes

NM system should transmit calculated target time at the most penalising regulation reference point in addition to CTOT to all concerned users. Those users should be able to manage this new feature and potential system upgrades should be foreseen.

In case of single arrival regulation, it should be possible for the Airport/TMA to amend the TTA, leading to a recalculation of the CTOT by NM.





Family 4.3.2 – Reconciled Target Times for ATFCM and arrival sequencing

The scope of this Family contains the process, procedure and system upgrades related to the reconciliation of multiple local Target Time constraints, coming from Airport (AOP), ANSP (either AMAN/extended AMAN or en-Route) or Network DCB process.

Considering the current status of development work, the concept still needs to be validated at SJU level

Family 4.4.2 - Traffic Complexity Tools

Traffic Complexity tools continuously monitor and evaluate current and expected traffic loads and estimated controller's workload in order to optimise the use of available capacity.

Depending on the time horizon, the tools will use predefined metrics to enhance long-term ATFCM, and/or enhanced planned trajectory prediction for mid-term ATFCM and/or real time trajectory data for short term ATFCM. Traffic complexity tools also enhance the real time ATCO workload estimation.





AF #5 – Initial SWIM



Fig. 15 - AF#5 iSWIM - Work Breakdown Structure

SWIM is part of the **Data Communication Infrastructure** as well as of the **ATM systems connected to the Data Communication Infrastructure** in the SESAR EATM Architecture.



SESAR EATM Architecture



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THE PROJECT VIEW OF THE PILOT COMMON PROJECT

SWIM supports the exchanges of ATM information between the Operational Stakeholders for all data domains, ground-ground and air-ground. Initial SWIM (iSWIM) as called in the PCP, is limited to some specific **Ground-Ground Aeronautical**, **Meteorological**, **Cooperative Network and Flight Data Information exchanges**.



Based on the ICAO definition of SWIM depicted above, according to which "*SWIM comprises standards, infrastructure and governance enabling the management of information and its exchange between operational stakeholders via interoperable services*", the Deployment Programme contains 12 Families, as a guideline for the operational stakeholders to implement initial SWIM projects. The 12 Families fall into 3 distinct sets.

A first set is dealing with the **necessary common components and structures**. "*Common*" in this respect means that **only one common system or one common set of rules is to be deployed for the geographical scope** mandated by the Commission Implementing Regulation (EU) no. 716/2014. Thus, all operational stakeholders have to collaborate and put these in place together to facilitate the SWIM interoperability and interconnectivity:

- Family 5.1.1 PENS1: the first implementation of PENS ending in June 2018 with a possible extension to end 2019 due to the probable deployment delay of NewPENS;
- Family 5.1.2 NewPENS: the new PENS implementation, with a new stronger governance, launched very beginning 2016 replacing PENS1 after a transition period (2017-2019)
- Family 5.1.3 SWIM Governance and Registry implementing the necessary common structures and processes for SWIM operation and evolution
- Family 5.1.4 PKI and Cybersecurity developing the necessary common security requirements to guarantee a common secure SWIM implementation

The first set is complemented by a second set that deals with the **specific infrastructure components to be implemented by each operational stakeholder** within its own area of responsibility. These stakeholder infrastructure components form the basis for information provisions and consumptions dealt with in the third set:

- Family 5.2.1 dedicated Internet Protocol Network Services to support IP exchanges facilitating family
- Family 5.2.2 dedicated SWIM infrastructure (*middleware*) realizing the SWIM Yellow and Blue Profiles
- Family 5.2.3 dedicated PKI and Cybersecurity components and processes to meet local security requirements, in line with the common ones defined in Family 5.1.4



The third and last set is dealing with the **different kinds of ATM information exchanges defined in the PCP**, including the interdependencies with the other AFs:

- Family 5.3.1 The Aeronautical Information Exchanges
- Family 5.4.1 The Meteorological Information Exchanges
- Family 5.5.1 The Cooperative Network Information Exchanges
- Family 5.6.1 The Flight Information Exchanges
- Family 5.6.2 The Flight Object Information Exchanges

Finally, **Appendix 1** of the DP Planning View contains a **list of services**, developed in the context of SESAR 1 or services deployed or planned by NM. This list defines a **starting point for the SWIM implementation** and thus guides the Operational Stakeholders to a partial coverage of the ATM information exchanges required by the PCP. **Evolution of this starting point shall thereafter be under the responsibility of the SWIM Governance**.




Family 5.1.1 – PENS 1: Pan-European Network Service version 1

PENS 1 is a means for information exchanges between European ANSPs by providing European-wide connectivity via Internet Protocol (IP) V6.

Thus it is a prerequisite for implementing SWIM, since the PCP mandates the use of an IP-based network for SWIM.

Family 5.1.2 - NewPENS: New Pan-European Network Service

NewPENS is the successor of PENS 1, replacing it after December 2019.

Like PENS 1 it offers IP V6-based connectivity, yet extending the scope of operational stakeholders beyond ANSPs to Airport Operators, Airspace Users, Network Manager, Military Authorities and MET Service Providers.





Family 5.1.3 - Common SWIM Infrastructure Components

Common Infrastructure Components of SWIM are those elements of the SWIM infrastructure (systems or sets of rules) to be deployed only once for the entire geographical scope mandated by the PCP.

The Common Infrastructure Components consist of the SWIM Governance arrangements ensuring a common baseline and controlled evolution of SWIM and the SWIM registry as one of the Governance mechanisms, which in turn is governed itself.

Family 5.1.4 - Common SWIM PKI and cybersecurity

Common SWIM PKI and cyber security are those elements related to the security of SWIM to be addressed only once for the entire geographical scope mandated by the PCP.

This comprises the common specifications relating to PKI and its governance, e.g. processes related to certificates, common requirements, rules for delegating certificates etc.





Family 5.2.1 - Stakeholders Internet Protocol Compliance

Complementing the PENS 1 and NewPENS networks on European level, each stakeholder has to have an internal Internet Protocol (IP)-based network.

This type of network is a prerequisite for supporting SWIM information exchanges using the SWIM TI Profiles.



Family 5.2.2 - Stakeholders SWIM Infrastructure Components

The SWIM Infrastructure Components to be deployed at each operational stakeholder comprise technical parts – the SWIM TI Blue Profile and the SWIM TI Yellow Profile – as well as organizational means – like training and certification of technical personnel or other components necessary for stakeholder SWIM implementation (supervision, monitoring and control).



These components constitute the foundation for implementing SWIM information exchanges and SWIM-enabled systems.



Family 5.2.3 - Stakeholders SWIM PKI and cyber security

The scope of this Family aims at implementing basic public key infrastructure management at each operational stakeholder including certificate management, key lifecycle management, training and certification of technical personnel, monitoring and control, implementation of audit programmes ensuring continuous compliance with common and local policies and standards etc.

Family 5.3.1 - Upgrade/Implement Aeronautical Information Exchange System/Service

This Family is part of the implementation of actual information exchanges and aims at upgrading or implementing Aeronautical Information Exchange systems and services in accordance with SWIM principles.

The systems shall be upgraded or implemented to support the exchange of Aeronautical Information via SWIM services in the role of either service provider or service consumer.





Family 5.4.1 - Upgrade / Implement Meteorological Information Exchange System / Service

This Family is part of the implementation of actual information exchanges and aims at upgrading or implementing Meteorological Information Exchange systems and services in accordance with SWIM principles.

The systems shall be upgraded or implemented to support the exchange of Meteorological Information via SWIM services in the role of either service provider or service consumer.

Family 5.5.1 - Upgrade / Implement Cooperative Network Information Exchange System / Service

This Family is part of the implementation of actual information exchanges and aims at upgrading or implementing Network Information Exchange systems and services in accordance with SWIM principles.

The systems shall be upgraded or implemented to support the exchange of Network Information via SWIM services in the role of either service provider or service consumer.







Family 5.6.2 – Upgrade/Implement Flight Information Exchange System/ Service supported by Blue Profile

This Family is part of the implementation of actual information exchanges and aims at implementing Flight Object Information Exchange systems and services using the Blue SWIM TI Profile in accordance with SWIM principles.

The systems shall be upgraded or implemented to support the exchange of Flight Object Information via SWIM services in the role of either service provider or service consumer.









AF #6 – Initial Trajectory Information Sharing

Fig. 16 - AF #6 Initial Trajectory Information Sharing

The primary objective of ATM Functionality #6, **Initial Trajectory Information Sharing**, is the **integration of aircraft predicted flight path information and other on-board parameters into the ATM systems**. To achieve this, a successful implementation of the **data link capabilities** described in (EC) No 29/2009, the Data Link Services Implementing Rule, is an essential prerequisite. In addition to these air/ground data link capabilities, an effective ground/ground dissemination of the aircraft predicted flight path information is needed.

After the first implementations of the DLS IR (i.e., "CPDLC"), it became apparent that the VDL Mode 2 network deployed within the scope of the DLS IR did not meet the performance requirements set by the DLS IR and the complementing standards. A detailed analysis of the network issues was conducted in the "**ELSA study**": "**VDL Mode 2 Measurement, Analysis and Simulation Campaign**". Major results and recommendations of this study have been incorporated in the family descriptions of AF6 (specifically, 6.1.3 and 6.1.4, as described below).

Based on the results of the ELSA study, SDM developed the "Data Link Services (DLS) Implementation Strategy towards Initial Trajectory Information Sharing", that was further elaborated into the "**Data Link Services (DLS) Recovery Plan**". This DLS Recovery Plan focuses on the **implementation of the ELSA recommendations that take effect in the communication domain** (family 6.1.3) **and aircraft** domain (family 6.1.4).

Based on the DLS Recovery Plan, EC mandated **SDM to act as the Data Link Services (DLS) Implementation Project Manager**. To support the implementation of the DLS Recovery plan, EC has also requested **EASA**, **EUROCAE and NM to act on specific gaps identified by ELSA**.

The AF6 families are grouped in the following three domains:

ATSP domain upgrades for Initial Trajectory Information Sharing

- Family 6.1.1 ATN B1 based services in ATSP domain complementary family
- Family 6.1.2 ATN B2 based services in ATSP domain complementary family

Communication domain upgrades for Initial Trajectory Information Sharing

 Family 6.1.3 – A/G and G/G Multi Frequency DL Network in defined European Service Areas – complementary family



Aircraft domain upgrades for Initial Trajectory Information Sharing

- Family 6.1.4 ATN B1 capability in Multi Frequency environment in aircraft domain
- Family 6.1.5 ATN B2 in aircraft domain

Families related to **ATN Baseline 1** (ATN B1) target the implementation of the original DLS IR on ANSP (6.1.1) and Airspace User (6.1.4) side. These families enable **CPDLC (beside other applications)**. Family 6.1.4 includes ELSA study's recommendations for the aircraft domain.

Families related to **ATN Baseline 2** (ATN B2) target the **implementation of trajectory information sharing on ANSP/NM (6.1.2) and Airspace User (6.1.5) side**. These families enable the **ADS-C EPP application**, including the ground/ground dissemination of the trajectory information through flight object exchange.

Family 6.1.3 is related to the implementation of an air/ground and ground/ground network supporting ATN B1, ATN B2 and ACARS and providing:

- in the short term, coverage and performance required to satisfy the DLS IR, and
- in the medium term, **capacity to support the increased data volume** expected with the introduction of **trajectory downlinks with ADS-C EPP**.

Operational benefits achieved by the implementation of AF6 are envisaged by the PCP in the areas of **improved de-confliction and the reduction of tactical interventions as a result of improved use of target times and trajectory information**. However, AF6 can also be regarded as an **infrastructure provision**, integrating the aircraft as a node into the ATM network.



Family 6.1.1 - ATN B1 based services in ATSP domain

Implementation of ATN B1 capability in the ATSP domain in order to secure compliance with the original DLS mandate EC 29/2009 as amended by 2015/310 and its complement concerning ground/ground exchange of flight data, EC 30/2009. This implementation concerns ATM system configuration, new hardware, software, interfaces, contractual arrangement of access to any other ground based end system and transit routing domains, training of technical staff, development of new controller working procedures and training material and controller training.

Family 6.1.2 - ATN B2 based services in ATSP domain

Implementation of EPP capability in the ATSP domain, to enable the ATSP to establish the appropriate connection and contract with aircraft and receive and process the EPP.

This implementation concerns ATM system configuration, software, interfaces including interconnection to a central EPP management entity if appropriate, development of new controller working procedures and training material and controller training.



Family 6.1.3 - A/G and G/G Multi Frequency DL Network in defined European Service Areas

Implementation of multi-frequency DL network environment to attain the network capacity required for AF6.

This implementation concerns primarily the G/G and A/G datalink network domains; it will concern the securing of the required radio frequencies from the appropriate authority, design, deployment and interregional integration of the G/G and A/G networks and contractual as well as physical arrangements of interconnection to any third party or transit routing domains.

Family 6.1.4 - ATN B1 capability in Multi Frequency environment in aircraft domain

Implementation of ELSA "best-in-class" capable configuration in the airborne domain in order to enable aircraft to use datalink communication in multi-frequency environment.

This implementation concerns the procurement and installation of avionic equipment in the prescribed and approved configuration, crew training and procedures.

Family 6.1.5 - ATN B2 in Aircraft domain

This implementation concerns the procurement and installation of avionic equipment in the prescribed and approved configuration.



3.2 The path towards a synchronized implementation

The overall Gantt of PCP implementation

The Annex to Regulation (EU) no. 716/2014 – describing the technical content of the ATM Functionalities to be implemented – identifies the *deployment target dates*; as reported within Article 2 of the Regulation, as "*the date by which the deployment of the ATM functionality in question is to be completed and fully used operationally*". Article 1.3, 2.3, 3.3, 4.3, 5.3 and 6.3 of the Annex illustrates the **deployment target dates for each ATM Functionality**, or – when needed – for the deployment of specific sub-sets of their technological, procedural and/or operational elements.

A short recap of the deployment target dates – as laid down by the PCP Regulation – are reported in the table below.

AF #1	Extended AMAN and PBN in high density TMA	Extended AMAN and PBN in high density TMAs shall be operated from I st January 2024					
AF #2	Airport Integration and Throughput	Departure Management synchronized with Pre-departure sequencing shall be operated from 1st January 2021					
		Departure Management integrating Surface Management Constraints shall be operated from 1ª January 2021					
		Time-Based Separation for Final Approach shall be operated from 1# January 2024					
		Automated Assistance to Controller for Surface Movement Planning and Routing shall be operated from 1 st January 2024					
		Airport Safety Nets shall be operated from 1# January 2021					
AF #3	Flexible ASM and Free Route	Direct Routings (DCTs) shall be operated from 1 st January 2018					
		Free Route Airspace (FRA) shall be operated from 1 st January 2022					
AF #4	Network Collaborative Management	Network Collaborative Management shall be operated from 1st January 2022					
AF #5	Initial SWIM	iSWIM shall be provided and operated from 1 st January 2025					
AF #6	Initial Trajectory Information Sharing	Initial Trajectory Information Sharing shall be ensured by ATS providers and by NM from 1# January 2025					
		At least 20% of the aircraft operating within the airspace of ECAC countries from the ICAO EUR Region – corresponding to at least 45% of flights – shall be equipped with the capability to downlink aircraft trajectory using ADS-C EPP from ^[24] January 2026.					

Fig. 17 - Deployment Target Dates, as specified within Regulation (EU) no. 716/2014

In order to support the impacted operational stakeholders in their deployment activities and in turn to **enable the compliance with the aforementioned mandatory target dates**, the Deployment Programme defines a common and shared roadmap for the implementation of PCP-related elements.

The Programme therefore defines the **expected start and end dates** of deployment for each of the 48 identified Families, therefore **outlining the most appropriate** *window* within which the related implementation activities should be planned and subsequently carried out by the relevant stakeholders impacted by the PCP.

Such window and the associated Initial Operational Capability and Full Operational Capability dates have been identified on the basis of:

- the **readiness for implementation** of the operational improvements, in terms of **technological maturity** of the elements to be deployed and of **availability of standards, regulations and recommended practices** to support a harmonized and effective implementation;
- the **urgency for deployment**, in order to timely pursue the achievement of the associated performance benefits.

The **full picture** of the implementation windows is translated in the chart below, the **overall Gantt chart** of the Pilot Common Project deployment.



SESAR Deployment Programme (Edition 2017)



Fig. 18 - Overall Gantt of PCP Implementation



The Deployment approach for a timely PCP implementation

In order to better **streamline and harmonize the Pilot Common Project deployment** across the wide number of Stakeholders impacted by Regulation (EU) no. 716/2014, the Deployment Programme complements the Family-based Gantt with the **identification of the most effective way to complete the implementation** of an ATM Functionality and/or of a Sub-ATM Functionality.

In other words, the **deployment approach** for each AF and Sub-AF represents the **sequencing of the deployment activities** (e.g. of specific families) associated to an ATM Functionality, and corresponds to the **preferred approach to be followed by operational stakeholders impacted by the PCP Regulation** and therefore requested to invest in the implementation of new technologies and/or operational improvements.

It is worth underlining that the proposed **approach** shall be **tailored by involved stakeholders at local level**, as the Family implementation time span might differ from one geographical area / operational environment to another, depending on several elements.

This **approach** has been determined on the basis of the combination and weighting of the following **principles** and **criteria**:

- Sequence in time
- Interdependencies among families
- Potential acceleration of performance benefits

As some families are interdependent and some are pre-requisites to others, the proposed deployment Approaches and the associated flow diagrams must be aligned with these relationships. In particular, the optimum approaches place the Families into the most effective logical and chronological sequencing order, whilst also identifying those Families whose deployment can proceed in parallel, potentially leading to an early realization of the associated performance benefits stemming from the deployment of the technological and operational elements included in each Family.

In addition, it shall be noted that – as the technological and operational elements of the 6 ATM Functionalities are tightly intertwined between each other – the elaboration of the AF-based **deployment approaches** enabled an **overall mapping** of the deployment-related interrelations **between AFs and Sub-AFs**, providing in a unique snapshot a wide-reaching **overview of the full Pilot Common Project implementation**.

By construction, the recommended **deployment approaches per ATM Functionalities are stable in time**, and could only be changed at the occasion of an evolution of the Pilot Common Project Regulation.

Building on the stable recommended deployment approaches per AF laid down in the DP, the **Planning View** will identify by each new edition and for each AF the **next steps on the way to the recommended approach**, turning the required **short term implementation** into the recommended priorities for the next CEF Transport Call that the DP and its planning view shall specify.

At the same time, the **short-term deployment approach** will be complemented in the **Planning View** with a description of the performance contribution from each AF and Sub-AF to the main 4 KPAs that appear in the SES High-Level Goals. This performance assessment, in line with the PCP CBA, will be notwithstanding a qualitative indication to allow identify the most relevant DP Families contributing to a certain KPA. The aim is not to provide quantitative values, nor to amend or update the benefits part of the initial CBA, but to flag the performance benefits.



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It must be noted that the **AFs and sub-AFs cannot be seen as isolated projects**. They are interconnected and there are interdependencies among them within the PCP. These interdependencies are sometimes actual pre-requisites, and sometimes mere enhancements of one functionality over another. In any case, it will be worth giving an **overview of the main linkages** to have them taken into account when describing the Approaches. The overall picture with the interdependencies among the different AFs will be explained at the end of this section, once each individual AF has been detailed. This will give a better understanding to the reader of how all the DP Families are linked.

In the next pages, each ATM Functionality will be depicted with its sub-AFs and DP Families. The diagrams will encompass the corresponding text explaining the families sequence in time and the **deployment approaches** for each Sub-AF.

In the diagrams, a **normal arrow** means that one family is a pre-requisite of the successor family, and therefore should be deployed in sequence, although sometimes part of a predecessor family can start being deployed in parallel with part of the successor family. More specifically, according to the Families clusterization proposed within section 3.1, the **light blue arrows** represent the **core PCP families**, whilst the **green and red ones** respectively indicates the **facilitating and complementary families**.

The **small bubbles** with the Family and Sub-AF numbers indicate that the given family or Sub-AF has been fully achieved, whilst the **dark blue bubbles** indicate the achievement of the Sub-AF.



AF1 – Extended AMAN and Performance Based Navigation in the High Density TMAs

AF1 is divided into **two sub-AFs**: Extended AMAN and PBN in high density TMAs.

To achieve the **Extended AMAN** implementation, the DP includes *Family 1.1.2 AMAN upgrade to include Extended Horizon function*. This Family describes the core of the Extended AMAN Sub-AF, and although the Basic AMAN is also included in the DP, the full Extended AMAN functionality could be deployed directly without having previously a Basic AMAN.

The second Sub-AF, **PBN in high density TMAs**, comprises RNP-based operations. RNP procedures are based on quality assured geographical data stored in databases, thus *Geographical Database (Family 1.2.2)* has been introduced. Based on accurate geographical data the *RNP Approach* with vertical guidance (*Family 1.2.1*) and *RNP1 Operations in high density TMAs (ground capabilities) (Family 1.2.3)* should be implemented. Finally, *RNP routes below Free Route Airspace (Family 1.2.5*), is not strictly part of the



Regulation but is addressing a gap in PCP connecting Free Route Airspace with TMAs, delivering additional benefits in terms of cost-effectiveness, predictable profiles, and fuel saving if implemented.

It should be noted that RNP 1 is not mandatory in the PCP for the airspace users, *RNP1 operations (aircraft capabilities) (Family 1.2.4)*. However, desirable performance would only be achieved once the aircraft are equipped to be able to both use RNP 1 and RNP APCH capabilities.



AF2 – Airport Integration and Throughput

AF2 is divided into **five sub-AFs**: Departure Management Synchronised with Pre-departure sequencing, Departure Management integrating Surface Management Constraints, Time-Based Separation for Final Approach, Automated Assistance to Controller for Surface Movement Planning and Routing and Airport Safety Nets.

Sub-AF 2.1, **Departure Management Synchronised with Pre-departure sequencing** requires the integration of the Initial Departure Management and of the basic A-CDM systems, in order to support optimised pre-departure sequencing. *Family 2.1.2 Electronic Flight Strips* is also a pre-requisite for the achievement of this Sub-AF. Finally, the Initial AOP which will be fed by the Initial DMAN and A-CDM is crucial to connect the relevant stakeholders and to share the data and information related to the different status of planning phases. *Family 2.1.4 Initial AOP* is also interdependent with *Family 4.2.4 AOP/NOP Information Sharing*. All these elements contribute to achieving S-AF 2.1.

Sub-AF 2.2, **Departure Management integrating Surface Management Constraints** will require the A-SMGCS level 1 & 2 fully implemented (*Family 2.2.1*). Specially A-SMGCS is required to provide the optimised taxi-time, which would be integrated into the Initial DMAN. DMAN integrating A-SMGCS constrains using a digital system, such as Electronic Flight Strips, integrating "Airport safety Nets associated with A-SMGCS Level 2" supplemented by an advanced A-SMGCS routing function shall be integrated into flight data processing systems for departure sequencing and routing computation. Therefore, to



successfully achieve this Sub-AF, *Families 2.1.1, 2.1.2, 2.2.1,* and part of *2.4.1* need to be implemented to achieve S-AF 2.2.

Sub-AF 2.3, **Time-Based Separation for Final Approach** is reflected in the DP by the *Family 2.3.1* and with its implementation, the separation of aircraft in sequence on the approach using time intervals instead of distances will be enabled. The *Family 2.1.2 Electronic Flight Strips* will enhance the performance delivered by TBS. Both Families will contribute to achieving S-AF 2.3.

Sub-AF 2.4, **Automated Assistance to Controller for Surface Movement Planning and Routing** is covered by *Family 2.4.1 A-SMGCS Routing & Planning. Families 2.1.2, 2.2.1* are the pre-requisites to implement the routing and planning functionalities (automatic generation of taxi routes with the corresponding estimated taxi time and management of potential conflicts). All these Families contribute to achieving S-AF 2.4.

Sub-AF 2.5, **Airport Safety Nets** will be covered by *Families 2.5.1 ASN associated with A-SMGCS level 2* and *2.5.2 Vehicle and Aircraft systems contributing to airport safety nets*. It should be noted that *Family 2.4.1* FOC Date is currently 01/01/2024 while *Families 2.5.1* and *2.5.2* which both depend (partially) on *2.4.1* output have their FOCs currently set at 01/01/2021. It should be extended to 01/01/2024 to match with *2.4.1* FOC. It should also be noted that *Family 2.2.1 A-SMGCS Level 1 and 2* is a pre-requisite to *Families 2.5.1, 2.5.2* and *2.4.1*. All these Families contribute to achieving S-AF 2.5.

AF3 – Flexible Airspace Management and Free Route



AF3 is divided into **two sub-AFs**: Flexible Airspace Management and Free Route.

Flexible Airspace Management requires airspace management tools to support AFUA and Dynamic Airspace configurations. This Sub-AF requires interaction and real time data exchange between ASM, ATFCM and ATC systems during planning and execution phases. The deployment approach goes through families *3.1.1, 3.1.2* and *3.1.3*, partially enabling the achievement of *3.1.4 Management of Dynamic Airspace configurations*, which will support the dynamic airspace configurations for DCTs and FRA. This is not a mature concept and still requires further developments and validations, therefore the deployment approach cannot yet be fully established.

With regards to **Free Route**, the approach focuses on the ATM systems upgrade (Flight data processing system, including HMI) to support the DCTs and Free Route (*Family 3.2.1*), which is a pre-requisite for FRA (*Family 3.2.4 Implement FRA*). To facilitate early implementations before the target deployment date, FRA may be implemented through intermediate steps (*Family 3.2.3 Implement published DCTs*). The



implementation of FRA is dependent on system upgrades, airspace design and airspace reservations involving civil/military coordination including OAT routes.



AF4 – Network Collaborative Management

AF4 is divided into **four sub-AFs**: Enhanced Short Term ATFCM Measures, Collaborative NOP, Calculated Take-off Time to Target Times for ATFCM purposes, and Automated Support for Traffic Complexity Assessment.

The first Sub-AF, **STAM**, comprises STAM Phase I and STAM Phase II in the DP. STAM Phase I is a predecessor of STAM Phase II, but the deployment of STAM Phase I is not a mandatory task due to the fact that STAM Phase II focuses on network workflow procedures and STAM Phase I is more locally focused. It will be with the STAM Phase II tool and procedures, once implemented, that the ATFCM planning will be managed at network level by the Network Manager ensuring an efficient relationship between NM, FMP and airspace users. STAM Phase II needs the new information management platform described in *Family 4.2.2 Interactive Rolling NOP*. This is the reason why the deployment approach for this Sub-AF goes through 4.2.2 and 4.1.2.

The **Collaborative NOP** as described in the PCP regulation needs to integrate the NOP and the AOP information. Therefore, the *AOP/NOP information sharing* (Family 4.2.4), which is the technical data layer on the collaborative NOP, is part of the deployment approach together with the *Interactive Rolling NOP* (Family 4.2.2). The *Interface ATM systems to NM systems* (Family 4.2.3), which addresses the message exchange between NM systems, ANSPs ATM systems and AU/FOC/WOC flight plan filing systems in respect of collaborative flight planning, could be deployed in parallel with 4.2.2 and 4.2.4.

The third Sub-AF, **Calculated Take-off Time to Target Times for ATFCM purposes** is still pending of full validation, and hence the deployment approach cannot be fully established yet. *Family 4.3.1* comprises the part of the Sub-AF that is ready to be implemented, consisting on the transmission of the calculated target times to allow an early partial optimisation from a local point of view. However, the reconciliation of multiple local target time constraints, coming from the airport, the ANSPs or Network DCB processes is still to be validated.



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Finally, **the Automated Support for Traffic Complexity Assessment** will be achieved directly through the implementation of *Family 4.4.2 Traffic complexity* tools. This Family is enabling a better capacity management, which will enhance the ATFCM and Free route. It is therefore connected with *Family 4.1.2* STAM Phase II and *Families 3.2.1 Upgrade of ATM systems to support DCTs and FRA* and *3.2.4 Implement FRA*.



AF5 – Initial System Wide Information Management

AF5 is divided into six sub-AFs: Common infrastructure components, SWIM Technical Infrastructure and Profiles, Aeronautical information exchange, Meteorological information exchange, Cooperative network information exchange and Flight information exchange.

For the first Sub-AF, **Common infrastructure components**, the DP includes a set of four Families to cover the full infrastructure components as described in the Regulation. For the successful implementation of SWIM, the proper governance and registry is paramount, but however some Stakeholders have already initiated the implementation of the SWIM infrastructure components even without the governance in place. While 5.1.3 deals with the common components governance and registry, Family 5.1.4 deals with the dedicated stakeholders' components.

SWIM Technical Infrastructure and Profiles include the Blue and Yellow SWIM profiles. In this diagram, a coloured dark blue arrow has been used to indicate the Blue Profile, and the dark yellow arrows mark the Yellow Profile. The Blue profile is to be used for exchanging flight information between ATC centres and between ATC and Network Manager, and thus it is essential to deploy Family 5.2.1 to its achievement, but also Families 5.1.4 and 5.1.3. For the Blue SWIM profile, in parallel Families 5.1.1 *PENS 1* and 5.1.2 *New PENS* (transition phase to migrate from PENS 1 to New PENS is expected from 2017 to 2018) will also be required.

Aeronautical information exchange, Meteorological information exchange and Cooperative **network information exchange** sub-AFs can be implemented in sequence directly once the Yellow Profile is available. However, the **Flight information exchange** Sub-AF would also require the availability of the Blue profile.





AF6 – Initial Trajectory Information Sharing

AF6 has only one Sub-AF, which is the Initial Trajectory Information Sharing.

The **Initial Trajectory Information Sharing** consists of the improved use of target times and trajectory information, including where available the use of on-board 4D trajectory data by the ground ATC system and Network Manager System. The approach to successfully achieve the full AF6 deployment goes through two phases based on a phased approach for the implementation of the A/G DL communication infrastructure through *Family 6.1.3* and the initial implementation of the DLS IR as prerequisite for AF6:

- During the first phase, *Family 6.1.3 1st Phase* (VDL Mode 2 Multi Frequency upgrade) will provide the required VDL Mode 2 network performance to support the implementation of CPDLC as per DLS IR (EC 29/2009 and amendment). The first phase of *Family 6.1.3* is deployed in parallel with *families 6.1.1* (ground capabilities to support CPDLC) and 6.1.4 (airborne capabilities to support CPDLC).
- 2. During the second phase, the focus of *Family 6.1.3* implementation will be the increase of the A/G DL network capacity primarily through the deployment of "Model D" Target Solution per ELSA study results. (Note: Preparatory activities for the second phase are performed in parallel to the first phase activities for Family 6.1.3.) This network optimisation is necessary to support the increased data volume produced by the downlink of the ADS-C EPP aircraft trajectory data that is implemented parallel to *Family 6.1.3* through families 6.1.2 (ground capabilities to support ADS-C EPP) and 6.1.5 (airborne capabilities to support ADS-C EPP)

Family 6.1.3 implementation will be completed (i.e., the required network capacity will be provided with the second phase) before *family 6.1.2* and *6.1.5* implementations will be completed.

Benefits expected from Family 6.1.2 (ADS-C EPP/ground) implementation can only be achieved after the implementation of Family 6.1.5 (ADS-C EPP/airborne). However, there is currently neither a clear mandate for airspace users to implement Family 6.1.5, nor sufficient planned (within PCP timeframe) availability (in terms of supported aircraft types) of avionic components to pursue the full implementation of Family 6.1.5.



Interdependencies among the 6 ATM Functionalities and the DP Families

As noted at the beginning of the deployment approach section, the **DP Families and each AF are not isolated projects**. There are many interdependencies among the different activities needed to successfully deploy the PCP. These interdependencies appear in all AFs, and sometimes they are due to the fact that **some elements of one AF are enablers for another AF**, or because **a given Sub-AF will be enhancing the performance and capabilities of another Sub-AF**. This section aims at explaining the main interdependencies within all the ATM Functionalities illustrating the linkages among the DP Families.







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6.1.2 Family 5.6.2 the Flight Object (FO) will be required by family 6.1.2



3.3 SDM Synchronization and Monitoring Approach

One of the main SDM responsibilities concerns the **synchronization of the SESAR Deployment Programme** realization, together with its coordination and execution. In this light, efficient and effective technical monitoring of implementation activities are considered pivotal to ensuring the timely implementation of the Programme and the achievement of its expected performance benefits, both taking into account links among families and inter-dependencies between Implementation Projects.

An overview of the key features of the **synchronization and monitoring methodological approach** applied by the SESAR Deployment Manager is outlined in the following Figure and described below.



Fig. 19 - Overall SESAR Deployment Manager Synchronization Methodology

1. Preliminary activities

During the SESAR Deployment Programme elaboration, SDM identifies some **key principles** to be applied to the **overall DP**, in order to ensure its synchronized realization. In particular, SDM focused on:

- Synchronisation needs at Family level: the Families included in the DP have been analyzed in order to identify the synchronization needs related to the affected Stakeholders groups as well as to the sequencing of the Families themselves;
- Milestones to be monitored to ensure a coordinated deployment of the Programme: SDM identified a set of "common" milestones to be monitored during the execution phase; such set includes milestones to be applied to all the Implementation Projects ⁵ (IPs) and milestones which are specific on the basis of the Family to which each candidate IP belongs.

Such principles are reviewed before each update of the DP, in order to confirm their applicability.

2. Pre-bid phase

The "**pre-bid phase**" anticipates the elaboration of SDM-coordinated proposals in response to periodical CEF Calls for Proposals. At this stage, the operational stakeholders provide "**Indications of Interest**" (IoI) to declare their intention to participate in the Call; SDM analyses them in order to **verify that synchronization needs at "IP level" have been taken in duly account** and **interacts directly with the operational stakeholders**, providing tailored suggestions and guidance in order to support them in

⁵ An Implementation project is a deployment or a development initiative established by one or more operational stakeholders under the coordination of the SESAR Deployment Manager, which aims at contributing to the implementation of one (or more) ATM functionalities in the framework of the SESAR Pilot Common Project.



the subsequent elaboration of project proposals through targeted formal feedbacks, concerning technical elements, as well as to planning/sequencing of the initiatives.

Specifically, in the pre-bid phase the SESAR Deployment Manager aims at:

- Checking projects compliance to PCP Regulation and the association to the DP Planning View, in order to ensure alignment of implementation projects with the DP and provisions for easier coordination and synchronization by SDM in the execution phase;
- Raising quality of the future proposals to a common high level standard, in particular through the harmonization of descriptions of the projects and continuous interactions with the operational stakeholders to provide feedback and comments, setting the way for a more efficient monitoring of the activities;
- Supporting cooperation and dialogue among individual stakeholders with closely related projects targeting the reduction of the PCP implementation fragmentation, as well as ensuring the adequate level of coordination with military stakeholders potentially impacted by the PCP implementation activities;
- Identifying how submitted initiatives planned to cover the **identified Family level "gaps"** identified in the DP Monitoring View with an impact on the synchronization dimension;
- **Triggering proposals** where relevant gaps identified in the Programme appeared partially uncovered, with potential consequences on other implementation initiatives.

3. <u>Bid phase</u>

The "**bid phase**" consists in the elaboration of the proposals coordinated by SDM to be submitted to INEA in response to the CEF Calls for Proposals.

In this phase, SDM analyses the "**IP proposals**" submitted by the operational stakeholders, containing the necessary information on the Implementation Projects to be included in the proposals, and interact with them in order to enhance the overall quality of the proposals themselves. The activities performed aim at ensuring that the adequate level of detail is provided, with specific regard to monitoring milestones and synchronization/coordination needs. It is important to stress that, as for the "pre-bid" phase, also in the bid Phase continuous interactions with the operational stakeholders take place, also to enhance the quality of the proposal.

In order both to secure the most relevant projects for a timely and effective PCP implementation and to allow for the smooth execution of monitoring synchronization activities, the candidate projects are assessed by SDM through **5 key items**:

- Continuity of implementation with projects already awarded through previous CEF Calls;
- Level of **readiness** and nature of the relevant Family associated to the implementation activities;
- Link to and coverage of one (or more) of the gaps in the DP Monitoring View;
- **Timeframe** of the implementation initiative;
- Multi-stakeholder involvement.

4. Execution phase

An effective and comprehensive monitoring of the Programme during the **execution phase** is necessary in order to ensure the timely and synchronized implementation. In this light, following the awarding of Implementation projects by INEA, SDM monitors the achievements of the ongoing projects and proposes, where necessary, the most convenient **mitigation actions** to ensure a synchronized implementation of the Programme. In particular, the following **high-level principles** underpin the execution phase as a whole:

- Time: deployment activities have to be performed within the agreed timeframe, in order to enable the timely implementation of the PCP and the effective achievement of the expected performance benefits;
- Quality: the expected scope of the awarded Implementation Projects should be correctly fulfilled, in order to ensure the effective deployment of the PCP;
- Progress: a continuous monitoring of the progress achieved is needed to ensure the timely, synchronized and coordinated implementation of the projects and, of the PCP;



 Costs: consistency between planned and actual costs represents an important indicator of the capacity of Implementation Projects to fulfill the envisaged deployment scope within the defined timeframe.

The monitoring and coordination activities performed by SDM leverages on data provided by the operational stakeholders:

- At specific "monitoring gates", i.e. three times per year, leading to the elaboration of the "DP Monitoring and Performance View – SESAR FPA";
- Through "**continuous interactions**" with SDM in order to provide information on completed projects/tasks/milestones/deliverables throughout the year.

In particular, the analysis of the progress achieved by the IPs is made possible through the submission of "supporting documents" and/or relevant information by the operational stakeholders, providing:

- Information on tasks, milestones and deliverables accomplished and actual costs incurred;
- Rationales for delays in tasks, milestones and deliverables.

SDM **reviews and validates** supporting documents and relevant information provided by concerning the projects' achievements; furthermore, it interacts with the operational stakeholders to investigate delays in the achievements and their impacts and to agree on appropriate mitigation actions.

It is worth noting that:

- The gathering of consistent information concerning the IPs achievements is made possible through the active involvement of all the parties within the Action (SDM, Implementing partners, Action leader, Activity leaders, PMO) and continuous interactions among them;
- The collection of monitoring information is performed through the STAR tool, which represents the main reporting and communication tool within the Actions under SDM coordination.

SDM closely monitors any misalignment ("**discrepancies**") between the planned and actual situation of projects in order to anticipate any potential negative impacts on the overall Action and synchronise and coordinate suitable actions for the effective mitigation. In compliance with the four high level principles stated above, discrepancies are identified when a project overcomes defined thresholds in relation to four main dimensions:

- Time: Actual/expected start date or end date of an IP, a task or a deliverable or the actual/revised delivery date of a milestone not aligned with the planned dates;
- Quality: "Supporting documents" submitted by the Implementing Partners (IPPs) not in line with the quality requirements set by the SDM and/or not fully covering the expected scope.
- **Progress**: Declarative progress of an IP or a task not aligned with the theoretical progress;
- Cost: Actual costs significantly higher (overspending) or lower (underspending) than planned costs at IP/task level;



THE PROJECT VIEW OF THE PILOT COMMON PROJECT

3.4 Global Interoperability

The analysis of the necessary harmonization of the main technological developments and evolution, as well as the necessary synchronization needs, is at the cornerstone of the SDM effort to contribute to global interoperability. Special reference was given to the risk of lack of global interoperability, which has been representing a key concern for airspace users in the SDM stakeholder consultation process.

While many countries around the world are implementing ATM improvements, the United States **FAA's NextGen and European Union's SESAR** are the two **largest ATM modernization programs currently under way**. The cooperation between US FAA and EU SDM was therefore identified as instrumental for SDMs contribution to global interoperability and to support harmonization of standards, technologies and procedures on deployment matters. The SDM commits to the need to **work on a complete life cycle view (definition, development, deployment) of both NextGen and SESAR**, confirming the importance of promoting SESAR as one project with definition, development and deployment fully covered. With respect to cooperation with the FAA and global harmonization the SDM works therefore closely with the SJU, ensuring a single SESAR view to the international stakeholders' community.

Framework and guidance from Policy Level

The international activities of SDM take place under the **oversight of the policy level led by the European Commission, which has delivered a specific mandate to SDM** to set the scope of the cooperation with the FAA.

Regarding European cooperation with US/FAA, for **R&D purposes** the cooperation between SESAR JU and NextGen is taking place under the umbrella of the **MoC between the EU and US⁶ with specific reference to Annex 1**. With respect to **deployment**, the SDM cooperation with the US/FAA is currently taking place under the umbrella of the **Letter of Intent (LoI)**, signed by FAA and EC in June 2015.

Whilst cooperating with the FAA through two different frameworks in the period 2016-2017, SDM and SJU are working closely together to ensure that **SESAR is perceived as a single project**. In case of any future development towards a revised US EU MoC, covering the full life cycle, the cooperation of SESAR and FAA will evolve the updated framework according to the same principles.

Objectives

SDM activity on global interoperability and harmonization, including the cooperation with FAA, is feeding the rolling updates of the Planning View of the Deployment Programme in the technical areas, especially with respect to data communication and SWIM. The cooperation with the deployment colleagues in the FAA continuous to make the **Deployment Programme more focused with respect to issues of global interoperability to avoid any extra burden to the (airspace) users on standards, procedures and equipment** due to non-alignment or late alignments on global interoperability.

With respect to SDMs work on global interoperability and cooperation with FAA **initial focus areas of cooperation have been identified and addressed in the work plans**, including but not limited to Data Comm, SWIM, AMAN/TBFM⁷, with the aim to:

- gaining understanding of NextGen and SDM deployment strategies, implementation priorities, timelines and milestones associated;
- identify potential gaps and needs, discovered during implementation, in terms of standards;
- identify risks to timely implementation resulting from a potential lack in global interoperability;
- identify risks on interoperability and global harmonization, as well as sharing mitigation strategies⁸;

⁸ See also GAO Report (GAO-15-608) July 2015, Report to Congressional requesters, Next Generation Air Transport System. Improved Risk Analysis Could Strengthen FAA's Global Interoperability Efforts



⁶ Memorandum of Cooperation between the United States of America and the European Union, 3rd March 2011, published in the Official Journal on the European Union 5th April 2011 (MoC including Annex 1)

⁷ TBFM = Time Based Flow Management and is part of NextGen Portfolio

- assessing the feasibility and the need for US/EU synchronizing deployment activities and on synchronized risk mitigations actions;
- exchange on economic impact assessment and business cases;
- sharing of lessons learnt and best practices.

Furthermore, the results of the cooperation with FAA on deployment matters will also feed the SESAR input to the updates of ICAO Global Air Navigation Plan (GANP) and respective process for the updates of the ASBUs to ensure the reflection on global perspective of the deployment aspects of ATM modernization programmes in Europe and the US. SDM also contributes to the Global Air Navigation Industry Symposium (GANIS) process to reflect the needs of the European deployment stakeholders accordingly. The coordination on global interoperability aims to identify and address **topics and activities in the global** (ICAO) **context where information need to be shared** and subsequently **where currently coordination is on-going or will be required**.

The DP Planning View contains the mapping of the Programme with the ICAO GANP/ASBUS. A **mapping of ATM MP, DP, ICAO ASBUs and NextGen** is ongoing and will be provided to the international stakeholder community contributing to the relevant ICAO processes, with a special focus on the update of the GANP.

State of Harmonisation between SESAR and NextGen

In December 2016 the second edition of the State of Harmonisation Document on the state of US/EU Air traffic modernization and its programs SESAR and NextGen was published simultaneously by SJU/SDM and FAA⁹. The purpose of this regular publication is to provide a high-level summary of the current state of progress towards achieving the necessary level of harmonization and global interoperability between NextGen and SESAR. More broadly, the publication reflects the current and planned collaboration efforts by the United States and the European Union to harmonize and secure the modernization of air traffic management bilateral as well as globally in support of the ICAO Global Air Navigation Plan (GANP) and its Aviation System Block Upgrade (ASBU) programme.

Both NextGen and SESAR recognize the need to integrate the air and ground parts of their respective ATM systems by addressing efficiency needs of flight trajectories planning and execution and the seamless and timely sharing of accurate information. The US–EU harmonization work aims to ensure that modernization and advances in aviation and in the air navigation systems worldwide can be made in a way that supports a high-performing aviation system over time and global cooperation leading to seamless operations and safe and efficient practices for the airspace users and the travelling public.

NextGen and SESAR have together made significant progress in several critical areas since the publication of the first edition of the State of Harmonization in 2014 and the state of harmonization document includes for the first time the full life cycle of the programmes – including deployment. The European deployment stakeholders are invited to contribute their views and expectations for the future progress via the SDM Stakeholder Consultation Platform and via the consultation activities of the Cooperative Arrangements to the different key technical issues (i.e. in particular but not limited to Datalink, SWIM and AMAN).

Outlook to upcoming DP editions

As outlined above, it is foreseen to **incorporate outcomes from the SDM-FAA cooperation work** into the functional views of the SESAR Deployment Programme in order to complement it with a wider global perspective. With respect to ICAO SARPs and guidance material related to deployment, SDM will work in close cooperation with SJU, feeding and supporting the relevant working groups at European level on deployment matters, under the guidance of EC. SDM will further seek **co-operation of the manufacturing industry in this context** (especially airborne manufacturers but not limited to); this activity takes place under the framework of the Cooperative Arrangements with the manufacturing industry according to Regulation (EU) no. 409/2013.

⁹ NextGen – SESAR State of Harmonization (Second Edition) – 2016, prepared by the Coordination Committee (CCOM) for the US-EU MoC Annex 1 High-Level Committee



THE PROJECT VIEW OF THE PILOT COMMON PROJECT

Eventually, the **international exchange on experiences on deployment execution**, lessons learnt and best practices in implementation are expected to contribute to SDMs capability to fulfill the tasks of synchronization and coordination for Common Projects implementation in accordance to Regulation (EU) no. 409/2013. The key implementation initiatives with respect to DataComm implementation and on SWIM governance will be in the focus and will benefit from the SDM FAA cooperation.



PERFORMANCE APPROACH



4. Performance Approach

The Pilot Common Project has been adopted by the Commission after positive opinion of the EU Member States and endorsement by the operational stakeholders on the basis of a high-level Cost Benefit Analysis (CBA) that demonstrated an overall benefit¹⁰.

The performance approach of the Deployment Programme aims at coordinating, synchronizing and monitoring the implementation of the PCP against the boundaries of the high-level CBA that has triggered PCP adoption in 2014.

To meet this objective, the performance approach includes:

- An overview of **SDM's role within the SES performance framework**, presented within the following paragraphs;
- An overview of the "Performance Assessment and CBA Methodology" that SDM has applied in support to its performance policy and how it builds on and connect with the methodologies used by other SES and SESAR bodies involved into performance, presented within the following paragraphs and in the dedicated Annex;
- The presentation of the expected DP contribution to performance, to be included in the yearly updated **DP Planning View**;
- The presentation of the yearly updated **Deployment Programme Cost Benefit Analysis** (CBA) in the **DP Monitoring & Performance View.**

4.1 SDM in the SES performance framework

The SDM has been established by the European Commission as a SES instrument to ensure timely, synchronised and coordinated implementation of SESAR through a series of Common Projects. As such, SDM's performance approach shall comply with SES overall performance framework, use common indicators and methodologies with other SES bodies dealing with performance and build on their expertise and early results.

SESAR Deployment Manager (SDM), according to its regulatory framework set by Commission Implementing Regulations (EU) No 409/2013 and No 716/2014, **considers the performance driven deployment of the Pilot Common Project and any subsequent Common Project as a priority**.

SDM commitment is focused on a **constant improvement of the methodology** to assess the consistency with and level of contribution to European Union-wide performance targets¹¹ provided by technological investments. Within the scope of its responsibilities, SDM's performance policy is to:

- Guarantee compliance to relevant regulations and adherence to the European ATM Master Plan as reference for operational changes that are essential enablers to achieve the Single European Sky (SES) performance objectives;
- 2. Guarantee full coordination with SJU, PRB, NM and EDA on performance assessment;
- 3. Guarantee the **consultation with the implementing partners on performance analysis** before they are published and within the consultation process defined for the Deployment Program;
- 4. Guarantee the **coordination of performance assessment with Military stakeholders** through EDA;
- Provide the assessment of implementing projects against SES performance KPA, namely safety, capacity, environment and cost efficiency as part of the synchronisation effort of the Deployment Program;
- 6. Provide the analysis of the costs and expected benefits of the PCP related implementation projects;

¹¹ European Union-wide performance targets' means the targets referred to in Article 9 of Commission Implementing Regulation (EU) No 390/2013.



 $^{^{10}}$ PCP global cost benefit analysis is available at

http://ec.europa.eu/transport/modes/air/sesar/doc/ec-716-2014_article4c_globalcba.pdf

- 7. Provide **the monitoring and the assessment of impact of implementing projects** on each performance target;
- 8. Promote the **use of good practices in the field of cost benefit analysis methodologies** and the **adoption of continuous improvement models**;
- 9. Guarantee that all involved staff is aware of its role in the achievement of performance driven deployment;
- 10. Develop and promote, at management and implementation levels of the SESAR Deployment Governance, a **performance driven culture**.

Since implementation as from 1 January 2012 of the performance scheme, the EU has been operating a formal and explicit performance-driven approach, which includes performance indicators – fit for setting binding regulatory targets on specific stakeholders accountable for delivering measurable performance outcomes. Through a succession of Reference Periods (2012-2014, 2015-2019, ...) the performance scheme drives and monitors the final achievement of SES High-level Goals. As explained in the Commission Implementing Decision C(2015) 9057, "a Performance Ambition is considered as an estimation of the contribution of the SESAR project to the Single European Sky (SES) Performance objectives. This estimation shall be confirmed after the validation of the relevant Research, Development and Deployment activities".

SESAR deployment shall fit within this performance scheme: investments, benefits and performance gains drawn from SESAR deployment shall support the achievement of the specific targets of the active Reference Period. **SDM is going to cooperate with the Performance Review Body (PRB) to ensure this compliance, in particular** through the alignment of KPIs used by SDM and PRB allowing to follow the improvements in ATM.

Another key player in the SES performance framework is the Network Manager (NM). Since 2011, with a specific consolidated local and network perspective, the NM has been forecasting, planning, monitoring and reporting to help deliver the performance targets of the Single European Sky. Since its establishment in December 2014, SDM has been closely cooperating with NM with the objective to build on NM's wide experience, tools and findings and to ensure consistency with the Network Strategy Plan (NSP), Network Operations Plan (NOP) and European Route Network Improvement Plan (ERNIP).

Finally, the Global Cost-Benefit Analysis that SJU has delivered back to 2013 in support to PCP's adoption sets the overall frame for SDM's action in the field of performance.

This document is referred to as the **"Reference and supporting material (EC) No 716/2014 article 5(C) Global cost-benefit analysis"**. With regards to the PCP CBA, the SESAR Deployment Manager shall pursue several objectives:

- Monitoring that CBA's boundaries are met: SDM shall monitor that PCP is implemented within the boundaries of the CBA and that, in particular, the targets assumed in the CBA for the 5 sensitivity drivers are met¹²;
- 2) Addressing discrepancies behind the overall positive result of the CBA: whilst the PCP CBA shows an overall benefit of 2,4 billion € (Net Present Value) over the period 2014-2030, it highlights some issues on which SDM shall be vigilant, such as:
 - AF5 and AF6 where CBA at AF level is negative;
 - AF1, AF2, AF3, AF4 where the different investments and benefits are not necessary having similar ramp-up periods or payback timings;
- 3) Gathering actual costs¹³ and updated expected benefits data of all on-going implementation projects in relation with PCP in order to continuously monitor their expected contribution to performance during execution. Moreover, these data could be used to update PCP CBA at the occasion of a PCP review.

¹³ Cost information is only available of CEF funded IP projects (FPA)



¹² Air Traffic Growth, Fuel and CO2 savings, Delay Cost Savings, reduction of costs for the ATM service provision, PCP investments costs ground and airborne

4) For any completed project, monitoring the switch to operation and the actual contribution to performance. The actual contribution to performance shall be compared with the declared/expected contribution to performance set when initiating the project and monitored during the execution of the project. Comparisons results will be used to adjust expected contributions to performance for other implementation projects as well as for earlier benefits assessment in the R&D phase. These data would be of importance for SESAR2020 and the update of performance characteristics of SESAR (PCP) solutions, which would improve the R&D figures by 'closing the loop'.

4.2 Performance Assessment and CBA Methodology

SDM's performance assessment and CBA methodology is the **cornerstone of SDM's performance policy**. It bridges between technological investments required to achieve new ATM functionalities required through the PCP Regulation and ATM performance improvement. It contributes to ensure that **all benefits expected from the whole PCP implementation will materialize** whilst not exceeding the estimated cost. It is an essential tool in monitoring PCP implementation, assessing and monitoring cost and benefits of implementation projects submitted or not by operational stakeholders but also assessing the impact of "missing implementation projects", i.e. implementation projects not submitted timely and identifying solutions to recover such situations and get the whole PCP implemented.

The performance assessment and CBA methodology describes the different steps taken to set the baseline against which performance will then be monitored during DP execution. **Detailed methodology is annexed to the SESAR Deployment Programme**. In particular, the performance assessment and CBA methodology assumes that co-funding is awarded by INEA and reflected by the operational stakeholders in their investment plans in accordance with relevant regulations, in particular the Implementing Regulations on CEF - (EU) Reg. n.1316/2013, on the Charging Scheme – (EU) Reg. n. 391/2013 – and on the Performance Scheme, (EU) Reg. n. 390/2013.

In particular, the Annex includes:

- Performance indicators and their corresponding CBA metrics that allow quantifying benefits;
- A detailed "consistency check" table between the Performance Indicators used by the SDM, the KPIs of the SES II Performance scheme and the KPIs of the ATM Master Plan. The three sets of indicators are coordinated between SDM, SJU and the PRB;
- Detailed explanation of the top-down approach and the bottom-up approach in the measuring of the expected benefits;
- Detailed explanation of the cost effectiveness analysis performed before submission.



RISKS MANAGEMENT PLAN



5. Risks Management Plan

5.1 SDM Approach to Risk Management

The prompt detection and effective management of risks is key in order to ensure the coordinated, timely, successful and synchronised implementation of the SESAR Deployment Programme. The present risk management plan builds on an "iterative approach" which will be implemented during the execution of the Programme, so as to ensure the most efficient and effective management of any event which might have a negative impact on the DP.

The Risk Management approach is composed by three phases, as illustrated below.

Risk Assessment

The first phase of the methodological approach is represented by the "Risk Assessment", which is composed of three steps: Risk Identification, Risk Analysis, and Risk Evaluation. The objectives of this phase are to ensure the prompt identification of any event which might have a negative impact on the execution of the Deployment Programme, to perform in-depth analysis of the identified risks, and to evaluate effectively risks in terms of probability and impact.

Risk Identification

The identification and management of risks at "Deployment Programme level" is at the core of SDM activities. Risks at this level are defined as those events which might have **significantly negative impacts on the successful, synchronized and timely implementation of the Deployment Programme and the overall PCP.** In order to guarantee an efficient categorization of all risks, their identification is conducted at four different levels, i.e. **Project** (in the remits of the Project Managers), **Activity** (Activity Leaders), **Action** (Action Leaders), and **Deployment Programme** levels (SDM). Moreover, also external stakeholders (e.g. PMO), where applicable, can support the identification of risks at any level.

It is important to mention that the identification of risks at "Deployment Programme level" by SDM is a continuous activity performed during all the DP lifespan:

- During the **development of the DP**, SDM identifies risks at Programme Level, covering, for each risk, objectives affected, consequences / impacts, and mitigation actions;
- During the **Deployment Programme "Execution phase"**, risks at Programme level are identified by SDM taking into account the results of monitoring activities, the results of continuous interactions with Action, Activity and Project Managers, and the analysis of any external event which might have a negative impact on the successful implementation of the Programme.

Moreover, SDM will play a proactive role in the identification of risks, and each "discrepancy" (i.e. misalignment between planned and actual results in terms of implementation cost, time and delivery quality) will be analysed and managed in cooperation with IP, Activity and Action Leaders, in order to prevent the escalation to risk.

In addition, the risks identification at Project Level starts during the **Implementation Projects'** "**Proposal phase**". During this phase, Project Managers provide SDM with a list of the main risks / factors of uncertainty / major elements of complexity / externality which may affect the implementation of the Project by submitting their "IP Proposals" through the SESAR Tool for ATM Roll-out (STAR) tool.

Risk Analysis

During the **"Risk Analysis"** step, risks which have been previously identified are analysed in order to enable the subsequent evaluation step.

In particular, SDM, in cooperation with Action Leaders, Activity Leaders, Project Managers and external stakeholders (if needed), analyses the identified risks which might affect the coordinated, successful,



synchronized and timely implementation of the overall Deployment Programme, by allocating them to one of five well-defined categories: **Cost**, **Time**, **Performance**, **Interdependencies**, or **Quality**.

Such activity is performed by SDM through:

- Preliminary interaction with Action, Activity, Project;
- Organisation of internal meetings / workshops with the involvement of SDM professionals and, if needed, external professionals to finalise the analysis of the identified risk.

Risk Evaluation

The Risk evaluation step aims at assessing the risks which have been previously identified and analysed, in terms of:

- Probability: likelihood that a given adverse event can negatively impact on the coordinated, successful, timely and synchronized deployment of the Programme;
- **Impact**: level of severity through which adverse events impact the successful DP Implementation.

Both Probability and Impact are assessed by SDM through a qualitative evaluation, according to a five-level scale: *a*) Very low; *b*) Low; *c*) Medium; *d*) High; *e*) Very high.

The matrix below presents an overview of the possible categorisation of each risk after SDM evaluation. SDM aggregates the result of the



Fig. 20 – SESAR Deployment Manager Risk Matrix

probability / impact analysis in order to define the **risk level** within the following scale: *a*) High, *b*) Medium, *c*) Low *d*) No Risk.

It is worth noting that the impact evaluation takes the utmost account of the **"interdependencies"** among projects in the DP, both within the same Action and across different Actions.

In particular, the interdependencies among projects are detected since the earliest stages of the DP elaboration, thus enabling a prompt identification and evaluation of risks through:

- Experts judgement, which leverages on Project management and ATM expertise;
- Execution of "Scenario analysis" exercises, also performed (if needed) taking into account quantitative evaluation (in particular with for the assessment of risks within the "cost" category).

Risk Mitigation

The second phase of the methodological approach is represented by the "**Risk mitigation**", which aims at ensuring the prompt identification and implementation of mitigation actions with regard to each risk which has been identified, analysed and evaluated.

On the basis of the results of the risk assessment step, SDM identifies the most suitable mitigation actions to be implemented which can lead to the resolution and closure of the risk. Specifically, for each risk, mitigation actions are defined by SDM in terms of **owner**, **activities** to be performed, and **timing** for implementation. In addition, SDM is in charge of the follow-up of the mitigation actions, which is defined in terms of **reporting frequency** and **content**.



Risk Monitoring

The third phase of the methodological approach aims at ensuring that risks and related mitigation actions are effectively monitored over time so as to verify their evolution. In order to enable the effective monitoring of identified risks, the following activities are performed by SDM:

- 1. Each risk is assigned to a specific SDM expert in order to continuously monitor the evolution of the risk, interact with the relevant stakeholders, and periodically report to SDM management with regards to the evolution of the risk and the degree of success of the mitigation actions;
- 2. The "risk register" within the STAR tool is continuously maintained, in order to provide updated information on risks' and mitigation actions' evolution anytime.

5.2 Risks and Mitigation Actions

In accordance to its **responsibility of** "*ensuring effective management of risks*", as stated at Article 9 (d) of Reg. (EU) n. 409/2013, the SESAR Deployment Manager identified, assessed and evaluated all risks whose occurrence could **affect the implementation of the SESAR Deployment Programme** and of the Pilot Common Project.

Taking into account the principles underpinning the Single European Sky initiative and the need to directly involve in the Risk Management activities all interested parties, SDM has been liaising **directly with those stakeholders potentially affected by the DP-level risks**, as well as with the potential **candidates to undertake Mitigation Actions** to limit their impact.

In parallel, the SESAR Deployment Manager is working **closely with the SESAR Joint Undertaking** in order to ensure that the **risks listed in the Deployment Programme** are well-connected and **linked with the risks listed in the ATM Master Plan**, especially with regard to implementation-related issues. As a result of this process, the **following risks have been identified**:

- **1.** Misalignment between DP and operational stakeholders' investment plans
- 2. PCP Implementation outside the framework of SESAR Deployment FPA
- 3. Failure to adequately achieve full military involvement
- 4. Failure to provide required standards and regulations on time
- 5. Failure to ensure global interoperability
- 6. Misalignment between CEF co-funding profile and readiness for implementation
- 7. Late definition / failure to establish SWIM Governance
- **8.** Late implementation of AF6: Initial Trajectory Information Sharing
- **9.** Late delivery of IOP SESAR Solutions
- **10.** Late industrialisation decisions
- **11.** Unaddressed cyber-security vulnerabilities
- **12.** Misalignment in Full Operational Capability dates
- **13.** Lack of adherence to SESAR Deployment Programme

In accordance with the proposed Risk Assessment Approach, the 13 identified risks have been assessed and consequently positioned on the **Deployment Programme Risk Evaluation Matrix** as reported within the picture below.

The following tables have been developed in order to identify and present those risks with higher relevance to the successful and timely implementation of the Deployment Programme



Fig. 21 – SESAR Deployment Programme Risk Matrix (2017 Edition update)



and thus the full Pilot Common Project. The tables detailing the **13 DP-level risks** and the **associated Mitigation Actions** are structured in order to clearly show the following elements:

- the **title** of the Risk;
- the **objectives** which are **most likely to be impacted** by the identified Risk;
- the indication of their **potential impact on the PCP implementation**, as well as its probability of occurrence. Each element is scored, on the basis of a **qualitative assessment** performed by the SESAR Deployment Manager, in cooperation with other relevant SES bodies, helping to characterize each Risk on a three-level scale (High Level, Medium Level and Low Level);
- the envisaged **consequences / impacts** which might stem from the risk occurrence;
- the **Mitigation Actions** to be implemented (either by the SESAR Deployment Manager or by other stakeholders) in order to reduce the likelihood of the risk occurrence, or to mitigate its impacts.



SESAR Deployment Programme – Risks and associated Mitigation Actions

1 Misalignment bet	ween DP and operational stal	keholders' ir	vestment p	lans <mark>Mediu</mark>	m Level Risk	
Objectives affected by the Risk	Timely PCP implementation and release of associated benefits	Impact	Medium	Probability	Medium	
Consequences and impacts	The gap analysis showed that there are families that are not implemented or just partially implemented in the PCP geographical scope. The impact of the late implementation of the Families identified as high relevance could lead to a potential delay of the overall PCP implementation. Furthermore, in some cases the deployment of pre-requisites is lagging behind, with potential impacts on the subsequent investment end dates. The analysis has been performed taking into consideration projects awarded through CEF Transport Calls, as well as other implementation initiatives not funded by INEA, potentially resulting in a postponement or cancellation by the operational stakeholders. When this situation occurs, the delivery of performance benefits would be delayed accordingly. Additionally, late or missed investment could also have a negative impact on other stakeholder categories, jeopardizing the achievement of full PCP objectives.					
Mitigation Actions	 By SESAR Deployment Manager Strong promotion of the Deployment Programme together with dedicated local face to face meetings between SDM and "concerned stakeholders" and/or group/platform of stakeholders (e.g. at airport level). Stress also at local level the need to close the gaps in the high readiness families as a priority; Strong promotion and information initiatives in order to emphasize the need to proceed with the deployment of pre-requisites and enablers for the Pilot Common Project; Preparation and distribution of information packages to the operational stakeholders to support/facilitate the submission of the IPs both at technical and financial/administrative level; Support/facilitate the submission of proposals through a dedicated and timely process (anticipated as much as feasible) on Indications of Interest; Facilitation of stronger partnership between the operational stakeholders in preparation for the upcoming CEF calls, both at local and European level; Enhancement of the transversal approach and buy in among airspace users, airports and ANSPs; Synchronisation / coordination activity on identified projects by SDM, through all phases, from their preparation towards the submission to INEA until the project so SDM and their effective transmission to INEA by SDM. Organize dedicated meetings and/or communication flows in order to ascertain why a project was not awarded and to check whether it can be successfully submitted within next CEF Calls. 					



2 PCP Implementa	mentation outside the framework of SESAR Deployment FPA High Level Risk					Level Risk	
Objectives affected by the Risk	PCP Benefits	Impact	High	Prob	ability	Medium	
Consequences and impacts	within its current mandate, SDM should prioritize its effort to monitor the progress of implementation only for those projects awarded through SESAR deployment FPA. Should a significant part of PCP be implemented outside SESAR deployment FPA and not properly monitored by SDM, this could lead to incomplete picture of PCP's implementation status and to an impact on overall performances analysis.						
Mitigation Actions	ation Actions By SESAR Deployment Manager To perform annually the monitoring exercise with stakeholders both inside and outside SESAR FPA, in order to keep track of all implementation initiatives related to PCP in EU. By other Stakeholders/Authorities EC to streamline the EU reporting processes in order to avoid any unnecessary						

3 Failure to adequ	uately achieve full military involvement					Medium Level Risk	
Objectives affected by the Risk	Full and timely PCP implementation, associated benefits	Impact	Medium	Pro	bability	Medium	
Consequences and impacts	The lack of adequate military involvement, both at European and local level, could lead to an insufficient buy in of the military community and to a "backlog" concerning the necessary investments in line with PCP and DP priorities.						
Mitigation Actions	 concerning the necessary investments in line with PCP and DP priorities. By SESAR Deployment Manager Maintain the strong communication channel between SDM and EDA in order to facilitate and accelerate dialogue with the military authorities (Cooperative Arrangement with EDA was signed on 29th June 2015); Continue to liaise with EDA to further facilitate local coordination between the local civil stakeholders (level 3) and the military authorities; Continue to support EDA in the promotion of the PCP and the DP amongst military authorities; Identify and highlight the areas where military projects can be expected in the context of CEF Transport Calls; Support implementing partners enabling the local civil/military authorities. By other Stakeholders EDA to continue with the promotion of the PCP amongst military authorities to submit Implementation Projects to CEF Transport Calls, partners to the Deployment Calls. 						



4 Failure to provid	le required standards and re	egulations o	on time	High L	evel Risk		
Objectives affected by the Risk	Harmonized PCP implementation, associated benefits	Impact	High	Probability	Medium		
Consequences and Impacts	Some of the families necessary for the full PCP implementation are not ready yet for deployment as indicated by their planned completion date of V3-phase (Pre- Industrial Development & Integration of E-OCVM – European Operational Concept Validation Methodology) and/or not covered by appropriate standards (ESOs and EUROCAE responsibilities), specifications and dedicated means of compliance (EASA responsibility). This issue could lead to a non-harmonized deployment, a lack of interoperability, integration problems and consequently to the need of reinvestments at a later stage to upgrade the deployed solutions to the required standards. Ultimately, this could negatively impact the operational deployment and the delivery of the expected benefits.						
Mitigation Actions	 By SESAR Deployment Man Continue to reinforce the syne SJU for the prioritization of Demonstrations (SDM has see EASA, EUROCAE and Europer work programmes with the of Standardisation Rolling De Cooperative Arrangement we EASCG (European ATM Starelevant organisations; Manufacturing industry and in contributing to the time marketing of the necessary ICAO for standards and reprovision as well as the apriorities. 	rgies with: of the valida signed the Co bean Standar deployment p evelopment vith EUROCAE ndards Coord operational ly developm hardware an recommended alignment of	tion exercise operative Arr dization Org priorities, as io Plan (RDP) 5); dination Grou stakeholders ent of the n d software; d practices, their conter	es and the L rangement wi anizations to dentified in th (SDM has up) bringing t to seek their ecessary star to ensure t nt with the o	arge Scale th SJU); align their e European signed the cogether all r assistance ndards and heir timely deployment		
	 By other Stakeholders/Authorities Relevant stakeholders to refer to and use existing standards and regulatory material and/or updated material to the greatest extent to avoid new rulemaking and/or standardisation tasks. EUROCAE members to adequately promote and provide resources to the working groups involved in the development of the required standards. EC to promote stronger commitment by key players for timely delivery and necessary funding to bodies involved in critical development of standards and regulation to secure necessary resources. Implementing stakeholders to report to SDM the identified issues experienced with standards and regulations, allowing the SDM to liaise with the relevant bodies. 						


5 Failure to ensu	re global interoperability			Medium	ı Level Risk
Objectives affected by the Risk	Harmonized PCP implementation, associated benefits	Impact	Medium	Probability	High
Consequences and impacts	 The consequences of the lack of global interoperability are the potential misalignment for avionics and/or processes between the different aviation world regions (e.g. between SESAR / NextGen, as the ATM modernisation programmes), potential misalignment between the different avionics vs. ground systems and amongst ground systems themselves. The potential impact could be: Civil and military Airspace users having to buy, certify, install, maintain, train and carry redundant systems; Increased costs and workload for civil and military airspace users, as well for airports and ANSPs; Additional costs due to misalignments could overshadow operational benefits and efficiencies. This risk is strongly linked to the Risk n. 4. 				
Mitigation Actions	By SESAR Deployment Man SESAR Deployment Manager h to handle this specific risk. SDM and SJU coordinate with this specific topic to ensure timelines of major ATM oper Master Plan and Deployment F With respect to ICAO activities with the members of the ICAA as required, under the political to ensure timely and content a Special focus is being given GANP/ASBUS update activities Furthermore, SDM is seekin (notably airborne equipme interoperability and alignment By other Stakeholders SJU with SDM promoting SE towards FAA/NextGen and ICA Relevant stakeholders to adec the working groups involved o EC to promote interoperable globally. High priority to be g Ground/Ground) and Surveilla	Ager has appointed FAA (NextGe adequate ac ation & tech Programme w s on global ha O working gr I guidance of lignment with to European ag assistance nt manufac of industrialit SAR requirer AO GANP/ASE quately prom on European a and synchr- iven on Data ince systems	d an Internat n and ATO) u tions in sec nical change vith NextGen armonisation oups nomina EC and in clo n the Europea n deploymer e from the turers) on ization and d BU activities. ote the SES/ and global lev onized mano Link System implementat	ional Relation under the EU/ uring require s through al Implementat , SDM is worl ated by Europ se cooperatio an deployment nt alignment manufacturin the issue eployment ro on full life AR deployment vel. dates, with t ns (both Air/(tion strategies	IS Manager US MoC on ments and ignment of ion Plan. <ing closely<br="">ean States in with SJU, it priorities. with ICAO of global padmaps. cycle view, nt needs to he US and Ground and s.</ing>



6 Misalignment betv	veen CEF co-funding profile and	l readiness fo	or implement	ation Hig	h Level Risk
Objectives affected by the Risk	Timely PCP implementation, associated benefits	Impact	High	Probabilit	y Medium
Consequences and impacts	The outcome of the Deployment Programme gap analysis, clearly states the need for more Implementation Projects by operational stakeholders to achieve full PCP implementation. Therefore, significant investments are still required. In particular, some key families in the DP are not ready for implementation ye due to an insufficient level of maturity. The conjunction of both constraints could lead to a significant time gap in PCI implementation.				ly states the rs to achieve I required. nentation yet e gap in PCP
Mitigation Actions	 By SESAR Deployment Man To continue the liaison with PCP requirements. To continue the cooperation that the lack of maturity implementation of the PCP. To carefully review the rear Planning View of the Deploy By other Stakeholders/Aut Align co-funding profile (calls of families' readiness for imp PCP throughout the whole CEP 	ager EC about th with SJU in o y of some diness of eac ment Progra horities and available lementation, period.	he availabilit order to empl functionalitie ch family in t mme. e co-funding) ensuring sm	y of grants hasize the c es has on the yearly u to foreseea hooth imple	to cover full ritical impact the overall update of the ble evolution mentation of

7 Late definition ,	/ failure to establish SWIM	governance		High	Level Risk
Objectives affected by the Risk	Timely and harmonized PCP implementation, associated benefits	Impact	High	Probability	Medium
Consequences and impacts	Implementation of SWIM-technology could be delayed significantly and/or SWIM interoperability could be substantially impaired due to a lack of SWIM governance in place.			and/or SWIM of SWIM-	
Mitigation Actions	By SESAR Deployment Mar Continue to support the acti Governance and all the releval SDM established and chaired a drafted a SWIM Governand implementation. Execution of 3 actions in acco and forms the basis for a new Airports, ANSPs, Airspace Use have proposed a common pi 2016, which was kicked off in By other Stakeholders Airports, ANSPs, Airspace Use MET service providers to Governance definition.	hager vities related int stakehold a dedicated S ce strategy ordance with SWIM Gover ers, Military A roject related February 20 ers, the Netw work togeth	to the esta ers. WIM Govern detailing th the Action P rnance projec Authorities ar to SWIM C 17. ork Manager er for the	ablishment of nance Focus na Action I Plan has bee ct. nd MET servi Governance	of the SWIM Feam, which Plan for its n completed ce providers for CEF Call thorities and of SWIM



8 Late implement	ation of AF6: Initial Traject	ory Informa	tion Sharin	g Medium	Level Risk
Objectives affected by the Risk	Timely PCP implementation, associated benefits	Impact	Medium	Probability	Medium
Consequences and impacts	DLS is an essential prerequisite for the business trajectory (Initial Trajectory Information Sharing) which is the backbone of the SESAR operational concept. Therefore, benefits from a considerable portion of SESAR solutions would be severely inhibited unless AF6 is fully implemented to achieve the required VDL Mode 2 network performance and capacity as well as the integration of the EPP into the ATM systems.				
Mitigation Actions	 By SESAR Deployment Man Monitoring the implementat "Data Link Services (DI implementation of the ELSA SDM to perform its role as D with EC mandate. Support operational stakeh Services (DLS) Recovery Pla Cooperate with EASA, NM, complementary activities ne in support of the i4D traject By other Stakeholders/Aut To adhere to the requirement Recovery Plan" and follow S EASA, EUROCAE and NM cooperation with SDM. 	ager ion of the DL S) Recover Crecommend SIMPlemer an". EUROCAE a eeded for the cory. Chorities Ints laid down DM indicatio to fulfil the	S in line with y Plan", v ations. ntation Project e implement and SJU in full deploym within the " ns and consu e mandates	the requirem which focuse thanager in ation of the the definition nent of Datalin Data Link Ser ultation steps. received by	ients of the s on the accordance "Data Link of all the nk Services vices (DLS) EC in full

9	Late delivery of	IOP SESAR Solutions			Medium	Level Risk
Ob	jectives affected by the Risk	Timely PCP implementation, associated benefits	Impact	Medium	Probability	Medium
C	onsequences and impacts	 The PCP regulation requires the provision of flight information exchanges through two different SWIM Technical Infrastructure (TI) profiles: Yellow TI profile for Flight information exchanges which do not require real time performance; Blue TI profile for the network intensive and real time exchanges of tactical Flight information data between ACCs and the Network Manager. The Blue profile is currently encountering some delays in its operational validation and consequently the update of ED 133 is being postponed until these validations are over. The initial IOP (iIOP) from SESAR 1 and some planned SESAR 2020 activities will serve as the basis for validating the PCP IOP standard which will be published in 2020 by EUROCAE as ED-133 Revision. The ED-133 update proposals will be provided by the SJU in the form of a deliverable. These deliverables will feed the work of EUROCAE WG-59 who will remain in charge of publishing a final ED-133 revision in 2020. This postponement implies a potential overall delay of AF5 and other related AFs with respect to PCP deadlines. 		exchanges require real of tactical operational until these ne planned OP standard The ED-133 able. These n charge of a potential ines.		
M	litigation Actions	 By SESAR Deployment Mar Continue the collaboration to synchronise the IOP vali Assess the industry's readi By other Stakeholders SJU to continue the on-going 2018, allowing a final ED-133 	hager with SJU on t dation and de ness for imple activities to o revision in 2	the on-going eployment ro ementation deliver a con 020.	IOP validatio oadmaps; nplete SESAR	n activities, Solution in



10	Late industrialis	sation decisions			M	1edium	Level Risk
Obj	jectives affected by the Risk	Timely PCP implementation, associated benefits	Impact	Medium	Prob	ability	Medium
Со	onsequences and impacts	The industrialisation decision for developing the expected capabilities may not be made by the manufacturers if an adequate return on investment is not envisaged, even if the standards are available. This might be the case, in particular, for airborne functions where a mandate is not put in place.				es may not nent is not ne case, in e.	
M	itigation Actions	 By SESAR Deployment Man Activate cooperative arrang the Manufacturing Industr common view of the capabi Identify alternative fundir development. 	gements and gements and ry, in order ilities require ng and fina	/or other me to align ex d for deployi ncing mecha	eans o pectat ment; anisms	of coope ions an s to su	ration with d share a pport this

11	Jnaddressed cy	ber-security vulnerabilities			High	Level Risk
Obje	ectives affected by the Risk	Timely PCP implementation, associated benefits	Impact	High	Probability	Medium
Cor	nsequences and impacts	Contrary to the traditional A bespoke systems, the level besides the usage of COTS Moreover, the interactions be have also grown. These cha however, introduce vulnera security risks, which is ev internet based solutions . A the system, the implementati are secure as a whole, than systems (including legacy sy European ATM system.	TM systems, of automatic systems and tween tradit inges and to abilities into en more sig As even low i fon roadmap ks to a secu ystems), cor	that used to on and inter nd open stational actors echnological of the system gnificant wi impact incide must ensure ure integration tributing as	o work as a roperability v andards, has and also with a improvem is in the form th the intro ents could end that delivered on into opera a result to	network of vithin ATM, increased. n new ones ents may, n of cyber- duction of ode trust in ed solutions ational ATM a resilient
Mit	igation Actions	 By SESAR Deployment Mar To identify in the DP those standards and regulations, to and regulations. By other Stakeholders/Aut • EC to ensure efforts on ATM options for strengthening of • SJU to establish principles a resilience is included approx 	families whi gether with t thorities 1 cyber-security and processes priately with	ch present a the available ity are coord and resilien s for ensuring in the SESAR	a need of cy cybersecurit inated, and a ce. g that cyber-s work progra	vbersecurity y standards ssess policy security and mme.



12 Misalignment in	n Full Operational Capability	dates		Medium	Level Risk
Objectives affected by the Risk	Timely PCP implementation, associated benefits	Impact	Medium	Probability	Medium
Consequences and impacts	Dependencies between Families may cause misalignment between their Full Operational Capability target dates. For example, whilst some sub-functionalities in AF2 are supposed to be implemented by 2024, they are also a pre-requisite for another AF/Sub-AF to be deployed by 2021. This could entail a delay in the achievement of the PCP deadlines, as a consequence of the un-readiness of the predecessors.				
Mitigation Actions	 By SESAR Deployment Man Identify dependencies am between their FOC target of and SDM proposed mitigati Liaise with EC to present to on timely and full PCP depl Support EC in the identifiprocess. By other Stakeholders/Aut EC to launch the PCP review to the state of the state o	hager longst Famili dates. Inform ion strategies he results of oyment; ication of inc chorities o solve incon	es which m applicants ; the analysis consistencies sistencies.	ay cause mi about the cor and the poss during the I	salignment 1sequences ible impact PCP review

13	Lack of adherend	ce to SESAR Deployment Prog	ramme		Medium	Level Risk
Obj	ectives affected by the Risk	Timely PCP implementation, timely release of associated benefits	Impact	High	Probability	Low
Со	nsequences and impacts	Lack of buy-in of Deployment Programme would negatively affect the level of engagement and involvement in the implementation of the Pilot Common Project and in the overall ATM modernization effort. Such low engagement could result in lower investments (or no investments), thus affecting the overall implementation of the PCP.				
Mi	itigation Actions	 By SESAR Deployment Man Continue with the involution stakeholders impacted by Consultation Platform. Continue taking into accorduring consultation cycles between the statement of the	hager lvement and the PCP r bunt the com by operationa	d engageme egulation th nments and al stakeholde	ent of all nrough the S suggestions ers.	operational Stakeholder formulated



LIST OF ACRONYMS



6. List of Acronyms

Acronym	Meaning
A/G	Air / Ground
A-CDM	Airport Collaborative Decision Making
ADS-C	Automatic Dependent Surveillance – Contract
AF	ATM Functionality
AFP/ACH	ATC Flight Plan / ATC Flight Plan Change Message
AFUA	Advanced Flexible Use of Airspace
AMAN	Arrival Manager
ANSP	Air Navigation Service Providers
AOP	Airport Operations Plan
APCH	Approach
APV	Approach Procedure with Vertical guidance
ARES	Airspace REServations
ASBU	Aviation System Block Upgrade
ASM	AirSpace Management
A-SMGCS	Advanced Surface Movement Guidance and Control Systems
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATFCM	Air Traffic Flow and Capacity Management
ATM	Air Traffic Management
ATM MP	ATM Master Plan
ATN	Aeronautical Telecommunication Network
ATSP	Air Traffic Services Provision
AU	Airspace Users
CBA	Cost Benefit Analysis
ССО	Continuous Climb Operations
CDM	Collaborative Decision Making
CDO	Continuous Descent Operations
CEF	Connecting Europe Facility
CPDLC	Controller Pilot Data Link Communications
CPs	Common Projects
СТМ	Collaborative Traffic Management
СТОТ	Calculated Take-Off time
DCB	Demand Capacity Balancing
DCT	Direct Routings
DL	Data Link
DLS	Data Link Services
DMAN	Departure Manager
DP	Deployment Programme
EASA	European Aviation Safety Agency
EASCG	European ATM Standards Coordination Groups
EATM	European Air Traffic Management
EDA	European Defence Agency
EFS	Electronic Flight Strips
EGNOS	European geostationary navigation overlay system
E-OCVM	European Operational Concept Validation Methodology
EPP	Extended Project Profile



Acronym	Meaning
ERNIP	European Route Network Improvement Plan
ESOs	European Standardization Organizations
EU	European Union
EUROCAE	European Organization for Civil Aviation Equipment
FAA	Federal Aviation Administration
FAB	Functional Airspace Block
FO	Flight Object
FOC	Full Operational Capability
FPA	Framework Partnership Agreement
FRA	Free Route Airspace
G/G	Ground / Ground
GANIS	Global Air Navigation Industry Symposium
GANP	Global Air Navigation Plan
GHG	Greenhouse Gas
HMI	Human Machine Interface
ICAO	International Civil Aviation Organization
INEA	Innovative Network and Energy Agency
IOC	Initial Operational Capability
IOP	Interoperability
IP	Implementation Project
IP	Internet Protocol
IPP	Implementing Partners
IR	Implementing Regulation
KPAs	Key Performance Areas
MoC	Memorandum of Cooperation
NM	Network Manager
NOP	Network Operations Plan
NSP	Network Strategy Plan
OMIV	Occupancy Traffic Monitoring Values
PBN	Performance Base Navigation
PCP	Phot Common Project
PENS	
PKI	Project Management Office
DDB	Performance Review Body
	Polling Development Plan
PND	Required Navigation Performance
SBAS	Satellite Based Augmentation System
SCP	Stakeholder Consultation Platform
SDM	SESAR Deployment Manager
SES	Single European Sky
SESAR	Single European Sky ATM Research
SID	Standard Instrument Departure
SJU	SESAR Joint Undertaking
STAM	Short Term ATFCM Measures
STAR	Standard Arrival Routes
STAR	SESAR Tool for ATM Roll-out



Acronym	Meaning
SWIM	System Wide Information Management
TBS	Time Based Separations
TI	Technical Infrastructure
ТМА	Terminal Manoeuvring Area
TSAT	Target Start Up Approval Time
TSG	Thematic Sub-Groups
TTA	Target Time of Arrival
ттот	Target Take Off Time
VDL	VHF Digital Link
WBS	Work Breakdown Structure



7. Notes







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